ISSN 1811-5446

THE LAHORE JOURNAL OF ECONOMICS

Lahore School of Economics

Volume 16, No.1 **Jan-June, 2011**

THE LAHORE JOURNAL OF ECONOMICS

(Vol. 16 - 1, 2011)

Contents:

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 1-22

Prospects for Cooperative Marketing among Surgical Instrument Producers in Pakistan

Theresa Thompson Chaudhry*

Abstract:

Given that clustered firms in developing countries generally sell their goods through multinational firms, we seek to determine under what conditions might clustered surgical instrument firms band together and form a cooperative to "break out" of their relationship with multinational buyers to market their own goods. Our results, based on a survey of surgical instrument producers in Sialkot, Pakistan, demonstrate that firms are more likely to be interested in such initiatives once they have already had some direct experience in marketing, such as selling products under their own brand name and having already sold some goods directly to hospitals. Firms that have had relationships of longer duration with customers tend to be less likely to be interested in joint action initiatives. This indicates that a higher opportunity cost of engaging in joint action (as proxied by relationships of longer duration) reduces the likelihood of cooperative marketing initiatives in clusters.

Keywords: Surgical instruments, goods, cooperative, market, Pakistan.

JEL Classification: D24, M31, J54.

1. Introduction

An industrial cluster consists of a group of firms that are specialized by sector, located in close geographic proximity and composed mainly of small and medium-sized enterprises. Industrial clusters have been viewed as important in developing countries due to the significant contributions they make to their economies through the

* Associate Professor, Department of Economics, Lahore School of Economics, Pakistan.

generation of employment, output, and exports.[1] In the literature on clusters, some authors have termed the benefits of agglomeration *active* and *passive collective efficiency*. Passive collective efficiencies, such as market access, access to a large pool of skilled labor, technological spillovers, flexible specialization (vertical disintegration), and reduced transaction costs, are enjoyed by firms by virtue of their location within the cluster. On the other hand, active collective efficiencies require purposeful cooperation between the firms of the cluster to upgrade production, also called "joint action."[2] In this study, we wish to understand which firm and cluster characteristics contribute to firms' interest in intra-cluster cooperation to engage in a joint marketing initiative to sell their own goods, a form of active collective efficiency.

Given that industrial clusters in developing countries export the majority of their output through middlemen in developed countries, some authors express concern that these small manufacturers will remain as low value added producers while the multinationals designing, marketing, and retailing will keep the larger share of the profits (Schmitz, 1999). On the other hand, the proximity of clustered firms (both geographic and cultural) may provide a unique opportunity for small and medium sized firms to assert their interests and collectively market their goods in the world market.

This study provides an empirical analysis to determine which factors influence the decision of exporting firms in Sialkot's surgical instrument cluster to engage in a hypothetical joint venture that would allow them to market their own goods. Cooperation among the clustered firms may be necessary since many are too small individually to make the investments required to successfully market and distribute their output in a developed country market. This analysis will help to shed light on the ability of other, similar clusters to undertake initiatives of this type. We find that exporters with some previous experience in direct marketing are more interested in a consortia with other firms to market goods. On average, firms with a long trading relationship with its oldest customer

[1] Clusters produce a significant amount of output, with a great deal of this output bound for the export market. For example, India's Palar Valley clusters produce forty-five percent of the country's leather, where there are at least 600 tanneries in five clusters. In Tirruppur, India, there were at least 2000 clustered cotton knitwear firms in 1995, which produced about 70 percent of India's exports of this commodity (Banerjee and Munshi (2000)). In Ludhiana, India, there were 10,000 firms and 200,000 workers producing Rs 241 billion (almost $10 billion in U.S. 1991 dollars) of woolen knitwear in 1991 (Tewari (1999)). In Agra, India, 5000 clustered firms were producing 300,000 pairs of shoes per day in 1991-92 (Knorringa (1999)).

[2] Schmitz and Nadvi (1999), pg. 1504.

tend to express less interest in joint marketing agreements, most likely due to the fact that longer duration trading relationships are of high (and certain) value. Interest in joint marketing was unrelated to firm size, age, or utilization of bank credit.

In this paper, we attempt to determine whether firm level characteristics affect the decision of exporting firms to engage in a joint action marketing initiative. In other words, we determine which factors contribute to the exporting firms deciding to join together to collectively market their own goods rather than sell their output through a middleman. The rest of the paper will proceed as follows. Section 2 will discuss some of the relevant literature pertaining to clusters and joint marketing among firms. In Sections 3 and 4, we describe Sialkot's surgical instrument cluster and the design of the survey conducted there. The empirical model is set up in Section 5 and the results presented in Section 6. Section 7 concludes.

2. Literature Review

There is a substantial case study literature on clusters in developing countries including Brazil, India, Mexico, Pakistan, and Peru. These studies are mainly descriptive, highlighting the perceived benefits of clustering, both passive and active. Often, these studies stress the role of active cooperation among clustered firms that are jointly facing problems ranging from trade liberalization, loss of markets, and new quality and environmental standards (Kennedy (1999), Nadvi (1999a), Rabellotti (1999), Tewari (1999)). In addition, some have suggested that clustered firms may be able to cooperate in order to "break out" of the relationship with foreign buyers and carry out their own design and marketing in order to gain a greater share of producer surplus (Humphrey and Schmitz (2000), Kaplinsky (2000), Schmitz (1999)). Success in this respect has been mixed. Clustered shoe producers in Brazil were able to penetrate regional but not international markets in the design, distribution and marketing of output (Schmitz (1999)).

Rabelloti (1999) focused on the Guadalajara cluster in Mexico, and in particular how inter-firm relationships had been affected by increased competition after trade liberalization. She found firm performance to be positively correlated with inter-firm cooperation, both horizontal (with fellow manufacturers) and vertical (with suppliers), although the survey instruments were not wholly objective measures.

Schmitz (1999) examined the successes and failures of cooperative behavior in the 1980s and 1990s among Brazilian firms operating in Sinos Valley footwear cluster. Greater cooperation between manufacturers and intermediate input producers enabled improvements in the quality of goods, decreased delivery times and smaller batch sizes, in accordance with the changing demands of foreign buyers from the U.S. Starting in the late 1980s, increased competition from China for U.S. buyers put pressure on the firms in the cluster. The "Shoes from Brazil Program," a major joint action initiative to improve marketing abroad, failed because the largest five exporting firms (that were vertically integrated and had a close relationship with the largest U.S. buyer) undermined the plan, using their influence in the shoe manufacturers' association, Abicalcados.[3]

Cooperative marketing has been fairly extensively studied in agricultural settings. Also, in the management and marketing literature, there have been discussion papers on cooperative strategies (including marketing arrangements) within "fragmented industries" (Dollinger (1990)) and documentation of joint marketing arrangements among retailers and manufacturers (Dickinson and Ramaseshan (2008)). In industrial settings, however, there is little economic literature on this specific subject. The studies of joint ventures in industrial organization tend to focus on issues of transaction costs and residual rights of ownership for evaluating the optimality of investment levels achieved (Bai et al (2004), Cai (2003)). One exception is Kogut (1988), who studied the stability of joint venture agreements in the U.S., finding no relationship between joint marketing/distribution and the break-up of joint ventures.

Thompson (2005) developed a theoretical model of "joint action" for clustered firms to cooperatively market their own goods. It examined the conditions under which clustered firms in a developing country, heterogeneous in their expected quality of output, could functionally upgrade through cooperation to eliminate a foreign distributor from a developed country acting as an intermediary between the clustered manufacturers and the final market for the goods. The model proved that joint action can potentially occur among high quality type firms, but that low quality firms would continue to export through a middleman. An important determinant of whether joint action occurs is the opportunity cost of such initiatives, as determined by the prices that the middleman is willing to pay for the cluster's goods. The model also showed that joint action is more likely to take place when i) the size of the cluster, the

[3] Schmitz (1998), p 34.

probability of producing high quality output by the high type firms, and the final market price of the good are high, and ii) when the probability of producing high quality by the low type firms and the marketing cost are low. While the high quality firms do not need to be in the majority for cooperative marketing to succeed, a critical mass of high quality firms (the size of which depends on the parameter values) must exist as a necessary condition.

There is a small literature on industrial clusters in Pakistan, focusing primarily on the Sialkot surgical goods cluster. Nadvi (1999) documented the reaction of firms to actions by the U.S. Food and Drug Administration to halt imports from Sialkot on quality and safety grounds, leading to increased acquisition of ISO certifications by the cluster. Ilias (2001) focused on the role of family labor in Sialkot, concluding that there existed a labor market distortion such that family managers were preferred to non-family and therefore firm output was correlated with family size. Thompson (2005) and Chaudhry (2011) examined the relational aspects of inter-firm trust and switching costs respectively.

3. Description of the Sialkot's Surgical Instrument Sector

In Sialkot (Punjab, Pakistan), a cluster of surgical instrument manufacturers operates, consisting of approximately 230 producers and 2000 subcontracting firms (see Table 1). The cluster produces around 10,000 different varieties of surgical, veterinary, and manicuring instruments mainly for foreign markets including the United States and Western Europe, with three-quarters of the cluster's output destined for these two regions.[4] While the U.S. mainly imports Sialkot's disposable instruments, Europe principally imports the re-useable variety.[5] This output of the cluster is economically important, as it produces approximately 150,000 pieces annually with the value of production estimated at Rs 22 billion.[6]

Within the cluster, the production process typically takes place in stages. Other than the largest manufacturers, production of a final good is not carried out in a single firm. A large number of small firms that specialize in one or more stages of the production process constitute the vendor segment. On the other hand, larger firms sub-contract out few processes, and that the largest firms carry out 80-90 percent of production

[4] SMEDA (2001), pg 16, pg. 21.
[5] SMEDA (2001), pg. 17.
[6] LUMS (2010), pg. 172.

processes in-house.[7] The cluster also has local business associations, including the Metal Industries Development Centre, the Sialkot Dry Port Trust, the Sialkot Chamber of Commerce and Industry (SCCI) and the Surgical Instrument Manufacturer's Association (SIMA).

Table 1: Surgical Instrument Firms in Pakistan

Size of Firm	Number of Firms	Number of Employees	Revenues (Pakistan Rupees)	Capital (Pakistan Rupees)
Large	30	250-400	Rs 60-100 million	Rs 50-100 million
Medium	50	100-250	Rs 10-60 million	Rs 10-25 million
Small	150	30-50	Rs 1-10 million	Rs 1-5 million
Vendors	2000	5-20	Rs 1-1.5 million	Rs 50,000-1 million
Traders	800-1000	na	na	Na

Source: Board of Investment, Government of Pakistan

The origins of the cluster are quite interesting, having originated more than 100 years ago. Local blacksmiths began producing surgical instruments around the start of the 20th century at the request of the American Mission Hospital in Sialkot. In the 1930s, the cluster began exporting regionally to countries such as Egypt and Afghanistan, and supplied Allied forces during World War II. The industry expanded after World War II, but strong pro-labor legislation that was passed in 1973 led to dramatically increased labor costs for firms with more than 10 employees, leading the industry to shift to extensive sub-contracting, referred to as "vendorization."[8]

Quality concerns have plagued the cluster at times and reached a crisis point in 1994 when the U.S. Food and Drug Administration (FDA) halted imports from Pakistan, which was resolved when the firms adopted Good Manufacturing Practice (GMP) standards (Nadvi, 1999a). Not all firms use the most technologically advanced equipment and processes, as many of the machines have been locally built by means of reverse-engineering techniques. Again, the largest companies contrast with the smaller firms in that they tend to utilize more modern equipment. Nonetheless, the direct cause of the difficulties with the FDA were problems with the alloy composition of locally manufactured steel used for the disposable instruments, a problem that was accentuated by

[7] SMEDA (2001), pg. 39.
[8] SMEDA (2001), pg. 9 and pg. 52.

the lack of proper testing facilities.[9,10] Even after many Sialkot firms obtained GMP certificates, the firms continued to only have access to an outdated facility to test steel composition.

4. Description of the Survey Instrument

For purposes of this study, we designed and commissioned a survey of the surgical instrument cluster in Sialkot, Pakistan. However, when the interviewer (from a local university) visited the cluster, she found that only about 180 of the 220 exporting firms that were listed by SIMA (the local business association) were actually in operation at that time. Of these, 76 exporters at least partially completed the questionnaire, resulting in a 43 percent response rate.

The survey covered several aspects of the exporters' interactions with other firms, including relationships with its customers and suppliers. One portion of the survey dealt (which will be utilized here) with firms' current efforts at direct sales to hospitals and doctors, and the firms' interest in joint marketing initiatives. This section of the questionnaire can be found in Annex 1.

Table 2: Current Marketing Strategies

	Sales Under Your Own Name	Any Direct Sales to Hospitals	Internet Marketing
Yes	55.4%	69.6%	71.4%
No	44.6%	30.4%	28.6%
Number of Observations	56	56	56

With respect to the firms' current marketing strategies, nearly half of firms sell some products under their own name, and about 30 percent of firms engage in direct sales to hospitals (Table 2). An equal share engage in some direct sales through the internet. Appendix Tables 1 and 2 break these down by firm size (measured by employment) and firm age, but no clear pattern emerges.

From the survey, we know that thirty firms state that the idea of joint marketing has in fact already been discussed among exporters in Sialkot. The other questions dealt with the firms' interest in a *hypothetical*

[9] SMEDA (2001), pg. 49.
[10] Imported steel is used for the re-usable instruments.

joint marketing initiative (Tables 3a, 3b, and 3c). Interest was generally low, with just over a quarter of firms displaying some interest in a joint venture of this type. Of those potentially interested, about half of the firms would require a 25 to50 percent increase in prices paid to entice them to join. Stricter quality requirements from current customers (which would lower the value of the current relationship) led to similar answers, with slightly less than one-fourth of firms responding affirmatively. About one-third of firms would be more amenable to joint marketing if the majority of participating firms were large, while a similar share showed preference toward a joint venture with small firms. Looking at the breakdown by firm size, firms tended to favor a joint venture with other firms of the same size as them. This is consistent with other literature on joint ventures including Human and Provan (1997) and Saxton (1997). In Human and Provan (1997), alliance success appeared to be loosely correlated with the homogeneity of the alliance members. Saxton (1997) found subjective satisfaction with alliances to be positively correlated with structural similarities with a partner. Dickson and Weaver (1997) found a small positive correlation between alliance use and firm size.

More firms – over half – showed interest in direct sales through the internet. Overall, judging from Appendix Tables 1 and 2, the larger firms appear to be less interested in joint marketing, but more so in direct sales through the internet as compared to the small and medium sized firms. No clear patterns emerge with respect to these variables and firm age.

Tables 3a, 3b, and 3c: Interest among Exporters in Direct Sales and Joint Marketing.

Table 3a: General Interest in Joint Marketing, Conditional on Output Price

	Percent
Not interested in joint marketing	73.2
Yes, if 50% price increase	5.4
Yes, if 25% price increase	7.1
Yes, if 10% price increase	8.9
Yes, even if no price increase	5.4
Number of Observations	56

Table 3b: Interest in Joint Marketing, Conditional on Reactions of Existing Customers

	If Higher Quality Standards Imposed	Interest in Direct Internet Sales
Not interested in joint marketing	71.4%	42.9%
Yes, if don't lose current customers	7.1%	30.4%
Yes, even if lose current customers	14.3%	16.1%
No Answer	7.1%	10.7%
Number of Observations	56	56

Table 3c: Interest in Joint Marketing, Conditional on Size of Other Firms in Co-op

	If Mostly Large Firms in Co-op	If Mostly Small Firms in Co-op
More interested in joint marketing	32.1%	28.6%
Not more interested	62.5%	67.9%
No Answer	5.4%	3.6%
Number of Observations	56	56

5. Framework for Analysis

Probit regression techniques are used to determine how firm-level characteristics affect the decision of an exporting firm to engage in joint action to market their own goods. The dependent variable comes from the survey question asking about the exporting firms' interest in a hypothetical joint marketing initiative.

Drawing from the theoretical model developed by Thompson (2005), we hypothesize that the value of the firm's current trading relationship will be an important determinant of interest among firms in joint marketing. Specifically, the higher the value of the current trading relationship, the less likely will firms be to want to endanger it by enlisting alternate marketing channels. Other firm characteristics that could potentially influence the proclivity of exporters to engage in a joint action initiative to market their own goods include risk aversion, access to credit (as a source of funds to set up the project), and previous experience of the firm with direct marketing. Summary statistics for each of these variables can be found in Appendix Table 3. We estimate the following equation:

$$P_i = \alpha + \beta E_i + \gamma R_i + \delta D_i + \phi Z_i + \varepsilon_i$$

where:

E: Experience with direct marketing

R: Relationship with other firms

D: Opportunity cost of joint marketing

Z: Firm level controls

Previous experience in direct marketing is measured by two dummy variables that the firms have sold products under their own name and have sold some goods directly to hospitals. A prediction about the likely impact of previous experience with marketing is not immediately apparent. The existing literature on alliances between firms (for marketing among other joint ventures) indicates that previous experience with alliances contributes positively to the likelihood of future alliances (Gulati, 1995; Saxton, 1997). However, it says little about the effect of previous experiences in direct marketing on such cooperatives. Previous experiences with direct marketing will provide those firms with better information about both the costs and benefits of direct marketing. On the one hand, firms that have had some marketing experience might be more likely to be interested in expanding their efforts through a larger and broader joint marketing initiative if their past experience proves that the costs are high relative to the per firm benefits. On the other hand, if they have already had some success marketing on their own, they may not be interested in sharing their knowledge and experience with the rest of the cluster if the benefits per firm are high relative to the costs of breaking in. Given that we do not have estimates of the per firm costs or benefits of joint marketing, we will proceed without making a prediction for the signs of these coefficients.

Relationships between firms are measured by a dummy variable that firms speak at least weekly with other producers. Frequent interaction with other firms may positively affect a firm's joint marketing decision because this interaction may serve to spread information and help the initiative to gain momentum and support among the cluster firms. We predict that this variable will positively influence the decision of firms to participate in joint marketing. We also predict that access to credit, proxied by use of credit, should positively affect the decision to participate, since

these firms are more able to fund their participation in the initiative.

On the other hand, a firm's decision to participate in a direct marketing scheme should be inversely related to the value of the firm's trading relationship with its current trading partners. This variable is proxied by the duration of the firm's relationship with its oldest customer. Firms that are more risk averse should also be less likely to be interested in a joint action initiative. The proxies used to measure risk aversion are firm size (number of employees) and firm age. The hypothesis is that larger and older firms are less risk averse and therefore will express greater interest in joint marketing.

6. Regression Results

Probit and linear probability regressions are estimated for the probability that firms would decide to participate in the hypothetical joint action initiative, using various firm-level characteristics as explanatory variables as described in the previous sub-section. The results of these regressions are presented in Table 4.

The results show that firms with some previous experience in direct marketing, including selling some products under their own name and selling some goods directly to hospitals, have a greater interest in carrying out a joint venture with other firms for purposes of marketing. In the full probit model, firms that sell products under their own brand name are 26 percent more likely to be interested, and firms that have already sold some goods directly to hospitals are 34 percent more likely to be interested in a joint marketing initiative.

Firms that have had longer duration relationships with customers tend to be less likely to be interested in joint action. Increasing the duration of a firm's relationship with their oldest customer by one year reduces the likelihood that a firm is interested in a joint marketing initiative by about 8 percent. Increasing the duration by one standard deviation (from 11.55 to 20.19 years) reduces the probability that a firm is interested in joint action by nearly 52 percent. These results are consistent with the hypothesis that firms with a higher opportunity cost of joint action would be less likely to participate in such initiatives. Since the coefficient on the duration-squared variable is positive, one may be concerned that the impact of duration on the likelihood of carrying out joint action may become positive for some sample points. However, the median duration of relationship (with the oldest customer) is 10 years, and the effect of duration on joint action only

becomes positive at 38.5 years, and only one firm has a relationship of duration longer than this value.

Table 4: Joint Action Results, Marginal Effects

	Probit	Probit Full Model	Linear Probability	Probit (no dur)	Probit (% sale)	IV Probit (For Talk Weekly)
Employment (in tens)	0.003 (0.18)	0.009 (0.38)	-0.0003 (-0.03)	0.001 (0.05)	0.009 (0.48)	-0.007 (-0.43)
Employment squared	-0.0002 (-0.83)	-0.0004 (-0.6)	-0.0001 (-0.56)	-0.0002 (-0.7)	-0.001 (-1.0)	-1.4E-05 (-0.05)
Age	-0.013 (-0.8)	0.023 (1.16)	0.021 (0.79)	-0.009 (-0.59)	0.034 (1.54)	0.053 (1.61)
Age squared	0.0004 (1.09)	-0.0002 (-0.62)	-0.0002 (-0.36)	0.0003 (0.82)	-0.0004 (-0.88)	-0.001 (-1.16)
Sell some products under own name	0.250* (2.01)	0.257+ (1.95)	0.238+ (2.01)	0.256* (1.99)	0.195+ (1.73)	0.188 (1.25)
Sell some products to hospitals directly	0.267 (1.98)*	0.343* (2.34)	0.335** (2.71)	0.245+ (1.79)	0.321* (2.07)	0.324+ (1.93)
Relationship Duration - oldest customer (years)		-0.077** (-2.77)	-0.076** (-2.84)		-0.085** (-2.78)	-0.105** (-3.06)
Duration squared		0.002** (2.71)	0.002** (2.73)		0.002** (2.96)	0.003* (2.63)
Credit Use		0.111 (0.89)	0.136 (1.19)	0.046 (0.33)	0.089 (0.91)	0.302 (1.45)
Talk at Least Weekly with Other Producers		0.172 (1.37)	0.182+ (1.77)	0.131 (1.03)	0.122 (0.98)	0.644 (1.35)
Percentage Sales to Oldest Customer					0.001 (0.78)	-0.001 (-0.32)
Observations	56	56	56	56	46	46
Prob>Chi² (or Prob>F)	0.01	0.011	0.001	0.084	0.037	0.014
(Pseudo) R-squared	0.187	0.35	0.356	0.204	0.37	0.129

(Marginal effects coefficients reported; Robust z or t statistics in parentheses, **significant at 1%, *significant at 5%, +significant at 10%)

Having credit, either from a bank or through a credit association has a positive but insignificant effect on the likelihood of being interested in direct marketing. Since the cost of such an initiative was not discussed in the questionnaire, it is possible that the firms did not consider the potential cost when answering the questions about joint action.

Risk aversion (as measured by firm size and age) does not appear to affect the decision to participate in a joint marketing initiative. Intra-cluster

communication as measured by frequent interactions with other producers, while positive in sign as expected, also had no significant impact.

6.1. Robustness Checks

When the full model is estimated as a linear probability model, the results change very little whether in terms of the magnitudes of the coefficients or the statistical significance. The only noticeable impact is on "talk weekly with other producers" which becomes significant at the 10 percent level in the linear probability model.

There was some concern about the high correlation between firm age and duration of relationship with the oldest customer driving the results on the duration variable. However, when duration is dropped from the regression, the age variable still does not gain significance. Adding the percentage of sales to the oldest customer has very little impact, when the duration variable is added back into the regression.

In the final specification, we attempted to instrument for the frequency of inter-firm communication with variables associated with the quality of such interactions, including belief in the strength of informal contract enforcement and the use of social contacts to gain information about customers. The magnitude of the instrumented coefficient rises, but does not gain statistical significance. However, this is not surprising given that the first-stage results were weak.

7. Conclusions

Consortia have been proposed by UNIDO and others in order to allow small firms to generate greater bargaining power and achieve greater economies of scale.[11] UNIDO goes a step further and actively promotes export consortia in a number of countries including Morocco, Peru, Tunisia, and Uruguay, including the upgrading of member firms, joint purchases, promotion of exports and common branding (Antoldi et al, 2009). They find that homogeneity of the group of firms involved is an important factor in success when considering size, sector, and level of internationalization (with complementarities in product offerings also beneficial). Anecdotally they appear to have been successful in achieving these objectives; however, to our knowledge a scientific evaluation (using treatment and control groups) has not yet been implemented.

[11] LUMS makes a similar proposal for the fan industry in Gujrat and Gujranwala, Pakistan.

One can imagine that the outlook for joint marketing of goods might be difficult, particularly since the development of a brand name requires vigilance over and uniformity of quality. Indeed, in our survey, the general interest in joint marketing was low at little more than 25 percent. The joint marketing regression results show that exporters with some previous experience in direct marketing, including selling some products under their own name and selling some goods directly to hospitals, are more interested in carrying out a joint action with other firms to market goods. On average, firms with a long trading relationship with its oldest customer tend to express less interest in joint marketing agreements, most likely due to the fact that longer duration trading relationships are of high (and certain) value.

References

Antoldi, F., Cerrato, D., and Depperu, D. (2009). The Strategic Management of Export Consortia: An Analysis of the Experience of UNIDO in Morocco, Peru, Tunisia, and Uruguay. Report prepared for UNIDO.

Bair, J., and Gereffi, G. (2001). Local Clusters in Global Chains: The Causes and Consequences of Export Dynamism in Torreon's Blue Jeans Industry. *World Development*, 29 (11), 1885-1903.

Banerjee, A., and Munshi, K. (2000). Networks, Migration, and Investment: Insiders and Outsiders in Tirupur's Production Cluster. Mimeo.

Chaudhry, T. (2011). Contracting and Efficiency in the Surgical Goods Cluster of Sialkot, Pakistan. *South Asia Economic Journal,* 12(1), 91 – 115.

Dickinson, S. and Ramaseshan, B. (2008). Maximising Performance from Cooperative Marketing: Understanding the Role of Environmental Contexts. *Journal of Marketing Management,* 24 (5-6), 541 – 566.

Gulati, R. (1995). Does Familiarity Breed Trust? The Implications of Repeated Ties for Contractual Choice in Alliances. *The Academy of Management Journal*, 38(1), 85 – 112.

Human, S., and Provan, K. (1997). An Emergent Theory of Structure and Outcomes in Small-Firm Strategic Manufacturing Networks. *The Academy of Management Journal*, 40(2), 368 – 403.

Knorringa, P. (1999). Agra: An Old Cluster Facing the New Competition. *World Development,* 27 (9), 1587-1604.

Kogut, B. (1988). Joint Ventures: Theoretical and Empirical Perspective. *Strategic Management Journal*, 9 (4), 319 – 332.

Government of Pakistan, (2010). Industrial Policy, Its Spatial Aspects, and Cluster Development in Pakistan, Vol. 1: Analysis Report of the Industrial Policy 2010. Report prepared for the Ministry of Industries and Production, Government of Pakistan.

Nadvi, K. (1999). Collective Efficiency and Collective Failure: The Response of the Sialkot Surgical Instrument Cluster to Global Quality Pressures. *World Development,* 27(9), 1605-1626.

Nadvi, K. (1999). Shifting Ties: Social Networks in the Surgical Instrument Cluster of Sialkot, Pakistan. *Development and Change,* 30 (b), 141-175.

Saxton, T. (1997). The Effects of Partner and Relationship Characteristics on Alliance Outcomes. *The Academy of Management Journal*, 40(2), 443 – 461.

Schmitz, H. (1999). Responding to Global Competitive Pressure: Local Co-Operation and Upgrading in the Sinos Valley, Brazil. IDS Working Paper 82.

Schmitz, H. and Nadvi, K. (1999). Clustering and Industrialization: Introduction. *World Development,* 27 (9), 1503-1514.

Small and Medium Enterprise Development Authority (SMEDA), (2001). Government of Pakistan, Surgical Instrument Industry of Pakistan: Issues in Export Growth and Development Draft Report.

Tewari, M., (1999). Successful Adjustment in Indian Industry: the Case of Ludhiana's Woolen Knitwear Cluster, *World Development,* 27 (9), 1651-1671.

Thompson, T., (2005). Cooperation in Developing Country Industrial Clusters: Marketing in an Age of Globalization. Unpublished PhD Dissertation, University of Maryland College Park.

Appendix

Sialkot Firm Questionnaire (Selected Questions)

Name of Firm being interviewed: _____

Part 1: GENERAL QUESTIONS about interviewed firm:

1. What is the name of your firm? _____

2. How many employees did you have in August 2001? _____

3. When did your firm start to operate? _____

4. How many different products does your firm manufacture? _____

5. What percentage of your firm is owned by:

(a) the top manager or his family? _____%
(b) other private individuals? _____%
(c) other private firms? _____%
(d) other _____%

Part 2: Questions about cooperation and marketing

6. Does your largest customer
   (a) sell the surgical instruments you produce only under their own brand name
   (b) sell the surgical instruments you produce only under your company's name
   (c) sell some items under their brand name and others under your company's name

7. Does your second largest customer
   (a) sell the surgical instruments you produce only under their own brand name
   (b) sell the surgical instruments you produce only under your company's name
   (c) sell some items under their brand name and others under your company's name

8. Do you currently sell any surgical instruments directly to hospitals? (0) No (1) Yes
   If yes, do you use the internet/world wide web to market your products? (0) No (1) Yes

9. If other firms in the cluster were forming a cooperative to sell surgical instruments directly to hospitals rather than selling to surgical instrument companies in the U.S. and Europe, would you join it?
   (0) No (1) Yes *(if answer is yes, continue to next part of question, otherwise, go to question 10)*
   Would you still want to do that if it meant you lost your business relationship with the surgical instrument companies that currently buy from you? (0) No (1) Yes

10. Would you join in a cooperative with other manufacturers in Sialkot to market your products directly to hospitals or doctors rather than selling to surgical instrument companies in the U.S. and Europe if:
    (a) the price that hospitals paid for surgical instruments rose 10%? (0) No (1) Yes *(if answer is no, continue to part (b), otherwise go to question 11)*
    (b) the price that hospitals paid for surgical instruments rose 25%? (0) No (1) Yes *(if answer is no, continue to part (c), otherwise go to question 11)*
    (c) the price that hospitals paid for surgical instruments rose 50%? (0) No (1) Yes *(if answer is no, go to question 12, otherwise go to question 11)*

11. If the price that hospitals paid for surgical instruments rose and you were considering joining the cooperative, would you still want to join the cooperative if it meant you lost your business relationship with the surgical instrument companies that currently buy from you? (0) No (1) Yes

12. If the minimum quality standards demanded by surgical instrument companies rose, would you join a cooperative with other manufacturers in Sialkot to market your products directly to hospitals? (0) No (1) Yes (if answer is yes, continue to next part of question, otherwise, go to question 13)
    Would you still want to join the cooperative if it meant you lost your business relationship with the surgical instrument companies that currently buy from you? (0) No (1) Yes

13. If hospitals were willing to buy surgical instruments directly from Sialkot firms through the internet, would you consider doing that? (0) No (1) Yes (if answer is yes, continue to next part of question, otherwise, go to question 14)
    Would you still want to joint the cooperative if it meant you lost your business relationship with the surgical instrument companies that currently buy from you? (0) No (1) Yes

14. Would you be more likely to join such a cooperative if the other firms joining were mostly large firms? (0) No (1) Yes

15. Would be more likely to join such a cooperative if the other firms joining were mostly small firms? (0) No (1) Yes

16. Additional comments: Has the idea of a cooperative among Sialkot firms to avoid the middleman and sell directly in the U.S. and Europe ever been discussed? What factors would influence your decision?

_____

_____

_____

_____

_____

_____

Part 3: Questions about CUSTOMERS of the interviewed firm:

(The "First Customer" refers to your largest customer at the time your firm started as a private firm.)

	First Customer	**Newest Customer**
22. How long has he been a customer?	_____Years _____Months	_____Years _____Months

Part 5: FINAL GENERAL QUESTIONS

84. How often do you talk with other surgical instrument manufacturers in Sialkot?

(a) daily
(b) weekly
(c) monthly
(d) less frequently / not at all

87. Do you currently receive state or private bank financing? (1) yes (0) no

88. Do you belong to any sort of credit or saving association? (1) yes (0) no

Appendix

Table 1: Current Marketing Strategies and Interest in Joint Marketing, by Firm Size

	<20 Employees	20 - 49 Employees	50 - 149 Employees	150 - 249 Employees	>250 Employees	Total (% of firms overall)
Current Marketing Strategies						
Sales Under Your Own Name (current)	50.0%	38.9%	38.5%	85.7%	16.7%	44.6%
Any Direct Sales to Hospitals (current)	25.0	33.3	38.5	28.6	16.7	30.4
Internet Marketing (current)	16.7	33.3	38.5	28.6	16.7	28.6
Interest in Joint Marketing, Depending on Prices						
Not Interested	58.3%	77.8%	61.5%	85.7%	100.0%	73.2%
Yes, if 50% price increase	0.0	11.1	7.7	0.0	0.0	5.4
Yes, if 25% price increase	8.3	5.6	15.4	0.0	0.0	7.1
Yes, if 10% price increase	25.0	5.6	0.0	14.3	0.0	8.9
Yes, even if no price increase	8.3	0.0	15.4	0.0	0.0	5.4
Interest in Joint Marketing, if Higher Quality Standards Imposed by Current Cust.						
Not interested	70.0%	81.3%	76.9%	71.4%	83.3%	76.9%
Yes, if don't lose current customers	20.0	6.3	7.7	0.0	0.0	7.7
Yes, even if lose current customers	10.0	12.5	15.4	28.6	16.7	15.4
Interest in Direct Internet Sales						
Not interested	50.0%	62.5%	41.7%	50.0%	16.7%	48.0%
Yes, if don't lose current customers	50.0	18.8	25.0	33.3	66.7	34.0
Yes, even if lose current customers	0.0	18.8	33.3	16.7	16.7	18.0
Interest in Joint Marketing, Size of Other Firms in Co-op						
More interested if mostly large firms	25.0%	20.0%	46.2%	42.9%	50.0%	34.0%
More interested if mostly small firms	58.3	31.3	15.4	0.0	33.3	29.6

Appendix

Table 2: Current Marketing Strategies and Interest in Joint Marketing, by Firm Age

	5 Years or Less	6 - 10 Years	11 - 20 Years	21 - 35 Years	More than 35 Years	Total (% of firms overall)
Current Marketing Strategies						
Sales Under Your Own Name (current)	37.5%	75.0%	37.5%	50.0%	16.7%	44.6%
Any Direct Sales to Hospitals (current)	37.5	12.5	43.8	22.2	33.3	30.4
Internet Marketing (current)	37.5	12.5	43.8	16.7	33.3	28.6
Interest in Joint Marketing, Depending on Prices						
Not Interested	62.5%	75.0%	75.0%	77.8%	66.7%	73.2%
Yes, if 50% price increase	12.5	0.0	6.3	5.6	0.0	5.4
Yes, if 25% price increase	12.5	0.0	6.3	0.0	33.3	7.1
Yes, if 10% price increase	0.0	12.5	12.5	11.1	0.0	8.9
Yes, even if no price increase	12.5	12.5	0.0	5.6	0.0	5.4
Interest in Joint Marketing, if Higher Quality Standards Imposed by Current Cust.						
Not interested	71.4%	87.5%	86.7%	70.6%	60.0%	76.9%
Yes, if don't lose current customers	14.3	0.0	0.0	17.6	0.0	7.7
Yes, even if lose current customers	14.3	12.5	13.3	11.8	40.0	15.4
Interest in Direct Internet Sales						
Not interested	42.9%	50.0%	64.3%	43.8%	20.0%	48.0%
Yes, if don't lose current customers	28.6	37.5	21.4	43.8	40.0	34.0
Yes, even if lose current customers	28.6	12.5	14.3	12.5	40.0	18.0
Interest in Joint Marketing, Size of Other Firms in Co-op						
More interested if mostly large firms	28.6%	37.5%	31.3%	29.4%	60.0%	34.0%
More interested if mostly small firms	50.0	50.0	18.8	23.5	20.0	29.6

Appendix

Table 3: Summary Statistics

	Mean	Median	Std. Dev.	Min	Max
Number of Employees	95.54	45.5	121.45	5	585
Firm Age	18.59	16.5	12.34	2	53
Sell Some Products Under Own Name (0,1) (dummy)	0.46	0	0.50	0	1
Sell Some Products Directly to Hospitals (0,1) (dummy)	0.30	0	0.46	0	1
Would Participate in Joint Action (0,1) (dummy)	0.27	0	0.45	0	1
Duration of Trading Relationship with Oldest Customer (years)	11.55	10	8.64	1	40
Talk at Least Weekly with Other Producers (0,1) (dummy)	0.45	0	0.50	0	1
Credit Access (0,1) (dummy)	0.59	1	0.50	0	1

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 23-62

The Trade Potential of Pakistan: An Application of the Gravity Model

Nazia Gul* **and Hafiz M. Yasin****

Abstract

This paper attempts to estimate Pakistan's trade potential, using the gravity model of trade. Panel data for the period 1981-2005 across 42 countries is employed in the analysis. The coefficients obtained from the model are then used to predict the country's trade potential worldwide as well as within specific trading regions. The results reveal that Pakistan's trade potential is highest with countries in the Asia-Pacific region (the Association of Southeast Asian Nations [ASEAN]), the European Union (EU), the Middle East, Latin America, and North America. Specifically, the maximum potential exists with Japan, Sri Lanka, Bangladesh, Malaysia, the Philippines, New Zealand, Norway, Sweden, Italy, and Denmark. Therefore, Pakistan should explore ways and means to further improve its trade relations with the countries concerned, and also concentrate on ASEAN, the Middle East, and the EU to increase its market share as far as possible. The volume of trade between Pakistan and other members of the South Asian Association for Regional Cooperation (SAARC) and Economic Cooperation Organization (ECO) is very low, despite the existence of significant potential. The main obstacles to this end are the political and social tensions among neighboring countries, particularly between Pakistan and India, which are the main players of SAARC. The same obstacles exist in the case of the EU and NAFTA, where Pakistani exports are adversely affected by political considerations.

Keywords: Trade potential, gravity model, Pakistan.

JEL Classification: F19, O16.

1. Introduction

Pakistan has recently witnessed a significant increase in exports as a result of rapid improvement in the international trading environment. During 2002/03 to 2005/06, Pakistan's exports remained at 16 percent of gross domestic product (GDP) per annum, while imports remained at 29

* Research Officer at the Economic Advisor's Wing, Finance Division, Government of Pakistan, Islamabad.
** Associate Professor at the International Islamic University, Islamabad.

percent of GDP on average. Pakistan has adopted an export-led growth strategy since 2000/01 and the success of this strategy obviously requires that Pakistan have greater access to international markets for its products. The government has started negotiating several bilateral and regional trade agreements with neighboring countries. However, despite the importance of regional trade and the government's serious efforts, the volume of Pakistan's trade within SAARC and ECO is not up to the mark. The primary reasons for low trade within the region are obviously the political and military tensions that have prevailed among the major players for decades, and the protectionist policies adopted by the nations concerned. If the members succeed in removing the tariff and nontariff barriers as visualized by the SAARC charter, all countries of the region, including Pakistan, will reap the benefits of intra-regional trade.

The present study attempts to estimate Pakistan's overall trade potential with its traditional partners and other important countries by using panel data estimation. Further, keeping in view the importance of the implementation of the South Asian Free Trade Agreement (SAFTA) 2006, the study analyzes the extent of SAARC's integration into the world economy in general and for Pakistan in particular. The results are expected to provide useful insights into the trading capacity of Pakistan and help identify new areas for exploration.

The paper is organized as follows. We discuss the theoretical foundations of the gravity model in the following section. Section 3 provides a general overview of the application of this model. Here, we review some important studies on trade potential and the impact of regional trading arrangements on trade flows. Section 4 presents the model and discusses the methodology, while Section 5 discusses the data used in the estimation. Section 6 presents the primary results of the gravity model and Section 7 uses the estimated values of parameters to compute the trade potential of Pakistan. The last section presents conclusions and policy implications.

2. Theoretical Foundations

The gravity model derives from Newton's Law of Universal Gravitation and Bergen (1962) and Poyhonen (1963) pioneered the use of this concept in the area of international trade. According to the model, the volume of trade between two countries, like the gravitational force between two objects, depends directly on their respective 'masses' (where GDP is often used as a proxy for mass) and inversely on the distance

between them (which captures the transportation costs). The gravity equation thus derived can be expressed as:

$$F = G\ \frac{m_1 \,.\, m_2}{r^2} \quad \Rightarrow Trade_{ij} = \alpha .\ \frac{GDP_i \,.\, GDP_j}{Distance_{ij}} \qquad (1)$$

This equation is often transformed into linear form so that it conforms to the usual regression analysis:

$$\log\left(Trade_{ij}\right) = \alpha + \beta_1 \log\left(GDP_i .GDP_j\right) + \beta_2 \log\left(Distance_{ij}\right) + u_{ij} \qquad (2)$$

The classical application of the model is provided in Linnemann (1966), who added an additional variable to the model to reflect the commodity composition of the trade flows. The model was modified by Leamer (1974) for two-digit Standard International Trade Classifications (SITC) for commodities, and includes separate measures of relative factor endowments as independent variables to determine the impact of income and population. Although the gravity model of trade has been an empirical success, its theoretical justification has been subject to some controversy. Attempts have been made to explore its connections with the key elements of trade theory. These attempts are more recent, and are reviewed below.

Anderson (1979) was the first to apply utility functions (Cobb-Douglas and Constant Elasticity of Substitution) to derive the gravity model using the properties of linear expenditure systems (LES). It is an alternative method of carrying out cross-section budget studies and one with potentially important efficiency properties. However, its use is limited to countries where the preference for traded goods is similar and where taxation structures and transportation costs are also comparable.

Bergstrand (1985) applied CES preferences and generalized the gravity model by introducing prices. In another attempt, Bergstrand (1989) applied the monopolistic competition model and assumed that goods are differentiated among firms rather than countries. He offered an analytical framework for understanding the gravity equations, which is consistent with modern theories of inter-industry and intra-industry trade. A general equilibrium model of international trade was developed to illustrate how the gravity equation complies with the Heckscher-Ohlin model of inter-industry trade and/or the Helpman-Krugman-Markusen models of intra-industry trade. It should be noted that Helpman and

Krugman (1985) derived the gravity model under the assumption of increasing returns to scale in production. Bergstrand (1990) further extended the microeconomic foundations for a generalized gravity model to incorporate differences in the relative factor endowment and nonhomothetic preferences.

Anderson and van Wincoop (2001, 2003) have provided a general understanding of how border barriers affect trade and welfare in the context of the simple gravity model. They derive the gravity equation using the properties of market clearance and the CES structure of demand.

3. Applications of the Model

3.1. *An Overview*

Clarete et al. (2000) use the gravity model of bilateral trade to evaluate the effect of different preferential trading arrangements (PTAs) in the Asia-Pacific region. They use cross-section and panel data estimation techniques. Besides considering the basic determinants of the gravity model (GDP, distance, population, etc), they introduce dummies to measure the impact of PTAs on the trade of countries in the Asia-Pacific region. Their findings indicate that PTAs have contributed significantly to trade expansion both at the global and regional level. The study provides evidence that PTAs can create rather than divert trade.

Boris and Vedran (2002) discuss the level of trade integration within the southeast Europe (SEE) region, using simple tools such as the trade openness ratio and trade concentration indices. The authors conclude that the target trade potential for Croatia lies within the EU and Central Europe Free Trade Agreement (CEFTA) countries. Therefore, any further liberalization of trade with the SEE countries should be accompanied by similar considerations for EU and CEFTA countries.

Using panel data estimation techniques, Rehman (2003) applies the generalized gravity model to analyze the trade of Bangladesh with its major partners. The results show that Bangladesh's trade is positively determined by the size of economies, per capita gross national product (GNP) differential of the countries involved, and openness of the trading countries.

Konkhartchank and Maurel (2003) examine the impact of institutions on trade, and estimate the potential of trade between the

Commonwealth of Independent States (CIS),[1] central eastern European countries, and EU via the gravity model. They find that CIS trade is still characterized by a very large trade destruction effect, which implies that trade with EU countries could increase in the long run provided that the said effect is minimized. They conclude that trade reinforcing/trade openness will have a positive impact on growth only if institutions can create an environment conducive to safe and secure exchange and ensure that trade is attractive to and profitable for all parties.

Batra (2004) analyzes India's global trade potential by applying the augmented gravity model and using ordinary least squares (OLS) techniques. The model is used first to analyze international trade flows and then to estimate the trade potential of India with its partners. In addition to the primary variables, income and distance, the model is augmented by several conditioning variables that affect trade. The study indicates that India has maximum trade potential in the Asia-Pacific region, followed by Western Europe and North America. The highest potential for expansion of trade exists with China, the UK, Italy, and France, provided that certain barriers and constraints are removed. The results show that India could potentially attain ten times or more the level of existing trade with certain other countries, including Central Asian states such as Georgia, Turkmenistan, and Uzbekistan.

Helmers and Pasteels (2005) use 'TradeSim' (the third version of a gravity model software) to calculate the trade potential for developing countries and economies in transition. They show how gravity models can be specifically designed and applied.

Rehman et al. (2006) apply the augmented gravity model to identify trade creation and trade diversion effects originating from the SAARC Preferential Trading Agreement (SAPTA) and the other nine members of the Regional Trade Agreement (RTA). While using the panel data approach with country pair-specific and year-specific fixed effects, they note the expected signs for all the usual gravity variables and dummies. They find a significant intra-bloc export creation effect in SAPTA, but there is evidence of a net export diversion effect as well. Their results show that Bangladesh, India, and Pakistan are expected to gain from joining the RTA.

---

[1] The CIS comprises 11 countries: Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

3.2. *Studies on Pakistan*

There are only a few studies on Pakistan that use the gravity model. Here, we briefly discuss their main findings.

Khan (2000) estimates the gravity model to establish a relationship between bilateral trade in Pakistan and economic, geographical, and cultural factors. The trade volume (exports and imports of ten major commodities) is taken as the dependant variable. The explanatory variables are the real exchange rate, tariffs, distance, product of GNPs, product of per capita GNPs, official language (English), bordering country, and dummies to represent SAARC, ASEAN, NAFTA, and the EU. The model includes 21 countries and uses data for 1985, 1990, and 1994, covering ten commodities. All the variables are found to be highly significant except the variable for the bordering country, which is negative. This can be attributed to the historical conflict between India and Pakistan.

Another study conducted by the State Bank of Pakistan (2005) estimates a gravity model at the sectoral level. The value of exports is used as the dependant variable and several dummies are included to capture the effects of a common border, tariffs, common language, conflict, and geographical location, etc. The dataset covers 15 sectors for the years 2002 and 2003 to examine the trade potential of Pakistan with selected trading partners. The results indicate significant scope for expanding trade between Pakistan and India. According to the report, the true trade potential could have been far greater had both countries not engaged in conflicts, or had tariff and nontariff barriers been kept low. The sectoral level analysis indicates the existence of high trade potential in textiles, leather products, chemicals, food, beverages, and tobacco products.

Similarly, in a study conducted by the World Bank, Baroncelli (2007) applies the gravity model to estimate the "peace dividend" from trade in the case of Pakistan-India relations, where confrontation has been the norm for the past 50 years. The model uses bilateral trade data for 166 countries for the period 1948-2000 to estimate the trade potential between the two countries. The model includes two specific dummies to capture the impact of (i) PTAs, and (ii) a significant militarized dispute between Pakistan and India in any given year. The results indicate that, in the absence of war, trade would have been $591 million in 2000: a peace dividend of $474 million as against the recorded trade of $117 million for

that year. Likewise, adding the peace dividend and RTA gains leads to a potential trade volume of $683 million between Pakistan and India. The study concludes that the link between conflict and trade is negative and significant. It also confirms that the presence of systems of regional preference induces a higher flow of imports among partner countries.

4. Rationale for Study

As discussed in the introduction, Pakistan's exports are historically concentrated in a few products and directed towards a few countries. This situation could lead to severe instability in the trade sector. Pakistan's exports (mainly textiles) are directed toward the US, Germany, Japan, UK, Hong Kong, Dubai, and Saudi Arabia. The US is the single-largest export market for Pakistan, accounting for 26.4 percent of its exports, followed by the UK and Germany. Japan is fast vanishing as a destination for Pakistani exports: its share in total exports has been in decline for a decade, from 5.7 percent a decade ago to less than 1 percent last year (*Pakistan Economic Survey* for 2006/07). It seems clear that Pakistan needs to diversify its exports not only in terms of commodities but also in terms of markets for export stability. The case of imports follows a similar story. A brief picture of the factual position is given in Appendix-I.

Therefore, it is important to identify the countries or regions where Pakistan has high trade potential. This is the primary objective of the study. The testable hypothesis is whether the trade potential is high within the geographic region or outside. For this purpose, we use the gravity model (augmented) as our tool of analysis. It is obvious that, in South Asia, member countries could gain considerably more from unilateral trade liberalization than from the current SAPTA or proposed SAFTA. However, if tariff and nontariff barriers to trade among members are reduced further, then all these countries could experience welfare gains from the liberalization of bilateral trade. This could have a significant trade creation effect under SAPTA. The SAARC region would benefit substantially from regional integration and SAFTA, which is most likely to promote intra-regional trade. The gravity model can help evaluate the importance of SAFTA for the region as well as the extent of integration for SAARC into the world economy in general and for Pakistan in particular.

5. Analytical Framework

As discussed briefly in Section 2, the gravity model derives from Newton's Law of Universal Gravitation (like several other laws and concepts that were specific to the physical sciences). According to the gravity concept, the volume of trade between two countries depends directly on their respective sizes (usually the economic size as reflected by GDP) and inversely on the distance between them (as a proxy for transportation costs). Bergen (1962) and Poyhonen (1963) pioneered the use of the gravity concept in economic relationships. The primitive model is shown in Equation (1) above, in which the value of bilateral trade is directly related to the product of the GDPs of the trading partners, and inversely related to the distance between the two. The log-linear version of the model, commonly used in analysis, has also been shown as Equation (2). However, the rudimentary form has been further augmented by researchers to focus on other determinants of bilateral trade. It is interesting to note that theory has followed practice in the case of the gravity model.

5.1. *Augmented Gravity Model*

In addition to the traditional variables, several other conditioning variables can be added to the gravity model to account for other factors affecting bilateral trade. For instance, the basic model might include GDP per capita in the partner countries as an additional argument. More complicated models might contain other explanatory variables, such as the absolute value of per capita income differentials (PCGDPD) and dummies for a common border (BORDER), common language (LANG), and common socioeconomic region (REGL), etc. As usual, the dummies can take values of units or zeros. A representative equation is as follows:

$$\log(Trade_{ij}) = \alpha + \beta_1 \log(GDP_i GDP_j) + \beta_2 \log\left(PCGDP_i.PCGDP_j\right) + \beta_3 \log\left(Distance_{ij}\right) + \beta_4(BORDER_{ij}) + \beta_5(LANG_{ij}) + \beta_6(REGL) + \beta_7(PCGDPD) + u_{ij} \quad (3)$$

We intend to use the above equation/s or a variant in our analysis with further extensions. (For a detailed description of the variables, see the appendix).

5.2. *Panel Data Framework*

Traditionally, classical gravity models have been expressed as single equations using cross-sectional data to estimate trade flows

between a pair of countries for a particular period (one year). However, the panel data framework provides more useful information vis-à-vis single-equation models, and has become increasingly popular since it allows the study of a particular issue at multiple sites with periodical observations over a defined timeframe. Several estimation techniques have been used while using the panel data approach. In particular, the fixed effect and random effect models are the most prominent:

a. The Fixed Effect Model (FEM)

In the FEM, the intercept in the regression is allowed to differ among individual units in recognition of the fact that each cross-sectional unit might have some special characteristics of its own. Thus, the model can be written as:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} \quad (4.a)$$

The subscript *i* to the intercept term suggests that the intercepts across the individuals are different, but that each individual intercept does not vary over time. The FEM is appropriate in situations where the individual specific intercept might be correlated with one or more regressors (Gujrati, 2003). To take into account the differing intercepts, the use of dummy variables is the most common practice and, therefore, the specification is known as the least-squares dummy variable (LSDV) model, which can be written as:

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \beta_2 X_{2it} + \beta_{3it} + u_{it} \quad (4.b)$$

However, there is a disadvantage to the LSDV in that it consumes a number of degrees of freedom when the number of cross-sectional units is very large, since one has to introduce N dummies.

b. Random Effect Model (REM) or Error Components Model (ECM)

In contrast to the FEM, the REM assumes that the intercept of an individual unit is a random draw from a much larger population with a constant mean (Gujrati, 2003). The individual intercept is then expressed as a deviation from this constant mean value. The REM has an advantage over the FEM in that it is economical in terms of degrees of freedom, since we do not have to estimate N cross-sectional intercepts. The REM is appropriate in situations where the random intercept of each cross-sectional unit is uncorrelated with the regressors. The basic idea is to start

with Equation (5.a). However, instead of treating β_{1i} as fixed, it is assumed to be a random variable with a mean value of β_1. Then the value of the intercept for individual entity can be expressed as:

$$\beta_{1i} = \beta_1 + \varepsilon_i \quad \text{where i = 1, 2,…, n} \tag{5.a}$$

The random error term is assumed to be distributed with a zero mean and constant variance:

Substituting (5.c) into (5.a), the model can be written as:

$$\begin{aligned} Y_{it} &= \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_i + u_{it} \\ &= \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + w_{it} \end{aligned} \tag{5.b}$$

The composite error term w_{it} consists of two components: ε_i is the cross-sectional or individual-specific error component, and u_{it} is the combined time series and cross-sectional error component, given that $\varepsilon_i \sim (0, \sigma^2_\varepsilon)$, $X_{it} \sim (0, \sigma^2_u)$, where ε_i is independent of the X_{it} (Gujrati, 2003).

Generally, the FEM is held to be a robust method of estimating gravity equations, but it has the disadvantage of not being able to evaluate time-invariant effects, which are sometimes as important as time-varying effects. Therefore, for the panel projection of potential bilateral trade, researchers have often concentrated on the REM, which requires that the explanatory variables be independent of the ε_i and u_{it} for all cross-sections (i, j) and all time periods (t) (Egger, 2002). If the intention is to estimate the impact of both time-variant and invariant variables in trade potential across different countries, then the REM is preferable to the FEM (Ozdeser & Ertac, 2010).

5.3. *Endogeneity Issue*

The commonly employed gravity model, as shown in Equation (3) above, has been criticized for a two-way causation between the dependent variable (trade volume) and explanatory variable (GDPs of the trading partners). This is referred to as an endogeneity issue that can lead to biased estimates (although the degree of bias is unknown). A plausible solution is to use an instrumental variable to proxy the size of the economy: population instead of GDP, for instance. However, the populations of trading partners are often heterogeneous. Another

solution is to use the trade-GDP ratio as the dependent variable, but this leaves no scope for the GDPs to be used as explanatory variable. Yet another possible remedy is to use a simultaneous equation framework, which, when reduced, will lead to separate equations for both mutually dependent variables, which can be estimated using the generalized method of moments (GMM) technique or some other technique. However, this might also suffer from identification problems. In general, it is easy to find appropriate instruments that should be independent of the target variable and, at the same time, closely associated with the variable being replaced. Therefore, it seems advisable to confine ourselves to the general specification employed by numerous researchers and to set aside the endogeneity issue for the purposes of this paper.

6. Sample Size and Data

In order to estimate the trade potential of Pakistan, we follow a two-step procedure. First, we estimate the basic gravity model to determine the coefficients of Pakistan's trade flows with its trading partners. In continuation, we estimate the augmented gravity model by including other variables so as to evaluate their impact on trade. Finally, the estimated coefficients are used to evaluate Pakistan's trade potential in general and particularly in the presence of certain other regional groups.

We consider 42 countries (including Pakistan) from within different regional groups. These countries were selected keeping in view the importance of their trading relationships with Pakistan as well as the availability of data. We select three countries from **SAARC**: Bangladesh, India, and Sri Lanka; four countries from **ASEAN**: Indonesia, Malaysia, the Philippines, and Thailand; two countries from **NAFTA**: Canada and the US; and almost all countries from the **EU**: Belgium, France, Germany, Denmark, Italy, Sweden, Switzerland, Greece, the Netherlands, Portugal, Spain, and the UK. Likewise, we have included countries such as Egypt, Iran, Turkey, Kuwait, and Saudi Arabia from the **Middle East**; Australia, New Zealand, Japan, China, and Hong Kong from the **Far East**, and Argentina, Brazil, Chile, and Mexico from **Central and South America** in the analysis.

Annual data for the period 1981-2005 is considered, including Pakistan's exports to and imports from all other trading partners. This data was obtained from the Direction of Trade Statistics yearbook (various issues) published by the International Monetary Fund (IMF).

Data on GDP, GDP per capita, exchange rates, total imports, and total exports were obtained from the World Development Indicators (2007) database. Likewise, data on the consumer price index (CPI) was obtained from the International Financial Statistics database. Data on distance (km) between Islamabad (the capital of Pakistan) and the capital cities of other countries were obtained from www.indo.com/distance. A detailed discussion of the variables involved is given in Appendix-II.

7. Results of Gravity Model

Here, we discuss the results obtained from applying the gravity model to our panel data (on Pakistan's bilateral trade relations with its partners) with increasing detail at successive stages.

7.1. *Basic Gravity Model*

Specifically, we estimate Equation (2) (slightly modified for the REM) here, which is reproduced below for the time period t = 1981-2005 and for a cross-section of 42 countries, including Pakistan (the j_{th} country), which implies 41 pairs of cross-observations:

$$\log\left(Trade_{ij}\right)_t = \beta_1 + \beta_2 \log\left(GDP_i \cdot GDP_j\right)_t + \beta_3 \log\left(Distance_{ij}\right)_t + \omega_{ijt} \qquad (2)$$

The results are reported in Table-1 below. Both the traditional variables (product of GDP and distance) are found to be significant. They are of reasonable magnitude and carry the expected signs. We can deduce from this that Pakistan's bilateral trade with the countries concerned will increase by 0.95 percent as the product of GDPs increases by 1 percent. Likewise, the coefficient of the distance variable implies that, when the distance (as a proxy for transportation cost) between Pakistan and its trading partner increases by 1 percent on average, bilateral trade decreases by 1.44 percent. Hence, both variables are theoretically consistent with the hypothesis of the gravity model in that Pakistan's trade is directly related to the economic size of the partners and inversely related to the distance between them.

Table-1: Basic Gravity Model

Independent Variable	Coefficient	Standard Error*	t-Statistic*
Constant	-5.09	5.56	-0.92
Product of GDP	0.96	0.04	22.06
Distance	-1.45	0.67	-2.17
Adjusted R-squared	0.50	-	-

* The standard errors and t-statistics are hetroskedasticity-robust (White, 1980).

We also attempt to estimate the model by adding the product of per capita GDP of Pakistan's trading partners as an explanatory variable in addition to the primary variables (GDP and distance). However, the results are not encouraging. Although all three variables are statistically significant and carry the anticipated signs, the value of the coefficient of GDP is much smaller than that in the original model (i.e., in the absence of per capita GDP). The reason is obvious. Multicollinearity is likely to exist between the two explanatory variables, i.e., gross GDP and GDP per capita. Hence, it seems appropriate to drop this variable from further analyses.

7.2. *Augmented Gravity Model*

Next, we estimate the augmented gravity model for Pakistan. In addition to the traditional variables, the model incorporates the per capita differential and several other dummies to capture the impact of certain important factors on bilateral trade. The general model employed is shown as Equation (6) below:

$$\log (Trade_{it}) = \beta_0 + \beta_1 \log X_{1it} + \beta_2 \log X_{2it} + ...+\delta_1 D_{1t} + \delta_{2t} D_{2t} + \ldots\ldots + \omega_{it} \quad (6)$$

X stands for quantitative/ordinary variables (product of GDP, distance, and GDP differential) and D for qualitative/binary variables (dummies). The results are presented in Table-2 and a brief discussion follows.

Table-2: Augmented Gravity Model

Explanatory Variable	Coefficient	Std. Error*	t-Statistic*
Constant	-0.92	6.02	-0.15
Product of GDP	0.92	0.05	18.93
Distance	-1.95	0.73	-2.67
Border	-1.51	0.65	-2.33
Language	0.86	0.34	2.55
SAARC	-0.19	0.49	-0.39
ECO	0.52	0.56	0.92
Per capita GDP differential	0.11	0.05	2.32
Adjusted R-squared	0.50	-	-

Note: *The standard errors and t-statistics are hetroskedasticity-robust (White, 1980).

As evident from the above, the coefficient of the product of GDP is statistically significant at 1 percent and carries the expected sign. This reveals that Pakistan's bilateral trade increases by 0.92 percent as the product of GDP increases by 1 percent. The coefficient of the distance variable is negative and statistically significant at 5 percent. It implies that a 1 percent increase in distance leads to 1.95 percent reduction in trade between Pakistan and its trading partners.

In addition to the two primary variables, we include the absolute difference in GDP per capita for a pair of countries as an explanatory variable in the model so as to test for the relative strength of the Linder hypothesis vis-à-vis the Heckscher-Ohlin (HO) hypothesis. The coefficient of the variable concerned is positive and significant at 5 percent. The estimated value is 0.11, which implies that bilateral trade increases as the difference between the per capita GDP of Pakistan and its trading partner increases, but less than proportionately. Thus, the available results support the HO hypothesis (differences in factor endowments) in the case of Pakistan.

We discuss the impact of various qualitative variables below:

(i) To control for adjacency, we have included the border dummy variable. Interestingly, the coefficient of this variable has a negative sign (-1.51) and is statistically significant at 5 percent. As the model is specified in log form, we have to interpret the coefficient by taking the exponential. The projected results [exp (-1.508914)-1 = - 0.78] imply

that Pakistan's trade with its neighboring countries (those that share a common border) is 78 percent lower than expected. Apparently the results contradict theory/common wisdom. However, the reasons are obvious: only two countries, India and Iran (included in the analysis), have a common border with Pakistan. Trade with India, in particular, is restricted due to political conflict. Further, much of the border trade between Pakistan and Iran and Pakistan and India is underground and unrecorded. Likewise, lower skills and similar products, the low level of industrialization in the region, and more or less the same level of technical progress and development are also why Pakistan's trade with its neighboring countries is not as high as one would expect theoretically.

(ii) The dummy for common language is statistically significant at 5 percent and has the expected positive sign. The coefficient value 1.35 [exp (0.856285)-1 =1.35] indicates that trade between Pakistan and those countries with whom it shares a common language or culture will be higher by 135 percent.

(iii) The SAARC dummy variable does not show any significant impact on Pakistan's trade. The coefficient of the SAARC dummy itself is 0.17 [exp (-0.19)-1 = -0.17]. It shows that Pakistan's trade with SAARC countries is 17 percent lower than that of the rest of the world. Mutual trade within the region as a share of total trade is lowest in South Asia. The trade-GDP ratio is decreasing within SAARC, but increasing among countries outside SAARC. As discussed above, the low level of trade within SAARC is mainly due to political disputes between the major players, Pakistan and India. Similarly, countries' low levels of industrialization, similar levels of development, and enormous volume of unrecorded trade might also contribute to poor results. India and Pakistan have a significant role to play in the success of SAARC. Both countries account for four-fifths (80 percent) of the regional economy. However, efforts to promote regional integration and cooperation through SAARC have suffered greatly due to tensions and conflicts in the region (World Bank, 2006).

(iv) Likewise, the model fails to establish a significant relationship between Pakistan and other ECO members. Hence, we can conclude that both regional organizations are not playing their expected role in boosting trade flows among member countries. In contrast, all SAARC and ECO countries are involved in high trade outside these nominal RTAs.

7.3. *Further Augmentation*

Here, we try to re-estimate the model by incorporating certain other explanatory variables, particularly openness to trade and the real exchange rate, which seem to be important in international trade considerations. The inclusion of these variables will provide a test for the sensitivity of the model and its robustness. Two alternative proxies have been used by researchers for openness, namely the proportion of customs-to-total tax revenues and the trade-GDP ratio. However, the latter proxy is often preferred for obvious reasons. For instance, Rahman (2003) uses the trade-GDP ratio in a gravity model to analyze trade flows between Bangladesh and its trading partners. Hence, we also use this variable as a proxy for openness, primarily because data is available for the countries concerned.

The enhanced model shows some improvement over its counterpart in terms of goodness of fit. The coefficients for the primary variables, i.e., GDP (size of the economy) and distance between economic centers, are significant and carry the expected signs. Thus, the enhanced model supports the former results as per the basic gravity theory. It is interesting to note that all the dummies in the enhanced model carry the same signs as depicted in the original model. In particular, the common border variable stands again in contrast to what common wisdom would suggest. All the variables are statistically significant, with the exception of the ECO and SAARC dummies. The coefficient for the GDP differential is positive and significant, so our results support the HO hypothesis, as explained earlier. The real exchange rate is statistically significant at 1 percent, which implies that currency depreciation has a positive impact on Pakistan's trade. The results are depicted in Table-3.

Table-3: Extended Augmentation

Explanatory Variable	Coefficient	Std. Error	t-Statistic
Constant	-0.88	6.29	-0.14
Product of GDP	0.89	0.04	19.84
Distance	-1.69	0.71	-2.40
Border	-1.10	0.52	-2.12
Language	0.79	0.45	1.74
SAARC	0.28	0.54	0.51
ECO	1.00	0.73	1.36
Per capita GDP differential	0.13	0.04	3.06
Real exchange rate	0.04	0.02	2.33
Trade openness (partner country)	0.41	0.14	2.85
Trade openness (Pakistan)	1.45	0.29	4.93
Adjusted R-squared	0.53		

However, we are particularly interested in the impact of trade openness. We have estimated the model by including the variable concerned for Pakistan and its trading partners separately. The variable is significant at 5 percent and has the expected positive sign. This implies that Pakistan's trade with all partners under reference is likely to improve considerably with the liberalization of trade and removal of barriers in these countries. Specifically, only a 1 percent improvement in trade openness in its partner countries could increase Pakistan's trade by 0.41 percent. This is very important for the country's economy provided that its trading partners in the West open their doors to Pakistan's exports. Similarly, the coefficient of trade openness for Pakistan itself is also significant. It indicates that a 1 percent improvement in domestic openness could increase Pakistan's trade by as much as 1.45 percent. However, this result should be viewed with caution. In case Pakistan reduces trade barriers and opens its markets completely, as required by WTO, nothing but the volume of imports will increase, which could lead to further deterioration of the balance of trade. On the other hand, an improvement in the 'openness' of other countries is likely to increase Pakistan's exports significantly, despite tough competition in the markets.

7.4. *Segmented Gravity Analysis*

In this section, we discuss the results of the gravity model when the countries concerned are segmented into different regional blocs, i.e., the EU, SAARC, ECO, ASEAN, NAFTA, and the countries of the Middle East, Far East, and Latin America. The objective is to compare these results with those obtained from the larger model, and gain deeper insight into the relative significance of these regional groups for Pakistan. For this purpose, we adopt a two-pronged strategy:

In the first approach, the total number of countries is now distributed into smaller groups through the cross-section and the time span remains unchanged, i.e., the regressions cover the years 1981-2005. However, only three variables are included this time in each case, namely the product of GDP, distance, and the trade-GDP ratio as a proxy for openness. All other dummies are excluded to avoid the identification problem. We report the results in consolidated form in Table-4 below.

Table-4: Gravity Models - Comparative Position

Model ↓ Variable →	Constant	Product of GDP	Distance	Trade/GDP (Partner)	R-Square adjusted
Pak-versus-all countries	-0.88 (6.29)	0.89 (0.04)	-1.69 (0.71)	0.41 (0.14)	0.53
Pak-versus-EU	-25.21 (7.58)	0.97 (0.06)	-0.82 (1.00)	-0.54 (0.17)	0.68
Pak-versus-ASEAN	-2.45 (2.40)	0.65 (0.06)	-0.81 (0.24)	1.31 (0.16)	0.51
Pak-versus-SAARC-ECO	-10.85 (5.92)	0.61 (0.13)	-0.35 (0.44)	0.25 (0.33)	0.54
Pak-versus-Middle East	49.98 (11.84)	0.92 (0.07)	-7.99 (1.48)	1.03 (0.51)	0.39
Pak-versus-Far East	-3.07 (2.69)	0.66 (0.06)	-0.77 (0.19)	0.17 (0.12)	0.72
Pak-versus-NAFTA-Lt. Am.	-53.6 (36.0)	1.65 (0.17)	-1.93 (3.72)	0.16 (0.30)	0.61

Note: The standard errors are given in parentheses and these are hetroskedasticity-robust (White, 1980).

The coefficients of the 'size' variable (product of GDP) are of the same order except in the case of NAFTA. Here, the coefficient is quite large, obviously due to the presence of a very large economy (the US).

The coefficients for distance are of varying magnitude and significance level. Although the signs are as expected, the values are insignificant in many cases. This means that, although greater distance reflects higher transportation costs, other factors responsible for higher trade can easily overcome the distance factor.

The coefficients for trade openness show some interesting trends. With the exception of EU countries, all values are positive, thereby indicating that there is potential for Pakistan to expand its trade, provided that the countries concerned become more open or Pakistan enters into some sort of agreement with these groups/countries. The EU bloc is considerably open to international trade and Pakistan will face tough competition in the European market in the times to come, since our exports are mostly textiles, leather, and garments.

We have included four ASEAN countries in the analysis: Indonesia, Malaysia, the Philippines, and Thailand. Pakistan's trade with ASEAN is likely to improve significantly with the liberalization of trade and removal of barriers in these countries. The coefficient for trade openness is indicative of these prospects, i.e., a 1 percent increase in trade openness in ASEAN countries results in a 1.31 percent increase in Pakistan's trade. This is an important signal for Pakistan and it should explore the new avenues available in these countries.

We have combined the members of SAARC and ECO for data-related reasons. The group includes India, Bangladesh, Sri Lanka, Iran, and Turkey, besides Pakistan. The coefficient for the size of economies is statistically significant and carries the expected sign. In contrast, the coefficient for the distance variable is insignificant, although it carries the expected sign. The reasons for its insignificance can be easily explained keeping in view other factors that affect trade. Likewise, the coefficient of trade openness is not statistically significant, although the sign is positive. Pakistan is a founder member of both organizations. Unfortunately, for obvious reasons,[2] no significant progress has been made so far to transform these entities into functioning free trade unions.

[2] Some commentators refer to the intra-block trade diverting effects if a country enters into some sort of trade agreement with others. In fact, Pakistan has inherent trade agreements with other members of ECO and SAARC. However, the volume of our trade is very small with members of these groups. Thus, the intra-block trade diverting effects will be negligible, if any.

The countries in the Middle East are major trading partners of Pakistan and we have included Saudi Arabia, Kuwait, Egypt, Morocco, Kenya, and Nigeria (six countries). The results indicate that all the coefficients are statistically significant and have the expected signs.

Another important region is the Far East, which includes trading partners such as China, Japan, Korea, Hong Kong, Australia, and New Zealand. The results depict the expected signs for all coefficients. The coefficient for product of GDP is significant. Likewise, the coefficient for distance is statistically significant at 1 percent and indicates that trade between Pakistan and Far East countries increases by 0.77 percent if distance or transportation cost is reduced by 1 percent. The expansion and further improvement of the Karakoram Highway is likely to reduce transportation costs between China and Pakistan.

The last group in our segmented analysis comprises three countries from NAFTA (Canada, the US, and Mexico) and three from Latin America (Argentina, Brazil, and Chile). The countries are merged together for data-related reasons and to facilitate estimation. However, the results are not very encouraging. Both the coefficients for distance and trade openness are statistically insignificant. The reason is clear: Pakistan's trade with all these countries, particularly in Latin American, is not up to the mark. The only exception is the US, in which case the dependence of Pakistan is very high. The large size of the US economy obscures all other variables.

The second approach would be to introduce block-specific dummies and treat the data as a whole as suggested by the anonymous referees. However, the revised regression results do not show any significant improvements over the segregated regressions. The results do compare with the overall augmented model, however, and are shown in Appendix-III as a token of information only.

8. Trade Potential of Pakistan

We are now ready to evaluate Pakistan's trade potential. As discussed above, the results obtained from the gravity models are fairly reliable, keeping in view the data limitations and problems arising from the quantum of underground trade across territorial borders.

8.1. *Concept and Methodology*

The concept of trade potential has been extensively used by researchers studying international trade relations, particularly among eastern European countries. The methodology consists of selecting a sample of countries for which trade is supposed to have reached its potential. A gravity equation is then estimated to explain bilateral trade within the sample. The estimated coefficients given by the equation are used in simulations to predict the volume of trade between any pair of countries, given that data on GDP, distance, and population, etc. are systematically available. The simulated or predicted value of bilateral trade is then compared with the observed values to infer bilateral trade potential. As noted by Helmers et al. (2005), this methodology can be applied either at the aggregate or industry level. In the present study, we will carry out our analysis at the aggregate level.

We have estimated the augmented gravity model for Pakistan vis-à-vis 41 countries for a fairly long period (1981-2005). We will use the ratio (P/A) of predicted trade (P)—arrived at by the estimated value of the dependent variable—to actual trade (A) of Pakistan with the partner concerned to evaluate their trade potential, and to forecast the future trade direction. If the value of P/A exceeds unity, this implies that Pakistan has the potential to expand trade with the respective country. Similarly, the absolute difference between the potential and actual level of trade (P-A) can equally be used for this purpose. A positive value implies the possibility of trade expansion in the future while a negative value shows that Pakistan has exceeded its trade potential with a particular country. By using either the ratio or the difference indicators, we can classify those countries with which Pakistan has potential for the expansion of trade or otherwise.

8.2. *Evaluation of Trade Potential*

As noted above, we use the coefficients' estimates to evaluate trade potential, both from the overall (general-augmented) as well as the regional (segregated) models. Finally, we have to compare the results of both sets of estimates. For the sake of simplicity, we divide the entire time span (1981-2005) into five sub-periods to calculate the average values of predicted (P) and actual trade (A). The trade potential results, based on the coefficients of the aggregate model (see Table-3), are reported in detail in Appendix-IV (Tables I–II). Here, we discuss the results for the most recent period 2001-05 (Table-5).

According to our estimation, Pakistan possess sufficient potential (on average) to expand its trade with Australia, Austria, Bangladesh, Canada, China, Germany, Denmark, Spain, France, the UK, Japan, Hong Kong, Italy, Iran, Korea, Kuwait, Sri Lanka, Malaysia, New Zealand, the Philippines, Sweden, and Switzerland. However, the maximum trade potential exists with Norway and Brazil since the (P/A) ratio is considerably high. The (P/A) ratio equals unity (or nearly so) in the case of the Netherlands and Thailand, which implies that Pakistan's actual trade with these countries has reached its potential level. In contrast, Pakistan's actual trade has exceeded the predicted level for many countries (P/A <1), for instance, with Chile and Mexico.

Table-5: Overall Trade Potential of Pakistan (Summary)

Indicator **Country**	**P/A** **2001-2005**	**Indicator** **Country**	**P/A** **2001-2005**
Australia	1.02	Italy	1.05
Austria	1.04	Japan	1.09
Bangladesh	1.06	Korea	1.06
Brazil*	1.13	Kuwait	1.03
Canada	1.02	Sri Lanka	1.09
China	1.04	Malaysia	1.08
Germany	1.04	Netherlands	1.00
Denmark	1.06	Norway*	1.14
Spain	1.02	New Zealand	1.06
France	1.06	Philippines	1.06
UK	1.02	Sweden	1.08
Hong Kong	1.02	Switzerland	1.03
Iran	1.06	Thailand	1.01
Argentina	0.989	Morocco	0.761
Belgium	0.973	Mexico**	0.699
Chile**	0.701	Nigeria	0.712
Egypt	0.787	Portugal	0.989
Greece	0.965	Saudi Arabia	0.960
Indonesia	0.959	Turkey	0.958
India	0.949	USA	0.987
Kenya	0.991		

Note: * Indicates high trade potential.
** Indicates exhausted trade potential.

We have also used the results of the segmented gravity models to evaluate the trade potential of Pakistan across different geographic regions. It can be recalled that we included only three quantitative variables in the analysis and excluded all dummies. Even then, the results of the two specifications are comparable (see Table-4). The detailed results are shown in Tables III-IV in Appendix-IV, and the summary for the period 2001-05 is shown below in Table-6.

A quick look at the table reveals that there is significant scope for Pakistan to expand its trade with a number of countries. The maximum potential for 2001-2005 exists the Asia-Pacific region, followed by Western Europe, the Middle East, and Latin America. In the Asia-Pacific region, Pakistan has significant trade potential with Japan, Sri Lanka, Bangladesh, Malaysia, the Philippines, and New Zealand, while in the EU bloc, the potential for expanding trade exists with Norway, Italy, France, Sweden, and Denmark. In the Middle East, Pakistan has significant potential for the expansion of trade only with Iran, and within the Latin American region, there is high trade potential with Mexico. At present, Pakistan has approached the maximum trade levels with NAFTA countries; in other words, the potential is already exhausted. However, some scope exists there for future trade expansion with Canada.

Table-6: Regional Trade Potential of Pakistan (Summary)

Indicator Country	P/A 2001-2005	Indicator Country	P/A 2001-2005
EU			
Austria	1.054	Belgium	0.753
Germany	1.139	Spain	0.952
Denmark	1.129	Greece	0.825
France	1.280	Netherlands	0.889
UK	1.024		
Italy	1.350		
Norway	1.508		
Portugal	1.043		
Sweden	1.319		
Switzerland	1.135		
SAARC and ECO			
Bangladesh	1.343	India	0.689
Sri Lanka	2.900	Iran	0.490
		Turkey	0.666
ASEAN			
Malaysia	1.018	Indonesia	0.377
Philippines	5.155		
Thailand	1.509		
Far East			
Japan	1.618	Australia	0.909
Korea	1.082	China	0.942
New Zealand	1.075	Hong Kong	0.893
Middle East and ECO			
Iran	1.715	Egypt	0.486
Kuwait	1.308	Saudi Arabia	0.886
		Turkey	0.885
Middle East and Africa			
Kuwait	1.469	Saudi Arabia	0.526
		Egypt	0.248
		Morocco	0.270
		Kenya	0.900
		Nigeria	0.414
NAFTA and Latin America			
USA	1.629	Chile	0.652
Argentina	1.397	Mexico	0.508
Brazil	3.964		
Canada	1.889		

Note: P/A >1 indicates high trade potential, otherwise exhausted potential.

9. Conclusions and Policy Implications

All models and estimation techniques developed over time suffer from weaknesses. The present study is empirically based and therefore relies heavily on the availability, completeness, and authenticity of the data. The gravity model of trade also has its strengths as well as limitations. It is natural that trade relations between different countries should be stronger if they are comparatively nearer, have common borders, a common language, and close social relations. Political affairs (conflicts/tensions or friendships/coordination) are sometimes more powerful than economic and commercial considerations.

Our estimations reveal that Pakistan has the highest trade potential with partners in the Asia-Pacific region (ASEAN) followed by Western Europe, the Middle East, Latin America, and North America for 2001-2005. The maximum trade potential exists for Japan, Sri Lanka, Bangladesh, Malaysia, the Philippines, New Zealand, Norway, Italy, Sweden, and Denmark. Therefore, Pakistan should explore ways and means to enhance its trade relationships with these regions/countries. In any case, Pakistan will have to improve the quality of its exports and minimize the cost of production to enable it to compete well in the international market.

Our results illustrate the fact that Pakistan's trade within SAARC is very low, particularly with India. However, this result should be interpreted with caution, taking into consideration the volume of underground trade. There has been some recent improvement, as indicated by estimates for the period 2001-2005, i.e., the actual trade of Pakistan with India has slightly surpassed the predicted level. However, our trade with India is still low compared to others. Despite the fact that India has granted most favored nation (MFN) status to Pakistan, the latter is not in a position to export significantly to India. The reasons are both economic and political. Tensions between the two countries persist, which could continue to hamper even future trade prospects. Further, both countries are more or less in the same phase of development, have similar products and productive skills, and hence would not fulfill each other's needs even if trade barriers were removed. Of course, this does not imply that there are no prospects of future trade expansion between the two countries, but this will be conditional on some sort of political advancement to remove the roots of conflict. Although the launch of SAFTA in 2006 has resulted in significant changes in custom tariffs and reduced trade-related barriers, there is still room for further trade liberalization in the region.

The implications of this study for policy purposes are enumerated below.

(i) Trade barriers need to be reduced. However, this depends on the behavior of trading partners toward Pakistan, particularly in the West, who most often impose restrictions on Pakistani products.

(ii) One of the main problems in South Asian trade is the inadequacy of the region's transport and infrastructure network. Improvements in infrastructure are a prerequisite for successful trade flows within South Asia.

(iii) The propensity of all partners to export and import must be taken into account adequately when a trade policy is set, since Pakistan's trade is not sufficiently independent of country-specific effects.

(iv) So far, regional economic groupings, particularly SAARC and ECO, have failed to show any significant impacts on bilateral trade. Regional trade is constrained by restrictive rules and regulations, extensive sensitive lists, and uncoordinated efforts, besides the existing political tensions between India and Pakistan, both of who are major players. All these factors currently threaten to limit the trade potential of Pakistan within South Asia. Addressing these problems will depend on the extent to which South Asian Countries are willing to adopt new approaches.

(v) Special attention is required to improve the quality of exports so as to gain ground in competitive world markets though quality control and cost efficiency are necessary, not sufficient, conditions for trade promotion. Extensive efforts are needed on economic as well as political, diplomatic, and social fronts to retain existing markets and explore new ones. In particular, Pakistan ought to focus on ASEAN and the Middle East, where sufficient scope for trade exists.

Appendix-I

Direction of Trade (Pakistan)

Major Export Markets **(Percentage Share)**

Country	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08
USA	21.8	24.8	24.4	24.7	23.5	23.9	23.9	25.5	24.6	19.5
Germany	6.6	6.0	5.3	4.9	5.2	4.9	4.8	4.2	4.1	4.3
Japan	3.5	3.1	2.1	1.8	1.3	1.1	1.1	0.8	0.7	0.7
UK	6.6	6.8	6.3	7.2	7.1	7.6	6.2	5.4	5.6	5.4
Hong Kong	7.1	6.1	5.5	4.8	4.6	4.7	3.9	4.1	3.9	2.7
Dubai	5.4	5.7	5.3	7.9	9.0	7.3	3.3	5.6	1.1	0
Saudi Arabia	2.4	2.5	2.9	3.6	4.3	2.8	2.5	2.0	1.7	2.0
Subtotal	**53.4**	**55.0**	**51.8**	**54.9**	**55.0**	**52.3**	**45.7**	**47.6**	**48.1**	**34.6**
Other countries	46.6	45.0	48.2	45.1	45.0	47.7	54.3	52.4	51.9	65.4
Total Exports	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Ministry of Commerce, Government of Pakistan: Economic Survey 2006-07.

Major Import Markets **(Percentage Share)**

Country	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08
USA	7.7	6.3	5.3	6.7	6.0	8.5	7.6	5.8	8.1	6.1
Japan	8.3	6.3	5.3	5.0	6.6	6.0	7.0	5.6	5.7	4.6
Kuwait	5.9	12.0	8.9	7.1	6.6	6.4	4.6	6.2	5.4	7.5
Saudi Arabia	6.8	9.0	11.7	11.6	10.7	11.4	12.0	11.2	11.5	13.4
Germany	4.1	4.1	3.5	4.3	4.6	3.9	4.4	4.7	4.1	3.2
UK	4.3	3.4	3.2	3.4	2.9	2.8	2.6	2.8	2.3	1.9
Malaysia	6.7	4.3	3.9	4.4	4.6	3.9	2.6	3.0	3.0	3.9
Subtotal	43.8	45.4	41.8	42.5	42.0	42.9	40.8	39.3	40.1	40.6
Other countries	56.2	54.6	58.2	57.5	58.0	57.1	59.2	60.7	59.9	59.4
Total Imports	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

***Source*:** Ministry of Commerce, Government of Pakistan: Economic Survey 2006-07.

Appendix-II

Definition of Variables Used in Model

i. Trade

Trade in goods and services, between two countries, is the dependent variable. It is the sum of exports and imports between the two partners (in value terms).

ii. Gross Domestic Product (GDP)

GDP and population are two standard proxies used to measure the size of an economy. GDP is positively related to trade: the higher the GDP, the higher the trade. In most of the gravity models used here, the product of the GDPs of two countries has been used as a proxy for economic/market size and the productive capacities of the two countries. A positive sign is expected between trade and GDP. The population of the countries concerned is sometimes used as a proxy for market size.

iii. Per Capita GDP (PCGDP)

This variable is precisely equivalent, whether we express the explanatory variables as either GDP and population separately or as GDP per capita to account for two in one. Most often, GDP per capita has been used in gravity model estimation since it is also a good proxy for level of development. GDP per capita describes the link between the level of trade and a country's stage of development. The more developed two countries are, the more likely is the level of trade between them. Therefore, a positive sign is expected between trade and per capita GDP. We have included this variable only in the preliminary test.

iv. Per Capita GDP Differential - Absolute (PCGDPD)

According to the prediction of the standard gravity model, countries with similar levels of GDP per capita will trade more than

countries with dissimilar levels. Therefore, the absolute differential in the per capita GDPs of trading partners has been used as an argument.[3]

Our objective is not to test the validity of different theories per se, since our focus is on trade potential. However, we include this variable to determine the byproduct of our analysis in terms of the two contrasting hypotheses. A negative sign on the coefficient will support the Linder hypothesis, while a positive sign will support the HO hypothesis.

v. Distance

Distance is a proxy for transportation cost. The distance between two trading countries is often measured using the great circle formula (Head, 2000), which takes into account the longitude and latitude of the capital or "economic centre" of each country. Greater distances not only indicate larger transportation costs, but are also correlated with larger cultural differences, which can retard the transfer of information and establishment of trust. Therefore, we expect a negative sign in the gravity equation for the distance variable.

As already pointed out, researchers often incorporate a number of dummies in the model to capture the impact of certain qualitative variables, geographical factors, and historical ties between countries. A brief explanation of these variables follows below.

vi. Common Border/Adjacency

Two countries adjacent to each other or sharing a common border are more likely to trade due to stronger social and economic relations at the public level. To capture this feature, a dummy is often included in the

[3] The inclusion of this variable in the model is to verify and provide support to the contrasting opinions on this issue in the trade theory. For instance, the Helpman-Krugman theory predicts that the volume of trade should increase with increasingly equal distribution of national income (Batra: 2006). The Hecksher-Ohlin theory however, stands in stark contrast to this opinion and holds that countries with dissimilar levels of output will trade more than countries with similar levels. According to the Linder hypothesis, countries with similar levels of per capita income will have similar preferences and similar but differentiated products; and therefore they should trade more with each other. This hypothesis is often viewed as similar to the Helpman-Krugman theory in its prediction. "The Hecksher-Ohlin theory on the other hand predicts that the sum of logs of income per capita of both countries will have a positive effect on the log of trade, while the Linder hypothesis is associated with the prediction that the absolute value of the difference between per capita incomes will have a negative effect on trade. A positive value falls in the category of H-O theory" (Batra: 2006).

gravity model, in addition to the primary variable of center-to-center physical distance. It accounts for the effective distance between neighboring countries that are likely to be engaged in mutual trade more frequently (Head, 2000). The coefficient of the border dummy is expected to be positively related to trade.

vii. Common Language

People of two countries who speak a common language (and share a common culture and traditions) are likely to trade more highly than those who do not share these characteristics. A common medium of communication is expected to reduce transaction costs as it helps facilitate trade negotiations (Batra, 2006). The dummy for a common language is therefore expected to have a positive sign.

viii. RTAs

In order to facilitate international trade, countries often enter into bilateral and regional trading agreements. These arrangements have shown a positive effect on the volume of trade. To capture the impact of such contracts, one or more dummy variables are often added to the model, taking a symbolic value of unity if both countries belong to the same economic/trading community, and zero otherwise. The estimated coefficient describes the weight that can be attributed to a special regional effect. Many studies have found that trade between partner countries has been enhanced threefold if they are members of the same RTA. The inclusion of this dummy also helps analyze the trade diversion and trade creation effect. As noted above, we have included two dummies for RTAs, i.e., SAARC and ECO.

ix. Trade Openness

The more open a country, the greater its involvement in trade. The proportion of customs-to-total tax revenues or the trade-GDP ratio can be used as proxies for openness. We expect a positive sign for this variable.

x. Real Exchange Rate

In some studies, the real exchange rate is used as an explanatory variable and a proxy for prices. It is computed as local currency per unit of foreign currency adjusted for domestic and foreign inflation. Sometimes, the exchange rate adjusted for purchasing power parity is used.

Appendix-III

Augmented Gravity Model with Bloc-Specific Dummies

Model Variables	Constant	Product of GDP	Distance	DumBorder	DumBlock	DumLang	Percapita GDPD	RER	Tradeopen (Partner)	R-Square (Adjusted)
Pak-versus-all countries	-0.88 -6.29	0.89 -0.04	-1.69 -0.71	-1.1 0.52		0.79 0.45	0.13 0.04	0.04 0.02	0.41 -0.14	0.53
Pak-versus-EU	0.71 5.02	0.86 0.04	-1.81 0.57	-0.83 0.49	-0.36 0.5	0.67 0.42	0.17 0.04	0.04 0.01	0.44 0.13	0.53
Pak-versus-ASEAN	-0.45 5.04	0.87 0.04	-1.72 0.56	-0.52 0.51	0.92 0.51	0.77 0.4	0.17 0.04	0.04 0.02	0.42 0.14	0.53
Pak-versus-SAARC-ECO	-1.24 5.65	0.87 0.04	-1.62 0.63	-0.89 0.48	0.63 0.43	0.78 0.41	0.16 0.04	0.04 0.02	0.43 0.14	0.53
Pak-versus-Middle East	2.88 7.28	0.89 0.04	-2.09 0.79	-1.47 0.85	-1.7 1.37	-0.97 0.42	0.13 0.03	0.04 0.02	0.41 0.14	0.54
Pak-versus-Far East	1.21 5.97	0.87 0.04	-1.91 0.67	-1.06 0.64	0.88 0.72	0.63 0.43	0.15 0.04	0.04 0.02	0.42 0.14	0.53
Pak-versus-NAFTA-Lt. Am.	-0.43 5.31	0.87 0.04	-1.72 0.59	-0.7 0.57	-0.47 0.77	0.85 0.44	0.16 0.04	0.04 0.02	0.42 0.14	0.53

Appendix-IV

Trade Potential of Pakistan (Overall)

Table I: Countries with who Pakistan has Potential to Expand Trade

Indicator Country	P/A 1981-1985	P/A 1986-1990	P/A 1991-1995	P/A 1996-2000	P/A 2001-2005
Australia	0.987807	1.006984	1.002350	0.976296	1.019392
Austria	1.020216	0.913717	0.928857	1.113564	1.043261
Bangladesh	0	0.904346	0.964926	1.055630	1.063008
Brazil	0.704448	0.955113	0.942580	1.055182	1.135071
Canada	0.963942	1.004363	0.988498	1.020242	1.017025
China	0	0.968496	0.991877	1.030409	1.042315
Germany	0.982393	0.970114	0.975568	1.024253	1.043572
Denmark	1.000686	0.971761	0.947643	1.020916	1.061137
Spain	0.996741	0.972349	0.993170	1.010794	1.020093
France	1.007440	0.979509	0.941483	1.017949	1.056386
Hong Kong	1.009422	1.047872	0.968451	0.961235	1.025583
Iran	0.864536	0.947372	1.027135	1.088937	1.063372
Italy	0.964299	0.959695	0.975110	1.041652	1.050654
Japan	0.935945	0.951772	0.973588	1.048072	1.090864
Korea	0.983764	0.958836	0.963877	1.019454	1.059754
Kuwait	0.918818	0.989479	1.123642	1.013630	1.031012
Sri Lanka	0.896914	0.902143	1.016087	1.052375	1.097329
Malaysia	0.890703	0.990856	0.975157	1.033744	1.078544
Netherlands	1.040937	0.990802	0.983002	0.994745	1.001742
Norway	0.919394	0.868431	0.992859	1.078576	1.143315
New Zealand	0.948895	0.930460	0.997818	1.032990	1.065682
Philippines	1.159868	0.858587	0.959451	1.024688	1.063852
Sweden	0.969832	0.960548	0.951934	1.037285	1.076830
Switzerland	1.022602	0.999433	0.989270	0.958783	1.032698
Thailand	1.032784	0.870258	1.054206	1.037856	1.008648
UK	0.963554	0.994847	0.992713	1.020753	1.024415

P = predicted trade, A = actual trade.

Table II: Countries with who Pakistan has Exceeded Trade Potential

Indicator Country	P/A 1981-1985	P/A 1986-1990	P/A 1991-1995	P/A 1996-2000	P/A 2001-2005
Argentina	1.039448	1.598482	0.886612	0.832340	0.989561
Belgium	1.050188	1.024373	0.986528	0.979599	0.973522
Chile	-0.992120	-4.236570	0.856029	0.619649	0.701454
Egypt	2.167789	1.760523	0.910669	0.770319	0.787597
Greece	1.126787	0.984882	1.069323	0.921356	0.965833
Indonesia	0.967483	1.050675	1.031292	0.989131	0.959071
India	0.978872	1.088846	1.047280	0.980618	0.949263
Kenya	1.000836	0.988388	1.024692	0.976068	0.991494
Morocco	-9.145880	1.328307	0.946906	0.762457	0.760918
Mexico	-1.971100	1.213400	0.916616	0.774724	0.699782
Nigeria	0.919757	2.258793	1.323212	0.888188	0.711915
Portugal	1.473655	0.901950	0.964633	0.909544	0.989794
Saudi Arabia	0.930882	1.040741	1.054994	1.016400	0.960106
Turkey	1.072415	1.058522	0.951905	1.003680	0.958160
USA	0.996086	1.005870	1.011281	0.998562	0.987697

Trade potential of Pakistan (regional).

Table III: Countries with who Pakistan has Potential to Expand Trade

Indicator Country	P/A 1981-1985	P/A 1986-1990	P/A 1991-1995	P/A 1996-2000	P/A 2001-2005
			EU		
Austria	1.137352578	0.811927666	0.837542096	1.427747973	1.053899939
Germany	0.956291131	0.911936573	0.917830342	1.120323297	1.139212626
Denmark	1.046771846	0.979300659	0.893445106	1.068050660	1.129264459
France	1.075278625	0.965303431	0.760671856	1.080802043	1.280537206
Italy	0.813051700	0.848087550	0.916447295	1.250994954	1.349956933
Norway	0.817569979	0.666465863	1.078590371	1.237761598	1.508518330
Portugal	1.999916579	0.720611725	1.110029763	0.753606950	1.042883248
Sweden	0.908778030	0.891899212	0.909363766	1.146664050	1.319481570
Switzerland	1.067237488	1.008497426	1.039562245	0.791418017	1.135657813
UK	0.842590010	1.035062240	1.037817813	1.074609098	1.023935000
			SAARC and ECO		
Bangladesh	0.651011679	0.867632977	0.958304783	1.374974463	1.343115692
Sri Lanka	2.366959506	1.563167369	2.443460076	2.193996173	2.900584151
			ASEAN		
Malaysia	0.321026926	0.492811044	0.444019338	0.780458303	1.018108863
Philippines	4.571064951	1.814009985	2.544464428	5.190650879	5.155422358
Thailand	1.204476902	0.614190674	1.271517063	1.423270454	1.509532946
			Far East		
Japan	0.769718288	0.794378051	0.835171339	1.301768109	1.618099785
Korea	1.326792678	0.934921894	0.806914572	0.964802323	1.082680788
New Zealand	1.085576993	0.909940355	1.031804338	1.042268727	1.074953076
			Middle East and Africa		
Kuwait	1.051205780	1.252295152	1.860353828	1.423054533	1.46985046
			Middle East and ECO		
Iran	0.523481128	0.853901156	1.182475844	2.212496279	1.715455747
Kuwait	0.476750335	0.618405824	1.178113114	1.094131244	1.308258676
			NAFTA and Latin America		
Argentina	0.771210421	2.765037236	0.689690668	0.623510706	1.39733281
Brazil	0.387620692	0.787571107	0.762031679	2.084614484	3.96390995
Canada	0.525346794	0.794414999	0.854818865	1.408449260	1.88920301
USA	0.593728446	0.814288330	1.037956884	1.337217831	1.62904177

Table VI: Countries with who Pakistan had Exceeded Trade Potential by 2005

Indicator Years	P/A 1981-1985	P/A 1986-1990	P/A 1991-1995	P/A 1996-2000	P/A 2001-2005
EU					
Belgium	1.260169467	1.19074882	1.002600752	0.842884658	0.753486494
Spain	1.097231991	1.013923649	1.0798564	0.954338095	0.952616063
Greece	1.367883153	1.047312378	1.482724998	0.719981764	0.825343529
Netherlands	1.264944669	1.051757815	0.987359263	0.873005253	0.889590229
SAARC and ECO					
India	1.26796084	1.581028029	1.153707044	0.785906964	0.689285169
Iran	0.263669565	0.450555685	0.516876316	0.836204633	0.490156948
Turkey	1.980332393	1.704443021	0.806042676	0.909256822	0.666102253
ASEAN					
Indonesia	0.620632473	0.615405727	0.482319405	0.492536709	0.377061895
Far East					
Australia	1.241984129	1.155999625	1.022908234	0.774045953	0.909932908
China	0.668249316	1.137310498	1.297735683	1.253607609	0.94242452
Hong Kong	1.547684528	1.486066886	0.801636384	0.668638696	0.892766943
Middle East and Africa					
Saudi Arabia	0.546601356	1.252716664	1.097234411	0.998447416	0.52637379
Egypt	2.954937604	3.708859830	0.498773969	0.317076989	0.24784587
Morocco	13.89190531	3.105595225	0	0.356611370	0.27012479
Kenya	1.108987311	1.268670782	1.034720320	0.757206628	0.90028363
Nigeria	1.076680337	2.757395352	1.989090417	0.791530685	0.41467701
Middle East and ECO					
Egypt	2.982303776	3.314692612	0.769305621	0.451042419	0.486558988
Saudi Arabia	0.519078093	1.056457151	1.312033304	1.253256645	0.885965264
Turkey	1.261087539	1.439277996	0.812185409	1.052418036	0.884906846
NAFTA and Latin America					
Chile	4.091255652	3.712814729	0.759661858	0.373914032	0.65177942
Mexico	6.329781561	1.210942339	0.828703073	0.591419281	0.50868432

References

Achakzai, J.K. (2006). Intra-ECO Trade: A Potential Region for Pakistan's Future Trade. *Pakistan Development Review*, 45(3), 425-437.

Ahmed, S., and Ghani, E. (2007). South Asia's Growth and Regional Integration: An Overview. In *South Asia: Growth and Regional Integration*. Washington, DC: World Bank.

Anderson, J.E. (1979). A Theoretical Foundation for the Gravity Equation. *American Economic Review*, 69(1), 106-116.

Anderson, J.E., and van Wincoop, E. (2001). Border, Trade and Welfare. Working Paper 508. Boston, MA: Department of Economics, Boston College.

Baltagi, B.H. (2000). *Econometric Analysis of Panel Data*. Chapter 14. Englewood Cliffs, NJ: Prentice-Hall.

Baroncelli, E. (2007). The "Peace Dividend," SAFTA and Pakistan-India Trade. In Naqvi, Z.F. and Schuler, P. (Eds.), *The Challenges and Potential of Pakistan–India Trade*. Washington, DC: World Bank.

Batra, A. (2006). India's Global Trade Potential: The Gravity Model Approach. *Global Economic Review*, 35(3), 327-361.

Benedictis, L.De, and Vicarelli, C. (2004). Trade Potential in Gravity Panel Data Models. *Berkeley Electronic Journal of Economic Analysis and Policy*, 5(1).

Bergstrand, J.H. (1985). The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. *Review of Economics and Statistics*, 67(3), 474-481.

Bergstrand, J.H. (1989). The Generalized Gravity Equation, Monopolistic Competition and the Factor-Proportions Theory in International Trade. *Review of Economics and Statistics*, 71(1), 143-153.

Bergstrand, J.H. (1990). The Heckscher-Ohlin-Samuelson Model, the Linder Hypothesis and the Determinants of Bilateral Intra-Industry Trade. *Economic Journal*, 100(403), 1216-1229.

Boris, V., and Vedran, S. (2002). *SEE and the Trade Potential of Croatia*. Retrieved from www.wiiw.ac.at/balkan/files/Vujcic+Sosic.pdf

Burfisher, M.E., and Zahniser, S. (2001). Multilateralism and Regionalism: Dual Strategies for Trade Reform. In Mary E. Burfisher (Ed.), *Agricultural Policy Reform in the WTO: The Road Ahead*. Agricultural Economic Report 802. Washington, DC: United States Department of Agriculture/Economic Research Service.

Bussiere, M., and Schnatz, B. (2006). Evaluating China's Integration in World Trade with a Gravity Model based Benchmark. Working Paper 693. Frankfurt: European Central Bank.

Carrillo, C., and Li, C.A. (2002). Trade Blocks and the Gravity Model: Evidence from Latin American Countries. Economics Discussion Paper 542. UK: Department of Economics, University of Essex.

Cernat, L. (2001). Assessing Regional Trade Arrangements: Are South-South RTAs more Trade Diverting? Policy Issues in International Trade and Commodities, Study Series 16. Geneva: United Nations Conference on Trade and Development.

Clarete, R., Edmonda, C., and Wallack, J.S. (2002). Asian Regionalism and its Effects on Trade in the 1980s and 1990s. Economics and Research Department Working Paper 30. Manila: Asian Development Bank.

Deordorff, A.V. (1995). Determinants of Bilateral Trade: Does Gravity Work in a Neo-Classical World? Working Paper W5377. Cambridge, MA: National Bureau of Economic Research.

Egger, Peter. (2002). An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials. *The World Economy*, 25, 297-312.

Feenstra, R.C., Markusen, J.R., and Rose, A.K. (1998). Understanding the Home Market Effect and the Gravity Equation: The Role of Differentiated Goods**.** Working Paper 6804. Cambridge, MA: National Bureau of Economic Research.

Government of Pakistan. *Pakistan Economic Survey 2006-07*. Islamabad: Ministry of Finance.

Government of Pakistan. *Various Documents on Trade Policy*. Islamabad: Ministry of Commerce.

Greenaway, D., and Milner, C. (2002). Regionalism and Gravity. *Scottish Journal of Political Economy*, 49, 574-585.

Gujrati, D.N. (2003). Panel Data Regression Models. In *Basic Econometrics* (4th ed.). New York: McGraw-Hill.

Harris, M.N., and Matyas, L. (1998). The Econometrics of Gravity Models. Working Paper 5. Melbourne: University of Melbourne, Melbourne Institute of Applied Economic and Social Research.

Head, K. (2000). *Gravity for Beginners*. Vancouver: University of British Columbia, Faculty of Commerce.

Helmers, C., and Pasteels, J.M. (2005). *TradeSim (Third Version): A Gravity Model for the Calculation of Trade Potentials for Developing Countries and Economies in Transition*. Geneva: International Trade Centre.

Helpman, E., and Krugman, P.R. (1985). *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition, and the International Economy*. Cambridge, MA: Massachusetts Institute of Technology.

Kalbasi, H. (2001). *The Gravity Model and Global Trade Flows*. Isfahan: University of Isfahan, Department of Economics.

Kazmi, Sajid. (2006). Market Access through Free Trade Agreements: Pakistan's Experience. *Sustainable Development Policy Institute Research and News Bulletin*, 13(4-5).

Khan, A.H., and Mahmood, Z. (2000). *Pakistan and Emerging Global Trading Environment*. Lahore: Vanguard Books.

Koukhartchouk, O., and Mauref, M. (2003*). Accession to the WTO and EU Enlargement: What potential for Trade Increase?* Centre for Economic Policy Research Discussion Paper 3944. Paris: Université Paris.

Kumar, A. (2006). Pakistan and Bangladesh delay SAFTA Take Off. South Asia Analysis Group Paper 1891. Retrieved from http://www.southasiaanalysis.org/%5Cpapers19%5Cpaper1891.html

Kumar, A. (2006). *China-Pakistan Economic Relations*. Special Report 30. New Delhi: Institute of Peace and Conflict Studies.

Leamer, E.E. (1974). The Commodity Composition of International Trade in Manufactures: An Empirical Analysis. *Oxford Economic Papers*, 26.

Leamer, E.E., and Stern, Robert, M. (1970). Quantitative International Economics. *Journal of International Economics*, 1(3), 359-361.

Linnemann, H. (1966). *Modeling International Trade Flows: An Econometric Approach*. Amsterdam: North-Holland.

Ozdeser, H., and Dizen, E. (2010). Turkey's Trade Potential with Euro-Zone Countries: A Gravity Study. *European Journal of Scientific Research*, 43(1).

Paas, T. (2002). Regional Integration of International Trade in the Context of EU Eastward Enlargement. Discussion Paper 218. Hamburg: Hamburgisches Welt-Wirtschafts-Archiv.

Poyhonen, P. (1963). A Tentative Model for the Volume of Trade between Countries. *Weltwirtschaftliches Archiv,* 90, 93-100.

Rahman, M.M. (2003). *A Panel Analysis of Bangladesh's Trade: The Gravity Model Approach*. Sydney: University of Sydney.

Rahman, M., Shadat, W.B., and Das, N.C. (2006). Trade Potential in SAFTA: An Application of Augmented Gravity Model. Paper 61. Dhaka: Centre for Policy Dialogue.

Sayal, H.N. (2007). Pakistan and Malaysia Trade Relations. Retrieved from http://www.issi.org.pk/journal/2007_files/no 1/article/al.htm)

Sen, A., and Siddiqui, H. (2006). *India, ASEAN Toiling for Pact on Negative Items under FTA*. Retrieved from http://www.bilaterals.org/ article.php3?id_article=3850)

Simwaka, K. (2006). Dynamics of Malawi's Trade Flows: A Gravity Model Approach. Munich Personal RePEc Archive Paper. Munich: University Library of Munich.

Soderling, L. (2005). *Is the Middle East and North Africa Region Achieving its Trade Potential?* Washington, DC: International Monetary Fund, Middle East and Central Asia Department.

Soloaga, I., and Winters, A.L. (2001). Regionalism in the Nineties: What Effects on Trade? *North American Journal of Economics and Finance*, 12(1), 1-29.

South Asian Association for Regional Cooperation. *Charter of Democracy*. Retrieved from http://www.saarcsec.org/main.php?id=10&t=3.2

State Bank of Pakistan. (2005). Special Section 7.5: Pakistan's Export Potential: A Gravity Model Analysis. In *Annual Report 2004-05*. Karachi: Author.

Subramanian, A., and Wei, S.J. (2003). The WTO Promotes Trade, Strongly but Unevenly. Discussion Paper 5122. London: Centre for Economic Policy Research.

Thapar, R. (2006). SAARC: Ineffective in Promoting Economic Cooperation in South Asia. *Stanford Journal of International Relations*, 7(1).

Tinbergen, J. (1962). An Analysis of World Trade Flows. In *Shaping the World Economy: Suggestions for an International Economic Policy*. New York: The Twentieth Century Fund.

Wasam, H.S. (2003). *From SAPTA to SAFTA: Gravity Analysis of South Asian Free Trade*. Sri Lanka: University of Sri Jayewardenepura.

World Bank. (2007). World Economy Gravity Models. In *World Development Indicators*. [CD-ROM].

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 63-94

Comparative Advantage of Major Crops Production in Punjab: An Application of Policy Analysis Matrix

Muhammad A. Quddus* **and Usman Mustafa****

Abstract

This study uses data from 1999/2000 to 2004/05 to determine the relative efficiency of major crops (wheat, rice, sugarcane, and cotton) in Punjab (Pakistan) and their comparative advantage in international trade as measured by economic profitability and the domestic resource cost (DRC) ratio. An economic profitability analysis demonstrates that Punjab has a comparative advantage in the domestic production of wheat for self-sufficiency but not for export purposes. In basmati production, Punjab has a comparative advantage, and increasing Basmati production for export is a viable economic proposition. The nominal protection coefficient (NPC), effective protection coefficient (EPC), and DRC for Irri rice are more than 1: the given input-output relationship and export prices do not give Punjab a comparative advantage in production of Irri for export. Sugarcane growers did not receive economic prices (i.e. prices reflecting true opportunity costs) during 2001/02 and 2002/03 in an importing scenario, while in 2003/04, the NPC was 1.02, indicating positive support to sugarcane growers. The NPCs estimated under an exporting situation range from 1.33 to 1.99, indicating that the prices received by growers are higher than the export parity/economic prices. This is also an indication that sugarcane cultivation for exporting sugar is not feasible in terms of economic value. The NPCs for cotton under an importing scenario were less than 1 while under an exporting scenario were either close to or greater than 1, implying an expansion in cotton production as imports have been more expensive than domestic production.

Keywords: Crops, comparative advantage, domestic resource cost, policy analysis matrix (PAM), Pakistan.

JEL Classification: Q17, Q18.

* Director (In-charge), Punjab Economics Research Institute, Lahore.
** Chief Training Program, Project Evaluation and Training Division, Pakistan Institute of Development Economics, Islamabad.

1. Introduction

1.1. Agriculture in the Pakistan Economy

The agriculture sector is still one of the largest sectors of Pakistan's economy ahead of manufacturing, and accounts for 23.1 percent of gross domestic product (GDP). It accounts for 42 percent of the total employed labor force, and is the largest source of foreign exchange earnings. It also contributes to growth by providing raw materials as well as being a market for industrial products. During the 1990s, agriculture grew at an annual average rate of 4.5 percent per annum. The agriculture growth for 2004/05 is estimated at 7.5 percent. Major crops account for 37 percent of agricultural value added, minor crops contribute 12.2 percent to overall agriculture, livestock (the largest contributor to overall agriculture value added) accounts for 46.8 percent, fisheries account for 1.3 percent, while forestry accounts for 2.5 percent of agricultural value added (Government of Pakistan, 2005a).

1.2. Production of Major Crops

Wheat, rice, cotton, and sugarcane account for 91 percent of value added in major crops. Thus, the four major crops (wheat, rice, cotton, and sugarcane), on average, contribute 31.7 percent to value added in agriculture overall.

Cotton: Cotton is Pakistan's main cash crop and contributes substantially to national income. Cotton production fluctuated between 8 million and 14.6 million bales during the decade ending 2004/05. Pakistan, a net exporter of cotton, has now become a net importer as increasing consumption has outpaced its production. It accounts for 10.5 percent of the value added in agriculture and about 2.4 percent of GDP. Punjab is the main cotton producer, accounting for 80 percent of the area under cotton and 76 percent of production. In addition to providing raw material to the local textile industry, surplus lint cotton is exported. In 2004/05, the production of cotton was 14.618 million bales from an area of 3.221 million ha.

Rice: Rice is an important food cash crop. It is also one of Pakistan's main export items. It accounts for 5.7 percent of value added in agriculture and 1.3 percent of GDP. Rice is planted annually on an area of over 2 million ha and accounts for 18 percent of the area under cereals and 10 percent of the total cropped area. Rice production in 2004/05 was estimated at 4.991

million tonnes. Annual rice production (averaging 4.4 million tonnes in recent years) constitutes 17 percent of the overall output of cereals and 17 percent of the value added by major crops.

Sugarcane: Sugarcane is an important crop with high water requirements. Its share in value added in agriculture and GDP are 3.6 percent and 0.8 percent, respectively. Sugarcane was being cultivated over an area of 0.947 million ha during 2004/05. Its production increased from 52.1 million tonnes in 2002/03 to 53.4 million tonnes in 2003/04, but declined to 45.3 million tonnes in 2004/05.

Wheat: Wheat is the main staple food of the country's population and its largest grain crop. Production fluctuated between 15.21 million and 21.11 million tonnes during the decade ending 2004/05. Wheat contributes 13.8 percent to the value added in agriculture and 3.2 percent to GDP. Punjab is the largest producer of wheat, accounting for 76 percent of the area under wheat cultivation and 80 percent of the wheat produced by the country.

1.3. Problem Specification

In most developing countries, social or economic profitability deviates from private profitability because of distortions in factor and output markets, externalities, and government policy interventions that tend to distort relative prices. These include price fixation, restrictions on wheat movement, and quotas to flour mills. It is therefore necessary to assess the comparative advantage of the production of major crops in Pakistan. Analysis of this comparative advantage can help in deriving meaningful policy conclusions on how to transform the farming system toward more efficient crop activities.

As a member of the World Trade Organization (WTO), Pakistan is committed to the rules and regulations that the Uruguay Round applied to agriculture. The commitments cover a wide range of topics, including domestic support, market access, and export subsidies in agriculture. The potential benefits of this agreement for Pakistan will emerge from the trading regime in its present form and potential trading opportunities for both import substitution and export promotion. However, whether or not a country can take advantage of new trading opportunities will depend on its comparative advantage without the subsidies or with the limited subsidies that are permitted for all trading partners by the rules governing the new trading environment. Therefore, an assessment of the comparative advantage of crop production either for import substitution

or export can be helpful. The principal objectives of this study are to (i) determine the comparative advantage and competitiveness of Pakistan's major crops (wheat, rice, sugarcane, cotton); (ii) assess whether Pakistan qualifies for the export of wheat, rice, sugarcane, and cotton and/or whether it should produce these crops as an import substitution strategy; and (iii) measure the effect of policy incentives that might favor or discriminate against crop production.

2. Review of the Literature

Shahabuddin and Dorosh (2002) conducted a study on comparative advantage in Bangladesh's crop production. Their economic profitability analysis demonstrates that Bangladesh has a comparative advantage in the domestic production of rice for import substitution. However, at the export parity price, the economic profitability of rice is generally less than that of many nonrice crops, implying that Bangladesh has more profitable options than the production of rice for export.

Nelson and Panggabean (1991) find that the Indonesian sugar policy is a complex web of contradictory policies, including mandatory production, price supports, and fertilizer and credit subsidies. The policy analysis matrix (PAM) developed by Monke and Pearson (1989) provides a more complete perspective on social profitability and the divergence between and social costs than other commonly used social cost-benefit measures.

Khan and Ashiq (2004) use a PAM to conclude that seed cotton production has a strong national comparative advantage. The study further reveals that Sindh regained its historical dominance over Punjab in the crop by making a quantum jump in yield from 1997 onward. The nominal protection coefficient (NPC) indicates that seed cotton production in Pakistan is heavily taxed. Their findings suggest that, to exploit the potential of cotton cultivation to cater to local needs and earn foreign exchange, concerted efforts need to be made to improve the performance of the production and processing sectors.

Using the PAM, the Food and Agriculture Organization (FAO) (2004) measures the comparative advantage of production systems in Syria. In the study, the National Agricultural Policy Center has selected a number of specific agro-food chains: cotton, wheat, and olives as strategic crops, tomatoes as vegetables, oranges as fruit, and beef and milk production as livestock. The results conclude that all these systems achieved

a positive profit at private prices, the highest profit per hectare being achieved by tomatoes, followed by orange and olive production. Field crops such as cotton and wheat achieved a much lower return per hectare compared to the tomato and perennial production systems. However, cotton still generates a profit that is around four times the profit per hectare obtained by wheat-based systems, while flour production yields the lowest profit per hectare. The groups that achieved the highest profit at private prices were tomatoes, fresh oranges, and olive oil, while the field crops (hard wheat flour and soft wheat) maintained their profitability. In the livestock group, only the production of packed milk was profitable at its social price while meat production became unprofitable in live or fresh meat form. Cotton production was also not profitable at its social price.

Tweeten (1986) concluded that the southern US has a comparative advantage in the production of grains and soybean based on supply/demand and input and output prices under normal circumstances but with open markets, the southern US does not have a comparative advantage in the production of sugar, wool, and manufactured milk products. These commodities, along with additional tobacco, cotton, fruit, and vegetables, would have to be imported in the absence of price supports and trade restrictions. Red meat, poultry, eggs, and milk for fluid consumption have the characteristics of nontraded goods. In an open world market, the US would export or import only modest amounts of these commodities.

Gonzales, Kasryno, Perez, and Rosegrant (1994) examine trends in government policies and the production of five major food crops in Indonesia: rice, corn, soybean, sugar, and cassava. They analyze the effects of government input-output pricing policies on domestic production and incentives for these crops, and assess their relative comparative advantage under three trade regimes: import substitution, interregional trade, and export promotion. The measures used to assess economic incentives include direct, indirect, and total nominal and effective protection rates. The study finds that Indonesian rice has a comparative advantage as an import substitute but not as an export crop because of poor quality and a thin world rice market. Corn is the most efficient of the five crops as an import substitute. If corn productivity continues to improve, it could become competitive as an export crop. Soybean production despite rapid expansion is not efficient. Sugar is also economically inefficient.

Ahmad and Martin (2000) use a PAM to investigate the efficiency of Pakistani agriculture and the effect of policy interventions in six

primary agricultural systems: wheat, rice, cotton, maize, sugarcane, and potatoes. Of these six systems, only wheat was found to be socially inefficient. Cotton and rice, in contrast, were found to be highly profitable both privately and socially. Pakistan appears to enjoy a considerable comparative advantage in the production of both these crops.

Akhtar, Sharif, and Akmal (2007) also use the PAM methodology to determine the level of economic efficiency and competitiveness in the production of rice crop in Pakistan's Punjab. Their results indicate that expanding the production of Basmati rice could lead to an increase in exports. The production of Irri in Punjab is characterized by a lack of economic efficiency, implying the inefficient use of resources to produce the commodity. On the other hand, both Basmati and Irri rice production in Punjab demonstrate a lack of competitiveness at the farm level for the period under analysis. Moreover, the prevailing incentive structure has affected farmers negatively. A negative divergence between private and social profits implies that the net effect of policy intervention is to reduce the farm-level profitability of both rice production systems in Punjab. The results highlight the need to remove existing policy distortions in the structure of economic incentives to enhance economic efficiency and attain farm-level competitiveness in rice production.

Very few studies on Pakistan look at the relative efficiency of its major crops. Akhtar et al. (2007) compare Irri and Basmati rice but ignore the other major crops, while Ahmad and Martin (2000) make their conclusions based only on one-year datasets. There is a need to compare multiple-year data for multiple major crops to determine comparative crop advantages. Our study uses a six-year dataset (1999/2000 to 2004/05) to examine the relative efficiency of Punjab's major crops (wheat, rice, sugarcane, and cotton) and their comparative advantage in international trade as measured by economic profitability and domestic resource cost (DRC) ratio.

3. Methodology for Measuring Economic Incentives

This study assesses the impact of government interventions on the relative incentives and competitiveness of the four major crops under import substitution and export promotion trade regimes. Since agriculture is the dominant economic sector in Pakistan, government policies that promote agricultural production in general or affect relative incentives within agriculture can have substantial economy-wide effects (Krueger, Schiff, and Valdes, 1988). Annex-1 clarifies the concepts and terminology used here.

3.1. Measures of Economic Incentive

A wide range of government policies influences economic incentives in agricultural production. Price and subsidy policies, import and export policies, and more general macroeconomic policies such as changes in the exchange rate and interest rate policies may affect relative incentives in agriculture. These effects can be measured by using the nominal and effective protection rates as indicators (Gonzales et al. 1994).

3.1.1. Nominal Protection Rate

The border price of a commodity is used as a reference price when measuring the effects of government intervention policies. Without government intervention, the domestic producer price is expected to be closely related to the border price. The nominal protection rate (NPR) is then defined as the amount by which the domestic price of a tradable output deviates from its border price. It is stated as

$$NPR = (P_o^d / Po^b) - 1$$

P_o^d is the domestic producer price of the tradable agricultural product o, and P_o^b is the border price of o, evaluated at the official exchange rate, adjusted for quality, transport, storage, and other margins, measured under competitive conditions, and expressed in local currency. A positive NPR implies price protection and a positive incentive for the production of the commodity.

In calculating the NPR for an agricultural tradable, the market point for comparison is of crucial importance. Since the NPR is an indicator of output incentives or disincentives, there are two marketing points at which comparisons can be made. One is at the production point to determine the incentives that farmers receive at the farm level. The other is at the wholesale or consumption point to determine the effects of pricing policy over a broader spectrum of farm production-processing marketing activities.

3.1.2. Effective Protection Rate

The NPR can measure separately the sectoral and economy-wide effects on both outputs and inputs but not their net effects on the total agricultural production system. The effective protection rate (EPR) measures these net effects through their effects on the value-added of the agricultural product. Formally, it is conventionally expressed as

$$EPR = (P_o^d - \sum_j a_o P_j^d) / (P_o^b - \sum_j a_o P_j^b) - 1 = (V_o^d / V_o^b) - 1,$$

P_j^d is the domestic price of input j, Pj^b is the border price of input j expressed in local currency, V_o^d is the value added in domestic prices, and V_o^b is the value added in border prices expressed in local currency.

The numerator is the value added expressed in actual domestic market prices, while the denominator is the value added expressed in border prices converted to local currency. Again, the border price is used as the reference price that would prevail in the absence of interventions. In effect, the ratio is a summary measure of the incentives or disincentives caused by government policies and market distortions in both the output and input markets. A positive EPR, therefore, implies that a particular production activity is receiving a positive incentive through protection at the existing exchange rate and trade policies, while a negative EPR indicates a production disincentive.

3.2. Measure of Comparative Advantage

Comparative advantage in the production of a given food crop for a particular country or region is measured by comparing with its border price the social or economic opportunity costs of producing, processing, transporting, handling, and marketing an incremental unit of that food commodity. If the opportunity cost is less than the border price, then that country has a comparative advantage in the production of that particular food crop. In most developing countries, social or economic profitability deviates from private profitability because of distortions in the factor and output market, externalities, and government policy interventions that tend to distort relative prices. Comparative advantage or comparative efficiency in Punjab's economy is estimated here using the DRC.

The DRC of foreign exchange earned or saved from a particular production activity can be expressed as the ratio of domestic (nontaxable) factor costs in shadow prices per unit of output to the difference between the border price of output and foreign (tradable) costs (both expressed in foreign currency). In effect, the DRC is the "own exchange rate" of a particular production activity. Since the numerator is expressed in local currency and the denominator in foreign currency, the DRC can be used to determine the economic competitiveness of a production activity by comparing it with the shadow exchange rate (SER) of the currency. Thus, an activity is economically competitive or displays comparative advantage if the opportunity cost of earning or saving an incremental unit of foreign

exchange is less than the SER. The smaller the DRC relative to the SER, the greater is the activity's comparative advantage. Activities with the smallest DRCs display the greatest relative comparative advantage.

3.3. Policy Analysis Matrix

The concept of the PAM was developed by Monke and Pearson (1989) and augmented by developments in price distortion analysis by Masters and Winter-Nelson (1995). A PAM allows us to study the impact of policy by constructing different enterprise budgets, one valued at market prices and the other valued at social prices. After the formulation of the matrix, it provides an expedient method of calculating the measure of policy effects and events of competitiveness and economic efficiency/comparative advantage. A wide range of government policies can influence the protection/lack of protection of agricultural production, which can be measured using the NPR and EPR as indicators. This structure is particularly useful in identifying an appropriate way to change policy (Gonzales et al., 1993).

Several recent studies have used a PAM that relates to the comparative advantage and policy effect (Khan, 2001). The assessment of the comparative advantages of a given productive system encompasses a broad range of concepts emanating from cost-benefit analysis and the theory of international trade. The basic idea is that any economic activity in a given country has a comparative advantage insofar as it can compete with alternative sources of supply through import without benefiting from any specific support from the rest of the economy in the form of transfer of resources. Using the PAM framework, private profit (D) is equal to total revenue (A) less the cost of tradable inputs (B) and domestic resources such as land, labor, and capital (C), all evaluated at private prices (Table-1). Similarly, social profit (H) is defined as total revenue (E) less the cost of tradable inputs (F) and domestic resources such as land, labor, and capital (G), all evaluated at their social opportunity cost (social prices).

Table-1: Policy Analysis Matrix

	Revenue	Tradable Input	Domestic Factor	Profit
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Divergence	I	J	K	L

Notes: Private profit (D) = A-B-C

Ratio indicators for comparison of unlike outputs are:

Social profit (H) = E-F-G	Private cost ratio (PCR) = C/ (A-B)
Output transfer (I) = A-E	DRC = G/(E-F)
Input transfer (J) = B-F	Nominal protection coefficient on tradable output (NPC) = A/E
Factor transfer (K) = C-G	Nominal protection coefficient on tradable
Net transfer (L) = D-H= I-J-K	input (NPC) = B/F

Source: Monke and Pearson (1989).

The profit generated by a selected system is measured by subtracting from the value of the total tradable output the value of the tradable inputs and the values of the domestic factors utilized to produce the output. Considering that the total output sale is the revenue of the system, this accounting identity is computed using two price systems. The first line of the PAM contains the value for the accounting identity measured at private prices (A, B, C, D), which are the prices actually used by the different agents to purchase their inputs and domestic factors and sell their outputs. The second row of the PAM gives the value of the same identity but measured at social prices. These prices are the prices that would prevail if the value of tradable inputs and outputs and domestic factors were not modified either by the economic policy in place (tax, subsidy, price intervention) or by output, input, or factor market failure, which results in a distorted price system. The third row of the PAM is obtained by subtracting the social value from the private value, and indicates the magnitude of the divergence between the situation at private prices and social prices.

The PAM provides a range of indicators for assessing the efficiency of a system. If D is positive, then the system generates profit under the current policy and market conditions and is competitive. Similarly, if H is positive, then the system would be able to make a profit even without benefiting from a subsidy or being constrained by taxes, and is said to have a comparative advantage. If a system is benefiting from input use or has to pay higher prices for labor, then it can be

competitive, i.e., D>0, while having no comparative advantage, i.e., H<0 (Shahabuddin & Dorosh, 2002).

- The financial cost benefit ratio (FCB) is the value of the domestic factors against the difference between the revenue minus tradable input: FCB = C/(A-B). If this ratio is above 1, it means that the system utilizes a greater value of domestic factors than the value added, and is not profitable. If the FCB<1, the system is profitable.

- The DRC ratio provides a measure of the level of comparative advantage achieved by the selected system: DRC = G/(E-F). If the DRC is above 1, the system has no comparative advantage; if it is below 1, the system has a comparative advantage.

- The nominal protection coefficient (NPC) measures the level of protection for the tradable output by looking at the ratio of revenue at private prices to revenue at social prices: NPC = A/E. If the NPC is above 1, it indicates that the system benefits from protection. An NPC below 1 indicates that the main output is undervalued at its private price, resulting in a transfer of wealth from the production system to the economy.

- The effective protection coefficient (EPC) compares the value added at private prices to value added at social prices: EPC = (A-B)/(E-F). This gives us a combined index of the level of trade distortion on both tradable inputs and outputs, and provides a more accurate measure of the level of protection than the NPC. An EPC above 1 means that the selected system is protected while an EPC below 1 means that the system generates less value added at market prices than it would at social prices.

4. PAM Results

4.1. Wheat

Wheat is the leading food grain in Pakistan as well as in Punjab, and gets the highest priority in the government's agricultural development strategy. Punjab is the main wheat-producing province, accounting for 80 percent of national production and 76 percent of cropped area (Government of Pakistan, 2005b). In view of its importance, it is imperative to examine its competitiveness from the farmer's as well as national perspective. In view of the upcoming WTO regime, domestic

crop production in general and wheat in particular has become a challenging issue. To determine whether Pakistan has a comparative advantage in producing wheat, we have to estimate the NPC, EPC, and DRC in the context of wheat farming, based on detailed data for average farmers and the import/export prices of wheat. The efficiency parameters have been calculated for the period from 1999/2000 to 2004/05 (crop years). Data on the private and social profitability for these years is given in Annex-A.

4.1.1. NPC and EPC

Empirical estimates of the NPCs and EPCs for wheat in Punjab are given in Table-2. The NPCs are estimated by dividing domestic output prices by social prices, i.e., import/export parity prices. They measure the impact of output pricing policies without considering interventions/distortions in input markets. The table reveals that, during 1999/2000 to 2004/05, producer prices ranged from 18 to 32 percent less than their export parity levels, implying implicit taxation of producers as producer prices were less than the border prices. Over time, wheat has not received any protection during the period as both coefficients are less than 1.

Table-2: NPC and EPC for Wheat

Year	NPC = A/E	EPC = (A-B)/(E-F)
1999-2000	0.82	0.65
2000-01	0.72	0.52
2001-02	0.70	0.43
2002-03	0.68	0.41
2003-04	0.81	0.55
2004-05	0.76	0.53
Average	**0.75**	**0.52**

The EPC is the ratio of the difference between the revenue and tradable inputs' costs in private prices to that in social prices. Table-2 reveals that the EPC for wheat decreased from 0.65 in 1999/2000 to 0.41 in 2002/03. However, during 2003/04 and 2004/05, increased domestic prices of wheat and simultaneously increased input prices led to an increase in the EPC to 0.55 and 0.53, implying a reduction in implicit tax. It also shows that value added at domestic price was around 41 percent to 65 percent of value added at international prices during the observed period.

4.1.2. DRC

Table-3 presents the results of a DRC analysis for wheat for the period 1999/2000 to 2004/05. The DRC coefficients declined from 0.61 in 1999/2000 to 0.47 in 2004/05. The average DRC coefficient of 0.53 reflects that we earn/save one rupee of foreign exchange by employing our domestic resources of Rs0.53 in wheat production. It also implies that wheat has a comparative advantage, as the product can generate foreign exchange at a lower resource cost than the direct purchase of foreign exchange.

Table-3: DRC for Wheat

Year	DRC = G/(E-F)
1999-00	0.61
2000-01	0.56
2001-02	0.52
2002-03	0.48
2003-04	0.52
2004-05	0.47
Average	**0.53**

4.1.3. Import/Export Parity Prices

Pakistan was a regular importer of wheat up to 1999/2000. During 2002/03, the country exported about 1.7 million tonnes of wheat, but imported 1.5 million tonnes of wheat in 2003/04. Estimating the import parity prices of a commodity is helpful in determining the opportunity cost of resources used in its domestic production while export parity prices are helpful in ascertaining its competitiveness in the international market.

Both import and export parity prices have been calculated on the basis of the FOB (Pacific) quoted price of US Western White Wheat. The calculation of import/export parity prices is based on economic analysis.

The computational details of estimated import/export parity prices and NPCs of wheat for the study period are given in Table-4 (A&B). The estimates presented indicate that wheat producers have not received any protection. The prices received by the growers have been substantially below the corresponding import parity prices. The results

show that Pakistan (Punjab) has a comparative advantage in wheat production for food self-sufficiency.

Table-4A: NPC for Wheat in Import Parity Price Scenario (Rs/40 kg)

Year	CIF Price of Wheat	Transportation and Handling Charges	Transportation From Karachi to Lahore	Procurement Centre to Lahore	Import Parity price at Procurement Centre	Market Price	NPC
2001-02	374.2	55	40	6.7	462.5	281	0.61
2002-03	417.9	55	40	6.7	506.2	310	0.61
2003-04	467.6	55	40	6.7	556.0	385	0.69
2004-05	466.8	55	40	6.7	555.1	432	0.78

Table-4B: NPC for Wheat in Export Parity Price Scenario (Rs/40 kg)

Year	FOB Price of Wheat Karachi	Incidental Charges (Multan)	Export Parity Price at Procurement Centre	Procurement Centre to Lahore	Market Price	NPC
2001-02	259.5	73.6	185.9	6.7	281	1.57
2002-03	303.0	73.6	229.4	6.7	310	1.39
2003-04	350.4	74.8	275.6	6.7	385	1.43
2004-05	346.0	74.7	271.3	6.7	432	1.63

4.1.4. NPC in Export Parity Price Scenario

The NPCs estimated under an exporting situation range from 1.39 to 1.63, indicating that the prices received by growers were higher than the export parity/economic prices. This is also an indication that wheat cultivation for export at the current input-output and price relationship is not feasible as the current export of wheat is subsidizing consumers of the importing country through taxpayer money from Pakistan (Table-4B). On the whole, the results show that Pakistan (Punjab) does have a comparative advantage in wheat production for self-sufficiency but not for export given the current input-output and price structure.

4.2. Rice

Rice, an important food and cash crop, is the third-largest crop of Pakistan in terms of area after wheat and cotton. Punjab accounts for 69 percent of the area under rice cultivation as a whole and 58 percent of total production.

The estimation of the NPC, EPC, and DRC is based on detailed data for average farmers and export prices of rice. The efficiency parameters have been calculated for the period 1999/2000 to 2004/05

(crop years). Data on the private and social profitability for these years is given in Annex-B.

4.2.1 NPC and EPC

Empirical estimates of NPCs and EPCs with respect to Basmati and Irri (paddy) in Punjab are given in Table 5. The NPC is estimated by dividing domestic output prices by social prices, i.e., import/export parity prices. It measures the impact of output pricing policies without considering any interventions/distortions in input markets. The NPCs estimated for Basmati and Irri paddy for 1999/2000 to 2004/05 reveal that producers' prices for Basmati ranged from 1 percent less during 2002/03 to 28 percent less in 1999/2000 than the export parity prices, implying that producers' prices were less than the corresponding border prices. Over time, Basmati prices did not receive any protection during 1999/2000 to 2004/05. The EPCs indicate that the extent of implicit taxation of domestic producers of Basmati was higher during 1999/2000 to 2004/05. In the case of Irri, both the NPCs and EPCs are generally higher than 1, implying protection in its production.

Table-5: NPC and EPC for Basmati and Irri (Paddy)

Year	NPC = A/E		EPC = (A-B)/(E-F)	
	Basmati	**Irri**	**Basmati**	**Irri**
1999-00	0.72	1.21	0.65	1.35
2000-01	0.57	1.03	0.52	0.98
2001-02	0.89	1.43	0.43	1.67
2002-03	0.99	1.37	0.41	1.54
2003-04	0.97	0.95	0.55	0.78
2004-05	0.99	0.97	0.88	0.82
Average	**0.86**	**1.16**	**0.57**	**1.19**

4.2.2. DRC

The DRC indicates the opportunity cost of domestic resources used per unit of value added in the production of a commodity. If the DRC is less than 1, it indicates a commodity system with a comparative advantage, and if it is greater than 1, it implies a situation of disadvantage. Table-6 shows that the DRCs for Basmati were less than 1 during 1999/2000 to 2004/05, implying that Pakistan (Punjab) has a comparative advantage in Basmati production. The DRC ranged from 0.62 in 1999/2000 to 0.77 in 2004/05. This also means that the domestic resources involved in earning one US dollar through Basmati rice export

were consistently less than the corresponding exchange rate. Therefore, increasing Basmati production for exports is an economic proposition.

The DRCs for Irri are greater than 1, indicating that, at a given input-output relationship and price relationship in the export market, Pakistan does not have a comparative advantage in producing Irri for export.

Table-6: DRC for Rice

Year	DRC = G/(E-F)	
	Basmati	**Irri**
1999-00	0.62	1.83
2000-01	0.65	2.00
2001-02	0.70	2.22
2002-03	0.71	2.22
2003-04	0.72	1.08
2004-05	0.77	1.12
Average	**0.68**	**1.75**

4.2.3. Export Parity Prices of Rice (Paddy)

Pakistan exports both fine and coarse varieties of rice. The export of rice totaled 1.82 million tonnes in 2003/04, of which 0.816 million tonnes were of the fine variety. The export parity prices have been calculated on the basis of actual export prices and Thai White quoted prices (for coarse varieties) and economic parity prices have been worked out accordingly. Details are given in Table-7.

The NPCs for Basmati and Irri (paddy) estimated under an exporting situation range from 0.75 to 0.92 and 1.03 to 1.21, indicating that the prices received by growers of Basmati were lower, while for Irri, the prices received by growers were higher than the export parity/economic prices, indicating that Basmati prices in Punjab received no protection while Irri prices did.

Table-7: NPC for Rice (Paddy) in Export Parity Price Scenario (Rs/40 kg)

	Basmati	Irri	Basmati	Irri	Basmati	Irri	Basmati	Irri
Ave. fob (Karachi) Price	1153.20	410.9	1176.32	411.72	1184.74	461.50	1241.25	540.09
Expenses from Sheller	186.00	48.00	186.00	48.00	186.00	48.00	186.00	48.00
Product Recoveries per 100 kg of Paddy	45 kg	48.60	45	48.60	45.00	48.60	45kg	48.60
Value of Rice	435.24	176.37	445.64	176.77	449.43	200.96	474.86	239.15
Total Value of Products	526.93	239.11	561.51	236.87	565.26	268.88	600.00	318.46
Processing Charges	50.80	40.00	50.80	40.00	50.80	40.00	50.80	40.00
Export Parity Price of Paddy	476.13	199.11	510.71	196.87	514.46	228.88	549.20	278.46
Market price	356	205	468	218	473	257	451	338
NPC	**0.75**	**1.03**	**0.92**	**1.11**	**0.92**	**1.12**	**0.82**	**1.21**

4.3. Sugarcane

The economic efficiency of sugarcane production has been evaluated by estimating the NPC, EPC, and DRC through a PAM for both importing and exporting scenarios. The efficiency parameters have been calculated for the period 1999/2000 to 2004/05 (crop years). Data for the private and social profitability for these years are given in Annex-C.

4.3.1. NPC and EPC

Empirical estimates of NPCs and EPCs with respect to sugarcane in Punjab are given in Table-8. The NPCs are estimated by dividing domestic output prices by social prices, i.e., import/export parity prices. They measure the impact of output pricing policies without considering any interventions/distortions in input markets. The table reveals that, during 1999/2000 to 2004/05, producer prices ranged from 1 to 12 percent less than their import parity levels implying implicit taxation of producers as producer prices were less than the border prices. Over time, sugarcane in Pakistan received no protection during the observed period as the coefficients were less than 1. The NPCs using export parity prices revealed that cane growers received higher prices than export parity prices, implying that sugarcane cultivation is uneconomical for export.

Table-8: NPC and EPC for Sugarcane

Year	NPC = A/E		EPC = (A-B)/(E-F)	
	Import Parity Prices	Export Parity Prices	Import Parity Prices	Export Parity Prices
1999-00	0.99	1.54	1.59	0.97
2000-01	1.07	1.55	1.59	1.07
2001-02	0.93	1.38	1.35	0.86
2002-03	0.90	1.33	1.28	0.81
2003-04	0.90	1.99	2.08	0.80
2004-05	0.93	1.35	1.35	0.85
Average	**0.95**	**1.50**	**1.51**	**0.89**

The EPC is the ratio of the difference between the revenue and tradable input costs in private prices to that in social prices. Table 8 reveals that the EPC decreased from 0.97 in 1999/2000 to 0.85 in 2004/05. It also reveals that cane growers were implicitly taxed, ranging from 3 to 20 percent during the study period under an importing country scenario. The EPCs estimated using export parity prices of sugarcane in output pricing reveal positive support to sugarcane ranging from 28 to 93 percent.

4.3.2. DRC

Table-9 presents the results of a DRC analysis of the sugarcane crop for the period 1999/2000 to 2003/04. The DRC coefficients increased from 0.62 in 1999/2000 to 0.72 in 2004/05. The average DRC coefficient of 0.67 reflects that we earn/save one rupee of foreign exchange by employing our domestic resources of Rs0.67 in cane production. It also implies that sugarcane has a comparative advantage as the product can generate foreign exchange at a lower resource cost than the direct purchase of foreign exchange. Using export parity prices, the DRC for sugarcane production in Punjab is on average more than 1. It suggests that sugar export is not a viable proposition at the prevailing input-output relationships and prices.

Table-9: DRC for Sugarcane

Year	DRC = G/(E-F)	
	Import Parity Prices	**Export Parity Prices**
1999-00	0.62	0.97
2000-01	0.51	0.71
2001-02	0.66	1.00
2002-03	0.71	1.08
2003-04	0.81	1.57
2004-05	0.72	1.02
Average	**0.67**	**1.02**

4.4. Seed Cotton

The economic efficiency of cotton production has been evaluated by estimating the NPC, EPC, and DRC through a PAM. These parameters have been estimated under both import and export situations. The efficiency parameters have been calculated for the period 2002/03 to 2004/05 (crop years). Data on the private and social profitability of these years is given in Annex-D.

4.4.1. NPC and EPC

Empirical estimates for NPCs and EPCs with respect to sugarcane are given in Table-10. The NPC is estimated by dividing domestic output prices by social prices, i.e., import/export parity prices. It measures the impact of output pricing policies without considering any interventions/distortions in input markets. The NPCs in an export scenario were either close to or greater than 1, whereas under an import situation, they were less than 1. This implies an expansion in cotton production to meet the increasing raw material requirements, as imports have been more expensive than domestic production. The EPC takes into account the impact of policy interventions in input markets, which reveals the same inferences as drawn from the NPCs.

Table-10: NPC and EPC for Cotton

Year	NPC = A/E		EPC = (A-B)/(E-F)	
	Import Parity Prices	Export Parity Prices	Import Parity Prices	Export Parity Prices
2002-03	0.75	0.98	0.61	0.88
2003-04	0.92	1.22	0.83	1.21
2004-05	0.74	**0.96**	0.57	0.83
Average	**0.81**	**1.07**	**0.68**	**1.02**

4.4.2. DRC

The results of the analysis (Table-11) indicate that the DRC was less than 1 during the study period under both importing and exporting situations. Thus Punjab (Pakistan) enjoys a comparative advantage in cotton production. The DRC coefficients range from 0.52 to 0.68, implying that the cost of domestic resources involved in earning one US$ through cotton export is 32 to 48 percent less than the current exchange rate. Therefore, increasing cotton production is an economic proposition for export. Under the importing scenario, the DRC coefficients are lower than the corresponding coefficients estimated under the exporting situation, implying that the cost of domestic factors involved in saving one unit of foreign exchange through increased cotton production is only 33 to 49 percent of its market price. Thus, an expansion in cotton production for import substitution is highly cost effective.

Table-11: DRC for Cotton

Year	DRC = G/(E-F)	
	Import Parity Prices	Export Parity Prices
2002-03	0.43	0.62
2003-04	0.36	0.52
2004-05	0.46	0.68
Average	**0.41**	**0.67**

5. Conclusion and Policy Implications

The PAM was modeled to assess the competitiveness and comparative advantage of major crops such as wheat, rice, sugarcane, and cotton production in Punjab (Pakistan) and whether the province qualifies for export or should produce for self-sufficiency.

Economic efficiency in wheat production in Punjab during the study period was determined by estimating the NPC, EPC, and DRC. The results of the NPC revealed that, under an importing scenario, wheat production did not receive any protection. The prices received by growers were below the import parity prices. The same conclusion was drawn from the NPC, but the implicit tax on the producers under an importing situation was higher under the EPC than estimated from the NPC's. The DRC for wheat was less than 1, also indicating that Punjab has a comparative advantage in producing wheat. Overall, the PAM results showed that Punjab has a comparative advantage in wheat production for self-sufficiency but not for export given the current input-output and price relationships.

An analysis of Basmati production revealed that Punjab did not receive any protection during the study period as the NPC was less than 1. The EPC also supported this conclusion. The DRC, which was less than 1, indicated that Basmati production has a comparative advantage. It further implies that the cost of domestic resources involved in earning one US$ through export has been consistently less than the corresponding exchange rates. Thus, increasing Basmati production for export is an economic proposition. As far as Irri rice is concerned, both the NPC and EPC for Punjab are higher than 1, implying protection to its production in Punjab. The DRCs for Irri were greater than 1 during the study period, implying that, with the given input-output relationships and prices in export markets, Punjab does not have a comparative advantage in producing Irri for export.

The NPCs estimated for Punjab in a sugar-importing scenario (less than 1 for the crop years 2001/02 and 2002/03) showed that cane growers did not receive economic prices during these years. However, in 2003/04, the estimated NPC was more than 1, reflecting support to cane growers as the prices received exceeded the import parity prices. The NPCs estimated under an exporting situation were more than 1, indicating that the prices realized by growers were higher than the corresponding export parity/economic prices. This further reflects that sugarcane production for exporting sugar is not an economic proposition.

Cotton production is efficient in term of economic prices. The NPCs under an export scenario were either close to or more than 1, whereas in an importing situation, they were less than 1. This implies that an expansion in cotton production has a comparative advantage since imports are expensive than domestic production.

The results of the present study suggest exploiting the available potential in cotton cultivation to cater to local needs and earn foreign exchange. Concerted efforts need to be made to improve the performance of the production and processing sectors. Policies conducive to cotton production in the province are also important.

It is also clear from the results that Punjab should not produce wheat for export given the current conditions and policies. The export of wheat is an efficiency loss of scarce resources that could be used to produce other more socially profitable products or needed crops.

Basmati production for export is an economic proposition. As far as Irri is concerned, the given input-output relationships and prices in exports markets imply that in Irri Punjab does not have a comparative advantage in production for export. Finally, sugarcane production for export is not an economic proposition.

Appendix 1

Basic Concepts and Terminology

Measures of Economic Incentives

A wide range of government policies influence economic incentives in agricultural production. Price and subsidy policies, import and export polices, and more general macroeconomic policies such as exchange rate and interest rate policies may affect relative incentives in agriculture. These effects can be measured by using the nominal and effective protection rates as indicators.

Nominal Protection Rate

Border prices of commodities are used as reference prices in measuring the effects of government intervention policies. Without government intervention, the domestic producer prices are expected to be closely related to the border prices. The nominal protection rate (NPR) is then defined as the amount by which the domestic price of a tradable output deviates from its border price. It can be stated as

$$NPR = \left(\frac{P_o^d}{P_o^b}\right) - 1$$

Where P_o^d is the domestic producer price of a tradable agricultural product *o*, and P_o^b is the border price of *o*, evaluated at the official exchange rate, adjusted for quality, transport, storage, and other margins, measured under competitive conditions, and expressed in local currency. A positive NPR implies price protection and positive incentives for the production of the commodity.

Measures of Comparative Advantage

Comparative advantage in the production of a given food crop for a particular country or region is measured by comparing with its border price the social or economic opportunity costs of producing, processing, transporting, handling, and marketing an incremental unit of the food commodity. If the opportunity costs are less than the border price, then

that country has a comparative advantage in the production of that particular food crop. In most developing countries, social or economic profitability deviates from private profitability because of distortions in the factor and output markets, externalities, and government policy interventions that tend to distort relative prices. Comparative advantage or comparative efficiency is estimated using three indicators.

The net social or economic profitability (NSP), the domestic resource cost (DRC), and the resource cost ration (RCR). These indicators are formally defined as follows:

$$NSP = \left(P_o^s - \sum a_{oj} P_j^s - \sum b_{ok} P_k^s\right) \times Y_o$$

$$= \left(P_o^b - \sum a_{oj} P_j^b - \sum b_{ok} P_k^s\right) \times Y_o$$

$$DRC = \frac{\sum b_{ok} P_k^s}{P_{of}^b - \sum a_{oj} P_{jf}^b}$$

And

$$RCR = \frac{\sum b_{ok} P_k^s}{P_{of}^b - \sum a_{oj} P_{jf}^b E^*}$$

Where world (border) prices are taken as shadow prices of tradable inputs and outputs,

$$P_o^s = P_o^b \text{ and } P_j^s = P_j^b$$

The terms are defined as follows:

P_o^s = shadow price of output o;

P_j^s =shadow price of tradable input j;

a_{oj} = quantity of the jth input needed to produce a unit of output o;

b_{ok} = quantity of the kth input needed to produce a unit of output o;

Y_o = yield per hectare of output o;

P_{of}^{b} = border price equivalent of output o in foreign currency, adjusted for transport, storage, distribution, and quality differences;

P_{jf}^{b} = border-price equivalent of input j in foreign currency, adjusted for transport, storage, distribution, and quality differences; and

E* = equilibrium nominal exchange rate, taken as the shadow value of the exchange rate.

Net Social Profitability

NSP is calculated on a per hectare basis. It is the difference between gross revenue and total costs expressed in economic prices. As an indicator of comparative advantage, the interpretation of NSP is straightforward. A production activity has comparative advantage if the NSP is greater than zero.

Domestic Resource Cost

The DRC of foreign exchange earned or saved from a particular production activity can be expressed as a ration of the domestic (non-tradable) factor costs in shadow prices per unit of output to the difference between the border price of output and foreign (tradable) costs (both expressed in foreign currency). In effect, the DRC is the "own exchange rate" of a particular production activity, since the numerator is expressed in local currency whereas the denominator is in foreign currency. The DRC measures the social opportunity cost of domestic resources employed in earning or saving a marginal unit of foreign exchange. As a measure of comparative advantage, the DRC can be used to determine the economic competitiveness of a production activity by comparing it with the shadow exchange rate (SER) of the currency.

References

Ahmad, S., and Martin, R.P. (2000). Agricultural Policy Analysis in Pakistan: Illustrations in the Use of the Policy Analysis Matrix (Working Paper 00-27). Lahore: Lahore University of Management Sciences.

Akhtar, W., Sharif, M., and Akmal, N. (2007). Analysis of Economic Efficiency and Competitiveness of the Rice Production Systems of Pakistan's Punjab. *Lahore Journal of Economics*, 12(1), 141-153.

Balassa, B., and Schydlowsky, D.M. (1972). Domestic Resource Costs and Effective Protection Once Again. *Journal of Political Economy*, 80(1), 63-69.

Bruno, M. (1972). Domestic Resource Costs and Effective Protection: Clarification and Synthesis. *Journal of Political Economy*, 80(1), 16-33.

Corden, W.M. (1971). *The Theory of Protection*. London: Oxford University Press.

Food and Agriculture Organization. (2004). *Comparative Advantages of Selected Syrian Agro-Food Commodity Chains: Implication for Policy Formulation* (Projects GCP/SYR/006/ITA and TCP/SYR/29006A). Rome: Author.

Gittinger, J.P. (1982). *Economic Analysis of Agricultural Projects* (2nd ed.). Baltimore, MD: Johns Hopkins University Press.

Gonzales, L.A., Kasryno, F., Perez, N.D. Perez, and Rosegrant, M.W. (1994). *Economic Incentives and Comparative Advantage in Indonesian Food Crop Production* (Research Report 93). Washington, DC: International Food Policy Research Institute.

Government of Pakistan, (2004a). *Price Policy for Rice (Paddy), 2004-05 Crop* (Series 211). Islamabad: Agricultural Prices Commission.

Government of Pakistan, (2004b). *Support Price Policy for Seed Cotton, 2004-05 Crop* (Series 210). Islamabad: Agricultural Prices Commission.

Government of Pakistan, (2004c). *Support Price Policy for Wheat, 2004-05 Crop* (Series 212). Islamabad: Agricultural Prices Commission.

Government of Pakistan, (2005a). *Pakistan Economic Survey 2004-05*. Islamabad: Finance Division.

Government of Pakistan, (2005b). *Agricultural Statistics of Pakistan 2004-05*. Islamabad: Ministry of Food, Agriculture and Livestock.

Haque, M., Khan, M.J., and Ahmad, M. (1988). *Effective Rate of Assistance to Farmers in Punjab*. Lahore: Punjab Economic Research Institute.

Haque, M. (2004). Impact of Taxation on Farm Income in Punjab (1988-89 to 1996-97). Unpublished PhD thesis, Department of Economics, University of the Punjab, Lahore.

Khan, P.N., and Ashiq, R.M. (2004). Comparative Advantage of Cotton Production in Pakistan. *Pakistan Journal of Agricultural Economics*, 5(1), 1-16.

Krueger, A.O., Schiff, M., and Valdes, A. (1988). Agricultural Incentives in Developing Countries: Measuring the Effect of Sectoral and Economy Wide Policies. *World Bank Economic Review*, 2(3), 733-738.

Masters, W.A., and Winter-Nelson, A. (1995). Measuring the Comparative Advantage of Agricultural Activities: Domestic Resource Costs and the Social Cost-Benefit Ratio. *American Journal of Agricultural Economics*, 77, 243-250.

Monke, E.A., and Pearson, S.R. (1989). *The Policy Analysis Matrix for Agricultural Development*. Ithaca and London: Cornell University Press.

Nelson, G.C., and Panggabean, M. (1991). The Costs of Indonesian Sugar Policy: The Policy Analysis Matrix Approach. *American Journal of Agricultural Economics*, 73.

Shahabuddin, Q., and Dorosh, P. (2002). Comparative Advantage in Bangladesh Crop Production (Discussion Paper 47). Washington, DC: International Food Policy Research Institute.

Tweeten, L. (1986). Impact of Domestic Policy on Comparative Advantage of Agriculture in the South. *Southern Journal of Agricultural Economics*, 18, 67-74.

Appendix-A

Economic Efficiency of Resource Use in Wheat Policy Analysis Matrix (PAM) For Average Farmers (Based on Import Parity Prices)

Rs/Acre

	Revenue	Trade Cost	Domestic Factor Cost	Profit
1999-2000				
Private Prices	8310	4544	3765	1
Social Prices	10092	4343	3525	2224
Transfers	-1782	201	240	-2223
2000-01				
Private Prices	7705	4331	3891	-517
Social Prices	10725	4218	3633	2874
Transfers	-3020	114	257	-3391
2001-02				
Private Prices	7931	4917	3931	-917
Social Prices	11361	4357	3627	3377
Transfers	-3430	559	304	-4294
2002-03				
Private Prices	8384	5266	4005	-888
Social Prices	12330	4676	3711	3943
Transfers	-3946	590	294	-4831
2003-04				
Private Prices	10274	5769	4268	237
Social Prices	12617	5010	3961	3646
Transfers	-2344	759	307	-3409
2004-05				
Private Prices	11332	6443	4712	178
Social Prices	14961	5670	4365	4926
Transfers	-3629	773	347	-4749

Source: Support Price Policy for Wheat, 2005-06 Crop, APCom, Government of Pakistan, Islamabad.

Appendix-B

Economic Efficiency of Resource Use in Basmati and Irri (Paddy) Average Farmers

Rs/Acre

	Revenues		**Traded Cost**		**Domestic Factor Cost**		**Profit**	
	Basmati	**Irri**	**Basmati**	**Irri**	**Basmati**	**Irri**	**Basmati**	**Irri**
1999-2000								
Private Prices	8091	6737	3603	3247	4360	3719	124	-229
Social Prices	11194	5563	3461	2978	4773	4721	2959	-2136
Transfers	-3103	1173	145	269	-413	-1002	-2835	1907
2000-01								
Private Prices	6745	5848	3990	3433	4658	3884	-1904	-1468
Social Prices	11746	5653	3939	3184	5095	4955	2712	-2485
Transfers	-5001	195	52	249	-436	-1071	-4616	1017
2001-02								
Private Prices	10027	7927	4559	3872	4743	4331	-725	-276
Social Prices	11210	5546	3803	3112	5220	5392	2187	-2957
Transfers	-1183	2380	756	760	-478	-1062	-1462	2681
2002-03								
Private Prices	11483	7910	4660	3995	5083	4521	1740	-606
Social Prices	11639	5764	3853	3214	5561	5650	2225	-3100
Transfers	-156	2146	807	781	-479	-1129	-485	2494
2003-04								
Private Prices	11722	8647	5220	4377	5491	4708	1011	-438
Social Prices	12035	9116	4331	3645	5947	5910	1757	-439
Transfers	-313	-469	888	732	-456	-1203	-745	1
2004-05								
Private Prices	12760	9199	5665	4732	5728	4808	1367	-340
Social Prices	12939	9468	4832	4006	6230	6108	1876	-647
Transfers	-179	-268	832	725	-502	-1300	-509	307

Source: Support Price Policy for Rice (Paddy), 2005-06 Crop, APCom, Government of Pakistan, Islamabad.

Appendix-C

Economic Efficiency of Resource Use in Sugarcane Production Policy Analysis Matrix (PAM) Based on Import Parity Prices

(Rs/Acre)

	Revenue	Trade Cost	Domestic Factor Cost	Profit
1999-2000				
Private Prices	19393	5034	9399	4960
Social Prices	19516	4684	9180	5652
Transfers	-123	350	219	-692
2000-01				
Private Prices	25309	5070	9862	10377
Social Prices	23612	4714	9583	9315
Transfers	1697	356	279	1062
2001-02				
Private Prices	20239	5946	11337	2956
Social Prices	21692	5030	10972	5690
Transfers	-1453	916	365	-2734
2002-03				
Private Prices	19474	6060	12233	1180
Social Prices	21739	5122	11800	4817
Transfers	-2265	938	433	-3637
2003-04				
Private Prices	19048	6604	12945	-501
Social Prices	21055	5569	12473	3013
Transfers	-2006	1035	472	-3514
2004-05				
Private Prices	22436	7004	13645	1787
Social Prices	24057	5897	13004	5155
Transfers	-1621	1107	641	-3368

Source: Price Policy for Sugarcane 2005-06 Crop, APCom, Government of Pakistan, Islamabad.

Economic Efficiency of Resource Use in Sugarcane Production Policy Analysis Matrix (PAM) Based on Export Parity Prices

(Rs/Acre)

	Revenue	Trade Cost	Domestic Factor Cost	Profit
1999-2000				
Private Prices	19393	5034	8939	5420
Social Prices	13284	4265	8764	255
Transfers	6109	769	175	5165
2000-01				
Private Prices	25309	5070	9301	10938
Social Prices	17047	4288	9119	3640
Transfers	8262	781	182	7298
2001-02				
Private Prices	20239	5946	10772	3521
Social Prices	15209	4657	10513	38
Transfers	5031	1289	259	3483
2002-03				
Private Prices	19474	6060	10662	1751
Social Prices	15274	4791	11343	-860
Transfers	4200	1269	319	2612
2003-04				
Private Prices	22439	6628	12307	3508
Social Prices	12504	4914	10921	-4332
Transfers	9935	1712	386	7838
2004-05				
Private Prices	22436	7004	13645	1787
Social Prices	17332	5897	11635	-200
Transfers	5105	1107	2011	1987

Source: Price Policy for Sugarcane 2005-06 Crop, APCom, Government of Pakistan, Islamabad.

Appendix-D

Economic Efficiency of Resource Use in Seed Cotton Production in Punjab Policy Analysis Matrix (PAM)

(Rs/Acre)

	Revenue	Trade Cost	Domestic Factor Cost	Profit
	Based on Export Parity Prices			
2002-03				
Private Prices	15043	5780	7089	2174
Social Prices	15278	4766	6529	3983
Transfers	-235	1014	560	-1809
2003-04				
Private Prices	21751	6383	7223	8146
Social Prices	17861	5192	6646	6022
Transfers	3891	1190	577	2123
2004-05				
Private Prices	15549	6974	7548	1027
Social Prices	16141	5770	7016	3354
Transfers	-592	1204	532	-2327
	Based on Import Parity Prices			
2002-03				
Private Prices	15043	5780	7089	2174
Social Prices	20074	4881	6540	8653
Transfers	-5031	899	549	-6479
2003-04				
Private Prices	21751	6383	7223	8146
Social Prices	23764	5290	6655	11819
Transfers	-2012	1093	568	-3673
2004-05				
Private Prices	15549	6974	7548	1027
Social Prices	20978	5890	6883	8205
Transfers	-5429	1084	665	-7177

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 95-110

Impact of Monetary and Macroeconomic Factors on Wheat Prices in Pakistan: Implications for Food Security

Khalid Mushtaq[*], Abdul Ghafoor[**], Abedullah[***], and Farhan Ahmad[****]

Abstract

This paper attempts to evaluate the impact of monetary and macroeconomic factors on real wheat prices in Pakistan for the period 1976-2010, using Johansen's co-integration approach. The Augmented Dickey-Fuller test reveals that all the variables used are first-difference stationary, except the trade openness indicator, which is second-difference stationary. There is also a long-run equilibrium relationship among these variables. The results indicate that real money supply, openness of the economy, and the real exchange rate have a significant effect on real wheat prices in the long run. The impulse response function shows that a trade openness shock impacted wheat prices to some extent and that it took three to four years for prices to become stable, following the shock. The findings of the study suggest that the policy thrust should focus on increasing wheat supply in the country by enhancing production or by liberalizing trade. Efforts should also be directed toward stabilizing the value of the Pakistani rupee against foreign currencies, especially the US dollar.

Keywords: Wheat prices, co-integration, Pakistan.

JEL Classification: E00, E31.

1. Introduction

Pakistan's economy has exhibited a low food-inflation environment over the last several years (single-digit inflation rate) with a sharp pickup during the last three years (Government of Pakistan, 2010). Several internal and external factors have contributed to the recent

[*] Assistant Professor, Department of Agricultural Economics, University of Agriculture, Faisalabad, Pakistan.
[**] Assistant Professor (TTS), Department of Marketing and Agribusiness, University of Agriculture, Faisalabad, Pakistan.
[***] Assistant Professor, Department of Environmental and Resource Economics, University of Agriculture, Faisalabad, Pakistan.
[****] Postgraduate Student, Department of Agricultural Economics, University of Agriculture, Faisalabad, Pakistan.

pickup in food inflation in Pakistan. These factors include: (i) an economic recovery resulting in a rise in the levels of income with a consequential surge in domestic demand, (ii) the continued pass-through effect of the previous rise in international oil prices, and (iii) a sharp pickup in the international prices of essential commodities. A major factor in the rise in inflation is the continuously upward adjustment of administered prices, such as the support prices of wheat. Because of the importance of wheat, successive governments have intervened heavily in wheat markets, procuring wheat at administratively set prices to support farmers' incomes, and subsidizing wheat sales to flour mills or directly to consumers with the objective of stabilizing prices at levels affordable to consumers (Niaz, 1995). Recently, the government increased the price of wheat to stop its illegal leakage from the country. This could have direct implications for food security in the country because wheat is the staple food of a majority of the population.

The high volatility of food prices is of concern to the public and policymakers because such price movements deter increased agricultural productivity and tend to intensify inflationary pressures. Food price volatility also increases the uncertainty faced by farmers and agribusiness firms. In particular, prices are considered a true indicator of resource allocation and, as such, price volatility affects farmers' investment decisions, with serious ramifications for the land under cultivation, debt, farm incomes, and productivity. The shocks to money supply, exchange rates, and trade policies have significant impacts on food prices, real incomes, and per capita domestic food production (Kargbo, 2005).

This study aims to empirically estimate the impact of monetary and macroeconomic factors on wheat crop prices in Pakistan. The paper is organized as follows: Section 2 reviews related studies on food prices, Section 3 presents an empirical framework, Section 4 discusses the empirical results obtained, and Section 5 concludes the study.

2. Review of the Literature

The impact of monetary and macroeconomic factors on the agricultural sector, particularly the pricing of agricultural products, has received considerable attention in recent international research. However, investigating the impact of these variables on agricultural prices is a relatively new research area in Pakistan, and the studies available in this area are limited. A review of the existing literature reveals that the

exchange rate, interest rate, and level of money supply are key monetary variables, whereas the major macroeconomic variables are import/export trade policy instruments.

Barnet et al. (1983) investigate the role of increased money supply in causing a rise in nominal agricultural prices, and finds that agricultural price increases were at the heart of the 1970s inflation. Jabara and Schwartz (1987) show the relationship between agricultural prices and the exchange rate, concluding that the exchange rate affects the price of agricultural commodities. Orden and Fackler (1989) determine the effect of monetary policy and other macroeconomic shocks on the price of agricultural products. Taylor and Spriggs (1989) study the importance of monetary and macroeconomic variables on Canadian agricultural prices, finding that agricultural prices are more responsive to these variables in the short run. Similar findings are obtained by Robertson and Orden (1990) and Lapp and Smith (1992). Sephton (1992) models the link between commodity prices and exchange rates, and finds that currency depreciation Granger-causes commodity price inflation. He also suggests that macro-events have had important effects on commodity markets in Canada. Dorfman and Lastrapes (1996) find that agricultural prices (crops and livestock) increase in the short run as a result of positive money supply shocks.

Khan and Qasim (1996) reveal that greater monetary expansion has caused inflation in Pakistan. Husain and Mahmood (1998) also find a unidirectional relationship between money and prices in Pakistan. Kargbo (2000) examines the impact of monetary and macroeconomic factors on real food prices (RFPs) in eastern and southern Africa. The empirical results show that changes in domestic food production, coupled with income, trade, exchange rate, and monetary policies, have had a significant impact on real food prices with wide implications for food availability and food security in the region. Hyder and Shah (2004) find that the exchange rate has had a moderate effect on wholesale and consumer prices in Pakistan. Akbari and Rankaduwa (2005) indicate that the foreign price level of imports, money supply, and domestic output level are statistically significant determinants of the general price level whereas the exchange rate is a statistically insignificant determinant. Awokuse (2005) examines the dynamic relationship between monetary policy variables and agricultural prices, finding that the exchange rate affects agricultural prices. Cho et al. (2005) explore the linkage between changes in macroeconomic variables (real exchange rate and inflation rate) and changes in relative agricultural prices and show that long-term changes in the real exchange rate have a significant negative correlation

with long-term changes in relative agricultural prices. Kaabia et al. (2005) analyzes the impact of changes in monetary policy and the exchange rate on agricultural prices. Their results indicate that, while changes in macroeconomic variables affect agricultural prices, the reverse does not hold. Kargbo (2005) studies the impact of monetary and macroeconomic factors on food prices and finds that trade, the exchange rate, and monetary policy reforms have a significant impact on food prices and domestic agricultural production. Khan and Schimmelpfennig (2006) and Qayyum (2006) find a significant relationship between money supply and food inflation. Finally, Asfaha and Jooste (2007) investigate the short- and long-run impacts of monetary policy changes on relative agricultural prices in South Africa, and indicate the existence of a long-run relationship between agricultural prices, exchange rate, and money supply.

3. Empirical Framework

3.1. Data and Variable Specifications

We use annual time series data in logarithmic form for the period 1976-2010, related to real wheat prices (RWP) (Rs/40 kg), real money supply (RMS) (M_2, Rs million), real per capita income (Rs/person), real exchange rate (RER) (Rs/US$), per capita domestic wheat production (tons per million persons), and an indicator for trade openness (TO) (Rs million).[1] Our data is derived from various issues of the *Pakistan Economic Survey*, the Food and Agriculture Organization (FAO)'s statistical database, and the Handbook of Statistics on Pakistan's economy.

The wholesale price of wheat in Lahore is used as a proxy for nominal wheat prices and then transformed into real wheat prices using the wholesale price index (WPI) by setting 2000/01 = 100 as the base year. Real money supply and real per capita income is calculated using the gross domestic product (GDP) deflator by setting 2000/01 = 100 as the base year. The RER is calculated by the formula

$$RER = e \times p / p^*$$

where RER is the real exchange rate, p is the price level of the home country, p* is the price level in a foreign country, and e is the nominal exchange rate between the currencies of the foreign and home country,

[1] We know that Pakistan's agriculture sector has undergone structural transformation during the last 15-20 years and annual time series data does not depict ST dynamics.

expressed as the number of foreign currency units per home currency units (Ellis, 2001). Here, we use the wholesale price of wheat in Lahore as a proxy for the price level in Pakistan and the CIF international price of wheat to measure p*. We convert this into rupees by multiplying it by the nominal exchange rate (Rs/US$). The TO indicator is calculated as the ratio of the sum of the value of total exports and imports over the country's GDP (Kargbo, 2005). It is then converted into real terms using the GDP deflator (2000/01 = 100 as the base year).

3.2. Model Specifications

RWPs are assumed to be a function of the real money supply (RMS), real per capita income (Y), the RER, per capita domestic food production (DP), and the TO indicator. Thus, the general form of this function[2] is specified in log form as follows:

$$\text{In RWP} = \alpha_0 + \beta_1 \text{RMS} + \beta_2 \text{In Y} + \beta_3 \text{In RER} - \beta_4 \text{In DP} - \beta_5 \text{In TO} + \mu_t \quad (1)$$

Here, μ_t is assumed to be an identically, independently, and normally distributed (IID) error term with zero mean and constant variance. We expect a positive relationship between money supply and wheat prices since an increase in money supply causes the demand for wheat to increase, and this causes an increase in wheat prices. We expect real per capita income to have a positive or no significant impact on wheat prices, because higher income is an incentive for households to spend more on food or shift to luxuries.[3] If they spend more on food, food prices are likely to surge; if they move toward luxuries, food prices are likely to remain unaffected. The RER is expected to carry a positive sign. Since increase in the RER means that our currency is depreciating resulting in increased exports and lowered imports. The resulting impact on food prices will be positive. Increased domestic production means increased supply and this will result in lowered food prices. Thus, the per capita domestic food production variable is expected to carry a negative sign. The TO indicator is expected to have a negative impact on wheat prices. Since the opening up of an economy to international trade may result in increased imports, thus lowering food prices.

[2] The specification of Equation 1 in log form may not be free from the problem of serial correlation.
[3] The literature supported the argument that households in LDCs spend major part of their income on food and Pakistan is no exception in this regard.

3.3. Estimation Procedure

We begin by testing for the presence of unit roots in the individual time series of each model using the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1981) both with and without a deterministic trend. The number of lags in the ADF equation is chosen to ensure that serial correlation is absent using the Breusch-Godfrey statistic (Greene, 2000, p. 541).

An ADF equation is required to estimate the following by ordinary least squares (OLS).

$$\Delta Y_t = \alpha_3 + \beta_3 t + (\phi_3 - 1) Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta Y_{t-i} + u_t \quad (2)$$

Y_t is the series under investigation, t is a time trend,[4] and u_t refers to white noise residuals.

We do not know how many lagged values of the dependent variable to include on the right-hand side of Equation 2. There are several approaches to this, but we use the Lagrange multiplier test (Holden & Perman, 1994, p. 62).

If two series are integrated of the same order, Johansen's (1988) procedure can be used to test for the long-run relationship between them. The procedure is based on a maximum likelihood estimation of the vector error correction model:

$$\Delta z_t = \delta + \Gamma_1 \Delta z_{t-1} + \Gamma_2 \Delta z_{t-2} + \square + \Gamma_{p-1} \Delta z_{t-p+1} + \pi z_{t-p} + \Psi x_t + u_t \quad (3)$$

z_t is a vector of I(1) endogenous variables, $\Delta z_t = z_t - z_{t-1}$, x_t is a vector of I(0) exogenous variables. In this case $z_t = [RWP_t, RMS_t, Y_t, TO_t, RER_t]$ and $x_t = [DP_t]$. Further, in Equation 3, π and Γ_i are (n × n) matrices of parameters with $\Gamma_i = -(I - A_1 - A_2 - \ldots - A_i)$, $(i = 1, \ldots, k-1)$, and $\pi = I - \pi_1 - \pi_2 - \ldots - \pi_k$. This specification provides information about the short-run and long-run adjustments to changes in z_t through estimates of $\hat{\Gamma}_i$ and $\hat{\pi}$, respectively. The term ΠX_{t-p} provides information about the long-run equilibrium relationship between the variables in z_t. Information about

[4] The rationale for having a trend variable in the model is that as most of the series are trended overtime. So it is important to test the series for unit root having a stochastic trend against the alternative of trend stationary.

the number of co-integrating relationships among the variables in z_t is given by the rank of the π-matrix: if π is of reduced rank, the model is subject to a unit root; if $0 < r < n$, where r is the rank of π, π can be decomposed into two (n × r) matrices α and β, such that $\pi = \alpha\beta'$ where $\beta' z_t$ is stationary. Here, α is the error correction term and measures the speed of adjustment in Δz_t, β contains r distinct co-integrating vectors, that is, the co-integrating relationship between nonstationary variables. Johansen (1988) uses the reduced rank regression procedure to estimate the α- and β-matrices and the trace test statistic is used to test the null hypothesis of, at most, r co-integrating vectors against the alternative that it is greater than r.

If co-integration is established among the series, then impulse response analysis (Lutkepohl, 1993, pp. 43-56) can be used to obtain additional information about the dynamic interrelationships among the variables. The impulse response functions trace the effects of a single standard deviation shock to each of the variables in the system over specific time horizons. They are generated under the assumption that the π-matrix is of the rank determined by the trace statistic and are orthogonalized to account for contemporaneous correlation between equations (Mushtaq & Dawson, 2002).

4. Empirical Results

Table-1 presents the results of tests of the data series in logarithms for the unit root using the ADF test both with and without a linear trend. In the nontrended model, the absolute values of the ADF statistics for LRWP, LRMS, LY, LTO, and LRER are well below the 95 percent critical value of the test statistics, and hence the null hypothesis of the unit root for these variables is accepted. This shows that the given time series are nonstationary in their level form whereas LDP is a stationary series. In the trended model, the absolute values of the ADF statistics for our five variables LRWP, LRMS, LY, LTO, and LRER are again below the 95 percent critical value of the test statistics, and hence our variables except LDP are nonstationary (Table-1).

In order to test the significance of the trend in the time series, we use the $\tau_{\beta\tau}$ test, in which the null hypothesis is that the variables have no trend against the alternative that the variables have a significant trend. Under this test, the null of no trend is accepted for all the series except for LDP where the trend appears to be significant. These results direct us toward the more powerful Φ_3-test. The null hypothesis in the Φ_3-test is

that the variables have a unit root with no trend against the alternative hypothesis that the variables are trend-stationary. Under this test, we cannot reject the null of a unit root and no trend for all the series except for LDP, which appears to be a trend-stationary series. On the basis of all these test results, we conclude that all our data series are nonstationary, i.e., I(1)[5] except for LDP, which is a stationary series, i.e., I(0).[6]

Table-1: ADF Unit Root Test Results

Variables	Non Trended Model	Trended Model	$\tau_{\beta\tau}$	Φ_3	Conclusion
LRWP	-1.96	-2.15	1.45	3.08	I (1)
LRMS	-2.82	-1.38	1.03	4.51	I (1)
LY	-0.77	-2.43	2.33	3.04	I (1)
LDP	-4.76*	-6.21*	3.12*	19.30*	I (0)
LTO	-1.79	-1.64	-1.87	3.34	I (1)
LRER	-0.82	-3.52	2.59	6.81	I (1)
Critical values	-2.97	-3.59	2.85	7.24	

Notes: * Represents significant values.
Critical values (95 percent confidence level) are taken from Fuller (1976, pp. 373).
I(1) = nonstationary and I(0) = stationary.

After testing for the unit root, the next step is to test for co-integration. The unit root results indicate that the LDP series is I(0), i.e., stationary. Although this I(0) series cannot interpret the long-run relationship between I(1) variables, it can explain their short-run behavior and is therefore allowed to enter the unrestricted vector autoregressive (VAR) model as an exogenous variable. Johansen's procedure is applied to test the co-integration between the respective variables. The first step is to select the order of the VAR model. We use the LR-statistic, adjusted for small samples (Sims, 1980) to test the null hypothesis that the order of the VAR is *k* against the alternative that it is 4, where $k = 0, 1, \ldots, 4$ and for all cases, $k = 1$.[7] The second step is to test for the presence and number of co-

[5] All the series were made stationary after taking their first-difference; only the TO indicator (LTO) became second-difference stationary.
[6] As per capita food production and population grow at an average annual growth rate of 4.74 and 4.61 percent, respectively, over the given period, gains in food production are eroded by the increase in population. This appears to be an intuitive reason for why per capita food production is stationary.
[7] We also tried the Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC), which use a lag length of 1 and 4, respectively. To avoid over-parameterization, we chose 1 as the lag length (Pesaran & Pesaran, 1987).

integration vectors among the series in the model. Table-2 indicates that the first statistical value of the trace test (90.64) is greater than the 95 percent critical value (75.98). We therefore reject the null of no co-integration and accept that there is one co-integrating value. For the remaining three statistical values of the trace test (52.70, 23.70, and 10.37), we fail to reject the null of no co-integration.

Table-2: Co-integration Results for Trace Statistics

Null	Alternative	Statistic	Critical Value
r = 0	r = 1	90.64	75.98
r < = 1	r = 2	52.70*	53.48
r < = 2	r = 3	23.70	34.87
r < = 3	r = 4	10.37	20.18

Notes: List of variables included in the co-integrating vector: LRWP, LRMS, LY, LTO, and LRER.
List of I(0) variables included in the VAR: LDP.
Critical values (95 percent confidence level) are from Pesaran et al. (2000).
* Indicates where the null is not rejected.

In the Johansen model, the parameters in the co-integrating vector can be interpreted as estimates of the long-run co-integrating relationship between variables (Hallam & Zanoli, 1993). Therefore, the estimated parameter values from these equations (when normalized) for RWPs are long-run elasticities (see Table-3). The coefficients represent estimates of the long-run elasticities of RWPs with respect to the RMS, real per capita domestic income, TO indicator, and RER.

Table-3: Johansen's Normalized Estimates

Variable	Long-Run Elasticity	t-Ratio
LRWP	1.00	1.00
LRMS	-0.55	2.20*
LY	0.24	0.73
LTO	-0.44	-2.75*
LRER	-0.16	-2.00*
Intercept	8.36	3.41

Note: * Indicates significance at 5 percent.

Contrary to a priori expectations, increases in money supply (LRMS) depress RWPs in Pakistan. This could be due the fact that increases

in money supply cause inflation, which reduces the effective demand for wheat, thus depressing its price. Real per capita income (LY) has a positive relationship with wheat prices (as per our priori expectations) but shows an insignificant impact. This could be because wheat is a staple food item for a large proportion of the Pakistani population, and most families consume wheat in an almost fixed amount, so growth in incomes enhances food prices but insignificantly. The TO variable (LTO) has a negative impact on RWPs as per our priori expectations. This indicates that greater trade openness in international trade may increase imports, thus decreasing food prices in Pakistan by -0.44 percent in the long run (Kargbo, 2005, estimated -1.619, -1.47, and -7.67 for Cote d'Ivoire, Senegal, and Nigeria, respectively). This result is also in line with the recent experience of the wheat economy in Pakistan: during a wheat shortage, imports stabilize prices by increasing supply in the country. In the case of the exchange rate (LRER), our priori expectation was that it has a positive impact on wheat prices, but the results show that it has a negative impact in the long run. A 1 percent increase in the RER leads to -0.16 percent decrease in wheat prices. This could either be because in most years Pakistan has not been an importer of wheat, or because an overvalued exchange rate was used for agricultural commodities which depreciated exports and thus lowered prices (Kargbo, 2005, also calculated a negative relationship: -0.11 and -0.03 for Cote d'Ivoire and Senegal, respectively).

We estimated an impulse response function to obtain a better understanding of the dynamic interrelationships among the variables, how shocks are transmitted, and how long it takes for shocks to be eliminated. Figure-1 shows that one standard error (SE) shock in the equation for RMS does not have any significant impact on RWPs.

Figure-1: Generalized Impulse Response(s) to One SE Shock in the Equation for RMS

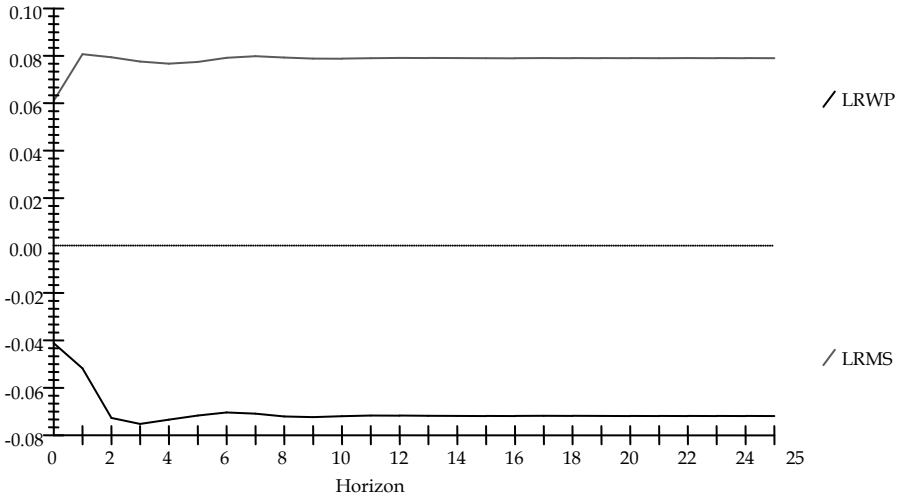


Figure-2 shows that one SE shock in the equation for real per capita income has an impact on RWPs to some extent. The intuitive reason for this might be that an increase in income causes consumers to shift their budgets to luxuries rather than wheat.

Figure-2: Generalized Impulse Response(s) to One SE Shock in the Equation for Real Per Capita Income

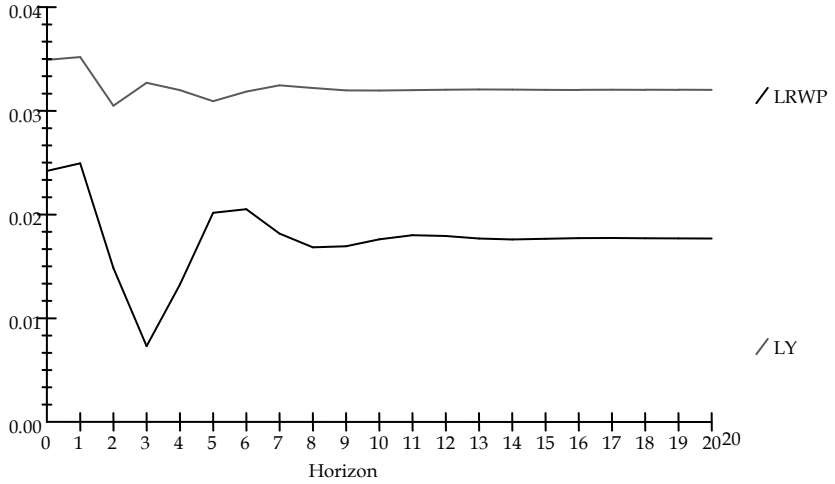


Figure-3 shows that one SE shock in the equation for TO has, as expected, a negative but small effect on RWPs. It takes three to four years for food prices to become stable after a shock in the TO indicator.

Figure-3: Generalized Impulse Response(s) to One SE Shock in the Equation for TO

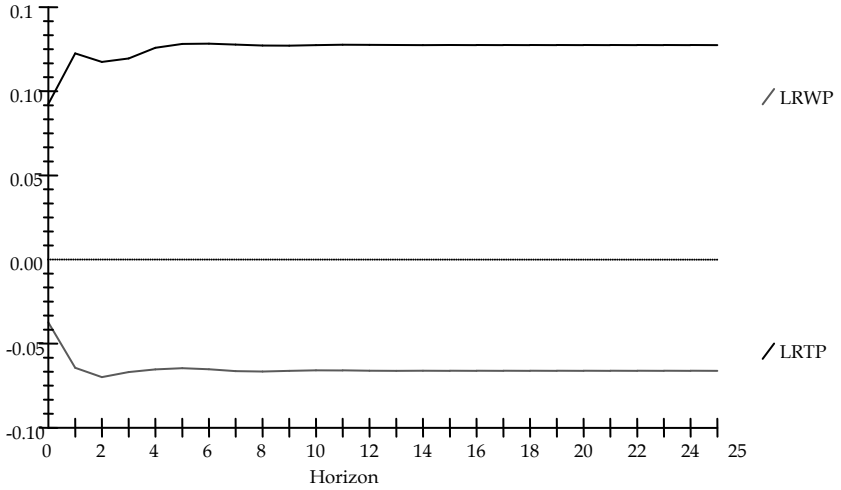
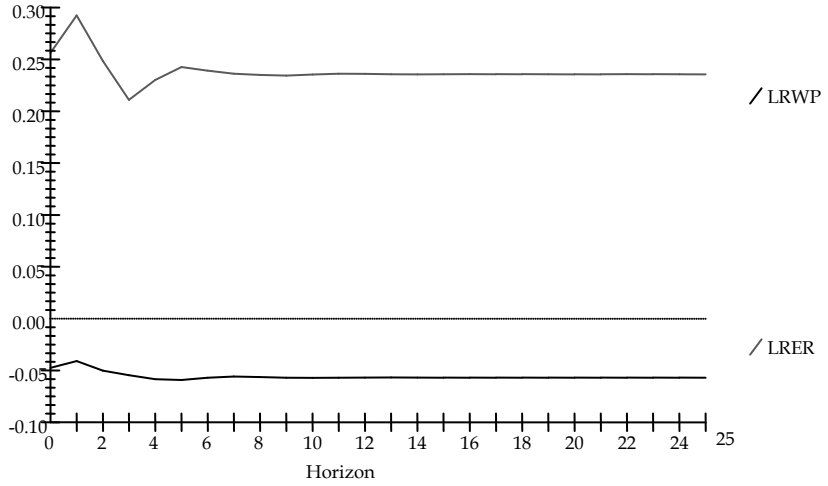


Figure-4 shows that one SE shock in the equation for RER does not cause much change to RWPs and prices look stable. This could be because Pakistan has not been an importer of food items, i.e., wheat, in most years.

Figure-4: Generalized Impulse Response(s) to One SE Shock in the Equation for RER



5. Conclusion and Policy Implications

We have used Johansen's co-integration approach to evaluate the impact of monetary and macroeconomic factors on RWPs for the period

1976-2010. All the variables were found to be first-difference stationary, except the TO indicator, which is second-difference stationary, and there is a long-run equilibrium relationship among the concerned variables. The results indicate that RMS, openness of the economy, and RER have had a significant effect on RWPs in the long run. The impulse response function indicated that the TO shock had some impact on wheat prices and that it took three to four years for prices to become stable following the shock.

The findings of the study suggest that the policy thrust should be to increase supply through enhanced domestic production as well as by liberalizing trade, and to stabilize the value of the Pakistani rupee against foreign currencies, especially the US dollar. These policy options could further help to stabilize wheat prices.

References

Akbari, A.H., and Rankaduwa, W. (2005). Determinants of Inflation and Feasibility of Inflation Targeting in a Small Emerging Market Economy: The Case of Pakistan. Meeting of the Atlantic Canada Economics Association, Halifax, Nova Scotia.

Asfaha, T.A., and Jooste, A. (2007). The Effect of Monetary Changes on Relative Agricultural Prices. *Agrekon*, 46, 440-474.

Awokuse, T.O. (2005). Impact of Macroeconomic Policies on Agricultural Prices. *Agricultural and Resource Economics Review*, 34, 226-237.

Barnett, R.C., Bessler, D.A., and Thompson, R.L. (1983). The Money Supply and Nominal Agricultural Prices. *American Journal of Agricultural Economics*, 65, 303-307.

Cho, G., Kim, M., and Koo, W.W. (2005). Macro Effects on Agricultural Prices in Different Time Horizons. Meeting of the American Agricultural Economics Association, Providence, Rhode Island.

Dickey, D.A., and Fuller, W.A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49, 1057-1072.

Dorfman, J.H., and Lastrapes, W.D. (1996). The Dynamic Responses of Crop and Livestock Prices to Money-Supply Shocks: A Bayesian Analysis using Long-Run Identifying Restrictions. *American Journal of Agricultural Economics*, 78, 530-541.

Ellis, L. (2001). Measuring the Real Exchange Rate: Pitfalls and Practicalities. Research Discussion Paper No. 2001-04, Reserve Bank of Australia.

Fuller, W. A. (1976). *Introduction to Statistical Time Series*. New York: John Wiley and Sons.

Government of Pakistan (2010). *Pakistan Economic Survey, 2009-10*. Islamabad: Finance Division, Economic Advisor's Wing.

Greene, W.H. (2000). *Econometric Analysis*. New Jersey: Prentice-Hall, Inc.

Hallam, D., and Zanoli, R. (1993). Error Correction Models and Agricultural Supply Response. *European Review of Agricultural Economics*, 20, 151-166.

Holden, D., and Perman, R. (1994). Unit Roots and Cointegration for the Economist. In Rao, B.B (Ed.), *Cointegration for the Applied Economist*. New York: St. Martin's Press.

Husain, F., and Mahmood, T. (1998). Causality between Money and Prices: Evidence from Pakistan. *Pakistan Development Review*, 37, 1155-1161.

Hyder, Z., and Shah, S. (2004). Exchange Rate Pass-Through to Domestic Prices in Pakistan. Working Paper No. 5, Islamabad: State Bank of Pakistan.

Jabara, C.L., and Schwartz, N.E. (1987). Flexible Exchange Rates and Commodity Price Changes: The Case of Japan. *American Journal of Agricultural Economics*, 69, 580-590.

Johansen, S. (1988). Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control*, 12, 231-254.

Kaabia, M.B., Gil, J.M., and Shebbi, H.E. (2005). Macroeconomics and Agriculture in Tunisia. 11th Congress of the European Association of Agricultural Economists, Copenhagen, Denmark.

Kargbo, J.M. (2000). Impacts of Monetary and Macroeconomic Factors on Food Prices in Eastern and Southern Africa. *Applied Economics*, 32, 1373-1389.

Kargbo, J. M. (2005). Impacts of Monetary and Macroeconomic Factors on Food Prices in West Africa. *Agrekon*, 44, 205-224.

Khan, M. S., and Schimmelpfennig, A. (2006). *Inflation in Pakistan: Money or Wheat?* (Research Bulletin 2). Islamabad: State Bank of Pakistan.

Khan, A.H., and Qasim, M.A. (1996). Inflation in Pakistan Revisited. *Pakistan Development Review*, 35, 747-759.

Lapp, J. S., & Smith, V. H. (1992). Aggregate Sources of Relative Price Variability among Agricultural Commodities. *American Journal of Agricultural Economics*, 74, 1-9.

Lutkepohl, H. (1993). *Introduction to Multiple Time Series Analysis*. 2nd ed. New York: Springer-Verlag.

Mushtaq, K., and Dawson, P. J. (2002). Acreage Response in Pakistan: A Cointegration Approach. *Agricultural Economics*, 27, 111-121.

Niaz, S. (1995). *Pricing of Farm Produce in Pakistan: Objectives, Practices and Experiences*. Islamabad: Print Associates International.

Orden, D., and Fackler, P.L. (1989). Identifying Monetary Impacts on Agricultural Prices in VAR Models. *American Journal of Agricultural Economics*, 71, 495-502.

Pesaran, M.H., and Pesaran, B. (1987). *Working with Microfit 4.0: Interactive Econometric Analysis*. Oxford University Press.

Pesaran, M. H., Shin, Y., and Smith, R. J. (2000). Structural Analysis of Vector Error Correction Models with Exogenous I(1) Variables. *Journal of Econometrics*, 97 (2), 293-343.

Qayyum, A. (2006). Money, Inflation, and Growth in Pakistan. *Pakistan Development Review*, 45, 203-212.

Robertson, J.C., and Orden, D. (1990). Monetary Impacts on Prices in the Short and Long Run: Some Evidence from New Zealand. *American Journal of Agricultural Economics*, 72, 160-171.

Sephton, P.S. (1992). Modelling the Link between Commodity Prices and Exchange Rates: The Tale of Daily Data. *Canadian Journal of Economics (Revue canadienne d'Economique)*, 25, 156-171.

Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*, 48, 1-49.

Taylor, J.S., and Spriggs, J. (1989). Effects of the Monetary Macro-Economy on Canadian Agricultural Prices. *Canadian Journal of Economics (Revue canadienne d'Economique)*, 22, 278-289.

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 111-142

The Reserve Equation and the Analytics of Pakistan's Monetary Policy

Rubina Hassan*

Abstract

This paper deals with the computation and analysis of some fundamental reserve aggregates and associated monetary statistics, which impart important information regarding the design and conduct of monetary policy at the State Bank of Pakistan (SBP). Specifically, we compute the data series for borrowed, unborrowed, free, and drainable reserves using balance sheet data published by the SBP for the period 1985-2009. Results show that Pakistan's monetary policy revolves around managing the exchange rate while using the t-bill rate as a key policy instrument. However, the value of the t-bill rate is both incorrectly and sub-optimally related to macroeconomic fundamentals rendering monetary policy time inconsistent. This hinges on the finding that, since 2000/01, the SBP has targeted the net free reserves of the banking system at 4 percent of total private deposits. Among other observations, we find that the scope of open market operations as a tool of monetary policy remains limited and that this limited role of open market defenses derives from the concern of the central bank to sterilize its own foreign exchange reserves. Furthermore, the growth rate of unborrowed plus drainable reserves bears a strong negative correlation with the annual average rate of inflation, which, on account of the former being consistently negative since 2005, implies that neither the government nor the SBP have an overriding concern for controlling inflation.

Keywords: Monetary policy, central banks, Taylor rule, monetary targets, Pakistan.

JEL Classification: E51, E52, E58.

1. Introduction

This paper deals with the computation, presentation, and analysis of some fundamental reserve aggregates and associated monetary statistics for Pakistan that the State Bank of Pakistan (SBP) does not explicitly publish (or even make any reference to in policy discussions)

* Assistant Professor, Department of Economics, University of Karachi.

but which, nevertheless, impart important information regarding the design and conduct of monetary policy at the SBP.

Our analysis originates in the fundamental question as to what drives monetary policy at the SBP. The SBP describes its policy as a set of discretionary measures that are implemented as and when deemed necessary, and which derive from a detailed review of the state of the economy, the practices of the banking system, and the statement of objectives of monetary policy (see, for example, SBP, 2009a, 2009b). In contrast to the claims of the SBP, we find that changes in the t-bill rate are systematically related to the rate of growth of national output, the rate of inflation, and the currency depreciation rate (Hassan & Shahzad, 2010).[1] This implies that the SBP implicitly subscribes to a Taylor type rule (see Taylor, 1993, 1998) which, quite unusually, dictates that it (i) raise the t-bill rate when output growth declines (Malik and Ahmad, 2007, also observe the same), and (ii) raise the t-bill rate when inflation increases (only in the long run) but by less than the amount of increase in inflation. This situation is further complicated by the SBP's claim that changes in the t-bill rate do not necessarily reflect changes in monetary policy and that the key monetary policy instrument at the SBP is the discount rate (SBP, 2009b).

The design and conduct of monetary policy—apart from the standard procedure of determining objectives, setting quantitative targets, choosing instruments, and ascertaining the way changes in instruments will help attain these objectives—requires the central bank to choose an operational target of monetary policy. This operational target is "an economic variable, which the central bank wants to control, and indeed can control, to a very large extent on a day-by-day basis through the use of its monetary policy instruments" (Bindseil, 2004). The SBP has never explicitly stated its operational target in any of its publications except for the recent monetary policy statement (SBP, 2009b) which states that the SBP targets the rate of monetary expansion consistent with (i) estimates of net foreign assets, (ii) estimates of the government's budgetary borrowing, and (iii)

[1] The policy rule equation referred to here states that:

$$TBR = 4.60 + 0.66 * TBR_{-1} - 0.18 * INFL - 0.48 * \left[\frac{YN_R - (YN_R)_{-1}}{(YN_R)_{-1}} \right] + 0.26 * INFL_{-1} - 0.15 * DEPRIC_{-1} - 6.72 * D04$$

TBR, *INFL DEPRIC* and YN_R and *D04* indicate the t-bill rate, inflation rate, currency depreciation rate, real national output, and the 2004 dummy, respectively. Hassan and Shahzad (2010) estimate this equation consistently (as all right-hand variables are stationary) using OLS with actual data for 1991-2007. The equation has an adjusted 95 percent fit with no signs of autocorrelation, heteroscedasticity, parameter instability, or structural shift, and tracks the policy rate with precision. It typifies the Taylor rule when we assume that expected inflation and potential output, respectively, equal their last-period values.

aggregate demand pressure reflected in the saving-investment gap. The statement outlines a complete operational procedure for monetary policy in terms of a target range set for the reverse repo rate that is consistent with the fundamental equation of monetary policy (see Bindseil, 2004, for a detailed rationale for and description of the policy equation).

The question as to whether the operational target of monetary policy should be a reserve variable—as suggested by the reserve position doctrine (RPD)—or an interest rate variable (which constitutes recent practice at many central banks) has been the subject of a longstanding debate in monetary policymaking (see Bindseil, 2004). Since the SBP has never officially subscribed to either of these positions and since it actively denies subscribing to a Taylor-type rule, we need to construct reserve aggregates for Pakistan to ascertain the operational basis of its monetary policy. Specifically, we use the balance sheet data of the SBP and the banking system to construct various reserve variables such as free reserves, borrowed reserves, and unborrowed reserves, in conjunction with the reserve equation to determine which operational targets of monetary policy the SBP has used in the past. Since, from a purely technical viewpoint, operational targets specified in terms of interest rates can be translated into reserve targets and vice versa by making use of the fundamental equation of monetary policy (see Bindseil, 2004; Mayes & Toporowski, 2007), this exercise is expected to reveal the cornerstones of the SBP's monetary policy. The analysis is also important in that it provides for the core element of any econometric model that incorporates banking sector behavior while analyzing monetary policy.

The remaining paper is organized as follows. In Section 2, we explain the theoretical linkages that lead to the empirical determination of the reserve equation for Pakistan. The reserve equation is then used to derive some useful monetary statistics for Pakistan for the period 1975-2007. Statistical calculations of the various components of reserve money, reserve equation, and monetary statistics are reported in Section 3, along with a discussion on their behavior and insights into monetary policy. The paper concludes with Section 4.

2. Reserve Equation and the Analysis of Monetary Policy

The analysis of monetary policy in terms of the reserve equation was the central idea of the RPD, which remained the popular monetary policy paradigm at the Federal Reserve Bank from the 1920s until the late 1980s, when the Federal Reserve first switched to inflation targeting and

then to interest rate management as a guide to monetary policy.[2] The RPD posits that, by managing one or the other reserve aggregates, the central bank can easily keep money supply on its desired path.[3] A formal analysis of money supply in terms of reserve aggregates originated in Meigs (1962) and has been described in many standard monetary economics texts (see, for example, Teigen, 1978; Branson, 1989). Although central banks and academic economists no longer rely on the reserve concepts when describing or setting monetary policy, the informational content of these concepts can seldom be denied (see Toporowski, 2006).

Below, we show both theoretically and empirically how the monetary data published by the SBP can be used to determine the quantity of reserve money and the reserve equation for Pakistan. We then explain some essential facts about monetary operations and monetary policy that the SBP has never explicitly published or used but which, spontaneously, constitute the core of its monetary operations and monetary policy.

2.1. *Derivation of the Reserve Equation*

Reserve money can be defined in three different ways: first, it is the sum total of the liabilities of the central bank; second, since assets and liabilities balance out,[4] reserve money is also the aggregate of the asset side of the central bank's balance sheets; and third, reserve money can be determined by accounting for the sources and uses of reserves. The first definition is a purely theoretical definition of reserve money. An

[2] The Federal Reserve has never adopted explicit inflation targeting. However, this is a debatable issue. Bindseil (2004) argues that the Federal Reserve under Alan Greenspan followed an implicit inflation targeting regime. Clarida, Gali, and Gertler (2000) argue that an active stance against inflation proved decisive in controlling inflation during the Volcker-Greenspan era. They write: "It is not the target but the attitude to inflation which matters." Similarly, Favero and Rovelli (2001) try to determine the preferences of a central bank by calibrating first-order conditions for the minimization of an appropriate quadratic loss function. They also find a slight shift (although statistically insignificant) in Federal Reserve behavior during the Volcker-Greenspan era toward inflation. Bernanke (2004) explains how the Federal Reserve has emerged as a strong inflation fighter without explicitly subscribing to an inflation targeting regime. Rudebusch and Svensson (1998) describe a large number of policy rules that are consistent with an inflation targeting (explicit or implicit) regime.

[3] Borrowed reserves, unborrowed reserves, total reserves, and excess reserves have all been proposed and used as potential operational targets of monetary policy over the 70-year lifespan of the RPD. A discussion of when and how a certain reserve aggregate was used by the Federal Reserve as a target and why it was abandoned can be found in Bindseil (2004).

[4] The standard balance sheet equation states that assets = liabilities + equity. However, we seldom make such a classification when dealing with the analytics of monetary policy in terms of central bank balance sheets; see Bindseil (2004) and Toporowski (2006). This type of classification is usually made for a central bank when dealing with the issue of central bank autonomy (see Ernhagen et al. 2002).

empirical determination of reserve money essentially originates in the second definition. (Another version of the second definition states that reserve money equals the sum of net domestic and foreign assets of the central bank.) Finally, while commercial banks use reserves for maintaining required and excess reserves (including vault cash), they obtain the same either by acquiring government debt (unborrowed reserves) or loans from the central bank (borrowed reserves). The reserve equation categorizes monetary data in accordance with each of these definitions so that they all yield the same aggregate quantity.

While it does not elaborate on reserve-related concepts and the reserve equation, the SBP's monetary survey defines reserve money in two equivalent ways (SBP, 2002, 2005):

$$R = NDA_{SBP} + NFA_{SBP} \tag{1}$$

$$R = CC + OD + RR_D + RR_T + RR_{NBFI} + RE + VC \tag{2}$$

Table-1 and Table-2 (see Annex) show the schematic balance sheets of the SBP's Issue Department and Banking Department (see SBP, 2002, 2005). Aggregating the respective sides of these two balance sheets to form a consolidated balance sheet and then writing the result in the form of an equation gives us the following:

$$\begin{aligned} &C + C_{Banking} + CRF + D_F + D_P + D_B + D_O + SDR_{Allocation} + BPay + Reval + Liab_{other} = \\ &G + F + SDR_{Issue} + C_{Issue} + S_{Issue} + G_{RBI} + A_{RBI} + C_{Banking} + BoE_{Internal} + S_{Banking} + BoPak \\ &+ SDR_{Banking} + GDB + A_G + A_{Banks} + A_{NBFI} + I_{Banks} + I_{NBFI} + I_G + I_{Other} + Asst_{Other} \end{aligned} \tag{3}$$

This equation can be manipulated (see Hassan and Shahzad, 2009, for details) to read as follows:

$$\begin{aligned} R = &\left(G + G_{RBI}\right) + \left(F + SDR + A_{RBI} + BoPak\right) + \left(Coins_{1\,plus} + Coins_{Subs} + OD\right) \\ &+ \left(S_{Issue} + S_{Banking} + I_G\right) + \left(BoE_{Internal} + GDB + A_G + A_{Banks} + A_{NBFI} - D_F - D_P - D_O\right) \\ &+ \left(I_{Banks} + I_{NBFI} + I_{Other}\right) + \left(Asst_{Other} - CRF - BPay - Reval - Liab_{other}\right) - C_{Banking} \end{aligned} \tag{4}$$

where the terms in parentheses can be identified respectively as the SBP's gold stock, foreign exchange holdings, treasury currency, portfolio of government securities, credit (net of government deposits), investments, and other balancing items (see, for example, Mishkin, 2006; Federal

Reserve Bank, 2002; Jordan, 1971].[5] Equation-4 provides a direct way of computing the quantity of reserve money using the balance sheets of the central bank. It tells us what assets denominate the outstanding quantity of reserve money in the economy and can thus, very adequately, be called the supply of reserve money.[6] The demand for reserve money arises out of its various uses by the nonbank private sector and the banking sector (hence, called the uses of reserves), and can be determined as per Equation-2.[7]

The reserve equation is defined as the equation showing the sources and uses of reserve money. Equation-2 describes the uses of reserve money. The standard definition of the sources of reserve money states that reserve money equals the sum of treasury currency (C_T), borrowed reserves (RB), unborrowed reserves (RU), and other balancing reserves (A) (see Toporowski, 2006; Bindseil, 2004; Federal Reserve Bank, 2002; Teigen, 1978; Jordan, 1971):

$$R = C_T + RU + RB + A \tag{5}$$

Treasury currency is defined as currency issued by the federal government in the form of coins and other deposits. Unborrowed reserves equal the central bank's portfolio of government securities plus total discounts and advances made by the SBP less the borrowings of scheduled banks from the SBP (Teigen, 1978), while borrowed reserves are defined as the total borrowings of scheduled banks from the central bank. The last term A represents all other sources less all other uses and represents the maximum amount of resources that can be drained from the economy through defensive open market operations (see Teigen, 1978; Jordan, 1971). Defining net free reserves of the banking system as excess reserves (including vault cash) less borrowed reserves (see Teigen, 1978; Jordan, 1971), we can rewrite Equation-5 as:

---

[5] The International Monetary Fund (IMF)'s *Monetary and Financial Statistics Manual* maintains that "central bank or central government holdings of unissued or demonetized currency are not financial assets and should not be recorded in sectoral balance sheets" (IMF, 2005). The last term in Equation-4 thus represents nothing more than the SBP's confusion as to whether or not to include currency held in the banking department as an asset of the issue department (see Hassan and Shahzad, 2009, for a detailed discussion on this issue). In what follows, we construct different definitions of reserve money and accompanying data while assuming that this confusion does not exist.

[6] Since the sum of the first and second terms in parentheses in Equation-4 represents the SBP's net foreign assets, Equation-1 implies that the sum total of the remaining components must be the SBP's net domestic assets.

[7] The demand and supply of reserve money become equal only when we remove the last term (i.e., currency held in the SBP's Banking Department) from Equation-4. This proves the inaccuracy of the SBP's balance sheet data.

$$\begin{aligned} R &= C_T + RU + RB + A \\ &= C_T + RU + RE + VC - RE - VC + RB + A \\ &= C_T + (RU - RF) + RE + VC + A \end{aligned} \tag{6}$$

In order to determine these variables empirically, we need to look at the consolidated balance sheets of the SBP and commercial banks. Table-3 (see Annex) shows a schematic representation of the balance sheet of the scheduled banks in Pakistan. The balance sheet can be written in equation form as:

$$D + T + RB = RR_D + RR_T + BC + BSI + RE + VC + x \tag{7}$$

The banking system's balance sheet identity states that the sum total of demand and time liabilities (D and T) plus the discount liabilities of the banking system (RB) equal required reserves against demand and time liabilities (RR_D and RR_T), bank credit (BC), banking sector investments (BSI), excess reserves ($RE + VC$), and a balancing factor (x: all other assets less all other liabilities). The banking system's balance sheet provides data on borrowed reserves[8]. The definition of treasury currency may be read directly from equation 4 above. We are thus left to determine the quantity of unborrowed reserves and the factor A. In line with the definitions used by Federal Reserve Bank (2002), Teigen (1978) and Jordan (1971), we define unborrowed reserves as the portfolio of government securities held by the SBP plus total discounts and advances made by the SBP (net of government deposits) less the borrowings of scheduled banks from the SBP. Thus, adding together the fourth and fifth terms in parentheses from Equation-4 and subtracting the amount of borrowed reserves from this total gives us an estimate of the amount of unborrowed reserves.

$$RU = (S_{Issue} + S_{Banking} + I_G) + \begin{pmatrix} BoE_{Internal} + GDB + A_G + A_{Banks} + A_{NBFI} \\ - D_F - D_P - D_O \end{pmatrix} - RB \tag{8}$$[9]

[8] The category "loans and advances to banks and nonbank financial institutions" in the SBP's balance sheet does not somehow match discount borrowings from the SBP.

[9] The SBP publishes data on borrowed reserves (advances from the SBP), excess reserves, vault cash (cash in banks' tills), one rupee and above coins, subsidiary coins, and other deposits. The volume of treasury currency, borrowed reserves, and free reserves is therefore known with certainty. However, data on unborrowed reserves has not been published in a readily usable format. We derive it using the definition in Equation-8. To the extent that unborrowed reserves are over/underestimated (because of the nonavailability of further disaggregated data that might need re-categorization), the factor A will need to be counter-adjusted. However, we expect this adjustment to be of a much smaller magnitude to make any significant differences to our analysis.

Finally, subtracting treasury currency, unborrowed reserves, and borrowed reserves from the total quantity of reserve money (Equation-5), we get data on the factor A that represents all other sources less all other uses of reserves.[10] The reserve equation is thus empirically determined. Combining the above results, we can write the complete reserve equation as

$$CC + OD + (RR_D + RR_T + RR_{NBFI}) + (RE + VC) \equiv R \equiv C_T + (RU - RF) + (RE + VC) + A \tag{9}$$

Canceling out excess reserves and vault cash on both sides, we get

$$(CC + OD - C_T) + (RR_D + RR_T + RR_{NBFI}) = (RU - RF) + A \tag{10}$$

Equation-10 is the reserve equation. It provides an important link between currency in circulation, required reserves, unborrowed reserves, and net free reserves of the banking system. The reserve equation is important because all its variables are directly linked with monetary policy instruments. Required reserves are linked to the reserve requirement ratios and the volume of demand deposits. Changes in unborrowed reserves take place through open market operations and are therefore related to the t-bill rate. Finally, the net free reserves of the banking system have a very close relationship with the interest rate differential (the money market rate less the discount rate) and deposits of the banking system. Monetary policy, whether it works through open market or discount operations (in the short run) or through reserve requirement setting (in the long run) can therefore be directly evaluated by making use of this identity.

2.2. *The Reserve Equation and Analytics of Monetary Policy*

The various definitions of money supply used by the SBP read:

$$\begin{aligned} M_2 &= (CC + OD) + (DD + TD + RFCD) = (CC + OD) + D_p \\ &= (NCGS + NCPS + NCO) + NFA \\ &= NDA + NFA \end{aligned} \tag{11}$$

[10] Using Equation-4, Equation-6, and Equation-8, we get $A = \begin{pmatrix} G + \\ G_{RBI} \end{pmatrix} + \begin{pmatrix} F + SDR + \\ A_{RBI} + BoPak \end{pmatrix} + \begin{pmatrix} I_{Banks} + I_{NBFI's} + I_{Other} + Asst_{Other} \\ -CRF - BPay - Reval - Liab_{Other} \end{pmatrix}$. This clearly shows that the term A represents the net foreign assets of the central bank plus its investments (net of capital gains, other liabilities, etc.) and, therefore, is the maximum amount of resources that can be drained out of the monetary system through defensive open market (sterilization) operations.

The reserve equation (Equation-10) and the demand definition of money supply (the first part of Equation-11) together with the assumptions that (i) the ratio of currency (including other deposits) to money supply is stable and predictable, and that (ii) required reserves are linked to deposits via the reserve requirement ratio, generate the definition of the reserve multiplier. Defining $\eta = (CC + OD)/M_2$, and $RR = \varphi \cdot D_P = \varphi(1-\eta)M_2$, we can write this relationship as

$$M_2 = \left(\frac{1}{\eta + \varphi(1-\eta)}\right) \cdot (RU + C_T + A - RF) = \mu \cdot (RU + C_T + A) - \mu \cdot RF \quad (12)$$

The money supply model in Equation-12, links money supply (M_2) to the reserve multiplier (μ) and reserve components, and simultaneously breaks money supply into its endogenous and exogenous components. Since the quantity of unborrowed reserves and treasury currency is directly under the control of the system, and since A can always be effectively drained out of the system through defensive open market operations, the first term represents the purely exogenous part of money supply. The second component is the net free reserves of the banking system and represents the endogenous part of money supply (Teigen, 1978; Branson, 1989). The central bank usually controls free reserves through its discount and standing facilities operations. Proponents of the reserve approach to money supply believe that once the quantity of unborrowed and free reserves is determined, the level of private deposits can be determined residually by making use of the expression: $\Delta RR = \Delta RU - \Delta RF + \Delta A$ [11]. The ratio of unborrowed reserves and free reserves to total private deposits, therefore, describes nothing else but monetary policy.

Finally, using Equation-1 and the last component of Equation-11, and defining $m_D = NDA/NDA_{SBP}$ and $m_F = NFA/NFA_{SBP}$ as the domestic and foreign asset money multipliers, respectively, we can write the overall money multiplier $(m = M_2/R)$ as $m = m_D \cdot \delta_D + m_F \cdot \delta_F$,

[11] This identity is the total differential of Equation-10 while holding currency in circulation constant. The differentials that appear in the expression are behaviorally related to bank deposits and the various interest rates, thereby also cross-linked to one another. Thus, when free reserves or unborrowed reserves change, they also cause a change in bank deposits, exerting a second-round indirect influence on required reserves (see Meigs, 1962, for a detailed discussion of these concepts). Casting out all these differentials in terms of their relationship with bank deposits and then inverting this functional relationship, our result indicates that bank deposits are residually determined through this identity. Clark and Kwack (1976) derive the same result in a slightly different context.

where the δ terms reflect the respective shares of domestic and foreign assets in reserve money. Since the numerator on the right-hand side of Equation-12 equals reserve money less excess reserves, we expect the reserve multiplier (μ) to be larger than the simple money multiplier (m) and the true descriptor of how much credit the banking system can generate from a given volume of reserve money.

3. Statistical Computations and Analysis

Using the above definitions and drawing on data from the SBP's balance sheets, the consolidated balance sheet of the commercial banks, monetary statistics, and monetary survey, we can construct data on the various components of the sources and uses of reserve money in the Pakistan economy for the period 1975-2009. All data is taken from the *Handbook of Statistics on Pakistan Economy 2005* and the SBP's annual reports (2006, 2007, and 2008), and counter-checked against the SBP's monthly bulletins and various Economic Surveys. The results of our statistical computations are provided in Table-5 (see Annex). The computed data series are then used to construct the time profile of a number of reserve indicators (derived in Section 2 above), the graphs of which are plotted in the figures following the data tables (see Annex).

Tables-5(a) and 5(b) illustrate our computed data series showing, respectively, the supply and demand components of reserve money. Table-5(a) corresponds to our categorization of the SBP's balance sheet data in accordance with Equation-4. Table-5(b) is simply a reprint of different data series from the sources listed above. Table-5(c) illustrates data on the sources of reserve money constructed in concordance with Equation-6. This dataset is then used to construct a time profile of unborrowed, free, and drainable reserve ratios; the ratio of broad money to unborrowed reserves; the endogenous and exogenous components of reserve money; the total volume of discretionary open market operation instruments along with its growth rate; the difference between unborrowed and drainable reserve ratios in comparison with the t-bill rate; the reserve multiplier in comparison with the simple money multiplier; the breakup of the simple money multiplier into its domestic and foreign components; and the growth rate of unborrowed reserves alongside the rate of inflation. The graphs are sufficient evidence of the fact that the SBP is doing much that is unneeded and neglecting a great deal while making monetary policy.

First and foremost, unborrowed and drainable reserve ratios are mirror images of each other. This means that the SBP carries out open

market operations only to counter-balance changes in the factor A. Since A consists of the SBP's foreign assets and its investments in banks and nonbank financial institutions (NBFIs) (net of factors that reflect its profitability), the essential conclusion is that the SBP carries out open market operations to balance these changes and its own business initiatives. The volume of open market operations thus becomes endogenous to the system. It therefore appears to be a historical fact, and essentially in this accounting context only, that changes in the t-bill rate do not reflect the SBP's monetary policy.

The SBP's motivation for carrying out open market operations also seems unconvincing. It defines its net foreign assets as the sum total of the first and second terms in parentheses in Equation-4 less some components of the category of "other deposits" (see SBP, 2005). The definition makes it clear that the SBP's foreign assets are earned reserves and not borrowed collateral (see Dooley and Garber, 2005, for details of these concepts). In a subsequent paper, we show that the control over domestic asset expansion requires the central bank to offset changes not in its own net foreign assets (which are earned reserves) but the net foreign assets of commercial banks, including other governments' deposits, the country's net position at the IMF, etc., but excluding their foreign bills.[12] Since the strategy of the SBP's open market operations resides in counter-balancing its own net foreign assets, it becomes obvious that the SBP is deeply concerned with managing the exchange rate, quite in contrast to its publicly held opinion that it is not doing so.

To demonstrate the flaw in this strategy, we compare the simple money multiplier with the reserve multiplier. We find that the difference between the two multipliers averaged at 0.3 before 1991 and at approximately 0.7 since then. One is thus forced to believe that the foreign currency denominated private deposit accounts allowed in 1991 have something to do with this difference. Mirakhor and Zaidi (2004) observe that, as per SBP policy requirements, commercial banks are required to sell the foreign exchange deposited with them to the SBP at a premium at the end of each working day. This implies that the SBP supplies extra short-term excess reserves to the banking system, thereby enabling them to disburse more credit, if and when required, than would otherwise be possible. Thus, while the SBP continues to believe that the banking system can transform every rupee of reserve money into (about) three rupees of

[12] This idea has been fully elucidated in the author's dissertation. The historical origins of the same can be traced back to the concept of the liquidity definition of balance of payments. Some useful discussions of this can be found in McKinnon (1969) and Knoester (1979).

broad money, the banking system actually translates it into four rupees.[13] The SBP's open market operations strategy lends further support to this endogenous credit expansion. Comparing the domestic and foreign asset components of the money multiplier, we find that the former is much larger than the latter. Still, the SBP is more concerned with draining away these foreign assets (as discussed above) than mopping up domestic liquidity. The domestic asset multiplier averaged at a value of 4 between 1991 and 2002, and increased to an average value of 17 (peaking at a value of 30 in 2003) between 2003 and 2007. On the other hand, the foreign asset multiplier remained a fractional value averaging at 0.80 (peaking at a value of 1.06 in 2007) during the entire 2003-07 period. The SBP's open market operations thus encourage long-run rent seeking by the commercial banking sector, thereby providing endogenous support to inflation.

Next, the total volume of discretionary open market instruments (the sum total of unborrowed plus drainable reserves) as a ratio of total private deposits shows a declining trend ever since financial liberalization in 1991. The monetary system thus appears to have some historical preoccupation with not making open market operation instruments the primary tool of monetary policy. The growth rate of the same variable is strongly negatively correlated with the rate of inflation (the correlation coefficient between the two is -0.6 over the period 1999/2000 to 2006/07). The recent inflation episode that took place at the end of 2005 can therefore be entirely attributed to a failure of monetary policy. To add substance to this argument, we note that the level of unborrowed reserves (as a percentage of total private deposits) started declining in 1999/2000 and became negative in 2002/03, stayed negative until 2004/05, became positive again in 2005/06 only to continue declining again (in fact, the difference between unborrowed and drainable reserves has been negative since 1999/2000). This indicates that the monetary system was providing excessive liquidity in the form of discount loans to commercial banks. This event corresponds to a similar situation that the US economy recently witnessed when financial turmoil led to unborrowed reserves becoming negative, marking the beginning of an inflation episode. The SBP has always asserted that Pakistan has shown no signs of being hit by

[13] The primary factor underlying this difference is the way in which excess reserves are accounted for by the monetary authority and monetary system. While the monetary authority needs to add excess reserves to form the reserve money aggregate (Equation-2), the monetary system treats excess reserves (net of discount borrowings) as a crunch on its reserve base (Equations-9 and 10). Thus, reserve money increases in volume as excess reserves increase, but the reserve base of the banking system shrinks, and hence a quantitatively larger multiplier value is obtained (the close association between the difference of the two multipliers and the free reserve-to-deposit ratio supports this intuition).

financial turmoil as the US and Euro-zone did in 2007/08. The data, however, speaks to the contrary.

That the SBP's open market operations strategy derives from some unfounded concerns becomes evident when we look at the graph that shows the difference between unborrowed and drainable reserve ratios alongside the t-bill rate. The difference between the unborrowed and drainable reserve ratios indicates nothing else but optimal open market operations (see Toporowski, 2006). Hence, we expect the t-bill rate to be a replica of this graph. However, we find that, at the SBP, the two become the same only when we plot the lagged value of the t-bill rate (which is an annual average) alongside the reserve difference. The SBP's monetary policy strategy is thus seen to lag behind in time, indicating again that the bank takes about six months to know what is happening in the economy and the money market. Viewed from another perspective, since the t-bill rate does not match the difference between the unborrowed and drainable reserve ratios in the current time period, monetary policy may well be identified as time-inconsistent (this could be one interpretation of why the output coefficient in our estimated Taylor rule equation is negative).

The conclusions that this discussion points to is that the SBP (i) speciously uses open market operations to balance changes in earned foreign exchange assets and its own business initiatives, thereby trivializing the t-bill rate; (ii) follows a time-inconsistent monetary policy owing to a one-year lag in taking the t-bill rate to its optimal level; (iii) is preoccupied with not using open market operations as the core monetary policy instrument; (iii) is unclear as to how this links to the formation of inflation expectations, and hence (iv) disowns inflation and its control.[14]

As for the answer as to what the SBP's monetary policy is about, we find that, prior to 1999/2000, the ratio of broad money to unborrowed reserves fluctuated around 4.6 percent of total private deposits, while since

[14] The answer as to who has ultimate control over inflation and currency depreciation comes from the answer as to how costly it is for the system to increase any (or both) of them. These costs are leveraged by the levels of domestic public debt holdings and external reserves. Thus, for example, if the government holds a large volume of outstanding public debt, inflation would be very costly in that it will eventually increase the service cost of this debt to the government. Similarly, a large volume of external indebtedness (or foreign reserve holdings) will make currency depreciation difficult for the central bank because it would then increase its service costs (or reduce the value of reserves) over and above the expected gains from increased exports. It follows that a strategy of increasing the exogenous component of money supply and accumulating foreign exchange reserves is sufficient to induce control over inflation and the currency exchange rate. The falling level of the sum of unborrowed and drainable reserves (which constitute the exogenous component of money supply) is therefore evidence that the SBP and the government are both absolutely hesitant to control inflation.

2000/01 onward, the SBP has managed to keep the net free reserves of the banking system closely fluctuating around 4 percent of total private deposits. Both these strategies of monetary policy have been demonstrated as inconsistent a long time ago even by proponents of the RPD. Free reserves have been known to be an improper target of monetary policy since the 1960s. Unborrowed reserves were demonstrated to be an improper target of policy both on account of the implementation complexities involved in the process and because of the wide swings in interest rates produced by it (see Bindseil, 2004, for a review of when a certain reserve aggregate was used as a policy guide by the Federal Reserve and how and why it failed). Recounting Meigs's (1962) arguments about free reserves being false indicators of the reserve pressure and on the practical failure of the 1979 Federal Reserve policy move[15] (see also Poole, 1982), we find that the SBP's spontaneous strategy of monetary policy lacks direction.[16] In fact, since the SBP has never explicitly stated that it is engaged in targeting the free reserves of the banking system, we can well infer—in light of the arguments put forward by Brunner and Meltzer (1964), Poole (1968), Bindseil (2004), Bindseil and Würtz (2007), and Gavin (2007)—that the SBP actually uses the discount rate as an anchor for conducting monetary policy.[17] The steady-state value of this anchor does not derive from any known estimates of the productivity of the domestic capital stock. Rather, its value is kept close to the t-bill rate, and not contrariwise (because announcements regarding the discount rate are always accommodative and have lagged behind changes in the inter-bank money market rate, only to allow more room for its variability. This implies that the true descriptor of the SBP's monetary policy is the t-bill rate, which is—incorrectly—related to inflation and output levels.

4. Conclusion

This paper computes and analyzes some fundamental reserve aggregates and associated monetary statistics that the SBP does not

[15] Meigs (1962) argues that (i) a given level of free reserves may be associated with different levels of money growth and deposit expansion, (ii) equal volumes of free reserves in different periods do not imply same bank behavior, (iii) changes in free reserve levels are inappropriate indicators of tight/easy monetary policy, and (iv) free reserves targets are self defeating.

[16] We call this strategy *spontaneous* because the SBP has never explained whether any of these reserves, unborrowed or free, are inelastic or contrariwise (as suggested by Gordon and Leeper, 1994) to the corresponding rate of interest. In fact, since the t-bill rate was constant during the 1980s and only white noise averaging 12.5 percent emerged during the 1990s, unborrowed reserves were perfectly elastic to the rate of interest. Similarly, the net free reserves ratio appears to have been positively correlated with the discount rate since 2001.

[17] The recent monetary policy statement (SBP, 2009b) did not announce anything new about monetary policy. It only made explicit what the SBP had been doing without announcing it.

publish or take into account, but which impart important information about the design and conduct of monetary policy at the SBP. Specifically, we compute the data series for borrowed, unborrowed, free, and drainable reserves using balance sheet data published by the SBP for the period 1985-2009 with a view to empirically determining the reserve equation for Pakistan. These data series are then used to analyze the strategy of monetary policy at the SBP.

We find the following:

1. The operational target for carrying out monetary operations at the SBP appears to have been a free reserves target since 2000/01, which, interpreted in the light of the fundamental equation of monetary policy and the various monetary policy statements of the SBP, is equivalent to using the discount rate as a policy anchor, whose value in turn derives from the t-bill rate.

2. The scope of open market operations as a tool of monetary policy remains limited owing to the declining trend in the sum total of drainable and unborrowed reserves (which equals the volume of discretionary open market instruments and also represents the exogenous component of broad money supply) held at the SBP.

3. Even this limited role of open market defenses derives from the SBP's concern to sterilize its own earned foreign exchange reserves rather than the unearned foreign exchange assets of the banking system. This is reflected in the unborrowed and drainable reserves being mirror images of each other. Since this observation also implies that the source of open market operations lies in the SBP's foreign asset accumulation (inter alia), one can conclude that the t-bill rate is endogenous to the monetary system. In fact, this is merely restating the fact that open market operations derive from a concern with managing the exchange rate.

4. The limited scope and concern regarding the conduct of open market operations is sub-optimally distributed in time whereby the t-bill rate lags behind its optimal value by about six months to one year and renders monetary policy time-inconsistent.

5. The growth rate of unborrowed plus drainable reserves bears a strong negative correlation with the annual average rate of inflation, which, on account of the former being consistently negative since 2005, implies that neither the government nor the SBP show significant concern for controlling inflation.

The conclusions recounted above imply that the SBP's monetary policy revolves around managing the exchange rate. The key policy instrument for implementing this strategy is the t-bill rate, which also guides the SBP in setting the discount rate. Two independent observations—the policy rule equation and the difference between unborrowed and drainable reserve ratios—suggest that value of this instrument is incorrectly set. This finding, combined with the presence of a significant Laursen-Meltzer effect in the face of the fact that the exogenous component of broad money is continuously declining, implies that the SBP is responsible for the ongoing inflation episode in Pakistan.

References

Bernanke, B.S. (2004). Inflation Targeting, Panel Discussion. *Federal Reserve Bank of St. Louis Review*.

Bindseil, U. (2004). The Operational Target of Monetary Policy and the Rise and Fall of Reserve Position Doctrine (Working Paper No. 372). Frankfurt: European Central Bank.

Bindseil, U., and Würtz, F. (2007). Open Market Operations: Their Role and Specification Today. In Mayes, D.G. and Toporowski, J. (Eds.), *Open Market Operations and Financial Markets*. New York: Routledge, Taylor and Francis Group.

Branson, W.H. (1989). *Macroeconomic Theory and Policy* (3rd Ed.). Harper and Row.

Brunner, K., and Meltzer, A.H. (1964). The Federal Reserve's Attachment to the Free Reserve Concept. In K. Brunner and Meltzer, A.H. (Eds.) *Monetary Economics*. London: Blackwell.

Clarida, R., Gali, J., and Gertler, M. (2000). Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. *Quarterly Journal of Economics*, 115 (1), 147-180.

Clark, P., and Kwack, S. (1976). Asset Markets and Interest Rate Determination in the Multi-Country Model (International Finance Discussion Paper No. 94). Washington, DC: Federal Reserve Board of Governors.

Dooley, M., and Garber, P. (2005). Is it 1958 or 1968? Three Notes on the Longevity of the Revived Bretton Woods System. *Brookings Papers on Economic Activity*, 1, 147-209.

Ernhagen, T., Vesterlund, M., and Viotti, S. (2002). How Much Equity does a Central Bank Need? *Sveriges Riksbank Economic Review*, 2, 5-17.

Favero, C.A., and Rovelli, R. (2001). *Macroeconomic Stability and the Performance of the Fed: A Formal Analysis 1961-98*. Milan: Universita Bocconi, Innocenzo Gasparini Institute for Economic Research.

Federal Reserve Bank. (2002). Federal Reserve Balance Sheet and Reserve Equation. In Board of Governors of the Federal Reserve, *The Federal Reserve System: Purposes and Functions*. Washington, DC: Author.

Gavin, W.T. (2007). Comments on Open Market Operations: Their Role and Specification Today. In Mayes, D.G., and Toporowski, J. (Eds.), *Open Market Operations and Financial Markets*. New York: Routledge, Taylor and Francis Group.

Gordon, D.B., and Leeper, E.M. (1994). The Dynamic Impacts of Monetary Policy: An Exercise in Tentative Identification. *Journal of Political Economy*, 102(6), 1228-1247.

Guttentag, J.M. (1966). The Strategy of Open Market Operations. *Quarterly Journal of Economics*, 80(1), 1-30.

Hassan, R., and Shahzad, M.M. (2010a). A Macroeconometric Framework for Monetary Policy Evaluation: A Case Study of Pakistan. *Economic Modelling*, 28 (1-2), 118-137.

Hassan, R., and Shahzad, M.M. (2010b). *An Essential Correction in the Measurement of Currency in Circulation and Reserve Money*. Manuscript submitted for publication.

International Monetary Fund. (2005). *Monetary and Financial Statistics Manual* (Chapter 4, p. 2). Washington, D.C.

Jordan, J.L. (1969). Elements of Money Stock Determination. *Federal Reserve Bank of St. Louis Review*, 10-19.

Knoester, A. (1979). On Monetary and Fiscal Policy in an Open Economy. *De Economist*, 127 (1), 105-142.

Malik, W.S., and Ahmad, A.M. (2007). The Taylor Rule and Macroeconomic Performance in Pakistan (Working paper No. 34). Islamabad: Pakistan Institute of Development Economics.

Mayes, D.G., and Toporowski, J. (Eds.). (2007). *Open Market Operations and Financial Markets*. New York: Routledge, Taylor and Francis Group.

McKinnon, R.I. (1969). *Private and Official International Money: The Case for the Dollar* (Essays in International Finance No. 74). New Jersey: Princeton University Press.

Meigs, A.J. (1962). *Free Reserves and the Money Supply*. Chicago: University of Chicago Press.

Mirakhor, A., and Zaidi, I. (2004). Foreign Currency Deposits and International Liquidity Shortages in Pakistan (Working Paper No. 04/167). Washington, DC: International Monetary Fund.

Mishkin, F.S. (2006). *The Economics of Money, Banking, and Financial Markets* (8th ed.). Addison-Wesley.

Poole, W.H. (1968). Commercial Bank Reserve Management in a Stochastic Model: Implications for Monetary Policy. *Journal of Finance*, 23, 769-791.

Rudebusch, G.D., and Svensson, L.E. (1998, February). Policy Rules for Inflation Targeting. Paper presented at National Bureau of Economic Research Conference on Monetary Policy Rules.

State Bank of Pakistan. (2002). *Monetary Survey Manual*. Karachi: Author.

State Bank of Pakistan. (2005). *Monetary Survey Manual (Revised)*. Karachi: Author.

State Bank of Pakistan. (2009a). *Annual Report 2008-2009* (Vol. I). Karachi: Author.

State Bank of Pakistan. (2009b). Monetary Policy Statement July-September 2009.

Taylor, J.B. (1993). Discretion versus Policy Rules in Practice. *Carnegie-Rochester Conference Series on Public Policy* 39, 195-214.

Taylor, J.B. (1998). The Explanatory Power of Monetary Policy Rules (Working Paper No. 13685). Cambridge, MA: National Bureau of Economic Research.

Teigen, R.L. (1978). *Readings in Money, National Income and Stabilization Policy* (4th ed.). Illinois: Richard D. Irwin Inc.

Toporowski, J. (2006). Open Market Operations: Beyond the New Consensus (Research Discussion Paper No. 14). Bank of Finland.

Annexure

Table-1: Schematic Balance Sheet of SBP (Issue Department)

Liabilities	**Assets**	
Currency held in SBP (Banking Department)	Gold coins and bullion	
	Approved foreign exchange	Sterling securities
		Government of India securities
Notes in circulation		India notes
(five rupee and above bills issued)	Unutilized allocation of special drawing rights	
	Domestic assets	Rupee coin/notes
		Government of Pakistan securities
		Internal bills of exchange and commercial papers
	Assets with RBI pending transfer to Pakistan	Gold coins and bullion
		Sterling securities
		Government of India securities
		Rupee coins

Source: State Bank of Pakistan (2005).

Table-2: Schematic Balance Sheet of SBP (Banking Department)

Liabilities		**Assets**	
Capital and reserves	Paid-up capital	Notes and coins held by SBP (Banking Department)	
	Reserve fund	Bills purchased and discounted	Internal bills of exchange
Deposits	Deposits of federal government		Government treasury bills
	Deposits of provincial government	Foreign exchange	Balances held outside Pakistan
	Deposits of banks		Special drawing rights held with IMF
	Other deposits at SBP	Advances to government	Government debtor balance
Allocation of special drawing rights by IMF			Loans and advances to government
Bills payable		Loans and advances to scheduled banks	
Revaluation account		Loans and advances to	
		NBFIs	
Other liabilities		Investments of SBP in	Scheduled banks
			NBFIs
			Government securities
			Other assets
		Other fixed assets	

Source: State Bank of Pakistan (2005).

Table-3: Schematic Balance Sheet of Banking Sector

Liabilities			Assets	
Capital paid-up and reserves			Statutory reserves	On-demand liabilities
Demand liabilities in Pakistan	Inter-bank	Borrowings		On-time liabilities
		Deposits	Balances in Pakistan	Cash in Pakistan
	Others	Deposits general		Balances with SBP
		Deposits other		Other balances
Time liabilities in Pakistan	Inter-bank	Borrowings		Money at call and short notice in Pakistan
		Deposits	Foreign currency	Held in Pakistan
	Others	Deposits general		Balances with banks abroad
		Deposits other		
Borrowings from SBP			Bank credit	Advances To banks
Borrowings from banks abroad				To others
Money at call and short notice in Pakistan				Bills purchased and discounted
Other liabilities			Investment in securities and shares	Federal govt. securities
				Provincial govt. securities
				Treasury bills
				Others
			Other assets	
			Advance tax paid	
			Fixed assets	

Source: State Bank of Pakistan (2005).

Table-4: List of Terms Used in Equations

Symbol	Description
C	Notes in circulation (currency issued)
$C_{Banking}$	Currency held by SBP (Banking Department)
CRF	Capital and reserves
D_F	Deposits of federal government
D_P	Deposits of provincial government
DoB	Deposits of banks
D_O	Other deposits at SBP
$SDR_{Allocation}$	Allocation of special drawing rights by IMF
B_{Pay}	Bills payable
$Reval$	Revaluation account
$Liab_{other}$	Other liabilities
G	Gold coins and bullion
F	Approved foreign exchange
SDR_{Issue}	Unutilized allocation of special drawing rights
C_{Issue}	Rupee coins/notes
S_{Issue}	Govt. of Pakistan securities
$BoE_{Internal}$	Internal bills of exchange and commercial papers
G_{RBI}	Gold coins and bullion with RBI
A_{RBI}	Other assets with RBI
$S_{Banking}$	Bills purchased and discounted (internal bills of exchange and government t-bills)
$BoPak$	Balances held outside Pakistan
$SDR_{Banking}$	Special drawing rights held with IMF
GDB	Government debtor balance
A_G	Loans and advances to government
A_{Banks}	Loans and advances to scheduled banks
A_{NBFI}	Loans and advances NBFIs
I_{Banks}	Investment in scheduled banks
I_{NBFI}	Investment in NBFIs
I_G	Investment in government securities
I_{Other}	Other investments
$Asst_{Other}$	Other fixed assets

Table-5(a): Reserve Money and its Components (Supply)

Year	Gold Stock	Foreign Exchange of SBP	Treasury Currency	SBP's Portfolio of Government Securities	SBP Credit	Government Deposits at SBP	Other Balancing Items	Reserve Money
1985	9,661.60	6,558.10	2,937.00	66,879.70	29,543.10	29,645.50	(15,684.20)	70,249.80
1986	11,276.80	12,008.10	3,110.00	68,552.50	37,238.20	34,573.70	(19,412.40)	78,199.70
1987	15,052.40	11,218.40	3,359.00	76,342.80	45,308.30	31,557.50	(19,504.10)	100,219.50
1988	15,286.50	4,367.40	3,520.00	82,114.80	53,005.70	30,209.20	(19,924.90)	108,160.70
1989	15,342.20	5,729.60	5,877.00	90,110.60	58,919.20	35,475.50	(18,544.90)	121,958.80
1990	14,960.30	9,175.90	4,968.00	110,990.40	65,449.40	46,809.40	(18,081.30)	140,655.20
1991	17,448.70	8,951.20	5,892.00	119,695.20	84,499.20	45,222.50	(21,384.10)	169,879.90
1992	17,443.10	20,401.80	6,517.00	173,778.50	77,460.80	65,101.50	(22,206.40)	208,293.50
1993	20,841.80	6,647.30	7,663.00	198,513.10	93,975.10	71,345.90	(32,436.60)	223,858.10
1994	24,296.50	63,164.60	8,987.00	188,715.60	95,957.10	89,418.80	(32,905.30)	258,797.10
1995	24,663.20	77,697.30	8,331.00	212,563.20	111,539.20	79,872.00	(48,931.90)	305,989.40
1996	27,566.90	63,989.40	10,079.00	240,450.00	90,013.90	81,487.40	(40,531.70)	310,080.70
1997	27,970.50	37,201.30	10,360.00	288,496.20	112,921.20	89,869.80	(40,033.60)	347,046.20
1998	28,291.20	32,997.80	9,677.00	253,189.90	148,589.80	99,394.30	(3,872.90)	369,478.80
1999	28,067.00	78,408.60	9,428.00	381,913.50	197,865.80	227,441.10	(70,258.10)	397,983.80
2000	31,508.10	59,715.90	11,217.00	573,371.20	220,666.50	323,991.60	(74,679.70)	497,807.60
2001	36,199.20	132,612.20	14,726.00	618,890.50	201,292.70	498,613.10	28,094.20	533,201.40
2002	40,020.30	287,586.10	17,567.00	328,592.80	179,238.00	327,154.70	58,749.40	584,599.00
2003	41,918.20	576,935.30	8,165.00	110,390.80	157,971.30	355,360.00	129,459.80	669,480.50
2004	48,305.20	645,544.70	7,721.00	133,274.90	188,703.00	310,451.70	59,771.70	772,868.90
2005	54,746.20	625,039.10	10,115.00	331,273.10	208,092.30	366,468.30	46,378.60	909,176.20
2006	77,557.70	689,674.80	12,529.00	516,661.20	224,235.50	410,494.60	(108,689.30)	1,001,473.70
2007	82,598.00	850,521.10	15,120.00	460,752.70	278,350.30	408,415.90	(68,357.20)	1,210,569.10
2008	124,607.70	612,461.00	12,595.00	1,042,646.20	240,270.30	428,693.30	(215,431.40)	1,388,455.70
2009	166,246.60	755,208.70	13,012.00	1,199,879.70	379,973.20	747,727.50	(258,791.50)	1,507,801.10

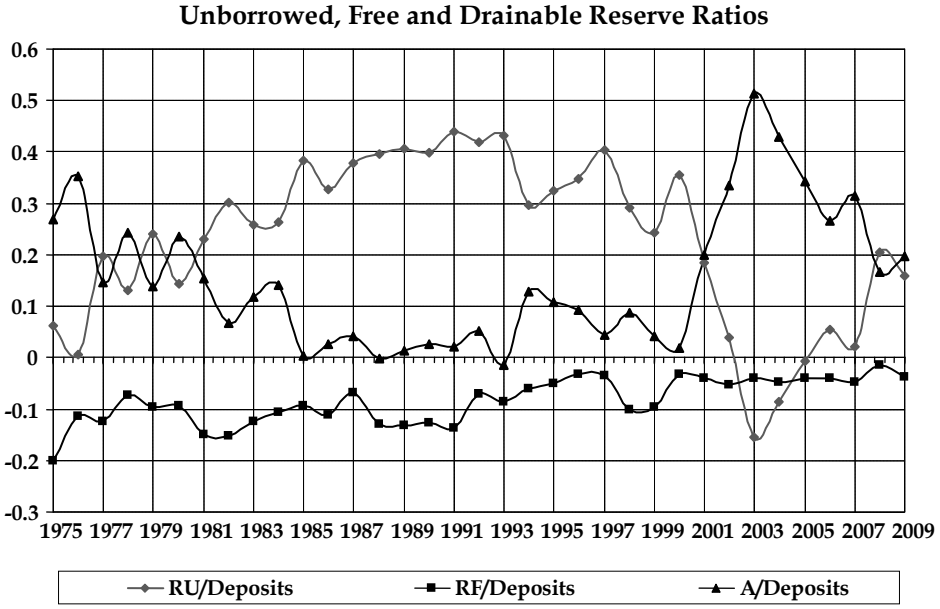
Table-5(b): Reserve Money and its Components (Demand/Uses)

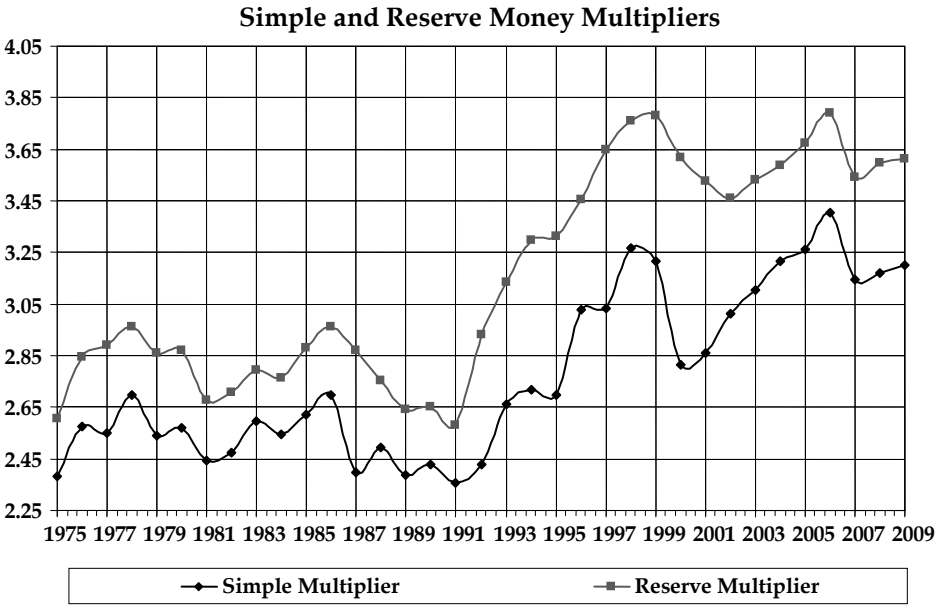
Year	Currency in Circulation	Other Deposits	Required Reserves (DD)	Required Reserves (TD)	Deposits of NBFIs	Excess Reserves	Vault Cash	Reserve Money
1985	56,701.70	742.00	3,674.26	3,691.65	(825.80)	2,178.89	4,087.10	70,249.80
1986	63,293.90	878.00	4,269.63	4,721.71	(1,922.80)	2,811.36	4,147.90	78,199.70
1987	74,765.50	1,102.00	4,722.42	5,370.64	(2,348.40)	11,984.15	4,623.20	100,219.50
1988	87,856.40	1,218.00	5,492.49	5,762.18	(2,419.60)	5,116.43	5,134.80	108,160.70
1989	97,996.80	3,132.00	6,035.63	6,171.27	(3,110.50)	6,749.91	4,983.70	121,958.80
1990	115,523.30	2,209.00	7,275.60	7,396.30	(3,574.10)	6,474.10	5,351.00	140,655.20
1991	136,999.40	3,114.00	8,533.25	9,196.25	(2,582.50)	7,280.50	7,339.00	169,879.90
1992	152,236.40	3,322.00	10,693.15	11,469.35	(5,053.90)	26,664.50	8,962.00	208,293.50
1993	166,864.90	4,449.00	12,311.45	13,960.00	(7,501.80)	22,473.55	11,301.00	223,858.10
1994	184,928.10	5,506.00	14,500.95	17,718.05	(9,342.00)	31,527.00	13,959.00	258,797.10
1995	215,579.60	5,055.00	16,918.80	20,916.45	(9,511.20)	40,667.75	16,363.00	305,989.40
1996	234,110.10	6,791.00	18,999.15	25,296.15	(13,650.40)	19,206.70	19,328.00	310,080.70
1997	244,140.90	7,135.00	19,960.15	29,118.25	(11,806.70)	40,677.60	17,821.00	347,046.20
1998	272,922.90	6,412.00	22,762.00	32,293.75	(13,365.10)	29,684.25	18,769.00	369,478.80
1999	287,716.90	6,212.00	25,902.95	33,918.15	(15,150.10)	40,513.90	18,870.00	397,983.80
2000	355,677.80	7,959.00	28,687.50	33,466.90	(38,668.20)	91,216.60	19,468.00	497,807.60
2001	375,465.80	11,292.00	30,655.85	36,358.85	(20,696.40)	80,947.30	19,178.00	533,201.40
2002	433,815.90	13,847.00	35,106.40	40,933.05	(14,360.90)	48,843.55	26,414.00	584,599.00
2003	494,576.80	3,499.00	43,858.65	46,158.20	912.70	50,060.15	30,415.00	669,480.50
2004	578,116.70	2,116.00	55,985.65	52,621.40	4,798.20	42,798.95	36,432.00	772,868.90
2005	666,056.90	3,355.00	66,350.85	63,489.45	8,210.30	58,251.70	43,462.00	909,176.20
2006	740,529.40	4,931.00	72,363.85	76,220.90	5,073.30	53,916.25	48,439.00	1,001,473.70
2007	848,773.50	7,012.00	211,867.46	17,470.53	(2,264.40)	78,095.01	58,072.00	1,210,569.10
2008	986,793.70	4,261.00	316,878.48	0.00	(85,662.70)	97,219.52	68,966.00	1,388,455.70
2009	1,160,536.20	4,662.00	184,586.15	0.00	(12,835.10)	93,845.85	77,006.00	1,507,801.10

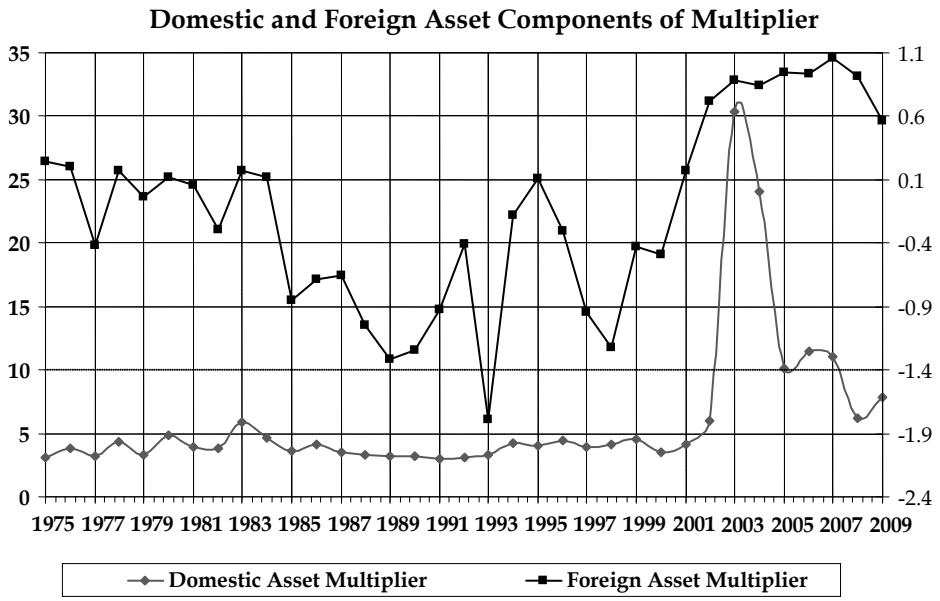
Table-5(c): Reserve Money and its Components (Sources)

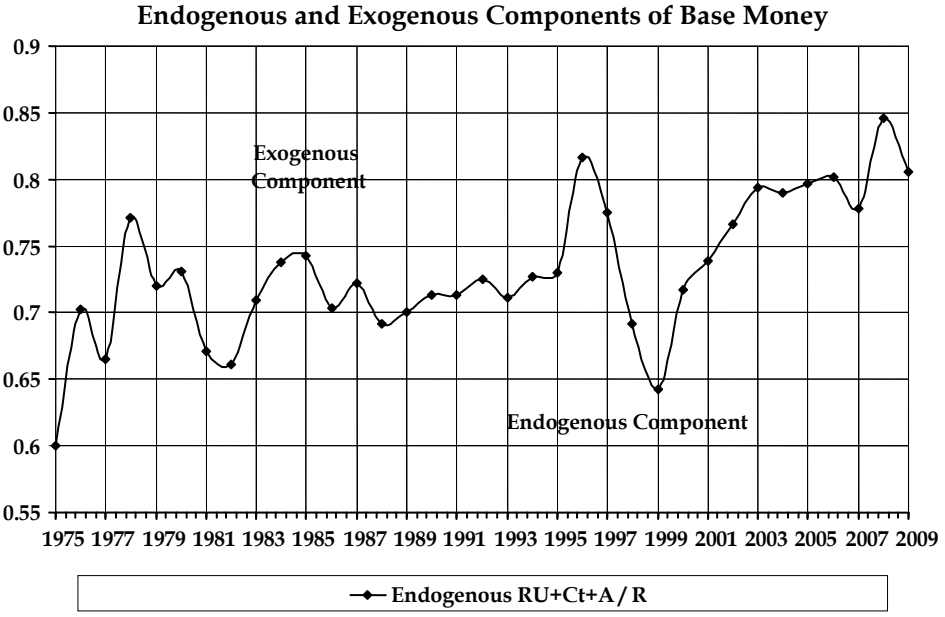
Year	Treasury Currency	Borrowed Reserves	Discretionary Open Market Instruments		Excess Reserves	Vault Cash	Net Free Reserves	Reserve Money
			Unborrowed Reserves	Drainable Reserves				
1985	2,937.00	18,065.30	48,712.00	535.50	2,178.89	4,087.10	(11,799.31)	70,249.80
1986	3,110.00	23,159.40	48,057.60	3,872.70	2,811.36	4,147.90	(16,200.14)	78,199.70
1987	3,359.00	27,811.20	62,282.40	6,766.90	11,984.15	4,623.20	(11,203.85)	100,219.50
1988	3,520.00	33,340.10	71,571.20	(270.60)	5,116.43	5,134.80	(23,088.87)	108,160.70
1989	5,877.00	36,547.70	77,006.60	2,527.50	6,749.91	4,983.70	(24,814.10)	121,958.80
1990	4,968.00	40,285.00	89,345.40	6,056.80	6,474.10	5,351.00	(28,459.90)	140,655.20
1991	5,892.00	48,785.00	110,186.90	5,016.00	7,280.50	7,339.00	(34,165.50)	169,879.90
1992	6,517.00	57,267.00	128,870.80	15,638.70	26,664.50	8,962.00	(21,640.50)	208,293.50
1993	7,663.00	64,577.00	156,565.30	(4,947.20)	22,473.55	11,301.00	(30,802.45)	223,858.10
1994	8,987.00	70,583.00	124,670.90	54,556.20	31,527.00	13,959.00	(25,097.00)	258,797.10
1995	8,331.00	82,668.00	161,562.40	53,428.00	40,667.75	16,363.00	(25,637.25)	305,989.40
1996	10,079.00	56,914.00	192,062.50	51,025.20	19,206.70	19,328.00	(18,379.30)	310,080.70
1997	10,360.00	77,999.00	233,548.60	25,138.60	40,677.60	17,821.00	(19,500.40)	347,046.20
1998	9,677.00	113,919.00	188,466.40	57,416.40	29,684.25	18,769.00	(65,465.75)	369,478.80
1999	9,428.00	142,147.00	210,191.20	36,217.60	40,513.90	18,870.00	(82,763.10)	397,983.80
2000	11,217.00	141,016.00	329,030.10	16,544.50	91,216.60	19,468.00	(30,331.40)	497,807.60
2001	14,726.00	139,367.00	182,203.10	196,905.30	80,947.30	19,178.00	(39,241.70)	533,201.40
2002	17,567.00	136,556.00	44,120.10	386,355.90	48,843.55	26,414.00	(61,298.45)	584,599.00
2003	8,165.00	137,882.00	(224,879.90)	748,313.40	50,060.15	30,415.00	(57,406.85)	669,480.50
2004	7,721.00	162,335.00	(150,808.80)	753,621.70	42,798.95	36,432.00	(83,104.05)	772,868.90
2005	10,115.00	185,068.00	(12,170.90)	726,164.10	58,251.70	43,462.00	(83,354.30)	909,176.20
2006	12,529.00	198,725.00	131,677.10	658,542.60	53,916.25	48,439.00	(96,369.75)	1,001,473.70
2007	15,120.00	269,109.00	61,578.10	864,762.00	78,095.01	58,072.00	(132,941.99)	1,210,569.10
2008	12,595.00	213,293.00	640,930.20	521,637.50	97,219.52	68,966.00	(47,107.48)	1,388,455.70
2009	13,012.00	293,641.00	538,484.40	662,663.70	93,845.85	77,006.00	(122,789.15)	1,507,801.10

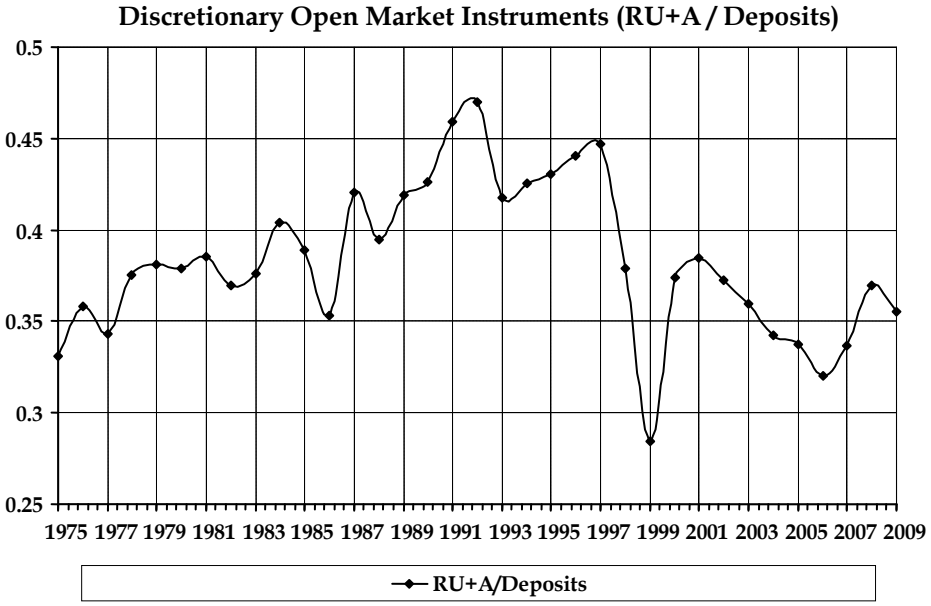
Graphs of Selected Monetary Policy Indicators

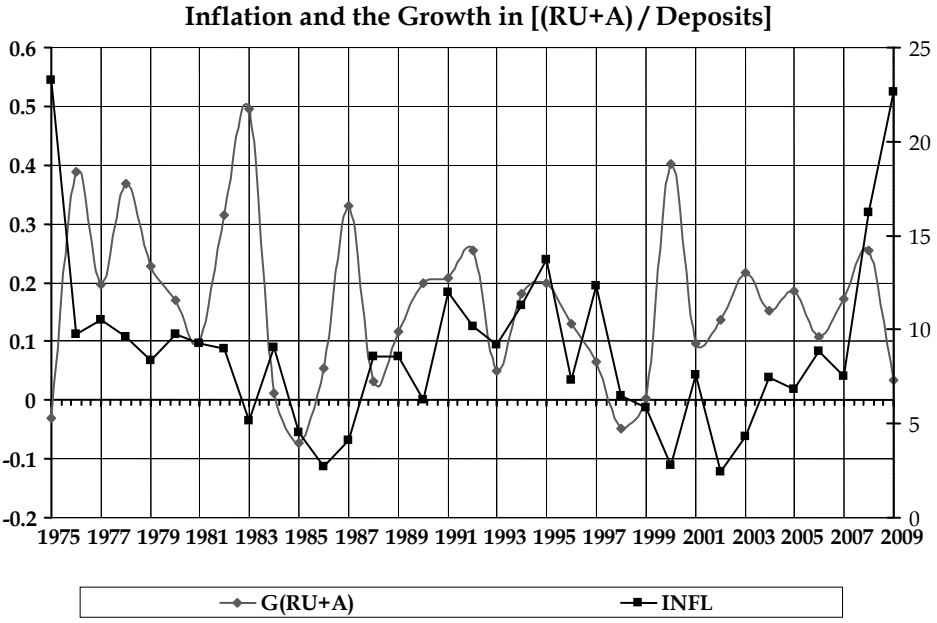


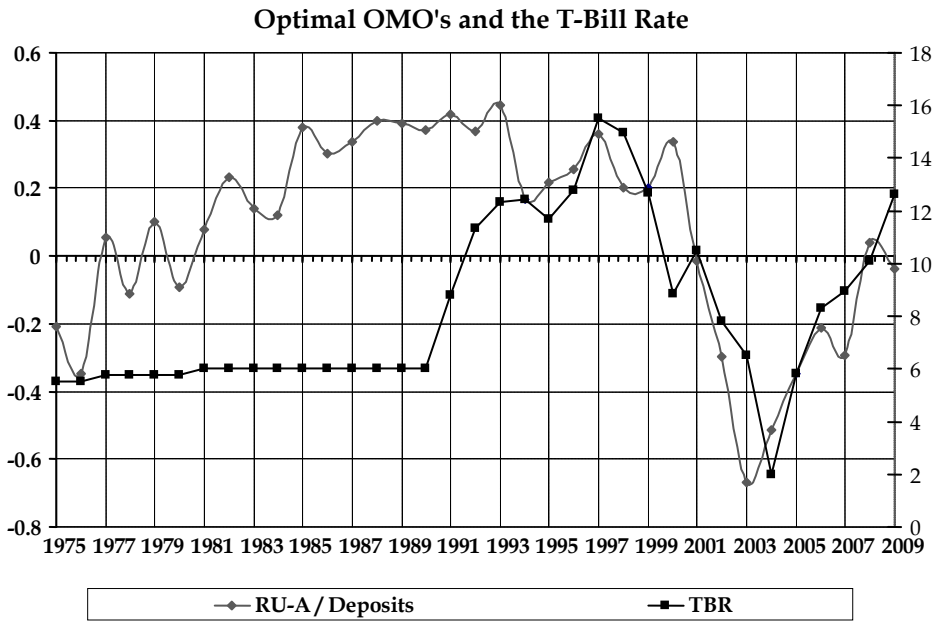


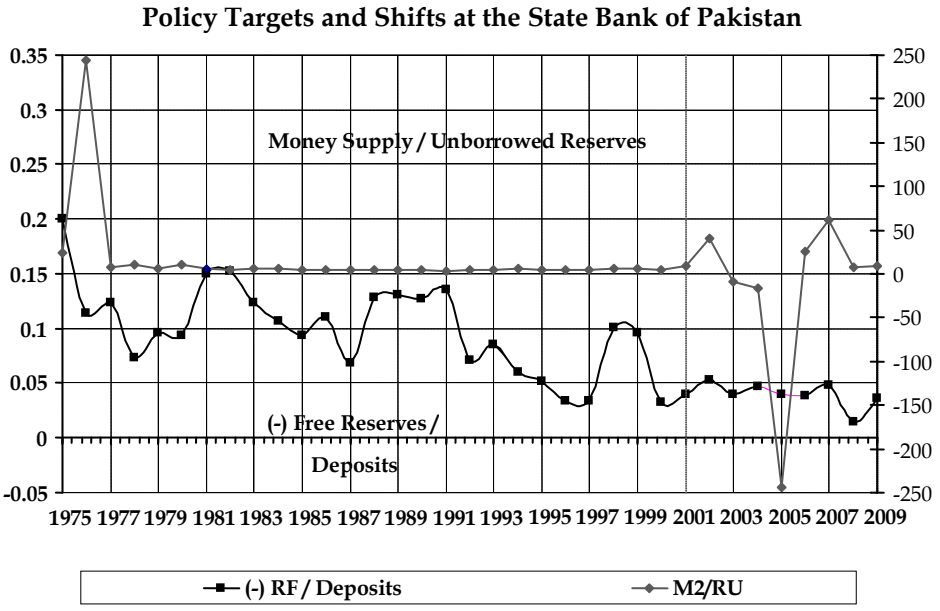

Domestic and Foreign Asset Components of Multiplier
35
30
25
20
15
10
5
0
1.1
0.6
0.1
-0.4
-0.9
-1.4
-1.9
-2.4
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
Domestic Asset Multiplier
Foreign Asset Multiplier


Endogenous and Exogenous Components of Base Money
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
Exogenous Component
Endogenous Component
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
Endogenous RU+Ct+A / R


Discretionary Open Market Instruments (RU+A / Deposits)
0.5
0.45
0.4
0.35
0.3
0.25
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
RU+A/Deposits


Inflation and the Growth in [(RU+A) / Deposits]
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
25
20
15
10
5
0
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
G(RU+A)
INFL


Optimal OMO's and the T-Bill Rate
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
18
16
14
12
10
8
6
4
2
0
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
RU-A / Deposits
TBR


Policy Targets and Shifts at the State Bank of Pakistan
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
250
200
150
100
50
0
-50
-100
-150
-200
-250
Money Supply / Unborrowed Reserves
(-) Free Reserves / Deposits
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
(-) RF / Deposits
M2/RU

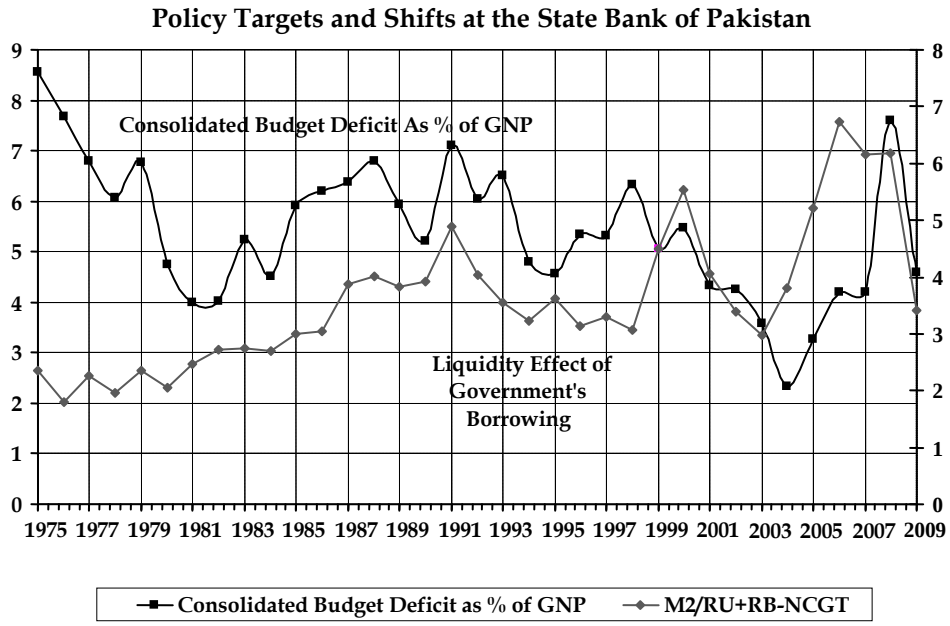

Policy Targets and Shifts at the State Bank of Pakistan
Consolidated Budget Deficit As % of GNP
Liquidity Effect of Government's Borrowing
0 1 2 3 4 5 6 7 8 9
1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009
Consolidated Budget Deficit as % of GNP
M2/RU+RB-NCGT

Table-6: Reserve Ratios Indicating the Historical Targets of Pakistan's Monetary Policy

Year	M2/RU	Criteria	Year	(-) RF/Deposits	Governor of SBP
1979	6.00	When a central bank targets unborrowed reserves, the ratio of money supply to unborrowed reserves remains constant	1979	0.0960	8. A. G. N. Kazi
1980	10.08		1980	0.0934	8. A. G. N. Kazi
1981	6.55		1981	0.1494	8. A. G. N. Kazi
1982	4.95		1982	0.1522	8. A. G. N. Kazi
1983	5.68		1983	0.1240	8. A. G. N. Kazi
1984	5.63		1984	0.1067	8. A. G. N. Kazi
1985	3.78		1985	0.0931	8. A. G. N. Kazi
1986	4.39		1986	0.1102	8. A. G. N. Kazi
1987	3.85		1987	0.0682	9. V. A. Jaffrey
1988	3.77		1988	0.1279	10. I. A. Hanfi
1989	3.78		1989	0.1307	11. Kassim Parekh
1990	3.82		1990	0.1271	11. Kassim Parekh
1991	3.64		1991	0.1361	10. I. A. Hanfi
1992	3.93		1992	0.0704	10. I. A. Hanfi
1993	3.80		1993	0.0849	10. I. A. Hanfi
1994	5.64		1994	0.0596	12. Mohammad Yaqub
1995	5.10		1995	0.0514	12. Mohammad Yaqub
1996	4.89		1996	0.0333	12. Mohammad Yaqub
1997	4.51		1997	0.0337	12. Mohammad Yaqub
1998	6.40		1998	0.1010	12. Mohammad Yaqub
1999	6.09		1999	0.0956	12. Mohammad Yaqub
2000	4.26		2000	0.0328	13. Ishrat Husain
2001	8.38	The switch to free reserve targeting disturbs the unborrowed reserve ratio erratically	2001	0.0398	13. Ishrat Husain
2002	39.92		2002	0.0530	13. Ishrat Husain
2003	(9.24)		2003	0.0395	13. Ishrat Husain
2004	(16.49)		2004	0.0472	13. Ishrat Husain
2005	(243.74)		2005	0.0394	13. Ishrat Husain
2006	25.87		2006	0.0391	14. Shamshad Akhtar
2007	61.83		2007	0.0483	14. Shamshad Akhtar
2008	6.86	Policy environment settles down	2008	0.0150	14. Shamshad Akhtar
2009	8.97		2009	0.0363	14. Shamshad Akhtar

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 143-172

The Role of Education and Income in Poverty Alleviation: A Cross-Country Analysis

Pervez Zamurrad Janjua* **and Usman Ahmed Kamal****

Abstract

The existing literature on education and poverty considers mostly primary data from an income point of view. However, the benefits of education vary from a direct income effect to positive externalities, which can help reduce poverty. This paper uses panel data for 40 developing countries for the period 1999 to 2007, and estimates coefficients by applying the random effect generalized least squares (GLS) technique. The study concludes, first, that income growth plays a moderately positive role in alleviating poverty, but that income distribution does not play a key role in poverty alleviation in the sample overall. Second, it concludes that education is the most significant contributor to poverty alleviation.

Keywords: Education, income, income distribution, poverty alleviation, GLS, Pakistan.

JEL Classification: I30, I32.

1. Introduction

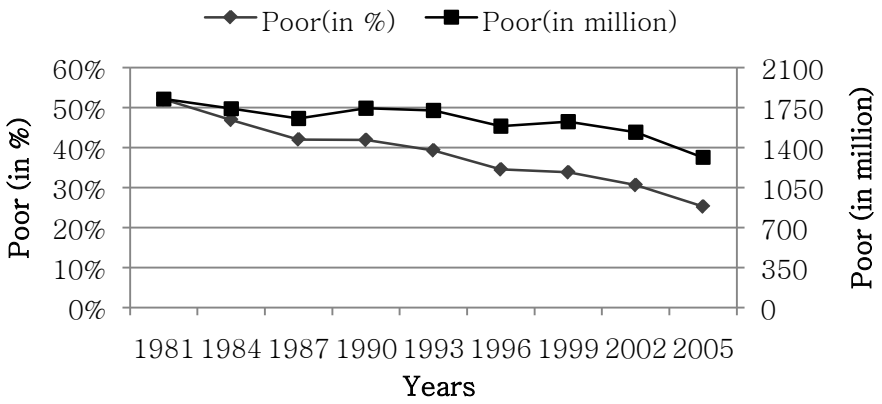
There has been ongoing debate on poverty for the last few decades. Why does the poverty exist throughout the world? What is happening to the world's poor? How can poverty be reduced? In particular, when we talk about globalization, economic growth, and living standards, we also talk about poverty. People living in poverty are unable to meet their basic needs, such as essential nourishment, basic health, and education. An expansion in earnings leads to a better nutrition plan, improved health, and better education. The recent focus on poverty by global bodies such as the World Bank and United Nations indicates the grimness of this issue. The Millennium Development Goals were put forward in September 2000 by the World Bank and United

* Foreign Professor at the International Institute of Islamic Economics, International Islamic University, Islamabad, Pakistan.
** MPhil student at the International Institute of Islamic Economics, International Islamic University, Islamabad, Pakistan.

Nations in an attempt to halve extreme poverty by 2015 from its level in 1990.

The World Bank's latest available estimates of poverty for 2005 reveal that about 25% of the world's population is extremely poor: that is, one in every four people is poor. Anti-poverty programs claim to have effectively resulted in a decline in the poverty level, bringing poverty down to half its level in 1990. Figure-1 below illustrates changes in the incidence of poverty between 1981 and 2005.

Figure-1: Incidence of poverty (116 countries calculated at US$1.25 per day/person)



Source: "PovcalNet", available on the World Bank web site http://www.worldbank.org

In a period of 24 years, poverty declined to 26 percent (by more than half its level in 1981). However, the actual numbers (instead of percentages) reveal that the rate of change has been sluggish. According to World Bank estimates for 116 countries in 1981, the total population of these countries was approximately 3,504 million, which increased to 5,205 million by 2005. In terms of these figures, the number of people living in poverty was 1,826 million in 1981 and 1,315 million in 2005, which shows that the number of people living in poverty actually fell by 511 million during this period. So, in reality, the decline in poverty is lower than perceived since 1981.

1.1. Statement of the Problem

The issue of poverty gives rise to two basic questions. First, why are people poor? Second, how can the poor escape poverty? Finding an appropriate solution to poverty requires determining its causes. Does the growth rate of per capita income influence poverty? Does a low income

level lead to poverty? Does the income gap between rich and poor create poverty? Does the difference in earning ability between low- and high-income groups cause poverty? Here, an empirical investigation of plausible poverty determinants becomes indispensable.

Many research analyses highlight the significance of income and income inequality as determinants of poverty. A significant amount of work on poverty has been done using income-based determinants, but poverty is not confined to income or income differentials. Different studies discuss income variables, income growth, and income inequality as possible determinants of poverty, and provide mixed evidence. If we assume on the basis of these findings that income variables do not adequately explain poverty alleviation, then we need to explore other possible determinants of poverty, e.g., lack of education, among others.[1]

1.2. Objectives and Hypotheses

In assuming that the poor do not want to remain poor and that others can play a role in helping them escape the vicious cycle of poverty, international organizations focus predominantly on income growth to alleviate poverty. Policymakers at the national level often aim for higher per capita income or reduction of income inequality to achieve the objective of poverty alleviation. The education level of an earning household member is an active factor in poverty risk (the risk of becoming poor), not only for himself/herself but also for his/her family. Since education can affect a person's earnings positively, estimates of the effect of education on poverty levels are useful for anti-poverty policy perspectives. The primary intention of this paper is to explore whether the formally educated population of a country has a considerable impact on the magnitude of poverty along with other variables such as per capita income growth and income inequality.

The World Bank classifies countries on the basis of income into four groups: low income, lower middle income, upper middle income, and high income. Here, we will focus on the first three because absolute poverty is not a major issue for high-income countries. We will randomly select a set of 40 countries from a population comprising those countries that fulfill our data requirements. We will then estimate an econometric model to test the following hypotheses:

[1] Asset distribution can also affect poverty. However, due to the nonavailability of data and estimation issues, we have excluded it from our investigation.

1. Does the number of formally educated people have a significant impact on the poverty extent of a country?
2. What contributes more to poverty reduction: education, per capita income growth, or income inequality?
3. Do all three variables behave similarly in different income groups of countries?

1.3. Significance of the Study

This study is based on theoretical as well as empirical observations and is distinctive because it investigates education as an additional determinant of poverty in contrast to conventional income-based determinants. Absolute poverty is a fundamental barrier to development, particularly for developing countries, which spend large amounts of funds in coordination with international organizations with the aim of poverty alleviation. A cheaper and more effective policy for poverty alleviation is crucial as public resources are not unlimited. Ascertaining the strength of different determinants of poverty can help establish appropriate policy recommendations.

Obviously, a world with a large number of poor people is neither socially nor economically acceptable. The central motivation to work on this issue was the yet unresolved poverty problem of Pakistan. A prominent view in the literature on economic development is that the poor have certain common characteristics that force them to stay poor: this is usually known as the "poverty trap." Therefore, useful results can be produced by analyzing the collective datasets of different countries to ascertain the causality of poverty. For Pakistan, the results of other countries' cumulative experience in recent years could provide a better path to move on.

2. Literature Review

The vast literature on poverty can be classified into theoretical and empirical approaches. Theoretical approaches focus mostly on the types of poverty or different social aspects of poverty. The empirical literature investigates evidence of the relationship between underlying variables based on observed statistics. The literature can also be divided on the basis of micro- and macro-level approaches.

Ellis (1984) takes a theoretical approach to describing different types of poverty. Here, the nature of poverty is examined in relation to a

model of causes affecting the welfare of a community, suggesting that it is possible to operationally distinguish among four major dimensions of poverty: economic, social, political, and legal. The study also discusses further aspects of poverty, stating that the classification of poverty into different types can help in understanding the problems faced by the community.

Ravallion (2001) describes the techniques used by the World Bank to measure poverty. The selected common poverty line (US$1 a day) typically prevails in low-income countries. This poverty line is converted into the local currency for consumption surveys by using purchasing power parity (PPP) exchange rates. Ravallion (2003) explains how different measures used for poverty or any other variable can lead to dissimilar results; if the approaches used are different, then their results cannot be considered legitimate.

Squire (1993) reviews efforts to reduce poverty in the developing world. The study uses country- and regional-level figures for poverty headcount, growth, and health measures to compare these efforts, concluding that (i) economic growth should be encouraged to induce the productive use of labor so that the poor can earn to escape poverty, (ii) public spending is an important source of improving health and educational attainment among the poor, and (iii) the provision of subsidized social services is better than direct cash transfers. The study does not use an estimation model to observe the effects of social indicators such as education and health on poverty.

2.1. Income and Poverty

Using survey data for 67 developing and transitional economies over 1981-94, Ravallion and Chen (1997)[2] show the type of correlation between growth of average living standards and poverty. They find a strong association between the rate of growth in average living standards and the rate at which absolute poverty falls: poverty almost always falls with a growth in average living standards and rises with a contraction. They also examine the relationship between living standards and income distribution and find that higher growth rates in average living standards do not tend to worsen the income distribution.

[2] Ravallion and Chen use income or expenditure as a welfare indicator, where income denotes household income per person and expenditure denotes household expenditure per person.

Ravallion and Datt (1996) decompose growth on the basis of sector output to determine the impact of the growth of different sectors on poverty. They show that the growth of the primary and tertiary sectors has contributed to a reduction in both urban and rural poverty, while the secondary sector has not delivered much to India's poor. They suggest fostering the growth of the primary and tertiary sectors to reduce poverty. However, they do not point to the alternative of enabling the poor to gain from the secondary sector by providing them with the skills and education that the sector requires, i.e., more skilled labor than the primary sector.

2.2. Income Inequality and Poverty

Besley and Burgess (2003) discuss global poverty trends, showing where the world's poor are located and how their numbers have changed over time. They also discuss the relationship between poverty, per capita income, and income inequality using regression estimation. Their findings confirm that increases in income per capita are associated with reductions in poverty. The study's outcome also illustrates the positive and significant association between income inequality and poverty.

Bénabou (2003) examines the interactions between income inequality, technological choice, and redistributive policies or institutions, showing that "a skill-biased technical change can potentially lead to the unraveling of the welfare state. When technological or organizational form is endogenous, firms respond to greater human capital heterogeneity with more flexible technologies, further exacerbating income inequality." This implies that human capital heterogeneity can result in income inequality via the wage inequality mechanism. In this scenario, the existence of social contracts such as educational assistance for the poor could help greatly in reducing wage inequality.

2.3. Education and Poverty

Shirazi (1994) investigates the incidence of poverty and socioeconomic profiles of the poor in Pakistan. He also explores the possibility of poverty alleviation through *infaq* using *zakah* and *ushr* collection. The study reveals that, in Pakistan, "the proportion of poor households having highly educated heads is extremely low [and the] majority of the educated heads of the poor household fall in the primary or below matriculation category of education." He also demonstrates how

"as the educational level of the head of the household increases the probability of that household being poor decreases."

Using data from the China Health and Nutrition Survey, Goh, Luo, and Zhu (2009) investigate the effect of income growth on poverty for the period 1989-2004 in eight provinces of China. They show that growth in income affects poverty negatively. In their study, income was found to grow for all segments of the population and, as a result, poverty incidence fell but the growth was uneven by region. Another finding was that education played an increasingly important role in household income determination for both urban and rural areas. Income gaps have increased between households with more and less human capital endowment.

Fafchamps and Quisumbing (1999) determine whether human capital affects the productivity and labor allocation of rural households in four districts of Pakistan. Using survey data collected by the International Food Policy Research Institute, the study's results show that "education raises off-farm productivity and induces rural Pakistani households to shift labor resources from farm to off-farm activities. This effect is strong, robust, and demonstrated via both the direct and indirect methods."

Maitra (2000) finds that the gap between the educated and noneducated increased in South Africa during the observed period due to differences in earning capacity. The study concludes that a household whose head has attained more than secondary school-level education performs significantly better than all other households.

Gundlach, Pablo, and Weisert (2002) study the relationship between education and income inequalities. According to their findings, "Education is not distribution neutral. Education seems to improve the income distribution and thus may allow the poor to benefit from growth to a greater extent. Accordingly, a focus of economic policies on education in order to reduce poverty and to speed up development appears to be justified."

Datt and Ravallion (1998) study a selected set of Indian states and show that "differences in trend rates of poverty reduction among states are attributed to differing growth rates of farm yield per acre and differing initial conditions; states starting with better infrastructure and human resources saw significantly higher long-term rates of poverty reduction." Some part of this better farm yield can also be considered an externality of education, as argued by Orazem, Glewwe, and Patrinos (2007), who show

that the impact of education on earnings and thus on poverty works mostly through the labor market. However, education can also add to productivity in other areas, such as peasant farming.

Mitch (2005) attempts to compare a number of existing studies on the relationship between education (schooling) and economic growth from a historical perspective. He finds that schooling may or may not have caused economic growth empirically. Rates of schooling and rates of economic growth have been observed to move in the same and opposite directions over the last three centuries. According to this analysis, human capital development, physical capital accumulation, structural changes in the economy, and foreign trade do play key roles in economic growth.

Barro (1996) uses panel data for 100 countries to test certain empirical theories related to growth. He uses the 3SLS technique for different constructed equations with different instrumental variables in each. His results show that, for a given level of per capita gross domestic product (GDP), the growth rate is positively affected by a higher initial level of schooling. Krueger and Lindahl (2001) attempt to reconcile the micro-econometric and empirical macro-literature on the effect of schooling on income and GDP. They show that the micro-level positive relationship between education and income is also true at a cross-country level.

Despite the potential difficulties (Mitch, 2005) in quantifying the real contribution of education to economic growth, education has always been considered a dominant tool for reducing poverty and inequality through productivity enhancement, which is also a key factor in sustainable economic growth. Easterly and Levine (2000) show that productivity growth explains most of the economic growth of developed countries while capital accumulation explains only a small part. Many countries continue to accumulate capital even while their economies shrink. Although total factor productivity relates to labor, land, and capital, the role of labor productivity is more important than all other factors of production. Education and skill promote labor productivity and, consequently, labor productivity positively influences the productivity of other factors of production.

In the literature, education and poverty exist in both directions, with low education being a cause and an effect of poverty. Estimating causality is always important because if we know the robustness of cause toward effect, then we can address the problem effectively. Poverty is strongly correlated with a range of family background variables,

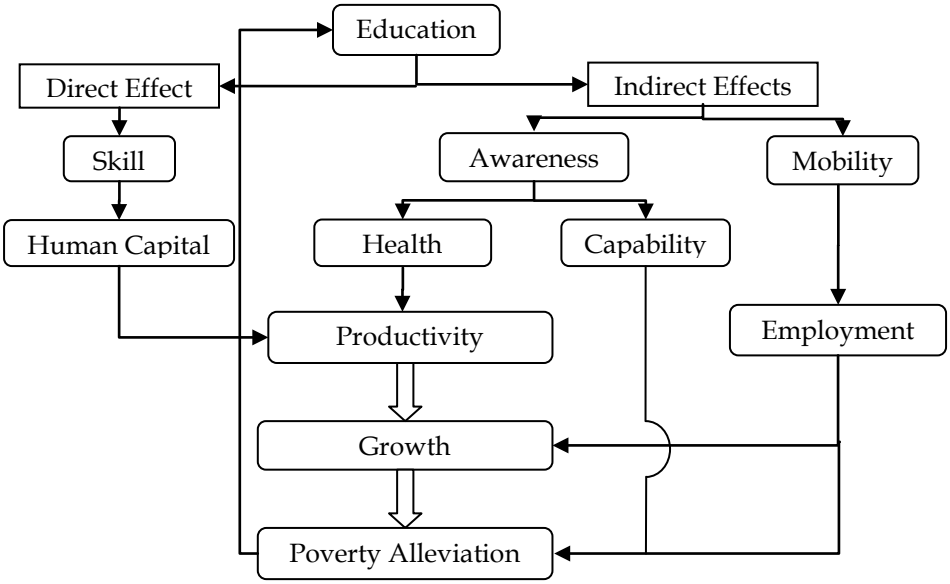
including parental education, which also influences children's educational outcomes (Berg, 2008) and at the same time, poverty is just one of many family background factors that limit learning. The Chronic Poverty Research Centre (2005) refers to evidence showing that formal education is strongly associated with the decreased possibility of chronic poverty. It also indicates that the level of schooling at which this might happen can vary between countries. The Chronic Poverty Research Centre (2008) shows that low education is a key factor in keeping people poor over decades or lifecycles. Our concern here is absolute poverty so we will not discuss the literature on chronic poverty as it requires addressing the vast area of nonquantitative aspects of poverty and other social variables.

The absolute poor in developing countries usually have low or even no education. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2007), the children most likely to be out of school or to drop out live in rural areas and come from the poorest households. The underlying aim of the Early Childhood Care and Education program was to provide a strong foundation in early childhood to escape from poverty in the future. Geda, Jong, Kimenyi, and Mwabu (2005) explore the determinants of poverty in Kenya by using household data. They reveal that, among all the variables "in all models, the most important determinant of poverty status is the level of education. Lack of education is a factor that accounts for a higher probability of being poor." Londoño (1996) suggests that inadequate education is the most important factor holding back Latin American economic growth and thus sustaining high levels of inequality and poverty. He concludes that improved education can bring about a large and relatively quick reduction in poverty due to its effect on individuals' earnings and growth.

Harper, Marcus, and Moore (2003) provide a comprehensive review of the literature on poverty reduction. Their discussion covers a number of key social processes that affect poverty. They also highlight the significance of education as a means of poverty reduction, and argue that a good-quality formal education widens horizons and increases future employment opportunities. They conclude that education can facilitate upward economic and social mobility, a better-paying and safer job, and general wellbeing. This conclusion confirms the importance of education in breaking different aspects of the poverty cycle, ranging from individual earning to parental and family effects.

Berg (2008) says: "Throughout the world it has been found that the probability of finding employment rises with higher levels of education, and that earnings are higher for people with higher levels of education." According to the study, "This connection between education and poverty works through three mechanisms. Firstly, more educated people earn more. Secondly, more (and especially better quality) education improves economic growth and thereby economic opportunities and incomes. Thirdly, education brings wider social benefits that improve economic development and especially the situation of the poor, such as lower fertility, improved health care of children and greater participation of women in the labor force." These findings support the view that the benefits (direct and indirect) of education result in changes in people's behavior and this behavioral change inevitably has an impact on poverty alleviation.

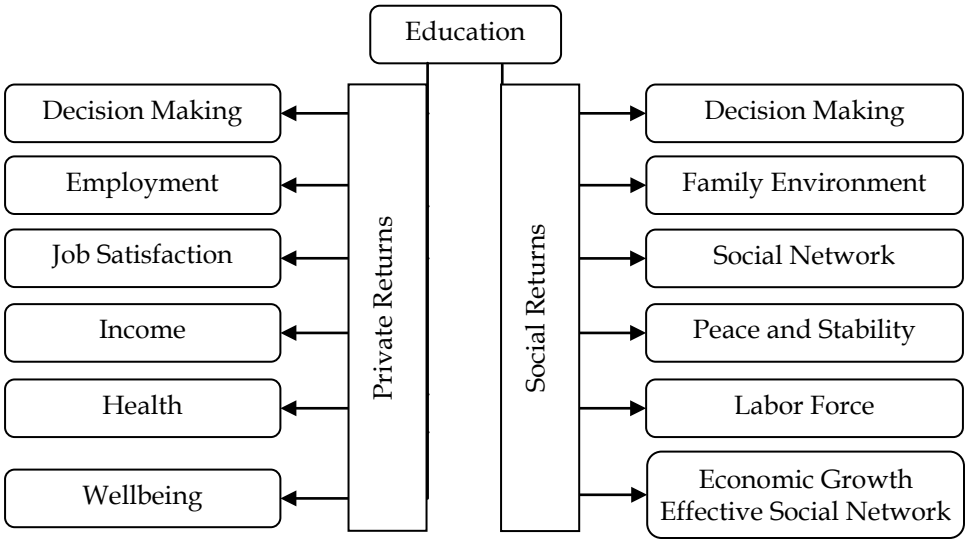
Figure 2: Impact of Education on Poverty Alleviation



From another but similar point of view, education pays off through both private and social returns. The distinction between private and social returns to education is that private returns refer to benefits received by the individual who acquires additional schooling, and social returns refer to benefits gained by society from that individual's schooling. Private returns include economic benefits such as higher lifetime earnings, lower levels of unemployment, and greater job satisfaction. They can also include consequences such as improved health and longevity. According to the human capital theory, schooling raises earnings because it enhances workers' skills, thus making employees

more productive and more valuable to employers. Riddell (2004) holds that the strong positive relationship between education and earnings is one of the most well established relationships in the social sciences.

Figure 3: Private and Social Returns of Education



The above mentioned literature proposes that education can reduce poverty through direct (income) and indirect (externalities) channels. In poverty reduction policymaking, an important choice is the level of education. Based on labor requirements and a country's development level, Gemmel (1996) finds that primary education is the most important for economic growth in low-income developing countries, secondary education for middle-income developing countries, and tertiary education for rich countries.

Self and Grabowski (2004) examine the impact of different educational levels on income in India. They classify education into three levels: primary, secondary, and tertiary. Their results show that primary education has a strong positive causal impact on income growth while secondary education has a comparatively limited impact on income growth.

Verner (2004) reveals that breaking the inter-generational transmission of poverty requires extensive action in the education sector. Low-quality education leads to low income, which in turn perpetuates poverty. He concludes that educational attainment is the single most important poverty-reducing factor. All levels of education from primary to tertiary are significant and negatively associated with the probability of

being poor. He suggests that improvements in access to and quality of education have been key to poverty reduction in Paraíba and northeast Brazil.

Previously, most studies on education showed that primary education yielded the highest returns but recent studies reveal mixed results in favor of both primary and secondary education. This indicates that the returns to education vary from country to country with factors such as the level of development, supply of educated workers, and shifts in the demand for skilled workers in the development process.

The literature review leads us to three conclusions. First, education can increase an individual's earnings by enhancing productivity and thus can significantly help reduce poverty. Second, the impact of education on poverty does not work only via income or a productivity mechanism (direct impact) but also through a number of externalities (indirect impact), e.g., through reduced infant mortality, better decisions, improved health and parental education, etc. Third, the impact of education on poverty can vary across regions due to a number of factors including economic circumstances, labor market requirements and the level and quality of education. These three conclusions suggest that education is a key variable in poverty alleviation. Thus, there is space for a study at the macroeconomic level to estimate the relationship between education and poverty due to the former's wide and unambiguous range of impacts on the latter.

3. Methodology of Investigation

This section defines the relevant variables and structure of our econometric model. The variables used in this study are poverty, per capita income, income inequality, and education.

3.1. Definitions of Variables

There is no commonly agreed definition of poverty. Definitions differ on what are to be considered basic human needs. However, the central meaning of poverty in all these definitions revolves around the "lack of fulfillment of basic needs." Poverty has many dimensions: for some, it is purely an economic matter; for others, it has social aspects too. Even within the economic notion, the ideas of absolute and relative poverty exist. This applies equally to the social point of view where there are further subcategories, e.g., political and psychological. In using different meanings and concepts of poverty, we are likely to come across

diverse methods of calculating poverty, resulting in dissimilar estimates. It is very difficult to quantify a social aspect of poverty for measurement purposes, which is why economic measures of poverty are often used in empirical research. Economic poverty is measured in both absolute and relative terms. For both measures, poverty can be defined as the inability to afford an adequate level of consumption, where this adequate level of consumption is defined as the bare minimum in the former and as an average in the latter (Black, 2003). Here, we use the definition of absolute poverty for the purpose of estimation. The questions why and which poverty measure we will use are explained in the next section.

The most comprehensive meaning of income in the literature is: "the amount of goods and services received by an individual" (Black, 2003). At the aggregate level, GDP refers to domestic income and gross national product (GNP) to national income. People are considered poor when they do not have enough income to fulfill their basic needs. An individual's income plays a key role in his/her poverty status when we consider the economic measure of poverty (either absolute or relative) because in both approaches the premise behind the measurement is income (expenditure). We can say that the same holds for a country's GDP/GNP per capita at the aggregate level with regard to its poverty rank. Pro-growth activists are of the view that an increase in the per capita income of a country ultimately leads to a decrease in the number of poor by increasing individuals' incomes or vice versa. It is a familiar notion in the literature that higher growth rates of per capita income convert into poverty reduction (Goh et al., 2009; Besley & Burgess, 2003). Generally, the growth rate of per capita income has been given a central objective status in poverty reduction programs throughout the world. However, countries experience poverty reduction through economic growth focused on the productive use of labor, the only asset owned by the poor (Squire, 1993). This finding makes it clear that pro-poor growth helps reduce poverty.

Income distribution has been widely discussed in the economic literature. Classical economists analyzed the distribution of income between factors of production. Recent economic literature on income distribution focuses primarily on individuals and households. By definition, income distribution refers to how the total income of a country is distributed among its population. The Lorenz curve and Gini coefficient (both measures of income distribution) represent the overall structure of income distribution among the population. The Gini coefficient indicates the level of income inequality by using the income

shares of the bottom and top quintiles of the population. The value of the Gini coefficient ranges between 0 and 1, where 0 indicates perfectly equal and 1 perfectly unequal income distribution. When the Gini coefficient is 0, all individuals in a society have the same income; when the Gini coefficient is 1, only one person has the whole income. Thus, the higher the value of the Gini coefficient, the greater is the degree of income inequality in a society. It has been argued that a more unequal distribution (income inequality) will ultimately push low-income people into poverty. The underlying idea is that if a few people share a very small part of the national income compared to others, then the poverty risk is greater for them. A number of empirical studies have verified this positive relationship between income inequality and poverty (Besley & Burgess, 2003; Goh et al., 2009).

Education means acquiring knowledge. Formal education, usually known as schooling, is the process of transferring knowledge and skills from one generation to the next. The education process can be divided into a number of stages, starting from basic literacy and numeracy to specialist learning. An individual's earning ability depends on his/her IQ, education, skills, and access to earning opportunities. Earnings or returns on education can take the shape of services, goods, or financial means. The volume of returns on education depends on the nature and quality of required skills and knowledge.

The stock of people with knowledge and skills is commonly known as human capital, and the basic source for acquisition of human capital is formal education. Some studies argue that the economic role of education or human capital is to foster economic growth by increasing per capita income. Empirical study-based results support the view that the higher a country's stock of human capital, the higher will be the income growth rate. On the other hand, various studies also support the view that formal education (schooling) does not lie solely behind economic growth but that other factors (physical capital accumulation, foreign trade, and the spread of financial services) also promote economic growth (Mitch, 2005). This view does not reject the idea that education helps people earn a higher income. Different rates of return for different schooling levels have been calculated throughout the world. These rates

vary from region to region depending on various factors. Thus, education can cause distributional changes in the income patterns of an economy.[3]

3.2. Variables and Model

Absolute and relative measures of poverty vary across countries. Relative poverty cannot be used as a measure of comparison between countries because they lack equivalent baselines. Different countries apply different poverty lines to measure absolute poverty but this difference exists only at currency levels. The basic concept behind absolute poverty measures is "command over commodities" and these commodities are similar in all surveys as supervised by the World Bank. For cross-country analysis, the same reference poverty line will produce better results at the aggregate level. Using PPP exchange rates based on the 1993 consumer price indexes (CPIs) of the countries studied, Chen and Ravallion (2001) constructed a poverty line of US$1.08 per day/person, known as the "Dollar a Day" poverty line. A revised version of the poverty line using CPI data for 2005 has also been developed, which indicates US$1.25 per day/person.[4] This poverty line reveals what percentage of the population is poor at a given point in time. This common headcount method is based on individuals' income/expenditure and both are commonly used to measure absolute poverty. The headcount of people living below the poverty line is denoted by P in our study.

Growth at the country level is usually measured in terms of GDP or GNP, so higher growth means higher income and vice versa. However, we also know that the poverty headcount measure calculates the national individuals living below the poverty line. Thus, in relation to poverty, it is preferable to use GNP statistics rather than GDP as it also works via the concept of national product. Another rationale for using GNP is that it includes income earned abroad by a country's citizens and a bulk of this income comes to the country in the form of remittances: many poor households live on the income sent from abroad by other household members. If we compare growth in absolute and per capita GNP, we find that per capita GNP growth is a better measure for poverty estimation than absolute GNP growth as it includes the population effect.

---

[3] In his introduction to the *Wealth of Nations*, Adam Smith (1776, p. 1) states that the proportion between the annual produce of a nation and the number of people who are to consume that produce depends on "the skill, dexterity, and judgment with which its labour is generally applied."

[4] Data for both poverty lines was taken from the International Comparison Program.

Income inequality is another commonly used variable as a determinant of poverty in cross-country studies.[5] There are different ways to measure income distribution: the Hoover index, Theil index, and Gini index measure income inequality. The Gini index is the most frequently used inequality index in empirical studies because it satisfies four important principles: anonymity, scale independence, population independence, and transfer principle. Besley and Burgess (2003) state that "although Gini coefficient is a one dimensional measure of distribution and even such measures can miss important changes in income distribution, it represents the only means of looking at the relationship between inequality and poverty for a broad range of countries." In line with Besley and Burgess (2003), we construct the following model to estimate poverty:

$$P_i = \alpha_0 + \alpha_1 \, PIncome_i + \alpha_2 \, Gini_i + \varepsilon \qquad (1)$$

P is the headcount of people (as a percentage of population) living below the poverty line of the *i*th country where *i* represents the cross-section units and PIncome denotes the per capita income growth of the *i*th country. In Equation (1) α_0 is the intercept term, α_1 is an estimate of the effectiveness of per capita income growth on poverty, and ε is the error term. Most of the existing literature suggests that a country's income growth affects its poverty magnitude in the opposite direction, which means that, if income growth is positive, it will reduce the poverty headcount and vice versa. Thus, the expected sign for α_1 is negative. An appealing implication of doubts regarding the "trickle down" theory is that the expected negative relationship between poverty and per capita income might still exist but its robustness is likely to be low.[6] In Equation (1), Gini represents the level of income inequality in the *i*th country and α_2 is a parameter that estimates the extent to which poverty is driven by income inequality. Most of the evidence from the literature supports a positive relationship between income inequality and poverty, so the sign for α_2 is expected to be positive. This positive relationship implies that the

[5] The asset inequality variable can also affect a country's poverty level. However, the ratio of asset rich-income poor people is very low compared to income rich-asset poor people. Therefore, the income inequality measure fulfils the requirement of the inequality variable. Another problem of correlation between both inequality variables can arise when we use both variables in the same regression estimation.

[6] This expected low robustness of income growth can be deemed as an opposition to the "trickle down" proposition.

poverty headcount and income inequality will move in the same direction where poverty is stimulated by income inequality.[7]

Sources of education vary between informal sources (e.g., libraries, the Internet, and museums) and formal sources (e.g., schooling and institutional training). The number of people in a country who undergo schooling is usually much higher than the number of people who have gone through training and gross and net enrolment rates are common measures that denote the number of students enrolled in school. Both enrolment rates are widely used as a measure of education in country-level investigations. The net enrolment rate is the more appropriate way of gauging how many people go through formal education in a country. The advantage of using the net enrolment rate over the gross enrolment rate is that the former does not overstate the numbers as in the case of the latter due to repeaters and replacements. Although the literacy rate is also a measure of education, the definition of the literacy rate[8] proposes that literacy alone will not help a person earn enough income to meet his/her essential expenditures. Formal education measures provide suitable datasets for this purpose.

In Equation (2), NES represents the net enrolment rate for formal secondary education in the *i*th country and α_3 is a measure of its effectiveness on poverty.

$$P_i = \alpha_0 + \alpha_1 \text{PIncome}_i + \alpha_2 \text{Gini}_i + \alpha_3 \text{NES}_i + \varepsilon \quad (2)$$

In the above equation, α_3 is a parameter of the relationship between education and poverty. Based on our earlier discussion, the expected sign for parameter α_3 for education is negative. The enrolment rate for secondary education is a commonly used proxy variable for education. Secondary education seems to have a stronger effect on poverty alleviation.[9] Equation (2) could be estimated if we needed coefficients at one point in time for all three hypotheses (see Section-1). However, our dataset comprises both cross-section as well as time series components. After the addition of the time series representative term t, the model is given in the following equation:

---

[7] Ravallion and Chen (1997) also show that growth in average living standards is almost uncorrelated with income distribution.

[8] The literacy rate indicates the proportion and number of persons within the population who can both read and write a short simple statement on their everyday life with understanding (http://data.un.org/).

[9] Professional (vocational and technical) education can effectively contribute to improving human capital. However, due to the nonavailability of data, it is not included in our estimation.

$$P_{it} = \alpha_0 + \alpha_1 \text{PIncome}_{it} + \alpha_2 \text{Gini}_{it} + \alpha_3 \text{NES}_{i(t-1)} + \varepsilon \quad (3)$$

4. Data Analysis and Results

In this section, we discuss data, estimation technique, and our estimation results.

4.1. Sources and Compilation of Data

Data for the poverty headcounts and Gini coefficients was downloaded from the World Bank's online PovcalNet.[10] Data for per capita income and net enrolment rates was taken from a UN data source.[11] Data for each variable was taken from the same source across the time series as well as cross-section units because different data sources may have used different techniques and tools for data collection. Moreover, the maximum available data for both time series and cross-section units was collected to minimize the artificial effect of interpolation or extrapolation. Apart from these precautionary measures, specific steps were taken in collecting data for each variable. For the poverty headcount, a revised version of the poverty line (US$1.25 per day/person at PPP 2005) was used. The UN data source was used to collect figures for net enrolment rates because UNESCO had collected this data by standardizing the years of education at the secondary level, which is advantageous for a cross-country comparison.

A dataset with a total population of 51 countries met the above mentioned required criteria. Our dataset constitutes a sample of 40 countries as cross-section units and nine years as time series units for each cross-section unit starting from 1999 to 2007 (see Appendix-1). Data for the poverty headcount (P) and Gini coefficient (Gini) was available at a frequency of three years in 1999, 2002, and 2005. For the variable of per capita income growth (PIncome), there were no missing values. The UN data source lacked enrolment rates at the secondary level for a few countries, among which only one or two time series units of data were missing for secondary net enrolments. In no case was any country selected that had more than four missing data points in the complete time series of any variable.

[10] Retrieved from http://iresearch.worldbank.org/PovcalNet/povcalSvy.html
[11] Retrieved from http://data.un.org/

4.2. Method of Estimation

In this study, we have used poverty as a dependent variable, and income, income inequality, and education as independent variables in Equation (3). Our data constitutes both cross-section and time series statistics and thus longitudinal data, or panel data, and has various advantages (Gujarati, 2005, p. 638; Dougherty, 2007, p. 409). First, it provides a better chance of studying the dynamics of change due to its larger sample size. Second, due to the combination of cross-section and time series units, it captures both spatial and temporal dimensions. Third, it can effectively capture the complexity of human behavior. Fourth, it may offer a solution to the problem of unobserved heterogeneity.

The two well-known techniques used for panel data in the GLS method are the fixed effect method (FEM) and random effect method (REM). FEM is appropriate in situations where the individual-specific intercept might be correlated with one or more regressors. A disadvantage of this method is that it consumes a lot of degrees of freedom when the number of cross-sectional units is large as more dummy variables are required (Yafee, 2003). Another major disadvantage (also in our case) of FEM is that "time-invariant variables and slowly moving variables can produce high standard errors or insignificant results" (Wilson & Butler, 2007), whereas REM assumes that the intercept of an individual unit is a random error from a mean value. Due to this assumption, REM requires a randomly selected sample from a given population. It is appropriate in a situation where the intercept of each cross-sectional unit is uncorrelated with the regressors. One advantage of REM over FEM is that it uses fewer degrees of freedom. Moreover, slow-moving or time-invariant variables can also be included while applying REM in contrast to FEM (Yafee, 2003).

The literature suggests that, if a sample is nonrandom, we should use FEM; if the sample is random, then the Hausman test will provide decisive indication regarding a suitable method (Dougherty, 2007, p. 421; Wooldridge, 2002, p. 288; Baltagi, 2005, p. 66). Given the above aspects, we will use REM followed by the Hausman test as our sample is drawn from a larger population of countries and the problem of greater degrees of freedom can also be avoided. Thus, the final equation for estimation is:

$$P_{it} = \alpha_0 + \alpha_1 \, PIncome_{it} + \alpha_2 \, Gini_{it} + \alpha_3 \, NES_{i(t-1)} + \mu_{it} \qquad (4)$$

The error term μ_{it} consists of both errors: the error from the intercept term and the error from the regressors.

4.3. Estimation and Results

Table-1 shows the regression estimates of coefficients for the whole dataset and for different subsets. Here, we have presented selected statistics for both individual variables and the overall model.[12]

Table-1: Selected Estimation Results

Estimation Method	**FEM**	**REM**	**REM**	**REM**	**REM**
Variable	**Set 1 Coefficient (p-value)**	**Set 2 Coefficient (p-value)**	**Set 3 Coefficient (p-value)**	**Set 4 Coefficient (p-value)**	**Set 5 Coefficient (p-value)**
Per capita income growth	-0.15145 (0.0002)	-0.2365 (0.0268)	-0.2379 (0.0005)	-0.0387 (0.0538)	-0.3985 (0.0000)
Income inequality	0.204628 (0.3291)	0.5263 (0.2866)	0.0937 (0.6669)	0.4948 (0.0021)	-0.0540 (0.8585)
Net enrollment rate in secondary education	-0.23682 (0.0476)	-0.5078 (0.0211)	-0.2881 (0.0202)	-0.1236 (0.1170)	-0.4662 (0.0002)
Adjusted R^2	0.9597 (0.0000)	0.4181 (0.0001)	0.3769 (0.0000)	0.4956 (0.0000)	0.6121 (0.0000)

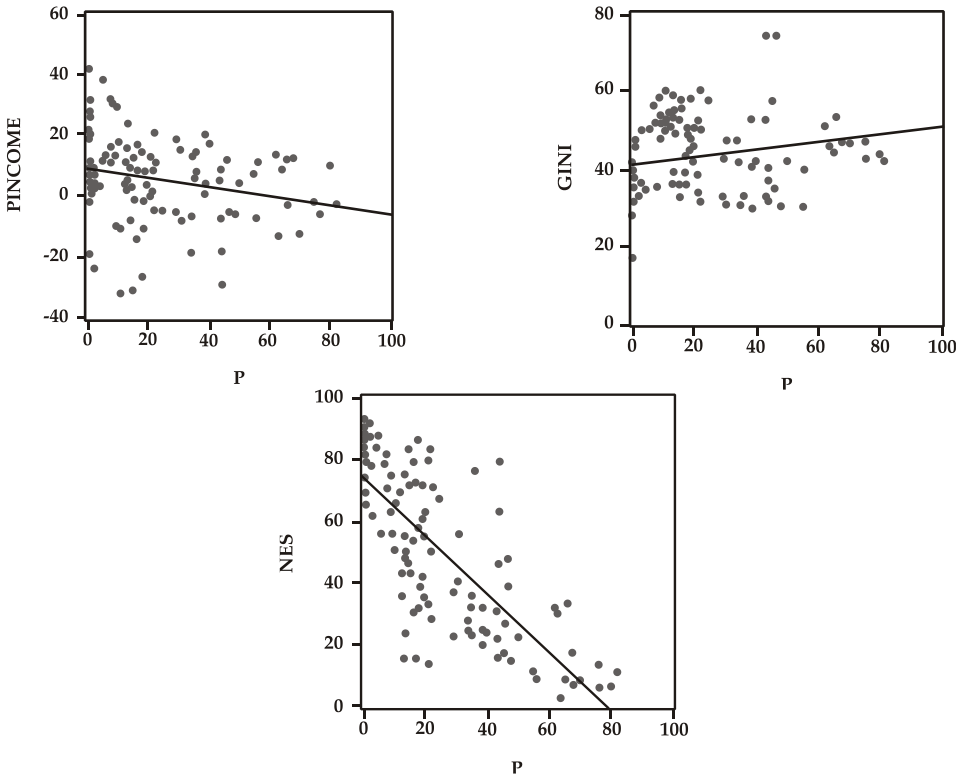
Notes: * Set 1 consists of the whole sample of 40 countries.
* Set 2 consists of 12 low-income countries.
* Set 3 consists of 16 lower middle-income countries.
* Set 4 consists of 12 upper middle-income countries.
* Set 5 consists of 12 countries that experienced high rates of poverty reduction during the observed period.

The table shows that PIncome is inversely related to the poverty headcount for the whole dataset. The p-value shows that the coefficient of PIncome is significant. Although the sign carried by the coefficient of PIncome favors the view that growth in per capita income reduces poverty, the coefficient's magnitude shows that per capita income growth has a moderate influence in terms of poverty reduction compared to other variables. The Gini coefficient shows that income inequality does not play a role in poverty reduction when compared to PIncome because it is not statistically significant. We also observe that the education-related coefficient is dominant compared to other coefficients in terms of magnitude and also strongly significant as shown by the p-values. The

[12] A lower p-value under the Hausman test suggests that FEM is a more suitable method for estimation than REM (see Appendix-2). Therefore, we have used FEM for estimation of the whole dataset (for REM results, see Appendixes-4 and 5). However, for all subsets, the results of the Hausman test favored the use of REM. For summery statistics, see Appendix-3.

bottom row shows the overall significance of the estimated model where R^2 is almost 0.96 and its p-value indicates that it is statistically significant. The following figures illustrate regression lines for each variable against the poverty headcount.

Figure-2: Relationship between Poverty and Independent Variables (Whole Sample)



The upper right figure shows a positive relationship between income inequality and poverty, but the relationship is not statistically significant. The upper left and lower figures show a negative relationship between per capita income growth and education and poverty. However, the lower figure's steeper slope indicates a strong negative relationship between education and poverty as compared to the modest negative relationship between per capita income and poverty as shown in the upper left figure.

For our first hypothesis, our derived results from the whole sample favored the view that formal education has a robust and significant effect on the poverty status of the sample countries. Thereafter, we divided our selected countries into three different income groups (low

income, lower middle income, and upper middle income) and estimated the same model for all three groups.

In the low-income group, the relationship between per capita income and poverty is significant. The relationship between income inequality and poverty is not significant, while that between education and poverty alleviation is more significant than the result of the total sample.

In the case of lower middle-income countries, the magnitude of the relationship between per capita income and poverty is similar to that of low-income countries. The Gini coefficient appears to be insignificant, while the coefficient for secondary education remains significant but with a moderately reduced magnitude.

In the upper middle-income group, the PIncome and Gini coefficients are significant. This is the only group of countries in which income inequality significantly affects poverty. The magnitude of the Gini coefficient shows that, when per capita income is high, income inequality can play a key role in poverty incidence. The secondary education-related coefficient loses its significance in this group of countries.

We selected 12 countries from the total dataset that had experienced high rates of poverty reduction between 1999 and 2007 to determine the determinants of poverty alleviation. Interestingly, our estimates show that per capita income and education are both statistically significant and their magnitudes show that both have a strong effect on poverty in this group. However, the coefficient for income inequality is not significant.

5. Conclusion and Recommendations

The above estimates drawn from the whole dataset lead us to three conclusions. First, per capita income growth played a moderate role in poverty alleviation in our selected countries during the observed period. Second, a decrease in income inequality played a stronger role in poverty reduction only in countries with higher per capita incomes. Third, secondary education emerged as the main contributor to poverty alleviation.

As discussed earlier, education clearly enhances people's earning ability. Interestingly, education can also help reduce poverty even if there is low growth in overall per capita income and little change in a country's income inequality. For example, as most illiterate people in developing

countries are poor, a policy pursuing a more educated population will lead to an increased supply of skilled labor in the economy, which will tend to decrease the wage rate, inducing increased demand for skilled labor. Due to the increased income of the poor, even with low income growth and little improvement in income distribution, the poor can be uplifted in a sustainable way, whereas mere income supports or subsidies will only help them for a shorter period. This is the difference between "enabling people" and "making people capable."

Keeping in view the above mentioned conclusions, economic policymaking in developing countries, without neglecting income growth and income distribution, should focus primarily on promoting education. At the same time, countries with comparatively higher per capita incomes should focus more on the distribution of income to achieve their objective of poverty eradication.

References

Anand, S., & Ravallion, M. (1993). Human Development in Poor Countries: On the role of Private Incomes and Public Services. *Journal of Economic Perspectives*, 7(1), 133-150.

Baltagi, B. H. (2005). *Econometric Analysis of Panel Data* (3rd Ed.). West Sussex, UK: John Wiley & Sons.

Banerjee, A.V., and Newman, A.F. (1994). Poverty, Incentives, and Development. *American Economic Review*, 84(2), 211-215.

Barro, R.J. (1996). Determinants of Economic Growth: A Cross-Country Empirical Study (Working Paper 5698). Cambridge, MA: National Bureau of Economic Research.

Bénabou, R. (2003). Human Capital, Technical Change, and the Welfare State. *Journal of the European Economic Association*, 1(2/3), 522-532.

Berg, S. van der. (2008). *Poverty and Education*. Paris: International Institute for Educational Planning and International Academy of Education.

Besley, T., and Burgess, R. (2003). Halving Global Poverty. *Journal of Economic Perspectives*, 17(3), 3-22.

Black, J. (2003). *A Dictionary of Economics*. Oxford: Oxford University Press.

Canagarajah, S., Mazumdar, D., and Ye, X. (1998). The Structure and Determinants of Inequality and Poverty Reduction in Ghana, 1988-92 (Policy Research Working Paper). Washington, DC: World Bank.

Chen, S., and Ravallion, M. (2007). Absolute Poverty Measures for the Developing World, 1981-2004. *Proceedings of the National Academy of Sciences*, 104(43), 16757-16762.

Chronic Poverty Research Centre, (2005). *The Chronic Poverty Report 2004-2005*. Manchester, UK: Author.

Chronic Poverty Research Centre. (2008). *The Chronic Poverty Report 2008-09*. Manchester, UK: Author.

Datt, G., and Ravallion, M. (1998). Why have some Indian States done better than others at Reducing Rural Poverty? *Economica*, 65(257), 17-38.

Dollar, D., and Kraay, A. (2004). Trade, Growth, and Poverty. *Economic Journal*, 114(493).

Dougherty, C. (2007). *Introduction to Econometrics*. Oxford University Press.

Easterly, W., and Levine, R. (2000). It's not Factor Accumulation: Stylized Facts and Growth Models (draft for Policy Research Group). Washington, DC: World Bank.

Ellis, G.F.R. (1984). The Dimensions of Poverty. *Social Indicators Research*, 15(3), 229-253.

Fafchamps, M., and Quisumbing, A.R. (1999). Human Capital, Productivity, and Labor Allocation in Rural Pakistan. *Journal of Human Resources*, 34(2), 369-406.

Feldstein, M. (1998). Income Inequality and Poverty. (Working Paper 6770). Cambridge, MA: National Bureau of Economic Research.

Geda, A., Jong, N. de, Kimenyi, M.S., and Mwabu, G. (2005). Determinants of Poverty in Kenya: A Household Level Analysis. Working Paper 2005-44, Storrs, CT: University of Connecticut.

Gemmell, N. (1996). Evaluating the Impacts of Human Capital Stocks and Accumulation on Economic Growth: Some New Evidence. *Oxford Bulletin of Economics and Statistics*, 58(1), 9-28.

Goh, C., Luo, X., and Zhu, N. (2009). Income Growth, Inequality and Poverty Reduction: A Case Study of Eight Provinces in China. *China Economic Review*, 20(3), 485-496.

Gujarati, D. N. (2005). *Basic Econometrics*. New York, NY: McGraw-Hill.

Gundlach, E., Pablo, J.N. de, and Weisert, N. (2002). *Education is Good for the Poor: A Note on Dollar and Kraay (2001)*. Helsinki: World Institute for Development Economics Research.

Harper, C., Marcus, R., and Moore, K. (2003). Enduring Poverty and the Conditions of Childhood: Lifecourse and Intergenerational Poverty Transmissions. *World Development*, 31(3), 535-554.

Krueger, A., and Lindahl, M. (2001). Education for Growth: Why and for Whom? *Journal of Economic Literature*, 39, 1101-1136.

Londoño, J. L. (1996). *Poverty, Inequality, and Human Capital Development in Latin America, 1950-2025* (World Bank Latin American and Caribbean Studies: Viewpoints). Washington, DC: World Bank.

Maitra, P. (2000). *The Effect of Household Characteristics on Poverty and Living Standards in South Africa*. doi: 10.2139/ssrn.241109

Mitch, D. (2005). Education and Economic Growth in Historical Perspective. In R. Whaples (Ed.), *EH.Net Encyclopedia*.

Orazem, P., Glewwe, P., and Patrinos, H. (2007). The Benefits and Costs of Alternative Strategies to Improve Educational Outcomes. Working Paper 07028, Ames, IA: Iowa State University.

Ravallion, M. (2001). Comment on "Counting the World's Poor" by Angus Deaton. *World Bank Research Observer*, 16(2), 149-156.

Ravallion, M. (2003). The Debate on Globalization, Poverty and Inequality: Why Measurement Matters. *International Affairs*, 79(4), 739-753.

Ravallion, M., and Chen, S. (1997). What can New Survey Data tell us about Recent Changes in Distribution and Poverty? *World Bank Economic Review*, 11(2), 357-382.

Ravallion, M., and Datt, G. (1996). How Important to India's Poor is the Sectoral Composition of Economic Growth? *World Bank Economic Review*, 10(1), 1-25.

Riddell, W.C. (2004, November). *The Social Benefits of Education: New Evidence on an Old Question*. Paper presented at the conference "Taking Public Universities Seriously", University of Toronto.

Rose, P., and Dyer, C. (2008). Chronic Poverty and Education: A Review of the Literature. Working Paper 131, Manchester: Chronic Poverty Research Centre.

Self, S., and Grabowski, R. (2004). Does Education at all Levels Cause Growth? India, A Case Study. *Economics of Education Review*, 23(1), 47-55.

Shirazi, N.S. (1994). An Analysis of Pakistan's Poverty and its Alleviation through *Infaq*. (Unpublished doctoral dissertation). International Islamic University, Islamabad.

Squire, L. (1993). Fighting Poverty. *American Economic Review*, 83(2), 377-382.

United Nations Educational, Scientific and Cultural Organization. (2007). *EFA Global Monitoring Report, Strong Foundations: Early Childhood Care and Education*. Paris: Author.

Verner, D. (2004). Education and its Poverty-Reducing Effects: The Case of Paraíba, Brazil, Policy Research Working Paper 3321, Washington, DC: World Bank.

Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

World Bank. (2003). *World Development Report 2004: Making Services Work for Poor People*. Washington, DC.

World Bank. (2006). *World Development Report 2007: Development and the Next Generation*. Washington, DC.

World Bank. (2008). *World Development Indicators 2008*. Washington, DC.

Appendix-1

No.	ID	Country	Income Group
1	ALB	Albania	Lower middle
2	ARM	Armenia*	Lower middle
3	AZE	Azerbaijan*	Lower middle
4	BLR	Belarus	Upper middle
5	BOL	Bolivia	Lower middle
6	BRA	Brazil	Upper middle
7	BGR	Bulgaria	Upper middle
8	BFA	Burkina Faso*	Low
9	KHM	Cambodia	Low
10	CPV	Cape Verde	Lower middle
11	COL	Colombia	Upper middle
12	ECU	Ecuador	Lower middle
13	SLV	El Salvador	Lower middle
14	ETH	Ethiopia*	Low
15	GMB	Gambia	Low
16	GHA	Ghana*	Low
17	GTM	Guatemala	Lower middle
18	JOR	Jordan	Lower middle
19	KAZ	Kazakhstan	Upper middle
20	KEN	Kenya	Low
21	LPD	Lao People's Democratic Republic*	Low
22	LSO	Lesotho	Lower middle
23	MDG	Madagascar*	Low
24	MYS	Malaysia	Upper middle
25	MRT	Mauritania*	Low
26	MEX	Mexico	Upper middle
27	MNG	Mongolia*	Lower middle
28	MOZ	Mozambique	Low
29	NAM	Namibia	Upper middle
30	NIC	Nicaragua	Lower middle
31	NER	Niger*	Low
32	PAK	Pakistan	Lower middle
33	PER	Peru	Upper middle
34	POL	Poland	Upper middle
35	MDA	Republic of Moldova*	Lower middle
36	LCA	Saint Lucia	Upper middle
37	SWZ	Swaziland	Lower middle
38	TJK	Tajikistan*	Low
39	UKR	Ukraine	Lower middle
40	VEN	Venezuela	Upper middle

Source: World Bank (2009).

* Countries witnessed high rates of poverty reduction during observed period.

Appendix-2

Hausman specification test

Chi-sq. Statistics	Chi-sq. d.f.	Prob.
11.22108	3	0.0106

Appendix-3

Summary statistics

	P	PIncome	Gini	NES
Mean	24.552	5.005	43.272	51.215
Median	18.195	7.114	42.580	55.065
Maximum	82.320	42.380	74.330	92.940
Minimum	0.000	-32.165	16.830	2.660
Std. Dev.	22.177	13.461	10.760	26.864
Total Obs.	120.000	120.000	120.000	120.000

Appendix-4

Regression results using REM

Variable	Coefficient	p-value	Adjusted R^2	p-value
PIncome	-0.1134	0.0015	0.4364	0.0000
Gini	0.1238	0.3956		
NES	-0.5111	0.0000		

Appendix-5

Country	Fixed Effects (p-value)	Country	Fixed Effects (p-value)	Country	Fixed Effects (p-value)
Albania	13.3383	Ethiopia	45.4701	Mongolia	34.0196
	(0.2015)		(0.0000)		(0.0022)
Armenia	27.7794	Gambia	30.4458	Mozambique	61.5890
	(0.0263)		(0.0057)		(0.0000)
Azerbaijan	20.8462	Ghana	35.7034	Namibia	40.9546
	(0.0626)		(0.0005)		(0.0146)
Belarus	15.6663	Guatemala	11.1791	Nicaragua	17.5817
	(0.1819)		(0.3591)		(0.1425)
Bolivia	26.8509	Jordan	13.0162	Niger	67.5216
	(0.0730)		(0.2974)		(0.0000)
Brazil	14.4915	Kazakhstan	17.4799	Pakistan	29.7191
	(0.3308)		(0.1680)		(0.0002)
Bulgaria	16.9641	Kenya	18.8053	Peru	16.2181
	(0.1627)		(0.0804)		(0.2354)
Burkina	54.4495	L P D	43.6236	Poland	15.9550
Faso	(0.0000)	Republic	(0.0000)		(0.2190)
Cambodia	42.9534	Lesotho	35.8491	Republic of	34.8216
	(0.0000)		(0.0031)	Moldova	(0.0054)
Cape	24.1466	Madagascar	69.6359	Saint Lucia	26.8051
Verde	(0.0544)		(0.0000)		(0.0256)
Colombia	17.2905	Malaysia	9.5178	Swaziland	60.7757
	(0.2180)		(0.4198)		(0.0000)
Ecuador	12.3522	Mauritania	14.4298	Tajikistan	44.6148
	(0.3542)		(0.0995)		(0.0001)
El Salvador	15.3544	Mexico	9.8816	Ukraine	17.1839
	(0.2137)		(0.4347)		(0.1496)
				Venezuela	18.0620
					(0.1402)

The Lahore Journal of Economics
16 : 1 (Summer 2011): pp. 173-175

Book Review

Edited by Shahrukh Rafi Khan and Jens Christiansen, *Towards New Developmentalism, Market as Means Rather than Master*, Routledge, Taylor and Francis Group, London and New York, 2011, ISBN13: 978-0-415-77984-5, pp 286.

Neo-liberalism has virtually seen its day and over the last three decades a significant amount of scholarship has evolved that provides a viable alternative to this paradigm. Further, the global financial and economic crisis plaguing countries the world over from 2007-2009 has led to the exploration of alternatives that are presented in this book by scholars.

The focus of this volume which came from a conference at Mount Holyoke College in 2008, is on an economic development strategy that improves on neo-liberalism, terming it `new developmentalism'.

Hence not only is it simply a critique of the neo-liberal strategy, but provides an alternative that is spelt out. In a nutshell, it is a form of as Khan states `developmental pragmatism', policy-oriented, institutional development and involvement with economic globalization; and equally importantly, the market is viewed as a means to be curbed for this alternative strategy rather than master whose commands are to be succumbed to.

Wade in his piece states that there is ample evidence questioning the argument that market liberalization should be the core of development strategy. He says that the global crisis is a wake-up call, and the experience calls for rethinking the proper role of states and markets in developing as well as developed countries. He elucidates that there is a consensus view that it was not enough to move towards free markets because the institutions necessary for free markets to operate well are invariably weak in developing countries.

Part II of the book dwells on the overall theme of new developmentalism, while Part III offers a criticism as well as prescriptions. Developmentalism involves an activist state with selective industrial policy. Industrial policy, as Khan explains, is defined as `Strategically creating comparative advantage in industries that embody dynamic efficiencies in low- and middle-income countries' (p4). New

developmentalism points out that export promotion and import substitution industrialization are complementary rather than mutually exclusive. Yet another difference in new developmentalist thought is the emphasis on governance capacities to render the state effective.

Chang in the next chapter highlights the fact that development has now come to imply something quite different from what it originally meant. Development has come to mean poverty reduction, the provision of basic needs, betterment of individuals and the like; that is anything but what the author envisages as development. As he puts it, Hamlet without the Prince of Denmark! This point of view is not in synchrony with the reality of development. In fact, says Chang, development requires 'systematic efforts to acquire and accumulate better productive knowledge through the construction of better organizations, the cross-fertilization of ideas within it, and the channeling of individual entrepreneurial energy into collective entrepreneurship' (p 55).

The crux of the argument of Reinert et al is that any policy aimed at salvaging nation-states from failing, should not just treat the symptoms and instead the causes, and analyze how to make the productive structure of failing states adopt the structure of developed ones. They categorically further state that the policies of the Washington Consensus resulted in the deindustrialization of many poor countries, ranging from Mongolia to Africa to Latin America. At the centre of fragile, failing and failed states is a productive system where that which makes for national unity is missing.

Grabel in her essay talks about how there exists an intellectual climate wherein, against the lessons of history, the state is considered to be the main hindrance to development and neo-liberal reforms are thought of as being the sole means in achieving goals of development. She argues for the concept of policy coherence whereby any single economic policy such as free trade, will only be beneficial in terms of outcomes if it is ensconced in a wider policy environment that is conducive and supportive. She further predicts that perhaps the recent global financial crisis and the considerable shifts in national power that will in all likelihood result, will create space for policy diversity and policy experimentation that opponents of neo-liberal policy conformance have been going on for quite a while now.

Abugattas and Paus present an essay on mobilizing public resources for a new development strategy in the age of globalization and

the fiscal space dilemma in Latin America. Harten presents a technical article on investment treaties as a constraining framework while Gallagher and Shafaeddin discuss government reform and industrial development in China and Mexico. Ndikumana presents an interesting piece on growth and development in Africa, challenges and opportunities.

The concluding part, Part V of the volume, includes an enlightening article by Zarsky on climate-resilient development paths. As he states, climate change has paradigm-shifting implications for development theory and policy. In defining climate resilient paths of industrial development he explains calls for a redefinition of development itself. Instead of growth or poverty alleviation, he defines development to be 'the building of local capacities for economic production and innovation' (p 232). Then climate resilient development is a socio-economic trajectory that sustains livelihoods that both ameliorate and adapt to global climate change.

In the concluding chapter, Khan presents a succinct historical overview of the development economics debate. He sums up that new developmentalism sees poverty as a symptom and the crux of the matter is the ability to generate sustainable productive employment in increasing returns spheres. Albeit in essence a trickle down approach, there is a conscious effort to distance itself from the compartmentalization of neo-liberalism, whereby structural adjustment is considered to be the root cause of poverty, and poverty alleviation programs the outcome.

The chapters in the book come across as being both refreshing, innovate and exciting and as well as a few making for arid reading. If only policymakers and academics would pay heed.

Lahore School of Economics **Nina Gera**
Lahore