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Paul Dorosh and Abdul Salam

Pakistan Institute of Development Economics

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ISLAMABAD**

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## **ABSTRACT**

This article provides a quantitative analysis of the effects of Pakistan government domestic wheat procurement, sales, and trade policies on wheat supply, demand, prices, and overall inflation. Analysis of price multipliers indicates that increases in wheat procurement prices (one means of promoting domestic procurement) have relatively small effects on overall price levels. Partial equilibrium analysis of wheat markets suggests that fluctuations in production, rather than market manipulation, are plausible explanations for price increases in recent years. Comparisons of domestic and international prices suggest that promoting private sector imports is one alternative for increasing supply and stabilising market prices, particularly in years of production shortfalls. Overall, this paper concludes that market forces play a dominant role in price determination in Pakistan, and that policies that promote the private sector wheat trade can both increase price stability and reduce fiscal costs.

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## I. INTRODUCTION

Wheat plays a central role in Pakistan's food economy, both in terms of production and consumption. Because of the importance of wheat, successive governments of Pakistan since Independence have intervened heavily in wheat markets, procuring wheat at administratively set prices to support farmer incomes and subsidising wheat sales to flour mills or directly to consumers with the objective of stabilising prices at levels affordable to consumers [Cornelisse and Naqvi (1987); Hamid, Nabi, and Nasim (1990); Dorosh and Valdés (1990); Ashfaq, Griffith, and Parton (2001); Ahmad, *et al.* (2005)].

Significant steps were taken toward liberalisation of wheat markets from the late 1980s to 2000. However, after consecutive relatively poor wheat harvests from 2002 to 2004 led to high market prices for wheat, the federal government, as well as the government of Punjab, took several policy measures designed to increase supplies, add to government stocks and stabilise prices, including imposition of restrictions on transport of wheat and subsidising sales of government imports. Wheat policy again shifted in 2005, as procurement prices were raised, restrictions on transport of grain were removed, and private imports encouraged.

These policy measures related to domestic procurement quantities and prices, private and government imports, and sales prices have had a major impact on wheat markets, prices and government subsidies in Pakistan. Moreover, because of the importance of wheat as a wage good and perhaps as a signal of government policy, increases in the wheat procurement price are seen as a major factor in determining the overall level of price inflation in the country.

The purpose of this article is to provide a quantitative analysis of the effects of these policies on wheat supply, demand, prices and overall inflation, drawing out implications for government policy to address wheat price stabilisation issues in both the short and long run. We first present a brief summary of the wheat economy in Pakistan and the political economy of wheat policy. Section 3 contains an analysis of the impacts of wheat procurement and the procurement price on the wheat market and overall price levels. Thereafter follows a brief analysis of current (2005) wheat production and prices. The final section includes concluding observations and policy implications.

## II. OVERVIEW OF THE WHEAT ECONOMY OF PAKISTAN

Annual wheat production in Pakistan from 2002 through 2004 averaged 19.0 mn tons, about 80 percent of which was produced in Punjab. Over this

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period, current production accounted for about 90 percent of total supply, with the remainder coming from imports and drawdown of government stocks.

Provincial governments, particularly the government of Punjab, intervene heavily in wheat markets. Government procurement averaged 4.0 million tons per year in 2002 and 2003, about 25 percent of production in these years. Punjab alone accounted for almost 90 percent of procurement, equivalent to 27 percent of its production.

Pakistan Agricultural Prices Commission (APCOM) surveys in major wheat surplus districts in Sindh in 1997 and in Punjab in 1998 indicate that 42 percent (Sindh) and 55 percent (Punjab) of wheat production sold within four months of harvest [Salam, *et al.* (2002)] and that overall about 62 percent of production is sold.<sup>1</sup> Farms larger than 25 acres accounted for an estimated 81 percent of wheat sales in Sindh and 67 percent of wheat sales in Punjab (Table 1). With 20 percent of wheat production used as payments for harvesting and threshing, these figures imply that only 18 percent of wheat production is retained for own-consumption in these surplus districts. Using the same percentages for wheat sales/production, total wheat sales (and rents-in-kind) are estimated at 15.6 mn tons for the period 2001-02 to 2003-04. Government purchases (domestic procurement) of 3.6 mn tons would then be equal to 19 percent of total market purchases/sales (Table 2).

Nationally, however, perhaps as high as 30 percent of wheat production is retained for own-consumption. Using this figure, total wheat sales in Pakistan would be about 13.4 mn tons, and procurement of 3.6 mn tons would be equal to 27 percent of the market. Similar calculations for the share of government sales of wheat to total availability suggest that government sales account for 31 to 38 percent of total purchases. Given that government releases (sales to flour mills) occur mainly from October through April (the onset of the wheat harvest), and that household purchases are likely to be concentrated in these months, these rough estimates suggest that government wheat has accounted for 80 percent or more of wheat purchases in the last six months of these years (2001-02 to 2003-04).

Pakistan Integrated Household Survey (PIHS) 2001-02 data also indicate that wheat sales are highly concentrated. The top 10 percent of wheat farmers in terms of sales account for 47 percent of total wheat sales; the top 20 percent of wheat farmers in terms of sales (only 5 percent of Pakistan's households) account for 67 percent of total wheat sales. Overall, only 20 percent of Pakistan's households have a surplus of wheat production over home consumption, and 23 percent of wheat farmers are net wheat purchasers.<sup>2</sup> Thus,

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<sup>1</sup>This calculation uses the 1999-2000 to 2001-02 production weights for Punjab and Sindh provinces (80/12).

<sup>2</sup>Net purchases are calculated on the basis of household production and an assumed per capita consumption of 140 kgs/person/year.

Table 1

*Production and Sales by Farm Size, Sindh 1996-97 and Punjab 1997-98*

	Production (Tons/Farm)	% Sold (w/in 4 Months)	% Sold (Est. Total)	% Sales (Est. Total)	% In-kind (Est. Total)
<b>Sindh: 1996-97</b>					
< 12,5 Acres	4.2	55%	55%	8%	17.7%
12 to 25 Acres	9.4	50%	63%	11%	17.1%
25 to 50 Acres	15.6	49%	67%	16%	16.7%
50+ Acres	47.0	37%	68%	65%	19.4%
Total	16.8	42%	66%	100%	18.6%
<b>Punjab: 1997-98</b>					
< 12,5 Acres	3.9	42%	42%	11%	23.5%
12 to 25 Acres	10.7	49%	60%	22%	20.9%
25 to 50 Acres	20.2	59%	65%	23%	19.8%
50+ Acres	53.0	61%	68%	44%	20.1%
Total	12.3	55%	61%	100%	20.8%
<b>Total Sindh and Punjab</b>	12.9	53%	62%	100%	20%

Source: Calculated using APCOM survey data from Salam, *et al.* (2002).

Note: Years indicated are May-April crop marketing years.

Table 2

*Pakistan: Estimates of Size of Wheat Market (2002-03 to 2004-05)*

	2002-03	2003-04	2004-05	Average
<b>Estimate 1: APCOM Survey</b>				
Production	18.2	19.2	19.5	19.0
Sales (62 Percent of Production)	11.3	11.9	12.1	11.8
Rents (in-kind; 20 Percent of Production)	3.6	3.8	3.9	3.8
Subtotal Sales, Rents	14.9	15.7	16.0	15.6
Own Consumption	3.3	3.5	3.5	3.4
Govt Procurement	4.0	3.5	3.4	3.6
Govt Releases	3.4	5.1	4.1	4.2
Availability	19.1	15.8	16.7	17.2
Total Purchases	15.9	12.4	13.2	13.8
Govt Proc/Production	22.2%	18.3%	17.3%	19.2%
Govt Proc/Total Sales, Rents	27.1%	22.3%	21.1%	23.4%
Govt Sales/Total Purchases	21.3%	41.5%	31.0%	30.4%
Govt Sales/Total Consumption	17.6%	32.4%	24.5%	24.4%
<b>Estimate 2: (Sales: 50 Percent of Production)</b>				
Subtotal Sales and Rent	12.8	13.4	13.6	13.3
Govt Proc/Total Sales, Rents	31.7%	26.2%	24.7%	27.4%
Govt Sales/Total Purchases	24.7%	51.0%	37.7%	36.4%
Govt Sales/Total Consumption	17.6%	32.4%	24.5%	24.4%

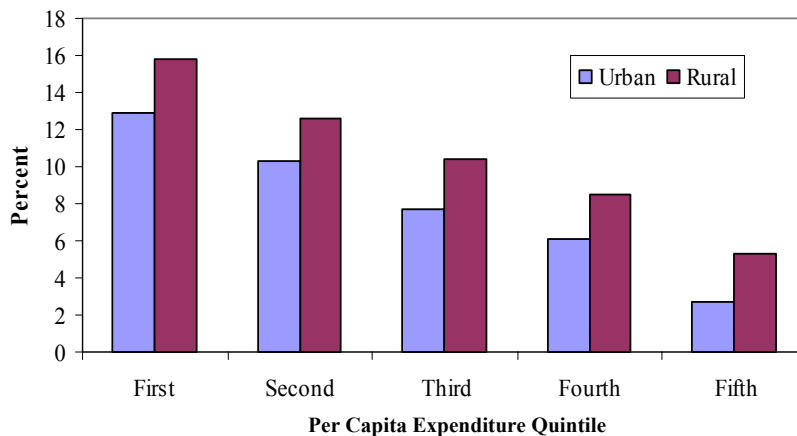
Notes: Estimate 1 uses shares of the 1997 and 1998 APCOM surveys of wheat farmers. These calculations assume that all in-kind payments for harvesting and threshing are re-sold. Years shown are May-April crop marketing years.

policies that support high producer prices directly benefit only the relatively small percentage of wheat farmers with wheat surpluses.

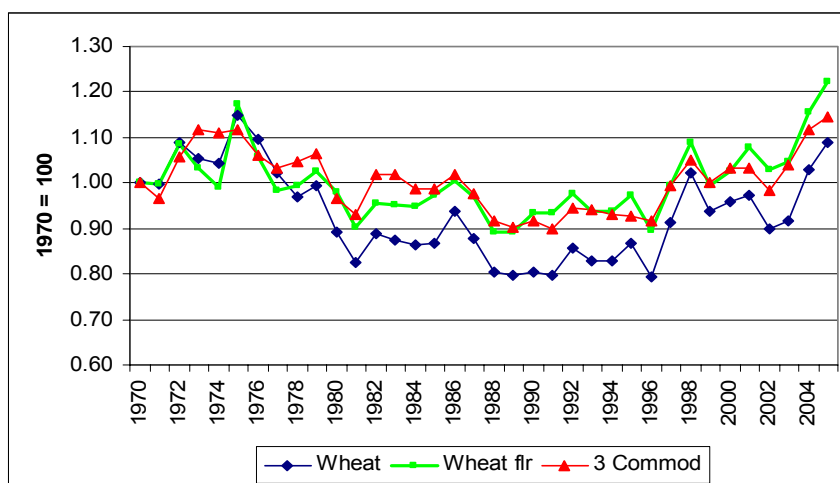
According to the 2001 FAO Food Balance Sheet for Pakistan, consumption of wheat provided 1042 calories/person/day, 42 percent of total caloric consumption (2457 calories/person/day). HIES 2001-02 data show a slightly higher absolute figure (1052 calories/person/day), but a much higher caloric share (58 percent of 1819 calories/person/day). Rural consumption per capita (10.3 kgs/person/month) is 42 percent higher than urban consumption per capita (7.24 kgs/person/month). Overall, there is little difference between quantities consumed across expenditure quintiles in urban areas, though wheat consumption rises with total expenditures for rural households (Figure 1). Budget shares of wheat are high for both urban and rural poor households: 12.9 percent for the poorest urban quintile and 15.8 percent for the poorest rural quintile.

Per capita net availability has declined in recent years, because of sub-par harvests that were not completely offset by increased government imports and draw down of stocks. From 1990-91 to 2001-02, per capita wheat consumption averaged 131 kgs/person/year. For the three year period, 2002-03—2004-05, however, per capita wheat availability (consumption) fell by 14 percent to 113 kgs/year. As a result of the reduced availability, real prices of wheat and wheat flour rose by 21 and 19 percent, respectively, from 2001-02 to 2004-05 (Figure 2).

**Fig. 1. Pakistan: Expenditure Shares of Wheat by Per Capita Expenditure Quintile, 2001-02**



*Source:* Calculated from HIES 2001-02 data.

**Fig. 2. Real Prices of Major Staples in Pakistan: 1970-2004**

Notes: Real price indices are calculated from data in Pakistan Economic Survey (various issues). Prices used are nominal retail food prices deflated by the CPI. Three commodity index is an un-weighted average of wheat, wheat flour and basmati rice.

### Government Wheat Policy

Government wheat policy in Pakistan attempts to balance competing interests of producers and consumers. On the production side, policy is aimed at increasing wheat productivity (yields) and output, as well as supporting farmer incomes. Increased wheat production has also been seen as part of an overall national food security strategy of reducing dependence on food imports. On the consumption side, the government has attempted to enhance household food security, particularly through ensuring availability of wheat flour at affordable prices and maintaining price stability. Food policy options are constrained, however, by overall fiscal constraints, as well as a desire to minimise fiscal subsidies on food. Moreover, the wheat procurement price has been seen as a major determinant of overall inflation because of its role as a wage good and an indicator of overall government price policy. Thus, wheat policy is to some degree constrained by inflation targets and inflation policy.

To achieve these objectives, the federal and provincial governments have employed various instruments. Domestic procurement quantities and prices are the major instruments for spurring domestic production and improving wheat farmers' incomes. The national procurement price and procurement quantity targets are set at the federal level, in consultation with provincial governments, though the implementation of procurement policy is the responsibility of provincial governments and PASSCO (Pakistan Agricultural Storage and Supplies Corporation). Likewise, sales of government wheat, almost exclusively to flour mills on a quota basis are largely the responsibility of provincial governments.

Provincial governments have generally set procurement targets aimed at securing enough grain for planned distribution and stock build-up. Restrictions on the transport of wheat were widely used until the mid-1990s to help insure that district officials of the provincial Departments of Food were able to meet their procurement targets. Marketing of wheat was subsequently liberalised, but in 2004 the Punjab government re-imposed restrictions on transport of wheat in an effort to meet procurement targets and then removed once again in 2005. Imports of wheat, undertaken by the federal government, have been used to supplement provincial food stocks and enable sufficient wheat sales to keep domestic price levels from rising too high. The government (and private sector contractors) also exported wheat in the 2000-01 through 2003-04 May-April marketing years following record levels of procurement in 2000.

There are major fiscal subsidies and economic rents involved in the sales of wheat to flour mills at below-market rates. Wheat issue prices (the price of wheat sales to flour mills) do not cover the full cost of procurement (domestic or imported), storage and handling. Provincial food subsidies in 2002-03 reached Rs 6.8 bn. This subsidy was 12 percent greater than total Public Sector Development Programme budget for the Health Division in 2004-05 (Rs 6.05 bn). Subsidies on sales of imported wheat accounted for another Rs 1.2 bn in that year.

These rents appear to accrue mainly to wheat millers who receive government wheat and perhaps to those involved in these transfers. Although there may be a stipulated sales price of flour, there is no effective enforcement mechanism. Since wheat flour produced from government wheat is not distinguishable from wheat flour produced from market wheat, their prices are the same. Profits from sales of wheat milled using government wheat are thus substantial, and there are many wheat mills that operate only in the November-April period and mill only government-supplied wheat.

Various groups of stakeholders are affected by and often attempt to influence these policies. Farmers, particularly those with net sales, benefit from increases in procurement prices and quantities. Flour millers gain from low issue (sales) prices of wheat that are typically below open market prices. Low market prices for wheat and wheat flour benefit net consumers, who account for about 80 percent of Pakistan's population. Provincial food departments make great efforts to achieve domestic procurement targets which provide most of the grain for subsequent distribution. Large-scale procurement creates and subsidised sales also create the possibility of substantial economic rents. Sales of grain (at the issue price) from the surplus provinces (typically Punjab) to other provincial food departments involve an implicit cross-subsidisation to the receiving provinces since issue prices do not cover the full costs of procurement, storage and distribution. The provincial and federal governments are also concerned with minimising fiscal subsidies and overall inflation. Finally, donors have generally pushed for reductions in food subsidies and an increased role of the private sector in wheat marketing.

Wheat policies have varied over time, however (Table 3). Substantial wheat market liberalisation took place in the late 1980s with the abolition of wheat ration shops and liberalisation of private wheat imports (which were subsequently disallowed). Throughout the 1990s, Pakistan was a net importer of wheat, with domestic production typically accounting for about 90 percent of availability. A bumper wheat harvest in early 2000 (i.e. the 1999-2000 crop year) led to a record procurement of 8.6 million tons and a large increase in stocks, some of which were subsequently exported (with an export subsidy). However, as noted above, crop shortfalls from 2001-02 through 2003-04, rising market prices, problems with government import tenders in early 2004, and low quantities of domestic procurement led the Punjab provincial government to place restrictions on transport of wheat across district and provincial boundaries in 2004. Procurement prices were raised sharply for the 2003-04 and 2004-05 wheat crops in an effort to spur procurement, but these price increases have raised concerns about their effects on overall inflation.

Table 3

*Chronology of Major Events in Pakistan Wheat Policy and Markets*

- 
- ◆ Independence to early 1980s: substantial government market intervention: ration shops with fixed prices, but substantial leakages and malpractices.
  - ◆ November 1987: abolition of wheat ration shops.
  - ◆ Late 1980s: broad trade liberalisation; private sector wheat imports allowed in late 80s, but subsequently disallowed.
  - ◆ Bumper harvest in 1999-00 (i.e., March-April 2000):
    - 8.6 million tons procurement; large increase in stocks.
    - Subsequent subsidised exports of stocks, including private sector exports.
    - Incentives for private investment in storage.
    - Public investments in laboratories for grain testing.
  - ◆ Crop shortfalls in 2001-02, 2002-03 and 2003-04.
  - ◆ Government policy response to shortfalls: 2004:
    - Restrictions on inter-provincial transport of wheat (and inter-district transport of wheat in Punjab).
    - Government tenders for imports (but some shipments rejected on quality basis in early 2004).
    - Increased procurement price for 2004-05 crop (to 400 Rs/40 kg).
  - ◆ Production recovery and market liberalisation: 2005:
    - Good harvest 2004-05 (21.1 million tons).
    - Lifting of restrictions on transport of wheat.
    - Encouragement of private sector commercial wheat imports.
-

### III. IMPACTS OF GOVERNMENT WHEAT POLICIES

#### Determination of Domestic Wheat Prices

In an importing country with free trade, domestic price levels would be determined by the international price adjusted for tariffs, transport and marketing costs (the import parity price). Throughout most of the 1990s, Pakistan's domestic wheat prices were below import parity price levels, however, in large part because subsidised sales of government commercial imports added to domestic supplies and reduced market prices.<sup>3</sup> In the wake of a bumper wheat harvest in 2000, domestic wholesale prices in Karachi and Lahore remained below their respective import parity levels (Figure 3), although in the 2000-01 and 2001-02 crop marketing years (May-April) Pakistan was essentially self-sufficient in wheat, drawing on the stock build-up from the 2000 harvest. Note that there was also no incentive for trade from India during this period, even if this trade had been legal (Figure 4).

With the relatively poor harvests in 2004 and 2005, however, domestic prices have risen substantially and since mid-2004 wholesale prices in Karachi have essentially been at import parity levels. Wholesale prices in Lahore remained at about 18 percent above import parity levels in 2004-05.<sup>4</sup> The implication is that if private trade were permitted with no tariffs, private sector imports would likely supply the Karachi market, adding to domestic availability of wheat at no cost to the government.

#### Impacts of Domestic Procurement on Market Prices

Given that government policies have limited private imports and kept domestic prices below import parity in most recent years, changes in quantities purchased or sold by the government in domestic markets, and the prices at which the government buys and sells have the potential to affect domestic market prices. In particular, the effect of the volume and price of domestic procurement on market prices of wheat depends crucially on whether the government buys less than the amount of wheat that farmers and traders are willing to sell (i.e. whether procurement is infra-marginal)<sup>5</sup> and the volume of subsequent distribution of wheat (i.e. the net procurement or distribution).<sup>6</sup>

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<sup>3</sup>See Ahmad (2003) and World Bank (2004).

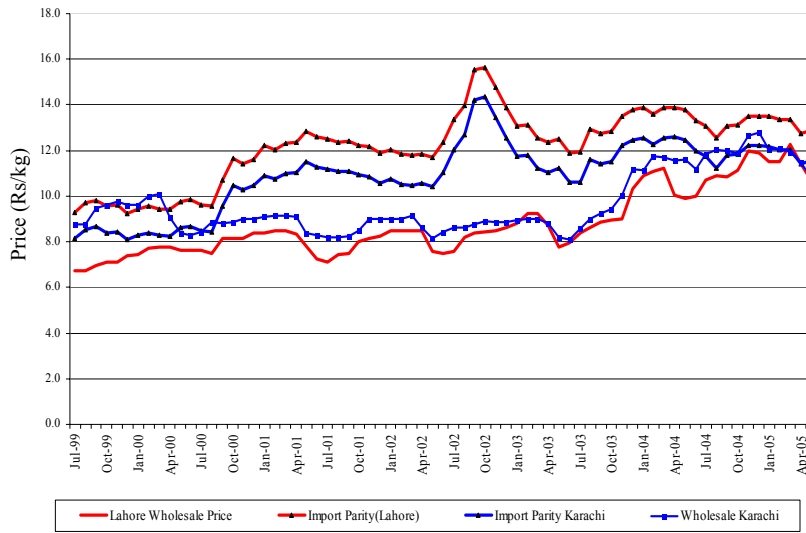
<sup>4</sup>Note that the import parity price for Lahore is higher than that for Karachi (approximately 13.2 and 11.9 Rs/kg, respectively in 2004-05), due to additional transport costs from Karachi port to Lahore for imported wheat.

<sup>5</sup>In this case, market prices will remain above the procurement price and will be set by the marginal supply and demand of wheat.

<sup>6</sup>Seasonal movements are complex and depend on private market price expectations, private storage behaviour and other factors, including the volume and timing of procurement and sales. This article does not cover these issues, though it is important to note that a government sales price that does not cover the cost of storage from the time of procurement to the time of sales will discourage private storage of grain.

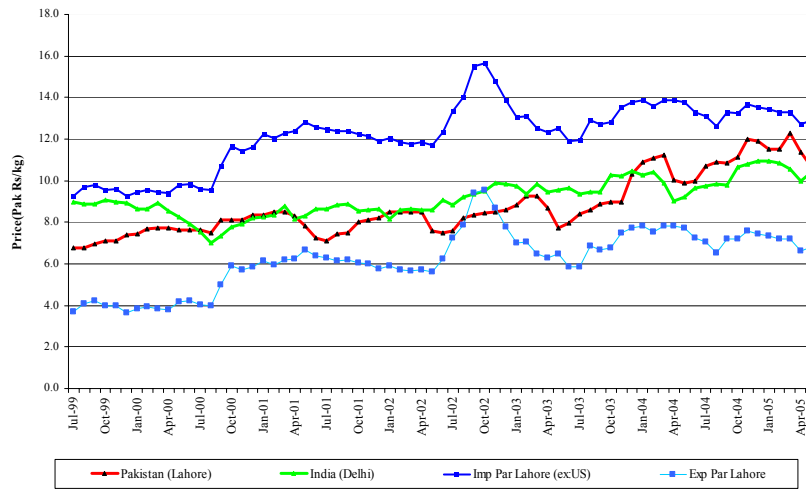


**Fig. 3. Import and Export Parity Prices of Wheat in Karachi and Lahore**



Note: Preliminary data using US Hard Red Winter and no quality adjustment.

**Fig. 4. Wholesale, Import and Export Parity Prices of Wheat in Delhi and Lahore**



Source: Authors' calculations.

Ratios of market prices to procurement prices during the May-August procurement season suggest that in several years (from 2000-01 to 2003-04), the procurement price did not have a direct effect on the market price. From 1990-91 to 1998-99, the average ratio of the Lahore wholesale price to the procurement price during the procurement season was 1.085, reflecting marketing costs from villages with procurement centres to the Lahore wholesale market. In some of these years, procurement targets were raised during the procurement season so as to enable government to buy all grain offered for sale. However, during the four-year period, 1999-2000 to 2002-03, this price ratio fell to 0.974 (a 10 percent decline), evidence that procurement during these years was less than the amount offered for sale at the government procurement price, (i.e. that procurement was infra-marginal). The implication is that in these years the procurement price was generally higher than market prices, and that quantity of procurement was exogenously determined (i.e. determined by government policy). Thus, the procurement price did not have a direct effect on market prices in these years. Rather, the procurement quantity determined the market price effects. In 2003-04, however, a year when procurement quantities fell short of targets, the price ratio rose again to 1.100, evidence from market prices that the government purchased all grain offered for sale at the procurement price.

In order for the procurement price to directly determine the market price, the government must purchase all wheat offered at that price.<sup>7</sup> Moreover, in terms of the average annual price, and ignoring regional or intra-annual price variations, what is important is annual net procurement, i.e. the difference between the volume of procurement in the immediate post harvest period and gross sales that take place mainly at the end of the crop year.<sup>8</sup> In this case, the price effect of net procurement is determined in the short-run only by net supply (production plus net procurement/sales—private imports are assumed to be zero) and the price-responsiveness of consumer demand (the own-price elasticity of wheat demand, defined as the percentage change in wheat demand given a one percent change in wheat prices).<sup>9</sup>

For example, increasing net procurement by 0.5 million tons in 2004-05 would have reduced availability by 3 percent and raised market prices by an estimated 6 to 10 percent. These calculations also suggest that in order to achieve this additional volume of procurement without coercing traders or

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<sup>7</sup>This assumes that the procurement price is high enough so that at least some government (unforced) purchases take place. Otherwise, the government must raise its procurement price to levels at which it actually purchases wheat in order to affect the market price.

<sup>8</sup>To illustrate this, consider the case of the government buying and selling the same amount of wheat. Again abstracting from regional and intra-annual considerations, with no change in net supply in the market, the average market price is unchanged.

<sup>9</sup>The time-period for this analysis is from just after the wheat harvest until the next wheat harvest; thus, production is fixed (exogenous). Net government sales are taken as exogenous. For a fuller description of a similar model, see Dorosh (2001).

placing movement restrictions on grain, the procurement price would need to be 6-10 percent higher than originally set.

### Impacts of Domestic Procurement on Inflation: Price Multiplier Analysis

Assuming that government procurement and trade policies are effective in raising the procurement and market price of wheat, there remains the question as to the overall effect of the procurement price on inflation. One approach to address this question is a price-multiplier model that assumes that all increases in costs and prices are passed on to purchasers, i.e. that quantities demanded and supplied are fixed, and that the overall price level is determined by a cost-push mechanism.<sup>10</sup>

For example, given a wheat flour budget share of 8.9 percent, a 13.8 percent increase in the price of wheat flour (equal to the April 2004 to April 2005 actual price increase) results in an estimated 1.23 percent increase in urban poor CPI without multiplier effects (equal to the budget share times the percent increase in price). Using the fixed input-output production coefficients derived from a 2001-02 Social Accounting Matrix for Pakistan [Dorosh, Niazi, and Nazli (2003)], the urban poor CPI rises by 1.27 percent, only a slight increase since wheat flour is not a major input into other sectors (Table 4). Assuming that incomes (wages and returns to capital) and household spending also

Table 4

*Price Multiplier Analysis of the Impacts of Wheat and Fuel Price  
Increases on General Inflation in 2005*

	Production Multiplier Wheat Flour	Full Multiplier Wheat Flour	Production Multiplier Fuel	Full Multiplier Fuel
Price Increase	13.80%	13.80%	17.70%	17.70%
CPI Rural Rich	0.80%	2.50%	1.20%	3.60%
CPI Rural Poor	1.10%	2.80%	1.20%	3.60%
CPI Urban Rich	0.60%	2.30%	1.30%	3.70%
CPI Urban Poor	<b>1.27%</b>	<b>3.00%</b>	<b>1.26%</b>	<b>3.70%</b>
Weight Urban Poor	0.089	0.089	0.013	0.013
Weight x Change in Price	<b>1.23%</b>	1.23%	<b>0.22%</b>	0.22%

*Source:* Price multiplier model simulations using the 2001 Pakistan SAM. Note that the weights for wheat flour and fuel in the CPI of the urban poor are calculated from the 2001 Pakistan SAM.

<sup>10</sup>This model is the dual of quantity multiplier model used in growth linkage analysis. See Roland-Holst and Tarp (2004). See Annex 1 for details of the model specification.

increase to leave levels of employment and quantities of consumption unchanged, multiplier effects are increased. Under these full multiplier assumptions, the wheat flour price increase leads to a 3.0 percent increase in the CPI of the urban poor. By comparison, under the same assumptions, the 17.7 percent increase in fuel prices in 2004-05 leads to a 3.7 percent increase in the CPI of the urban poor.

These estimates of inflation effects are an upper-bound estimate of the impacts of procurement price on other domestic prices (apart from possible monetary policy effects) since the analysis assumes that the market price is equal to the procurement price and the demand for all goods and services in the economy is exogenously determined.

### **Impacts of Domestic Procurement on Inflation: Econometric Analysis**

Econometric analysis by Khan and Qasim (1996) using annual data from 1971-72 to 1994-95 found that a 10 percent increase in the wheat procurement price would increase the food price index by 7.4 percent. Assuming the same relationship held in 2004, the 16.7 percent increase in the wheat procurement price in 2003-04 would increase the food price index by 12.3 percent.

This econometrically estimated effect of wheat prices on inflation is roughly 4 times the magnitude suggested by the price-multiplier, which itself overstates price transmission due assumptions of exogenous demand. Arguably, the econometric analysis captures mechanisms other than simply passing on of costs or adjustments to current prices. This analysis may also capture formulation of price expectations by various actors in the economy, perhaps because these actors interpret the wheat procurement price as a signal of overall government policy. The short annual time series data available, periodic changes in wheat policy, gradual changes in the structure of the economy over time, and the influence of other factors make it difficult to produce definitive econometric estimates or conclusive interpretations of the results, however.

### **Implications of Production Shortfalls: Wheat Market Prices in 2005**

Preliminary estimates in early 2005 suggested a record wheat crop, but market prices remained high even after the produce started arriving in the market and continued to rise through early June. This rise in market prices was most likely *not* due to manipulation of the market by private traders, but due to lower than expected production caused by damage from rains and high winds leading to poor grain filling and lodging of wheat. Even a small reduction in the wheat crop would have a major effect on market prices. Crop losses of just 5

percent in Punjab could lead to 8-14 percent increase in prices relative to expected prices with no production losses (Table 5).<sup>11</sup>

Private traders are unlikely to have significant ability to manipulate market prices given the large size of the wheat market. For example, the estimated value of wheat consumption in Lahore is about 19 crore Rs (\$3.0 mn)/week and Karachi about 28 crore Rs (\$4.5 mn)/week.<sup>12</sup> Given the large number of traders involved and relatively free movement of grain and flour into these cities, it would be extremely difficult and financially risky for a small group of traders to restrict market flows and store large enough quantities to affect market prices.

Table 5

*Price Effects of Domestic Procurement in Pakistan:  
Partial Equilibrium Analysis for 2005*

Imports (mn tons)	0.0	1.4	1.4	2.4
Production Level	Target	Target	Low	Low
Production (mn tons)	21.400	21.400	20.535	20.535
Imports (mn tons)	0.000	1.400	1.400	2.400
Supply (mn tons)	18.260	19.660	18.882	19.882
Wholesale Lahore (Rs/kg)	13.0	10.2	11.7	9.8
% Change Real Price	5.8%	-17.3%	-5.4%	-20.3%
% Change Nominal Price	16.4%	-9.0%	4.1%	-12.4%
Import Subsidy (bn Rs)	0.0	4.4	2.3	8.4
High Elasticity: (-0.5)				
% Change Real Price	3.4%	-10.8%	-3.3%	-12.7%

*Source:* Partial equilibrium model simulations.

*Note:* Base own-price elasticity of wheat demand is -0.3.

#### IV. CONCLUSIONS AND POLICY IMPLICATIONS

The analysis presented in this paper suggests that market forces are major determinants of wheat prices in Pakistan and that government wheat policies involving domestic procurement and government sales in most years have been

<sup>11</sup>The partial equilibrium model simulations in Table 5 assume exogenous levels of production, total imports and world prices (an import parity wholesale price of wheat in Lahore of Rs 13.30/kg, based on a CIF price of wheat in Karachi of \$186/ton). The market-clearing real domestic wheat prices is estimated using a wheat demand function based on 2004-05 base year levels of per capita wheat demand, an assumed 5 percent growth in real per capita incomes from 2004-05 to 2005-06, and an income elasticity of wheat demand of 0.2. See Dorosh (2001) for details of a similar model.

<sup>12</sup>The calculations for Lahore are as follows: 10 million people x 90 kgs/person/year = 0.90 mn tons/year or 75,000 tons/month (about 19,000 tons/week) with a value of about 190 mn rupees per week at 10Rs/kg. For Karachi, a population of 15 million is assumed.

infra-marginal, involving substantial rents, particularly on sales. Moreover, analysis of price multipliers using a recently developed Social Accounting Matrix for Pakistan indicates little evidence of major effects on overall price levels and inflation of increases in the procurement price, even under the assumption that the procurement price actually directly determines the market price. Thus, setting the procurement prices at levels near expected open market price levels is not likely to significantly add to overall inflation.

In recent years of production shortfalls, (particularly 2004), movement restrictions in Punjab province have been only partially effective in achieving procurement targets. Partial equilibrium analysis of price movements, suggest that the production shortfalls, rather than uncompetitive market behaviour and hoarding are the major reason for price increases. Moreover, these movement restrictions may inhibit market development in medium run, by discouraging investments in storage.

Instead of movement restrictions and forced procurement, sales of government imports could add to market supplies and limit the rise in market prices. In 2004-05, government imports were 1.4 million tons. Increasing the volume of imports and sales to 2.4 million tons for 2005-06 would reduce market prices by an estimated 10–16 percent relative to prices with only 1.4 million tons of imports (Table 5).

In order to promote efficiently functioning markets, it is important that any government imports and sales be transparent, with planned volumes of import announced in advance. A policy of reducing market prices through sales of additional imports is not costless, however. If imports with an estimated import parity cost of 13.3 Rs/kg in Lahore were sold in the wholesale market price there, the estimated subsidy would be Rs 4-6 billion (Rs 400-600 crore). If the issue price for this wheat was lower than the market price, the subsidy would rise accordingly.

One alternative to government imports in years of high prices and moderate international price levels is to allow private sector imports of wheat with little or no tariff, a policy which was actually adopted in mid- 2005. With domestic prices in Karachi in already near import parity, there was an opportunity for private trade to add to domestic supplies. After private imports were liberalised, private sector imports began to flow into the country in mid-2005, stabilising wheat markets at no cost to government.

Other policy reforms could also enable provincial governments to reduce their wheat subsidies substantially and still maintain the ability to address short-term market shortfalls. Retaining a separate security stock, but reducing domestic procurement and sales volumes, would substantially reduce costs. For example, a year-end security stock of about 1.0 million tons (the average in recent years in Punjab province), could be maintained with far less procurement and sales volumes (typically about 3 million tons of wheat). Similarly, setting

the sales price to flour mills at levels that cover full costs would also reduce subsidy. It would also encourage investment in wheat marketing and storage.

Given the complexity of wheat markets and wheat policy in Pakistan, further analysis is warranted, particularly since wheat markets are constantly changing due to changes in annual production, income shocks to households and changes in international markets. Nonetheless, the analysis presented in this paper suggests that market forces play a dominant role in price determination in Pakistan and that policies that promote the private sector wheat trade can both increase price stability and reduce fiscal costs.

## *ANNEX I*

### **METHODOLOGY FOR THE SAM-BASED PRICE MULTIPLIER ANALYSIS**

The Social Accounting Matrix (SAM)-based price multiplier analysis presented in this paper is based on the methodology of Roland-Holdst and Tarp (2005) and the 2001-02 Pakistan SAM [Dorosh, Niazi, and Nazli (2004)]. This original SAM included 117 accounts (34 activities, 33 commodities, 27 factors of production, 19 household groups, enterprises, government, rest of world and capital). For the cost-price analysis, the SAM was aggregated to 22 accounts, including 11 activities/commodities (wheat, paddy, cotton, other agriculture, wheat flour, rice, yarn, textiles, petroleum, other industry and services), 3 factors of production (land, labour and capital), enterprises, government, rest of world and capital.<sup>13</sup>

In the multiplier analysis, following Roland-Holdst and Tarp (2005), we consider production activities, factor incomes and household incomes to be endogenous, with exogenous levels of spending by enterprises, government, rest of world (exports) and capital (investment). The methodology used is similar to that of standard semi-input output (SIO) quantity multiplier used to measure the growth linkages generated from an exogenous increase in production of a given sector or an exogenous increase in demand [Haggblade, Hammer, and Hazell (1991)]. Instead of considering the effect of a policy shock on quantities with prices exogenous, however, we consider the effect of a policy shock (in this case, an exogenous increase in the price of wheat) on other prices with all quantities exogenous.

Splitting the SAM into four groups (activities, factors, households and other), we define four sub-matrices  $A_{ij}$  and  $X_{ij}$  where each element of sub-matrix  $A_{ij}$  is defined as the corresponding element of the SAM  $X_{ij}$  divided by the column  $j$  total, (See Annex Table 1).

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<sup>13</sup>In the aggregated SAM, imports (shown in the intersection of the Rest of World row) and the commodity columns were re-classified as negative exports (shown in the intersection of the activities/commodities rows and the Rest of World column).

Annex Table 1

*Structure of the Pakistan SAM*

	Activities	Factors	Households	Exogenous
Activities	X11	0	X13	X14
Factors	X21	0	0	0
Households	0	X32	X33	X34
Exogenous	X41	X42	X43	X44

Defining  $P$  as the price vector of endogenous accounts (with  $p_1$  as the price vector for activities,  $p_2$  as the price vector for factor accounts,  $p_3$  as the price vector for household accounts) and  $\pi_4$  as the price vector for exogenous accounts gives the following equations as determined by the accounting identities from the columns of the SAM:<sup>14</sup>

$$p_1 = p_1 A_{11} + p_2 A_{21} + \pi_4 A_{41}$$

$$p_2 = p_3 A_{32} + \pi_4 A_{42}$$

$$p_3 = p_1 A_{13} + p_3 A_{33} + \pi_4 A_{43}$$

Re-defining the matrix  $A$  as:

$$A = \begin{bmatrix} A_{11} & 0 & A_{13} \\ A_{21} & 0 & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix}$$

and

$$v = \pi_4 A(4)$$

where  $A(4)$  is the sub-matrix of the original  $A$  matrix composed by adjoining the columns of  $A_{41}$ ,  $A_{42}$  and  $A_{43}$ , gives:

$$p = p A + v = v (1-A)^{-1} = vM$$

where  $v$  is the vector of exogenous costs (taxes, import costs).

Row  $j$  of  $M$  can then be interpreted as the effects on prices resulting from a unit increase in costs of sector  $j$ . For the wheat price analysis in this paper, we examine the effects of exogenous increases in the prices of wheat and wheat flour separately, by utilising the elements of their respective rows in matrix  $M$ .

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<sup>14</sup>Note that since there are no direct payments from the activity account columns to households, the matrix  $A_{31}$  is a zero matrix; similarly, the matrices  $A_{12}$ ,  $A_{22}$ , and  $A_{23}$  are also zero matrices.



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