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Asymmetric Transmission in Wheat Flour Markets in Indonesia

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1. Introduction

Over the last decade, the real expenditure of wheat related products among Indonesians increased by 26 percent. According to analysis of the household expenditure survey, the rapid growth of expenditures to wheat related products is underpinned by the middle income group, which is followed by the poor. Wheat consumption is expected to continue growing with overall income growth and the rapid rise of the Indonesia's middle class. However, despite gaining importance, domestic wheat flour prices remain relatively high compared to international prices, and the co-movement between the two presents some irregularities.

This study is motivated by the existence of asymmetric price transmission (APT) at the Indonesia's wheat flour market. APT arises when downstream price changes co-move in a different manner to upstream price changes with international prices. APT can be of vertical or spatial nature. Spatial APT would arise, for example, when Indonesian prices of wheat flour fully reacted to increases to international wheat prices but reacted less to decreases. Vertical APT, instead, refers to the case in which input price changes are transmitted differently to output prices when they imply an increase and when they imply a decrease. Although no simple comparison can be made between wheat flour and wheat prices, one plausible hypothesis for the relatively high domestic prices for wheat flour is related to vertical APT. Visual inspection suggests that the widening gap between the domestic output and the foreign input price may be due to the fact that when the international wheat price goes up, the domestic flour price tends to go up relatively flexibly, but when the international price goes down, the domestic price seems sticky downwards. **Figure 1** shows the US hard red winter wheat (HRW), US soft red winter wheat (SRW), Indonesian wheat flour prices in the Indonesian rupiah terms. The nominal exchange rate is used for the currency conversion. Until the end of 1990s, the international wheat prices and the domestic wheat flour price were almost identical due to the heavy government's intervention to wheat imports and the wheat flour market. During the post Asian financial crisis era, the wheat flour price has been increasing regardless of the international wheat price movement. This resilience of the domestic wheat flour price decrease is visible from **Figure 1**, which suggests the existence of APT.

Figure 1: Nominal Wheat and Wheat Flour Prices

Indonesian wheat and wheat markets have been open for international trade and investments; however, a highly concentrated domestic market may be acting as a barrier for the emergence of potential competitors who could reduce the intensity of APT. This study aims at informing policy makers and private sector operators on how wheat and wheat flour market function in Indonesia. It measures the intensity of vertical APT in the wheat-wheat flour market and finds that wheat flour responses to foreign wheat prices are largely asymmetric, even allowing for different time-spans for arbitrage, for geographical heterogeneity, and for a diversity of adjustment costs into the transmission dynamics. The study also provides some background on the market for wheat flour that points to the existence of market power. This study, however, neither reveals any evidences that flour milling firms are exercising their monopolistic market power nor proves formally the link between market power and the intensity of APT.

The results of this paper suggest that as important as a liberal trade regime and competition, the gains from openness can be substantially lost when domestic markets are highly concentrated. In other words, a liberal trade regime is merely a necessary but not sufficient condition for ensuring that welfare gains are maximized and widespread in the society. Together with open trade policies, competition policies

are key in order to decrease the intensity of ATC, which would lower domestic wheat flour prices and allow a wider distribution of welfare gains due to trade.

The remaining of this paper is structured as follows. Section 2 presents some stylized facts of the wheat flour market in Indonesia. In Section 3, we present the conceptual framework of the analysis. Section 4 discusses the data used in the study and the empirical strategy to test for APT. Section 5 describes empirical strategy, and Section 6 presents the results of the analysis. Section 7 concludes and discusses policy implications. Section 8 lists references.

2. The stylized facts of the wheat flour market in Indonesia

Wheat and wheat flour imports

Indonesia is a net importer of wheat and wheat flour. There is virtually no domestic production of wheat; hence all wheat and wheat flour consumed in Indonesia is imported. Last decade, Indonesia on average imports 4.3 million metric tons (MTs) or the $1.1 billion worth of wheat annually. Wheat imports are from following three main countries: Australia, Canada, and USA. The amount of Indonesia's wheat flour imports has been considerably less than wheat imports. It is partly because flour cannot be stored for a long time due to humidity. Also, since there is an existing large capacity to mill wheat domestically, there could be cost efficiency of milling wheat locally. Wheat flour is mainly imported from Turkey, Sri Lanka and Australia.

Figure 2: Wheat and flour imports (value)

Figure 3: Wheat and flour imports (weight)

Wheat Flour Market: The Pre Asian Financial Crisis

The Indonesian government heavily intervened the wheat flour market since early 1970s. According to Robinson et. al. (1997), only the Indonesian Bureau of Logistics (Badan Urusan Logistik [Bulog]) was allowed to import wheat, and the import price was heavily regulated. Imported wheat was directly sent to the flour mills, and the sales price was determined by Bulog. Since 1984, the wheat price for flour mills had been fixed at 141 Rp/kg regardless of price fluctuation in the world wheat market. Wheat flour was then distributed through private and cooperative distributers to industries and private consumers at a fixed price. This heavy intervention of the government to the wheat flour market ended with the wake of the Asian financial crisis.

Wheat Flour Market: The Post Asian Financial Crisis

After the heavy government intervention to the market was withdrawn, the wheat and wheat flour market in Indonesia is considered to be open for trade. Nonetheless, some regulations and restrictions remain. Before 2009, there was no tariff for wheat and wheat flour imports. The five percent tariff for wheat flour imports was introduced in December 2009. In December 2010, the five percent import tariff was introduced for wheat imports. Amid the global food crisis, these tariffs were lifted in January 2011, and the zero tariff regimes for wheat and wheat flour were reinstalled.

Since 1998, any registered importer can import wheat or wheat flour. No special import license is required to import wheat and wheat flour. Importers can apply for the Importer Identification Number

(Angka Pengenal Importir [API]). With API, importers will pay lower income tax of 2.5 percent, while 7.5 percent of income tax will be levied without API. Wheat flour importers and producers have to obtain license issued by National Standard Agency (Standar Nasional Indonesia [SNI]) to certify their products. Also, since September 2009, wheat flour has to be fortified in a way to contain five types of minerals, as recommended by UNICEF, in wheat flour products.

The structure of the Indonesian wheat flour market

All imported wheat is processed by domestic milling firms to produce wheat flour for industry needs and household consumption. The Indonesian flour milling market is best characterized as concentrated. According to Indonesia Wheat Flour Association (Asosiasi Produsen Tepung Terigu Indonesia [Aptindo]), there were only four flour millers in the country in 2004. By 2009, ten importing wheat companies were transformed into flour millers. Aptindo estimates the number of flour millers will reach over 20 by the end of 2013.

Table 1: Wheat flour milling production capacity and its shares

Milled and imported wheat flour is distributed through various market channels. The distribution channel is vertically integrated. Wheat and wheat flour importers are associated with respective flour millers. Flour millers are associated with large food conglomerates. The food industry (about 200 firms) demands 31.4 percent of total wheat flour to produce instant noodles, dry noodles, bakery products, biscuits and cookies. Firms under the small and medium enterprise (SME) category and home industry (about 30,000 firms in total) consume 60.0 percent and 4.0 percent, respectively, of wheat flour to produce dry noodles, wet noodles, snacks, cookies, and bakery products. The rest, 4.6 percent, is consumed by households for home cooking. Wet, dry, and instant noodles as well as bakery cover more than 80 percent of the wheat flour use in Indonesia. In 2009, 29.7 percent of wheat flour became inputs for wet and dry noodles.

Figure 4: Wheat and wheat flour distribution channel

In 2010, the processing capacity of the two largest flour milling firms in the market concentrated 71.6 percent of wheat flour output. For a given level of output produced in the sector, the level of concentration is above the average of Indonesian manufacturing and food processing. Apart from market concentration, anecdotally, some large flour milling firms own a part of major sea ports, which can be exclusively used for domestic trade of wheat and wheat flour. Hence, large food conglomerates with own logistics facility can maintain their price competitiveness.

Figure 5: Concentration in Wheat Flour Industry

The source of the market power

A pertinent question is how current flour milling market leaders gained the market power initially and have been dominating the market for decades. It is generally agreed that the source of market power is originated from its establishment of the flour milling firm. Bulog was established in 1967 as a non-ministerial state agency. Since its inception, one of the Bulog's main tasks has been food security for the people of Indonesia. As a non-ministerial state agency, Bulog was a policy maker in itself as well as a policy implementer for food security. Before the establishment of the private flour mill, Bulog managed all flour milling.

According to Robinson (1986) and Abdulgani-Knapp (2007), the original idea to establish a private flour mill in Indonesia was taken in 1970 by a Singaporean firm, P.T. Prima. Then, P.T. Bogasari was established in 1971 and had partnership with the Executive branch of the government at that time (Robinson [1986], p. 232).

Robison (1986, p. 232) wrote:

> Five days after its establishment with a capital outlay of only Rp 100 million, Bogasari received bank credit of Rp 2,800 million and the license from Bulog to mill flour for the whole of Western Indonesia, including Java and Sumatra. At the same time, Bulog revoked Prima's original license and issued it with a license to mill for the less lucrative East Indonesia market, including East and West Nusatenggara, Kalimantan, Sulawesi, Maluku, and Irian Jaya.

In 1980, "P.T. Prima sold its 100 percent share to P.T. Berdikari", a trading group associated with the military (Robinson [1986] p. 233). In result, the troika partnership system by Bulog, P.T. Bogasari, and P.T. Berdikari was established. Since then P.T. Bogasari in Java and P.T. Berdikari in Sulawesi were the only two private flour mills which received wheat from Bulog (Robinson, 1997). Between the two, P.T. Bogasari remained a dominant power with the 87 percent share of the domestic market. In addition, P.T. Bogasari strongly influenced management of P.T. Berdikari (Robinson, 1997).

Since 1998, in theory the flour market, both imports and milling, has been completely open for new investment and exposed to competition. However, since the start-up cost has been paid by the government, and the distribution channel has been tightly integrated by the conglomerate of Bulog, P.T. Berdikari, and P.T. Bogasari for long time, new entrants to this market face stiff competition to the incumbents.

Wheat and Wheat Flour Demand

Wheat flour arguably consists of an essential part of the Indonesian diet. Even though direct consumption of wheat flour from home cooking is relatively small (i.e. 8.6 percent for home consumption at **Figure 3**), wheat flour is the essential ingredient for fresh and instant noodles, cookies, cakes, and breads. Wheat flour is emerging as new staple food for Indonesian's diet.

In order to analyze consumption patterns of wheat flour products, we analyze SUSENAS household expenditure survey data. To identify the poor, we apply the official poverty line. For the near poor, we double the poverty line; any household with per capita expenditure between the official poverty line and the twice as high poverty line is defined as the near poor. The non-poor household is any household above the double of the official poverty line. **Figure 6** shows the flour-based food item's expenditure share over the total food expenditure.

Figure 6: The Expenditure Share for the Flour-Based Food Items

The result clearly indicates that the higher the household income is, the higher expenditure share for flour-based food items becomes. Hence, it is inferred that the flour-based food items have relatively high income (i.e., expenditure) elasticity. For the flour-based food item budget share over the total food budget, the overall average share grows by 1.5 percent per annum last decade. The average annual

growth rates of the expenditure share for the poor, the near poor, and the non-poor are 4.2 percent, 1.7 percent, and 0.9 percent, respectively. For poor households, even though the budget share is the lowest among the household categories, but the growth rate of the flour-based food item is the highest at a significant margin. The rapid budget share growth of the flour-based food item among the poor household is because the extra income earned by the poor household is spent on this item. Hence, stabilizing and reducing the asymmetry of flour price adjustments after input price changes would have a positive impact for food security and be welfare enhancing for increasingly large portions of the population, including the poor.

3. Conceptual Framework

A relatively open trade regime in which price signals are the main driver of resource allocation will lead to maximized efficiency in the absence of other market failures. In such a setting, international price shocks will be fully transmitted to domestic prices. The welfare implications of this will depend on a number of factors that can be approximated by equations (1) and (2) below.

With product and labor markets being competitive, welfare changes at the household level will depend on whether the household is a net consumer or a net producer of the good and on the price change induced by the liberalized trade regime, as indicated by equation (1):

$$\Delta W = (q - c) \times \Delta Pd \quad (1)$$

where *W* is consumer welfare, *q* and *c* the quantities produced and consumed of the good respectively in the domestic economy, P_d is its domestic price, and delta is the change.

In turn, the change in the domestic price will depend largely on how international price shocks are transmitted to the domestic economy. Essentially, the domestic price will be determined by the price of the international substitute or the imported key input (i.e., wheat, and wheat flour) on trade costs (t), the price of foreign currency expressed in domestic currency units (*E*), and on other factors that may affect transmission given by the parameter (*d*) as expressed in equation (2):

$$Pd = Pw \times (1 + t) \times E + d \quad (2)$$

where P_w is the foreign price of the international substitute or of the foreign key input, for our purposes, *t* is the trade barrier cost (i.e., tariff plus non-tariff), *E* is the nominal exchange rate, and d is a price shifter.

A number of cases could arise in which the dynamics of price transmission are such that reductions in trade costs or in foreign prices do not result in welfare gains. For example, when product markets are imperfectly competitive or when there is a monopoly in the domestic distribution of the importable good, the monopolist could absorb part of the border price reduction into its own margins: *d* increases as t falls, but pass it to prices when the change in international prices imply an increase. This would lead to APT, and results in a transfer of welfare from consumers to the monopolist.

As Peltzman (2000) points out, APT may point to gaps in economic theory. If transmission is asymmetric, then it is difficult to be satisfied with a body of economic theory that treats it as an exception. Asymmetry in the transmission implies that a group is not benefiting from a price reduction (buyers) or increase (sellers) that would, under conditions of symmetry, have taken place sooner or have been of a

greater magnitude than observed. Hence, it implies a different distribution of welfare than would obtain under symmetry, because it alters the timing or the size of the welfare changes that are associated with price changes. An important question is then in which settings APT would prevail.

Drivers of Asymmetric Price Transmission

Market Power

The typical explanation for APT lies on a market failure related to an imperfectly competitive market. It is expected in the context of a monopoly that input price increases that lead to a reduction in profit margins would be transmitted faster to output prices than input price reductions. This would result in a positive asymmetry. However, as argued by Ward (1982), market power can also result in a negative asymmetry. If the oligopolist cares about market shares, she will be reluctant to increase output prices when input price increase, although leaning to reduce them when input prices fall.

Within this imperfectly competitive setting, imperfect information about the prices charged by other firms may also lead to APT. As argued by Borenstein et al (1997), the old output price offers a natural focal point when firms lack information about other firms' pricing decisions. Increases in input prices will lead to fast price responses because margins fall, but input price reductions will only be transmitted to output prices if sales fall below a threshold.

Unspoken collusion with high reputational costs can also lead to APT. After the input price increases, all firms will adjust output prices upwards to ensure competitors that they are willing to collude, while when the input price falls, they will avoid signaling the break of the implicit agreement (Balke et al (1998), Brown and Yucel (2000)).

Adjustment Costs

APT can arise if adjusting input or output prices or quantities is costly and if these costs are asymmetric with respect to increases or decreases. Peltzman (2000) for example argues that firms incur greater costs when they have to increase the input use or the level of outputs, after a fall in an input price, than when they reduce the input use or their level of outputs. This asymmetry arises because the former leads to search costs and price premium in increasing phases. In Ball and Mankiw (1994) for example, a nominal input price increase is more likely to lead to output price changes than an input price decrease, because with inflation, a portion of the necessary adjustment associated with an input price reduction, is carried out by inflation, reducing the real value of the margin.

4. Data & Empirical Strategy

Data

We analyze the relationship between retail wheat flour prices in Indonesia, international wheat prices, and the rupiah/dollar exchange rate. The data on retail wheat flour prices were obtained from the Indonesian Statistical Office (Badan Pusat Statistik [BPS]), and corresponds to monthly averages across 33 Indonesian provinces, for the period January 2000 to September 2010. International wheat prices were obtained from the World Bank Database for a matching period. Three reference series are considered: Canadian wheat prices, and two for different US classes of wheat: the SRW and the HRW. Although the three series show a high degree of co-movement, the three series are used for robustness

purposes. The rupiah/dollar exchange rates were also obtained for a matching period from the International Monetary Fund Database (IMF-IFS).

Figure 7: Wheat and Wheat Flour Prices, and Exchange Rates

Figure 8: Wheat and Wheat Flour Price Differences, and Exchange Rate variations

Figures 7 and 8 plot the series in logs and in log differences respectively. The asymmetry in the transmission of input prices to output prices is visible for at least two episodes of large wheat price changes. In September 2002, international wheat prices increased by 20 percent. The increase was partially reverted in the subsequent months. The same pattern cannot be observed for wheat flour prices, which seem to have increased (albeit by a smaller magnitude) after the input price increase but do not seem to have fallen after the input price fall during 2003.

A similar episode, though of larger magnitude, took place in late 2007 and early 2008, when wheat prices increased by 18 percent in September 2007, 19 percent in December 2007, and 35 percent in February 2008, to fall substantially in the months to come. While flour prices responded to the upward input shock, they do not seem to have responded to the downward shock. **Figure 8** shows that wheat price variations, both measured in dollars or in rupiah are greater than flour price variations, which is reasonable, being wheat flour a manufactured good, with a diversity of components adding up to total costs, some of which are less volatile than wheat prices.

Unit labor cost

Unit labor costs in the sector decreased over the 2000 when sharp movements in wheat prices occurred, suggesting that increasing portions of value added accrued to non-labor sources (**Figure 9**). This suggests that asymmetric transmission was not due to labor market, but to product market imperfections.

Figure 9: Unit labor cost

Complementary policies are needed, along with greater integration, to ensure that imperfectly competitive practices are minimized, so that gains from trade reach consumers, and public support for trade liberalization policies is maximized. These could take the form of competitive policies at the domestic level although further analysis is needed to understand the specific forms of these.

5. Empirical Strategy

Baseline Specification

To test for asymmetric price transmission from wheat to wheat flour markets, we estimate an error correction model, following the two-step Engle and Granger (1987) procedure.

In the first step, we estimate a long run relation between wheat flour prices, and international wheat prices and exchange rates, as in equation (3).

$$wf_t = \beta_0 + \beta_1 w_t + \beta_2 e_t + u_t \quad (3)$$

where wf_t correspond to the average retail price of wheat flour in Indonesia expressed in rupiah per kilo, at time t, w_t is the international price of wheat expressed in dollars per kilo, et is the nominal exchange rate expressed as rupiah per US dollar, and u_t is the error term which is assumed serially uncorrelated, and uncorrelated with the regressors. The subscript t is at time t. β_0, β_1 and β_2 are parameters.

Testing for vertical integration in the wheat – wheat flour production chain is analogous to testing for a common stochastic trend between wheat and wheat flour prices, once the exchange rate effects have been controlled for. The existence of that common stochastic trend implies, in turn, that, given wf_t and w_t being non-stationary (i.e., I(1)), there exists a linear combination that is stationary (i.e., I(0)). Testing that involves testing for a unit root in the estimated residuals from equation (3).

According to Engle and Granger (1987), if the residuals of equation (3) are stationary, then, an error correction mechanism exists, and can be represented as:

$$\Delta wf_t = \alpha_0 + \alpha_1 \Delta wf_{t-1} + \alpha_2 \Delta w_t + \alpha_3 \Delta w_{t-1} + \alpha_4 \Delta e_t + \alpha_5 \Delta e_{t-1} + \delta \hat{u}_{t-1,} + \vartheta_t \quad (4)$$

where the Δ operator denotes proportional changes, , $\hat{u}_{t-1}$ is the lagged estimated deviation from the long run equilibrium relationship estimated in equation (3), and δ is the parameter that captures the per-period speed at which wheat flour prices adjust to equilibrium after a shock, and ϑ_t is a white noise disturbance term.

A variation of equation (4) that consists in breaking the lagged estimated deviations into a positive and a negative term allows us to test whether the speed at which wheat flour prices adjust toward the long-run relationship with international wheat prices is different when it implies an increase in wheat flour prices (that is, adjustment from below the long run relationship), from when it implies a decrease in wheat flour prices (that is, adjustment from above the long run relationship). This is presented in equation (5):

$$\Delta wf_t = \alpha_0 + \alpha_1 \Delta wf_{t-1} + \alpha_2 \Delta w_t + \alpha_3 \Delta w_{t-1} + \alpha_4 \Delta e_t + \alpha_5 \Delta e_{t-1} + \delta^+ \hat{u}_{t-1,+} + \delta^- \hat{u}_{t-1,-} + \vartheta_t \quad (5)$$

where $\hat{u}_+$ is the estimated deviation from the long run equilibrium relationship estimated as in equation (3) from above, and $\hat{u}$ is the estimated deviation from the same relationship but from below.

Under symmetry, the speed at which shocks that push prices above equilibrium will be adjusted downwards is the same as the speed at which shocks that push prices below equilibrium will be adjusted upwards, implying that δ+ = δ-, which is a testable proposition in this framework.

To determine the appropriate lag length of the model (that in equation (5) is restricted to 1, for the sake of presentational simplicity) we maximize the Akaike Information Criteria (AIC). We control for seasonality by introducing monthly dummies in all regressions, and estimate all models using the heteroscedasticity-consistent Variance-Covariance matrix due to White (1980), and test for serial correlation of the error term using the Durbin's alternative test for autocorrelation, which is a special case of the Breusch-Godfrey test, which considers more than one lag, and is thus more general in determining whether there is any evidence of serial correlation.

Models at Lower Frequencies

Since we are exploring vertical integration of markets, it is important to acknowledge that different products may have different adjustment processes. For this reason, the data needs to have a frequency that exceeds the frequency of the adjustment process (e.g., the arbitrage transactions that integrate markets). Comparing results obtained at different data frequencies can be informative on different causes of asymmetric price transmission. For example, Miller and Hayenga (2001) argue that APT that is due to search costs and local market power can be found in high frequency cycles – while consumers, after a price shock, are uncertain if other retailers also increased prices, but not in low frequency cycles. APT in low frequency cycles (but not in high frequency ones) could be consistent, according to the authors, to inventory behavior, which firms will only adjust in response to low frequency price changes. Note, however, that market power that is held not only locally, but also nationally, could be consistent with APT in low and high frequency cycles.

To contrast the high and low cycle APT evidence, we aggregate the price data at the semester level (non-overlapping), by averaging the monthly data, estimate the models as in equations (3), (4) and (5), and compare the estimated coefficients on the speed of adjustment upwards and downwards, across different frequencies.

Models with Additional Input Prices as Controls

It is possible that in the absence of asymmetric price transmission from wheat to wheat flour price changes we reject the null hypothesis of the speeds of adjustments upwards and downwards being the same if there are other factors that adjust asymmetrically. Other factors would affect the wheat flour price as well as show some degree of co-movement with international wheat prices. Here we consider three possible factors.

First, energy prices, that are proxied by an index of electricity costs per unit of energy paid by manufacturers to PLN Indonesia. Because the price boom toward the end of the first decade of the 2000s meant increases not only in agricultural commodities but also in energy related ones, some co-movement is likely between wheat prices and the costs of acquiring energy. In addition, as argued by Baffes (2010), energy costs impact substantially the costs of agricultural commodities, and more so, the costs of food products such as wheat flour. Second, unit labor costs, or analogously, the labor costs per unit of output, measured as the ratio of the average wage in the wheat flour industry and their labor productivity. If labor costs are sticky downwards, weigh substantially in production costs, and are positively associated with food prices (all plausible assumptions), then omitting them in the price transmission analysis could induce a bias in the results that would lead to type I error, by rejecting the null of symmetry when the null is true. Third, the food component of CPI is incorporated, for similar reasons discussed for energy and labor costs, now controlling for a wider range of possible input prices that may be affecting output prices and correlated with international wheat prices.

Geographical Heterogeneity: Models by Province Capitals

The source of the asymmetry in the transmission of international prices of wheat to domestic prices of wheat flour may happen at the transport, distribution or logistics links of the production chain. Relying on cross-province average price data masks geographical heterogeneities that could help identifying whether this is the case. For example, if, for example, market power lied at the logistics segment in Jakarta, but not in Surabaya, one would expect the analysis by province to suggest asymmetric transmission in the former and symmetric in the latter city. Using average prices across provinces, it is a priori unclear what results would be expected. For these reasons, we also use geographically

disaggregated price data, and estimate province capital-specific error correction models (that implies running thirty error correction models, one for each of the province capital where price data are available).

6. Empirical Results

For series to be cointegrated, they need to have the same long-run properties. As such, the first step of the analysis consists of testing for unit roots in the domestic and foreign price series as well as on the nominal exchange rate, in levels and in their first differences. Results reported in **Table 2** confirm the initial hypothesis. Using alternative specifications (no trends, trends, and lags) for the Augmented Dickey Fuller tests, all price series are I(1) – their levels contain one unit root, since differencing them once, they appear stationary.

Baseline

Table 3 reports the results of estimating the baseline long run relationship between log domestic wheat flour prices in Indonesian rupiah, log international wheat prices in dollars, and the log of the rupiah per dollar exchange rate, for the Canadian wheat price reference (column 1), the US SRW wheat (column 2) and the US HRW wheat (column 3). For the three international reference prices considered, the estimated pass-through coefficient from wheat to wheat flour prices is neither statistically different from unity nor the pass-through from nominal exchange rates to wheat flour prices. Both results hint vertical integration between foreign wheat markets and domestic wheat flour markets, as it would be expected, given that all wheat consumed in Indonesia is imported.

Table 4 reports the results of estimating the baseline error correction models. The lag length chosen for each of the models maximizes the Akaike Information Criteria, which provides an indicator of the goodness of fit of the models. Odd-numbered columns in the table report the results of models in which the speed of adjustment to long run equilibrium was restricted to be equal for upward and downward price adjustments, while even-numbered columns report results in which asymmetric price adjustments were allowed. For the three international price series considered, the average speed of adjustment ranges in the interval between -0.04 and -0.03. This means that between a three to four percent of the discrepancy introduced by shocks to international wheat prices that push wheat flour prices away from their long run equilibrium are corrected within the first period, on average, and *ceteris paribus*. Interestingly, this average effect masks a sizable asymmetry. When the speed of adjustment upwards is allowed to differ from the speed of adjustment downwards, it is possible to see that shocks that imply increases in wheat prices (leaving wheat flour prices temporarily below equilibrium) are corrected upwards much faster than those that imply a correction of wheat flour prices downwards. Indeed, taking the case of Canadian Wheat as a reference international price, while shocks that imply adjustment upwards are corrected by ten percent in the first period, on average, those that imply adjustment downwards are corrected by less than 1 percent in the first period, with this effect being poorly determined statistically. Results in similar order of magnitude are observed when US SRW and US HRW prices are used, and in the three cases the difference in the speed of adjustment between upwards and downwards is statistically significant at 1 percent. In five out of the six models reported, the null of serially uncorrelated errors is upheld by the data at 1, 5 and 10 percent significance levels, while for the Canadian Wheat model of column (2), the null is upheld at 1 and 5 percent significance levels.

The results of **Table 4** point to a single conclusion: positive asymmetry is clear and sizable. The wheat flour price response is between 5 to 10 times greater when the input price rises than when it falls.

Low Frequency Data

Tables 5 and 6 report results of long run relation and error correction model estimates with lower frequency data, to understand whether the asymmetry in the adjustment to input price shocks is related with the time it takes for agents to arbitrate. The use of non-overlapping data with six-month instead of monthly periodicity reduces the sample to 22 periods. In line with the previously discussed results, the pass-through coefficients for international wheat prices and for the nominal exchange rate are not statistically significantly different from one. The estimated coefficients for the speed of adjustment in the error correction model (**Table 6**) differ with those estimated at higher frequency in that they are substantially larger. This is reasonable as they capture the portion of the processed adjustment after an input price shock, over a period of six months instead of over a period of a month. Indeed, over a six month period, the average speed of adjustment to equilibrium is in the range of 23.6 to 30.1 percent per period. However, the asymmetry in the adjustment remains. Taking Canadian wheat as a reference, while the speed of adjustment upwards suggests that 53.5 percent of the disequilibrium is corrected every period, the speed of adjustment downwards points to only 17.1 percent of the disequilibrium being corrected when it implies a wheat flour price reduction after a ceteris paribus reduction in international wheat prices. The null of serially uncorrelated errors is upheld at all conventional levels of significance in the six models estimated.

The intensity of the asymmetry is reduced, from the upward adjustment being five to ten times greater with monthly data, to being about three times greater with six-month periodicity data, although it is certainly not eliminated. If the asymmetry in the price adjustment is related to some degree of market power, this market power does not seem to be local in nature. While a one-month period may be too short for agents arbitrate, six months seem to provide agents with some space to obtain information about prices charged by others in the area.

Other Input Prices as Controls

Tables 7 and 8 report the results of estimating long run relations and error correction models with additional input prices as controls to reduce the scope for the results being driven by omitted variable bias. Column (1) in **Table 7** reports results when the food component of the CPI is added to the baseline specification of the long run relation, column (2) reports results when an index of electricity costs is added, column (3) adds unit labor costs, while column (4) adds the three together. The inclusion of the food CPI, likely correlated both with international wheat prices expressed in domestic currency, reduces substantially the pass-through of international wheat prices to wheat flour prices, and that of the nominal exchange rate, from about 0.9 in the baseline specification to 0.216 and 0.318 respectively. Including energy prices also reduces the coefficients on wheat and on the nominal exchange rate (NER) although by substantially less, while the inclusion of unit labor costs only reduces the wheat-wheat flour pass-through coefficient mildly, but has no effect on the coefficient on the NER. When all three additional inputs are added in the specification, surprisingly, energy costs appear to be weakly although negatively associated with wheat flour prices. In addition, even if the asymmetry is apparent, with the speed of adjustment upwards being very well defined and sizeable (14.4 percent of the disequilibrium corrected within the first period) and the speed of adjustment downwards being insignificantly different from zero, the large standard error of the downward coefficient of adjustment leads to a non-rejection of the null of symmetry. None of the models display significant evidence of serial correlation in the error terms.

Geographical Heterogeneity

The picture that emerges from looking at specific province capital suggests that asymmetry in the price adjustment after an input price shock is pervasive, although from a statistical point of view, the evidence is relatively blurry when compared to that found for averaged data. In 25 out of the 30 provinces considered, the speed of adjustment upwards is significant statistically and greater than the speed of adjustment downwards in absolute value. However, the large standard errors of the coefficient on the speed of adjustment downwards lead to the non-rejection of the null of symmetry. Only in the case of Kupang, the capital of East Nusa Tenggara, the point estimate of the speed of adjustment downwards exceeds in absolute value the estimate of the speed of adjustment downwards, although the difference is not significant statistically. In Pontianak, Pangkal Pinang, Gorontalo and Ternate, there is no evidence of correction of disequilibria induced by input price shocks, leading to the conclusion that in these cities the wheat flour market is not vertically integrated with the international wheat prices. In the latter four cities, however, the series are substantially shorter than the rest, with only five years of coverage, which is likely influencing the precision of the estimators. The null of serially uncorrelated errors is rejected for the models of Jambi, Pangkal Pinang, Serang Cilegon, Palangkaraya and Kendari, and upheld for the other 25 models.

7. Policy Implications and Conclusion

The following findings emerge from our analysis.

Finding 1: The wheat flour is one of the essential food items for the Indonesian diet and is likely to become more important as the economy grows.

Even though consumption of wheat flour for cooking only consists of a small share of the budget, wheat flour consumption in a form of bread, noodle, and snacks is an important element of the Indonesian diet. The growth rate of the expenditure share for flour-based food items is rapidly expanding among the middle income class as well as the poor. Hence, stabilizing and lowering the price of wheat flour is important for food security and welfare enhancement for the population, especially for the poor given the high food expenditure share.

Finding 2: Indonesia's flour milling market is concentrated, while trade and investment is relatively open.

The processing capacity of the two largest flour milling in the market concentrated 71.6 percent of wheat flour output. Wheat flour processing is more concentrated than the average concentration rate. This concentration of the flour milling market is likely stemmed from the way how the initial flour milling company was installed. On the other hand, for wheat imports and investment in the flour milling market, it is open to anyone who would like to enter this market. The tariff rates are low, and there is no restriction for investment.

Finding 3: The domestic wheat flour market is vertically integrated to the foreign wheat market.

The initial test result from the empirical model indicates the existence of vertical integration of the domestic wheat flour prices to the foreign wheat markets. Statistically, this shows in a robust cointegration relationship between domestic wheat flour prices and foreign wheat prices. This finding is as expected, since wheat is 100 percent imported.

Finding 4: The price adjustment upward is much faster than the one downward.

Results from high frequency data indicate that price adjustment upward is much faster than price adjustment downward when the domestic wheat flour price deviates from the long-run equilibrium price. Asymmetry of the speed of adjustment remains in results from low frequency data, that is to say, when a wider time-span is allowed for agents to do arbitrage operations. Even in low frequency data, the price adjustment upward is significantly faster than one downward, although the intensity of the asymmetry falls, as it would be expected. The results also remain when relying on data disaggregated at the provincial-capital level, and when other input prices that may be sticky downwards and correlated with wheat prices are added as controls.

Policy Suggestions

Wheat flour is gaining its importance in the Indonesian diet. Bread and noodles have been gaining a larger share of the food expenditure, and the rate of growth is faster for the poor. Hence, ensuring that the wheat flour market operates competitively casts important policy implications for food security and welfare enhancement of the poor.

According to data, the domestic wheat flour prices are sticky downwards while flexible upwards after a foreign shock pushes them away from the long run equilibrium level. Anecdotal evidences point that the concentration of the market share by a handful of flour mills seems to be one of the major causes of APT. In addition to market concentration of flour milling, the vertical integration aggravates the asymmetric speed of price adjustment.

Maarif (2001) states that there are challenges in fair competition in Indonesia because of high concentration of the market, which stems from a history of government intervention, even though there is legislation which stipulates the basic principles of fair competition and preventing the centralization or control of industries. Maarif maintains that unfair competition and concentration of the market share is due to weak implementation and enforcement of such industrial policy. The Indonesian Supervisory Commission for Business Competition (Komisi Pengawas Persaingan Usaha [KPPU]) single-handedly supervises the monopolistic competition in Indonesia. The KPPU's power needs to be strengthened, and if the situation warrants, the KPPU need to prevent any firms from exercising their monopolistic power or behaving in an oligopolistic manner.

This study does not identify any evidence that the large food conglomerate is exercising its monopolistic power. However, data indicate that the flour-milling market is highly concentrated, and the industry is vertically integrated. Results from dynamic analysis indicate that the wheat flour prices are slow to go downwards but fast to go upwards. These circumstantial evidences warrant further investigation on the market. The KPPU might want to consider enforcing and implementing fair and healthy competition policies for the sake of food security and better welfare of the poor.

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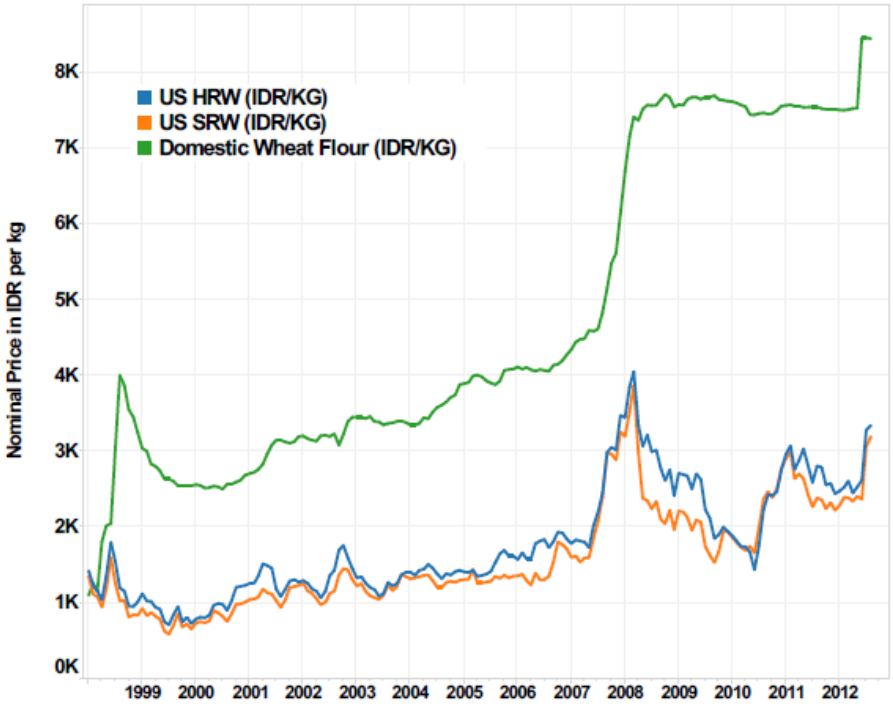
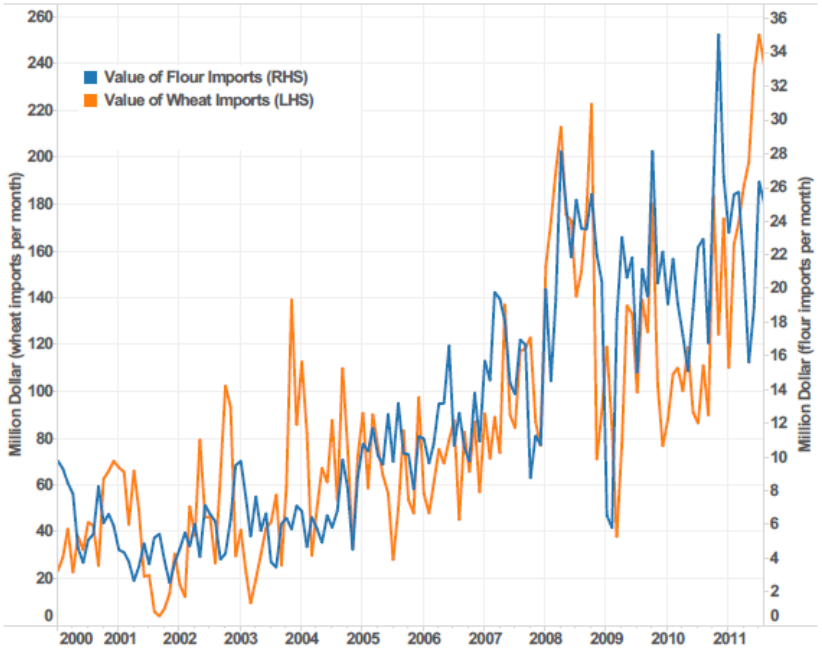
Appendix: Figures and Tables

Figure 1: Nominal Wheat and Wheat Flour Prices



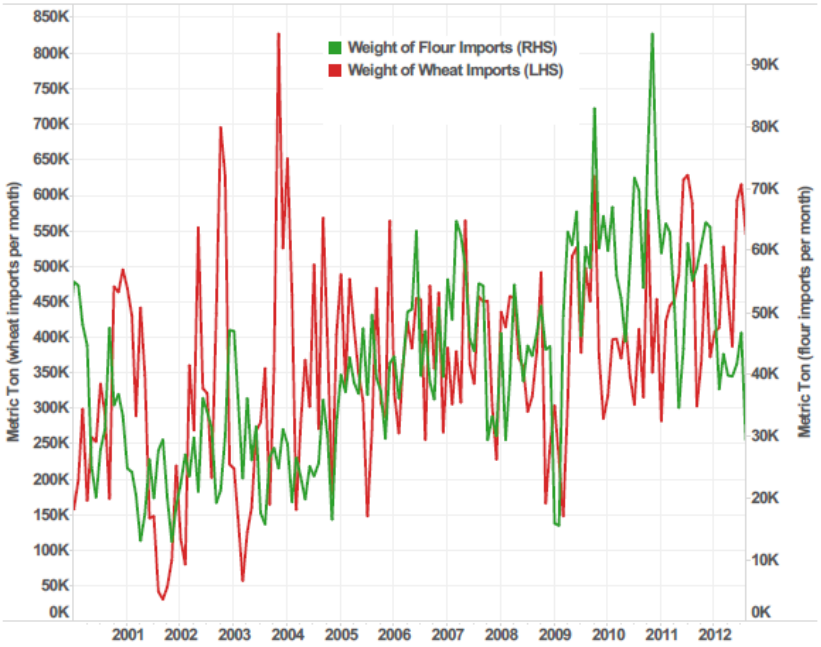
Source: BPS and authors' calculation

Figure 2: Wheat and flour imports (value)



Source: CEIC
Note: Since 2008, the wheat and flour imports to the special economic (bounded) zone are included.

Figure 3: Wheat and flour imports (weight)



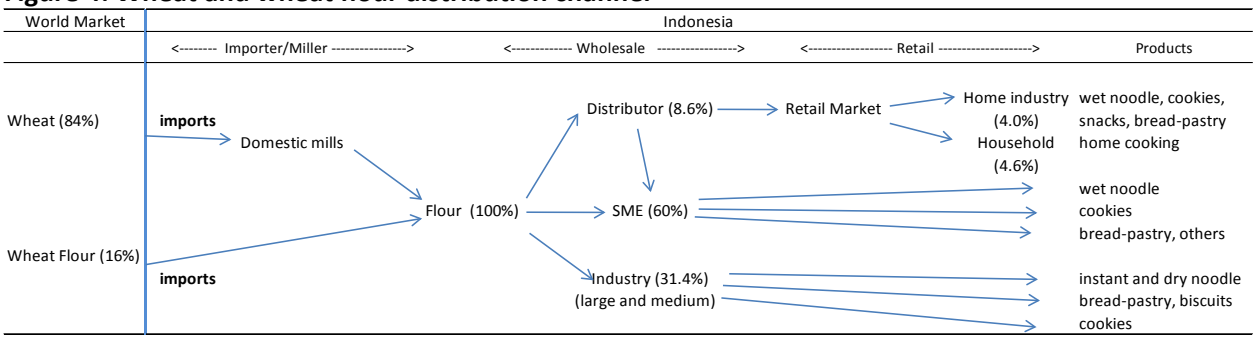
Source: CEIC
Note: Since 2008, the wheat and flour imports to the special economic (bounded) zone are included.

Table 1: Wheat flour milling production capacity and its shares

Company	Location	Production Capacity (MT/Year)	Share (%)
PT Indofood Sukses Makmur Tbk, Bogasari	Jakarta & Surabaya	4,905,000	62.1%
PT Eastern Pearl Flour Mills	Makassar	750,000	9.5%
PT Sriboga Ratu Raya	Semarang	450,000	5.7%
PT Fugui Flour & Grain Indones	Gresik	324,000	4.1%
PT Pangan Mas Inti Persada	Cilacap	300,000	3.8%
Others		1,165,000	14.7%
Total		7,894,000	100.0%

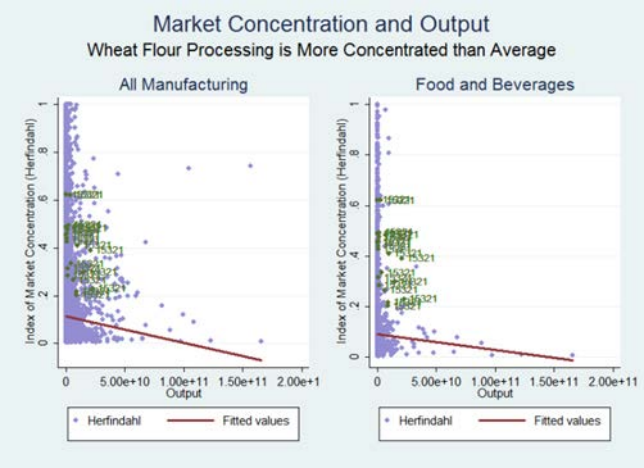
Source: APTINDO (March 2010)

Figure 4: Wheat and wheat flour distribution channel



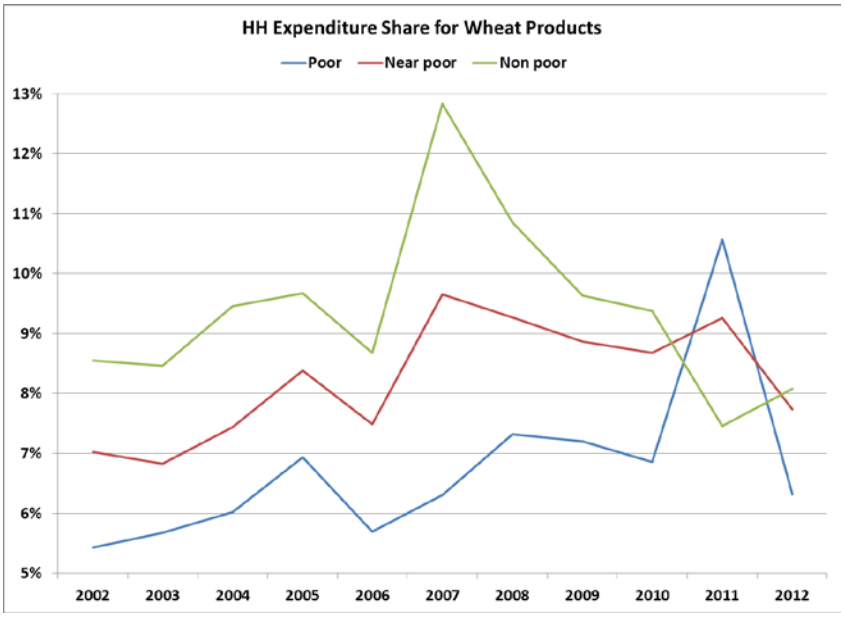
Source: Aptindo and the Bank staff calculation based on 2009 data

Figure 5: Concentration in Wheat Flour Industry



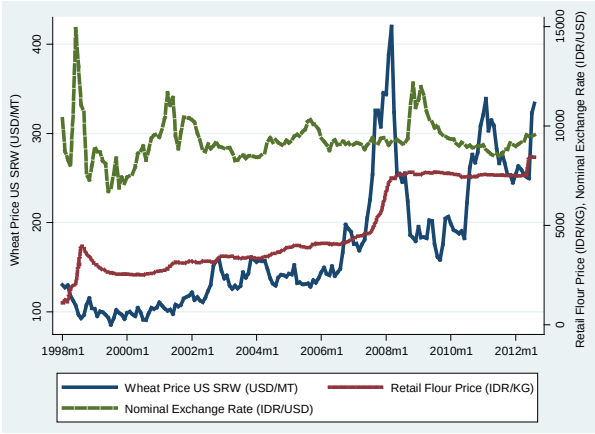
Source: Authors' calculations based on BPS data

Figure 6: The Expenditure Share for the Flour-Based Food Items



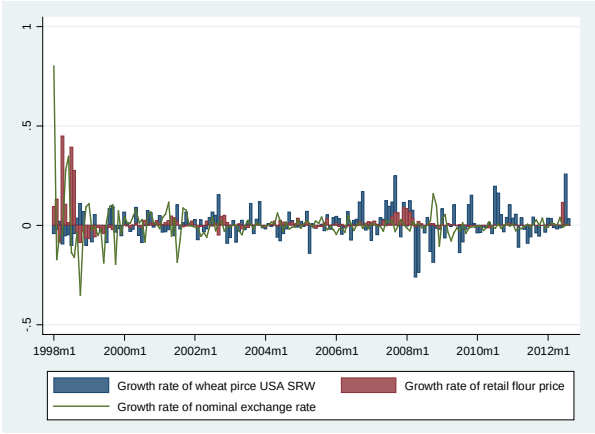
Source: SUSENAS household expenditure survey (various years)
Note: Definition of the poor is by BPS. The near poor is a household beyond the poverty line but below the twice poverty line.

Figure 7: Wheat and Wheat Flour Prices, and Exchange Rates.



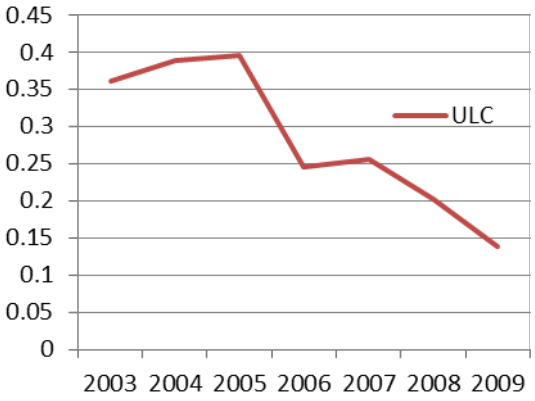
Source: BPS, WB and IMF-IFS

Figure 8: Wheat and Wheat Flour Price Differences, and Exchange Rate variations.



Source: BPS, WB and IMF-IFS

Figure 9: Unit Labor Costs in Wheat Flour Industry



Source: Authors' calculations based on BPS data

Table 2: Unit Root Tests on Price Levels and First Differences

Variable	Model	Z Stat	CV at 1%	CV at 5%	CV at 10%
Log Wheat Can	No Trend, No Lags	-1.093	-3.453	-2.877	-2.57
Log US SRW	No Trend, No Lags	-1.631	-3.453	-2.877	-2.57
Log US HRW	No Trend, No Lags	-1.417	-3.453	-2.877	-2.57
Log Wheat Flour (dom.)	No Trend, No Lags	0.02	-3.501	-2.888	-2.578
Log NER	No Trend, No Lags	-1.444	-3.456	-2.878	-2.57
D. Log Wheat Can	No Trend, No Lags	-13.479	-3.453	-2.877	-2.57
D. Log US SRW	No Trend, No Lags	-14.389	-3.453	-2.877	-2.57
D. Log US HRW	No Trend, No Lags	-13.595	-3.453	-2.877	-2.57
D. Log Wheat Flour (dom.)	No Trend, No Lags	-5.935	-3.501	-2.888	-2.578
D. Log NER	No Trend, No Lags	-15.004	-3.456	-2.878	-2.57
Log Wheat Can	No Trend, 1 Lag	-1.941	-3.453	-2.877	-2.57
Log US SRW	No Trend, 1 Lag	-2.403	-3.453	-2.877	-2.57
Log US HRW	No Trend, 1 Lag	-2.244	-3.453	-2.877	-2.57
Log Wheat Flour (dom.)	No Trend, 1 Lag	-0.515	-3.501	-2.888	-2.578
Log NER	No Trend, 1 Lag	-1.486	-3.456	-2.878	-2.57
D. Log Wheat Can	No Trend, 1 Lag	-10.156	-3.453	-2.877	-2.57
D. Log US SRW	No Trend, 1 Lag	-12.149	-3.453	-2.877	-2.57
D. Log US HRW	No Trend, 1 Lag	-11.635	-3.453	-2.877	-2.57
D. Log Wheat Flour (dom.)	No Trend, 1 Lag	-4.821	-3.501	-2.888	-2.578
D. Log NER	No Trend, 1 Lag	-12.83	-3.456	-2.878	-2.57
Log Wheat Can	Trend, 1 Lag	-2.817	-3.987	-3.427	-3.13
Log US SRW	Trend, 1 Lag	-2.904	-3.987	-3.427	-3.13
Log US HRW	Trend, 1 Lag	-3.014	-3.987	-3.427	-3.13
Log Wheat Flour (dom.)	Trend, 1 Lag	-1.892	-4.031	-3.446	-3.146
Log NER	Trend, 1 Lag	-1.904	-3.988	-3.428	-3.13
D. Log Wheat Can	Trend, 1 Lag	-10.17	-3.987	-3.427	-3.13
D. Log US SRW	Trend, 1 Lag	-12.163	-3.987	-3.427	-3.13
D. Log US HRW	Trend, 1 Lag	-11.66	-3.987	-3.427	-3.13
D. Log Wheat Flour (dom.)	Trend, 1 Lag	-4.793	-4.031	-3.447	-3.147

D. Log NER	Trend, 1 Lag	-12.857	-3.988	-3.428	-3.13

Table 3: Long Run Relation for Baseline Model

	(1)	(2)	(3)
Dep. Var.: Wheat Flour Price (Log)	Canadian Wheat	US SRW	US HRW
International Wheat Price(Log)	0.898***	0.911***	0.908***
	(0.0646)	(0.0658)	(0.0556)
Nominal Exchange Rate (Log)	0.804***	1.311***	0.891***
	(0.161)	(0.212)	(0.210)
Constant	-3.802***	-8.179***	-4.436**
	(1.310)	(1.874)	(1.804)
Seasonal Dummies	Yes	Yes	Yes
Observations	129	129	129
R-squared	0.803	0.745	0.709

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Error Correction for Baseline Model

	Canadian Wheat dl Wheat Flour	Canadian Wheat dl Wheat Flour	US SRW dl Wheat Flour	US SRW dl Wheat Flour	US HRW dl Wheat Flour	US HRW dl Wheat Flour
Lagged D. Log Flour Price	0.347***	0.225**	0.381***	0.266**	0.423***	0.296***
	(0.114)	(0.0942)	(0.126)	(0.109)	(0.126)	(0.105)
D. Log Wheat Price	0.0706**	0.0737**	0.0411*	0.0463*	0.0365	0.0347
	(0.0329)	(0.0333)	(0.0224)	(0.0239)	(0.0257)	(0.0231)
D. Log NER	-0.0333	-0.0315	-0.0199	-0.0318	-0.0337	-0.0289
	(0.0300)	(0.0267)	(0.0314)	(0.0300)	(0.0300)	(0.0286)
Adjustment Average	-0.0424***		-0.0385***		-0.0301***	
	(0.0114)		(0.00959)		(0.00915)	
Adjustment Downwards		-0.00969		-0.0142*		0.00282
		(0.00773)		(0.00752)		(0.00588)
Adjustment Upwards		-0.100***		-0.0933***		-0.104***
		(0.0207)		(0.0236)		(0.0196)
Constant	0.00500*	0.000577	0.00510*	0.00197	0.00382	-0.00315
	(0.00292)	(0.00310)	(0.00293)	(0.00289)	(0.00301)	(0.00295)
Observations	127	127	127	127	127	127
R-squared	0.505	0.566	0.492	0.536	0.463	0.563
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Akaike Information Criterion	-690.1314	-704.7159	-686.8403	-696.2504	-679.7812	-704.0041
Durbin Alt S.Corr	0.6292	0.0761	0.5598	0.1425	0.7391	0.3301
T-stat Adjustment	-3.72		-4.01		-3.29	
T-stat Adjustment Down		-1.25		-1.89		0.48
T-stat Adjustment Up		-4.84		-3.96		-5.32
Asym Test		0.000149		0.00245		2.82e-06

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Long Run Relation with 6-month Periodicity Data

VARIABLES	Canadian Wheat Log Flour P	US SRW Log Flour P	US HRW Log Flour P
Log Wheat P	0.932***	0.952***	0.956***
	(0.144)	(0.149)	(0.144)
Log NER	0.871**	1.496***	0.909*
	(0.405)	(0.477)	(0.508)
Constant	-4.616	-10.11**	-4.884
	(3.265)	(4.240)	(4.283)
Observations	22	22	22
R-squared	0.829	0.786	0.736

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Error Correction Model with Six-Month Periodicity Data

VARIABLES	Canadian Wheat dl Wheat Flour	Canadian Wheat dl Wheat Flour	US SRW dl Wheat Flour	US SRW dl Wheat Flour	US HRW dl Wheat Flour	US HRW dl Wheat Flour
Lagged D. Log Flour Price	0.225	0.0519	0.218	-0.00447	0.260	0.111
	(0.145)	(0.125)	(0.169)	(0.216)	(0.227)	(0.150)
D.Log Wheat Price	0.302***	0.304***	0.207***	0.283***	0.213**	0.217**
	(0.0814)	(0.0702)	(0.0633)	(0.0914)	(0.0976)	(0.0731)
D. Log NER	-0.0158	0.0371	0.115	0.144	-0.0352	0.0704
	(0.132)	(0.128)	(0.146)	(0.137)	(0.158)	(0.131)
Adjustment Average	-0.285***		-0.301**		-0.236**	
	(0.0779)		(0.107)		(0.0816)	
Adjustment Upwards		-0.535***		-0.609**		-0.616***
		(0.117)		(0.256)		(0.174)
Adjustment Downwards		-0.171*		-0.211**		-0.0402
		(0.0869)		(0.0856)		(0.0845)
Constant	0.0259**	0.0152	0.0275**	0.0182	0.0273*	-0.00654
	(0.0112)	(0.0133)	(0.0115)	(0.0170)	(0.0131)	(0.0194)
Observations	20	20	20	20	20	20
R-squared	0.765	0.818	0.640	0.624	0.575	0.763
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes	Yes
T-stat Adj. Upwards		4.57		2.38		3.54
T-stat Adj. Downwards		1.97		2.46		0.59
DurbinAlt S.Corr.	0.178	0.1928	0.1019	0.9279	0.1815	0.2245
Asym Test		0.0299		0.135		0.0204

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Long Run Relation with Other Input Prices as Controls

	Canadian Wheat (1)	Canadian Wheat (2)	Canadian Wheat (3)	Canadian Wheat (4)
Log Food CPI	1.017***			1.145***
	(0.0428)			(0.0433)
Canadian Wheat (Log of Price)	0.216***	0.811***	0.795***	0.234***
	(0.0312)	(0.0733)	(0.0652)	(0.0286)
Log NER	0.318***	0.782***	0.999***	0.0383
	(0.0586)	(0.158)	(0.143)	(0.0800)
Log Electricity Costs		0.0715***		-0.0163*
		(0.0178)		(0.00933)
Log Unit Labor Costs			-0.0235*	0.0454***
			(0.0120)	(0.00579)
Constant	-0.187	-3.115**	-5.115***	1.766**
	(0.504)	(1.314)	(1.135)	(0.686)
Observations	129	129	120	120
R-squared	0.965	0.812	0.842	0.974

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Error Correction Models with Other Input Prices as Controls

	(1) dl Wheat Flour	(2) dl Wheat Flour	(3) dl Wheat Flour	(4) dl Wheat Flour
Lagged D. Log Flour Price	0.514***	0.269**	0.295***	0.456***
	(0.125)	(0.106)	(0.105)	(0.137)
D. Log NER	-0.0214	-0.0264	-0.0287	-0.0399
	(0.0340)	(0.0312)	(0.0301)	(0.0332)
Lagged D. Log NER	0.0715*	0.0420	0.0419	0.0600*
	(0.0376)	(0.0360)	(0.0364)	(0.0335)
D. Log Wheat Price	0.0335	0.0688*	0.0707*	0.0342
	(0.0310)	(0.0369)	(0.0371)	(0.0364)
Lagged D. Log Wheat Price	0.0207	-0.000736	0.00693	0.0166
	(0.0335)	(0.0278)	(0.0290)	(0.0370)
D. Log Food CPI	0.218***			0.281***
	(0.0726)			(0.0824)
Lagged D. Log Food CPI	-0.195**			-0.227*
	(0.0965)			(0.131)
D. Log Electricity Costs		-0.00111		-0.00276
		(0.00574)		(0.00606)
Lagged D. Log Electricity Costs		-0.0103***		-0.00768**
		(0.00362)		(0.00375)
D. Log Unit Labor Costs			-0.00143	0.00536***
			(0.00323)	(0.00196)
Lagged D. Log Unit Labor Costs			0.00355	-0.000943
			(0.00237)	(0.00262)
Adjustment Upwards	-0.0802*	-0.104***	-0.106***	-0.144***
	(0.0404)	(0.0266)	(0.0266)	(0.0511)
Adjustment Downwards	-0.0351	-0.00472	-0.00669	-0.0521
	(0.0522)	(0.00773)	(0.0152)	(0.0541)
Constant	0.00314	-0.000325	0.00228	0.00355
	(0.00454)	(0.00315)	(0.00341)	(0.00455)
Observations	127	127	118	118
R-squared	0.526	0.577	0.557	0.566
Seasonal Dummies	Yes	Yes	Yes	Yes

T-stat Adj. Upwards	-1.98	-3.89	-3.97	-2.82
T-stat Adj. Downwards	-0.67	-0.61	-0.44	-0.96
Durbin Alt S. Corr.	0.1009	0.2546	0.2553	0.1812
Asym Test	0.585	0.000562	0.00256	0.276

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Error Correction Model Summary Results Disaggregated by Province Capital City

	Aceh	Medan	Padang	Riau	Jambi	Palembang	Pangkal Pinang	Bengkulu	Lampung	Jakarta
Adjustment Downwards	-0.101	0.00805	-0.0435	-0.0944	-0.0428	-0.0222	-0.193	-0.0340	-0.0160	-0.00329
	(0.0912)	(0.0738)	(0.0521)	(0.0865)	(0.0571)	(0.0550)	(0.244)	(0.0613)	(0.0611)	(0.0520)
Adjustment Upwards	-0.174*	-0.155*	-0.211**	-0.149**	-0.198*	-0.206**	0.219	-0.235**	-0.254**	-0.203**
	(0.0903)	(0.0869)	(0.0921)	(0.0674)	(0.111)	(0.100)	(0.136)	(0.112)	(0.106)	(0.0933)
Observations	190	190	190	190	190	190	58	190	190	190
R-squared	0.307	0.313	0.399	0.378	0.356	0.412	0.171	0.389	0.436	0.439
Seasonal dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Durbin Alt S.Corr	0.4447	0.6542	0.2151	0.9326	0.0537	0.848	0.0385	0.1148	0.3379	0.9169
Asym Test	0.649	0.266	0.225	0.681	0.337	0.217	0.176	0.224	0.135	0.147
	Serang Cilegon	**Bandung**	**Semarang**	**Yogyakarta**	**Surabaya**	**Bali**	**Mataram**	**Kupang**	**Pontianak**	**Palangkaraya**
Adjustment Downwards	-0.00719	-0.0124	-0.0247	-0.0277	0.0428	-0.0518	-0.0315	-0.179**	-0.0734	-0.00445
	(0.104)	(0.0527)	(0.0415)	(0.0677)	(0.0494)	(0.0421)	(0.0418)	(0.0820)	(0.0538)	(0.0367)
Adjustment Upwards	-0.326**	-0.176**	-0.188**	-0.229*	-0.236***	-0.173**	-0.149**	-0.122*	-0.164	-0.150**
	(0.131)	(0.0847)	(0.0923)	(0.127)	(0.0901)	(0.0727)	(0.0702)	(0.0668)	(0.106)	(0.0684)
Observations	58	190	190	190	190	190	190	190	190	190
R-squared	0.508	0.474	0.397	0.374	0.458	0.416	0.508	0.347	0.396	0.313
Seasonal dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Durbin Alt S.Corr	0.0681	0.702	0.5162	0.9834	0.3137	0.7941	0.8198	0.1917	0.7088	0.0009
Asym Test	0.134	0.201	0.160	0.278	0.0369	0.241	0.246	0.658	0.546	0.124
	Banjarmasin	**Samarinda**	**Manado**	**Gorontalo**	**Palu**	**Ujung Pandang**	**Kendari**	**Ambon**	**Ternate**	**Jayapura**
Adjustment Downwards	-0.0679*	-0.0354	-0.0558	-0.0610	0.00959	-0.0231	-0.0581	-0.0236	-0.0158	0.000592
	(0.0391)	(0.0424)	(0.0503)	(0.0977)	(0.0440)	(0.0522)	(0.0529)	(0.0469)	(0.0538)	(0.0491)
Adjustment Upwards	-0.189**	-0.182**	-0.198**	-0.0716	-0.159*	-0.177*	-0.173**	-0.152*	-0.0591	-0.154**
	(0.0810)	(0.0752)	(0.0784)	(0.0694)	(0.0896)	(0.0912)	(0.0847)	(0.0789)	(0.0645)	(0.0773)
Observations	190	190	190	58	190	190	190	190	58	190

R-squared	0.397	0.329	0.456	0.487	0.336	0.407	0.351	0.359	0.541	0.348
Seasonal dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Durbin Alt S.Corr	0.545	0.2313	0.5858	0.9281	0.8131	0.233	0.0204	0.8077	0.1546	0.9966
Asym Test	0.264	0.170	0.222	0.919	0.190	0.250	0.366	0.251	0.660	0.196