# Decomposing Changes in Agricultural Producer Prices

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## Abstract

This paper develops a method for decomposing changes in agricultural producer prices.  The
method builds on a procedure used by the World Bank, with the key variables in the decomposition
being trade prices, exchange rates, and agricultural trade policies.  The main ways by which we
expand on the World Bank decomposition procedure are by broadening the analysis of policy
effects, and by adding the effect from incomplete transmission of changes in border prices and
exchange rates to producer prices, and the effect on prices from interactions between variables as
they change simultaneously.  We demonstrate the decomposition method by using the Russian
poultry market in the late 1990s, and find that the dominant factor in changing the producer price
was the large depreciation of the ruble.  Many developing and transition economies have fluctuating
exchange rates.  The decomposition method presented in this paper could be used to test the
hypothesis that exchange rate movements are the main cause of changes in these countries'
agricultural commodity prices.  Another hypothesis that the method could help test is that an
important factor in affecting countries' agricultural prices is incomplete transmission of changes in
trade prices and exchange rates to domestic prices, where the incomplete transmission is mainly
caused not by policy, but rather by undeveloped market infrastructure.

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**Key words:** agricultural prices, price transmission, exchange rates, trade policy, Russian
agriculture, developing economies, transition economies

# Decomposing Changes in Agricultural Producer Prices

This paper develops a method for decomposing changes in agricultural producer prices, and then demonstrates the method using an example from Russian agriculture. The decomposition method builds on a procedure used by the World Bank, with the key variables in the decomposition being trade prices, exchange rates, and agricultural trade policies. The main ways by which we expand on the World Bank procedure are by broadening the analysis of policy effects, and by adding the effect from incomplete transmission of changes in border prices and exchange rates to producer prices, and the effect on prices from interactions between variables as they change simultaneously.

Producer price instability within a country can hurt incentives to produce and invest, as well as create volatility in farm income. Trade liberalization and growing integration into world markets make countries' agriculture increasingly vulnerable to fluctuations in world commodity prices and exchange rates. Decomposition methods that can identify and measure the main reasons why agricultural producer prices change would therefore provide useful information for policymakers.

## 1. The World Bank Decomposition Procedure

Quiroz and Valdes (1993), Valdes (1996), Valdes (1999), Valdes, Olsen, and Ocana (1999), and Valdes (2000) present a method for decomposing changes in countries' agricultural producer prices, and use the method for decomposition analysis for a number of developing and transition economies. Because this work either appears mainly in World Bank (WB) publications or was done by WB personnel, we call this method the "World Bank decomposition procedure." The decomposition begins with the equation

$$P_t^d = P_t^w X_t (1 + t_t^p)(1 + g_t) \qquad (1)$$

where $P_t^d$ is a country's real producer price for a commodity in time t, $P_t^w$ the real border (trade) price in foreign currency, $X_t$ the real exchange rate, $t_t^p$ the nominal rate of protection, such that $(1 + t_t^P)$ is the nominal protection coefficient, and $g_t$ a "markup" factor covering domestic transport and transaction costs that equalizes the domestic and border prices. The real values for the domestic and border prices are determined by dividing the nominal prices in time t by domestic and foreign price indices with respect to the base period, while the real exchange rate is determined by multiplying the nominal exchange rate by the ratio of the foreign to domestic price indices.

The next step in the WB decomposition derivation is to put equation (1) into natural logs and then differentiate with respect to time, which yields the decomposition equation

$$\dot{P^d} = \dot{P^w} + \dot{X} + \overset{\displaystyle\cdot}{\overbrace{(1 + t^P)}} \tag{2}$$

where a dot above a variable indicates the percent change in the variable. The term $(1 + g)$ drops out, because the World Bank decomposition procedure assumes that the transport/transaction costs as represented by g are a fixed proportion of $[P^w X (1 + t^P)]$. We also make this assumption in our decomposition procedure.

Equation (2) decomposes $\dot{P^d}$ by attributing its change to the changes in P$^w$, X, and the nominal protection coefficient $(1 + t^P)$, which measures the effect that policy has on P$^d$. The WB decomposition procedure computes $\overset{\displaystyle\cdot}{\overbrace{(1 + t^P)}}$ as a residual:

$$\overset{\displaystyle\cdot}{\overbrace{(1 + t^P)}} = \dot{P^d} - \dot{P^w} - \dot{X} \tag{3}$$

Analysis of the decomposition of $\dot{P^d}$ depends to a large degree on whether policy allows transmission of changes in P$^w$ and X to P$^d$. Some policies prevent transmission, because the policies

fix $P^d$ independent of $P^w$ and X.  Such policies include managed price policies of the type the United States and EU have maintained in the postwar period, but are now moving away from.  Trade quotas also "fix" domestic producer prices, in that the quota volume interacts with domestic supply and demand for a commodity to determine the domestic price, independent of the trade price and exchange rate.  Likewise, state trading in its most typical form, whereby a government agency determines the volume of a commodity to be exported or imported, can act like a quota (and might be tied to official quotas), again insulating $P^d$ from changes in $P^w$ and X.

With such policies, a "decomposition" of $\dot{P}^d$ using equation (3) could yield some useful information.  For example, if with a managed price policy $P^d > P^w X$ and policymakers raise $P^d$, $(1 + t^p)$ will increase (ceteris paribus), indicating that the price rise has increased the nominal rate of protection.  However, an economically meaningful decomposition of $\dot{P}^d$ should require that $P^d$ is a function of the variables used in its decomposition.  Policies that fix $P^d$ make the price independent of $P^w$ and X.  Consequently, changes in $P^w$ and X will not by themselves change $P^d$, such that attributing any change in $P^d$ to $\Delta P^w$ or $\Delta X$ becomes problematic.  This point does not mean that when policy largely fixes $P^d$, the WB decomposition procedure is inadequate and should be replaced by a better method.  Rather, it raises the question of how much economic sense there is in decomposing $\dot{P}^d$ when policy determines the value of $P^d$.

If agricultural price and trade policies that fix prices were dominant in countries throughout the world, one might conclude from the above discussion that the decomposition of changes in agricultural producer prices is not a very relevant issue.  However, such policies as they exist are diminishing, and the world in general is clearly moving toward policies that allow transmission. For example, the Uruguay Round Agreement on Agriculture banned import quotas, non-tariff

measures maintained through state trading enterprises, and most other non-tariff trade barriers, requiring countries to tariffy border measures.

The WB decomposition procedure can serve as a useful first step in decomposing changes in $P^d$ when policy allows transmission of changes in $P^w$ and X to $P^d$. It, however, has certain limitations. One deficiency, which the authors of the cited studies acknowledge, is that the procedure misvalues the contribution to $\dot{P}^d$ of the change in policy, as represented by $\dot{\overparen{(1+t^p)}}$, for the following reason. Given that $P^w$, X, and $(1+t^p)$ change simultaneously, equation (2) is incomplete, because it excludes the multiplicative terms that result from $\dot{P}^w$, $\dot{X}$, and $\dot{\overparen{(1+t^p)}}$ being multiplied by each other. The derivation of equation (2) is based on the assumption that all multiplicative terms are small enough to be ignored. The decomposition equation with the interactive multiplicative terms included is

$$\dot{P}^d = \dot{P}^w + \dot{X} + \dot{\overparen{(1+t^p)}} + \dot{P}^w\dot{X} + \dot{P}^w\dot{\overparen{(1+t^p)}} + \dot{X}\dot{\overparen{(1+t^p)}} + \dot{P}^w\dot{X}\dot{\overparen{(1+t^p)}} \quad (4)$$

In this case

$$\dot{\overparen{(1+t^p)}} = \frac{\dot{P}^d - \dot{P}^w - \dot{X} - \dot{P}^w\dot{X}}{1 + \dot{P}^w + \dot{X} + \dot{P}^w\dot{X}} \quad (5)$$

Comparing $\dot{\overparen{(1+t^p)}}$ in equations (3) and (5), we see that $\dot{\overparen{(1+t^p)}}$ in equation (3) misvalues the effect of policy changes on $\dot{P}^d$. This happens because equation (3) does not include $-\dot{P}^w\dot{X}$ in the right-side numerator, and also does not include $\dot{P}^w + \dot{X} + \dot{P}^w\dot{X}$ in the denominator (or what should be the denominator). Our decomposition will avoid this misvaluation of policy effects.

Another limitation of the WB decomposition procedure is that a decomposition that provides more information is possible. The following example demonstrates the point. Let $P^w = 50$, $X = 2$,

and tariff rate (t) = 0.2, such that $P^d$ = 120. If $P^w$ rises to 75, $P^d$ increases by 60 to 180. 50 of the increase results from a direct price effect (25 x 2), while 10 of the increase results from interaction of the rise in $P^w$ with the tariff (25 x 2 x 0.2). The latter can be called an *implicit policy effect*, which occurs when a tariff exists and $P^w$ or X changes. Although the tariff rate need not change, the rise in $P^d$ from this effect occurs because of the existence of the tariff. We can distinguish between an implicit policy effect and an explicit policy effect, which occurs when the tariff rate changes. The implicit and explicit policy effects that can be identified in decomposing changes in $P^d$ are similar to the implicit and explicit policy effects that Tangermann (2003) identifies in analyzing changes in the market price support part of producer support estimates (PSEs).

When policy allows transmission of changes in $P^w$ and X to $P^d$, $P^d$ can change not only because of the direct price effect and policy effects, but also because of deficient market infrastructure. Developing and transition economies in particular can suffer from poor infrastructure, which can have two main effects. First, it can result in high internal transport/transaction costs. Second, it can create the market imperfection of incomplete information (Fackler and Goodwin 2001, Barrett 2001, Barrett and Li 2002). In particular, producers in isolated areas might be unaware of prices (and especially price movements) in the domestic markets where their output competes with imports. Incomplete information can reduce the transmission of changes in $P^w$ and X to $P^d$. The change in $P^w$ or X is the active element in changing $P^d$, though the change in $P^w$ and X combines with incomplete transmission, caused by undeveloped market infrastructure, to change $P^d$. We call this the *incomplete transmission effect* on $P^d$.

The next section develops an alternative method to that of the WB for decomposing changes in producer prices when policy allows transmission of changes in $P^w$ and X to $P^d$. The method will allow one to isolate and measure the direct price effect, policy effects (both explicit and implicit),

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and incomplete transmission effect on $P^d$.

## 2. The Decomposition Method

We first derive the decomposition equation when an ad valorem tariff exists, and then examine how the equation should be altered when other transmission-allowing policies are operative. The derivation begins with

$$\dot{P}^d \equiv \dot{P}^d \tag{6}$$

We then multiply the right side $\dot{P}^d$ by $1 = \left( \dfrac{\overbrace{[P^w X \ (1+t)]}^{\bullet}}{\underbrace{[P^w X \ (1+t)]}_{\bullet}} \right)$, where t is the tariff rate.

$[P^w X \ (1+t)]$ is the *duty included landed price* (henceforth called simply *landed price*). It gives the value of the imported good immediately after it clears customs, and thereby equals the cif (cost, insurance, freight) value plus the tariff. In a well-functioning market economy, and assuming that internal transport/transaction costs for imports are the same as for domestic output, this value should determine the domestic producer price for the commodity.

In the right side term $\dfrac{\dot{P}^d \ \overbrace{[P^w \ X (1+t)]}}{\underbrace{[P^w X \ (1+t)]}}$, we can isolate the subterm $\dfrac{\dot{P}^d}{\underbrace{[P^w X \ (1+t)]}}$. This gives the price transmission elasticity (PTE) between the landed price and domestic producer price. We define *e* as the PTE, such that

$$e = \frac{\dot{P}^d}{\overbrace{[P^w X \ (1+t)]}} \tag{7}$$

This gives

$$\dot{P}^d = e \overbrace{[P^w X \ (1+t)]} \tag{8}$$

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The presence of the PTE ($e$) in the decomposition equation will allow analysis and measurement of the effect on $P^d$ of incomplete transmission from $\Delta P^w$ and $\Delta X$ to $P^d$ (the incomplete transmission effect).  In order to isolate the effect of incomplete transmission, we insert for the PTE not $e$, but rather $(e + k - k)$, where

$$k \;=\; 1 \;-\; e \tag{9}$$

$$e \;+\; k \;=\; 1 \tag{10}$$

$$\dot{P}^d \;=\; (e + k - k)\,\overbrace{[P^w X\,(1+t)]}^{\textstyle\bullet} \tag{11}$$

$$\dot{P}^d \;=\; \underbrace{\overbrace{[P^w X\,(1+t)]}^{\textstyle\bullet}}_{\textstyle A} \;-\; k\,\underbrace{\overbrace{[P^w X\,(1+t)]}^{\textstyle\bullet}}_{\textstyle B} \tag{12}$$

The letters below the equation identify the two right side terms.  If transmission from change in the landed price to $P^d$ were complete ($e = 1$, such that $k = 0$), term B drops out.  Assume that transmission is incomplete, such that $e, k < 1$.  The logic of our decomposition approach is that it isolates and measures the effect on $P^d$ assuming that transmission is complete (as measured by term A), as well as the effect on $P^d$ from the incomplete transmission that exists (as measured by term B). B measures the degree to which $P^d$ fails to change to the maximum extent possible because of incomplete transmission, or put differently, it measures the degree to which incomplete transmission cuts into this potential change.  The sum of the two parts gives the net effect based on the actual value of $e$.

The purpose of the decomposition equation is to allow us to measure the shares of $\dot{P}^d$ which are caused by, and therefore can be attributed to, $\dot{P}^w$, $\dot{X}$, and $\dot{t}$.  This requires that in the final form of the decomposition equation, no term contains the percent change of either a sum or product of two or more of these variables.  In terms A and B, the additive term $(1 + t)$ exists within

the larger term $\overbrace{[P^w X\ (1+t)]}^{\bullet}$. We want to break $\overbrace{[P^w X\ (1+t)]}^{\bullet}$ into its two additive parts. This is

done by using the result that the percent change of a sum of two numbers equals the sum of the of

percent change in each number, weighted by each number's share in their sum. This gives the

following:

$$\overset{\bullet}{P^d} \ = \ \frac{P^w X\ \overbrace{P^w X}^{\bullet}}{P^w X\ (1+t)} \ + \ \frac{P^w X\ t\ \overbrace{P^w X\ t}^{\bullet}}{P^w X\ (1+t)} \ - \ \frac{k\ P^w X\ \overbrace{P^w X}^{\bullet}}{P^w X\ (1+t)} \ - \ \frac{k\ P^w X\ t\ \overbrace{P^w X\ t}^{\bullet}}{P^w X\ (1+t)} \qquad (13)$$

<center>C           D           E           F</center>

The letters under each term again identify that term. The next step is to deal with the percent

change of a product of two or more variables. Attributing the share of individual variables to the

change in their product appears to be a problem without a definite mathematical solution. In its

decomposition of the change in the market price support part of PSEs, OECD confronts the same

issue. OECD (2002) employs a procedure that yields subterms that contain changes in only single

variables, with no changes in the product of two or more variables. We therefore use OECD's

approach for handling the problem.

In term C in equation (13), the subterms associated with $\overset{\bullet}{P^w}$ and $\overset{\bullet}{X}$ (obtained after

employing OECD's method) measure the change in $P^d$ from the direct price effect that occurs from

$\Delta P^w$ and $\Delta X$. In term D, the subterm associated with $\overset{\bullet}{t}$ measures the change in $P^d$ from the explicit

policy effect, while the subterms associated with $\overset{\bullet}{P^w}$ and $\overset{\bullet}{X}$ measure the change in $P^d$ from the

implicit policy effects (resulting from $\Delta P^w$ and $\Delta X$ interacting with the tariff). The magnitudes of

all the effects in terms C and D are based on the assumption of complete transmission of change in

the landed price to $P^d$. In terms E and F, the subterms associated with $\overset{\bullet}{P^w}, \overset{\bullet}{X}$, and $\overset{\bullet}{t}$ measure the

change in $P^d$ from the incomplete transmission effect, which results from changes in $P^w$, X, and t

<center>9</center>

being only partially transmitted to $P^d$.

The derivation of the decomposition equation when the tariff is a fixed per unit tax is similar to the derivation when the tariff is ad valorem. The landed price of the imported good now equals $[P^wX + T]$, where T is the per unit tariff. The only difference in the derivation compared to the ad valorem case is that in equation (6), one multiplies $\overset{\bullet}{P}{}^{d}$ in the right side by $1 = \left( \dfrac{\overset{\displaystyle\frown}{\overset{\bullet}{P^wX + T}}}{\overset{\displaystyle\frown}{\overset{\bullet}{P^wX + T}}} \right)$.

Another policy that can allow transmission from $\Delta P^w$ and $\Delta X$ to $P^d$ is technical barriers to trade (TBTs), defined to include sanitary and phytosanitary measures. If a country imposes a TBT on imports of a commodity, the typical consequence is that foreign suppliers must incur costs to satisfy the regulation. If the per unit cost of satisfying the barrier is B, the landed price for the import in the country imposing the barrier is $(P^w + B)X$. In deriving the decomposition equation, in equation (6) one now multiplies $\overset{\bullet}{P}{}^{d}$ on the right side by $1 = \left( \dfrac{\overset{\displaystyle\frown}{\overset{\bullet}{(P^w + B)X}}}{\overset{\displaystyle\frown}{\overset{\bullet}{(P^w + B)X}}} \right)$.

## 3. Empirical Example: The Producer Price for Russian Poultry

The example we use to demonstrate the decomposition method is the change in $P^d$ for Russian poultry producers over the period 1997-99. Since the mid 1990's, poultry has been Russia's biggest agricultural import commodity (in value terms). The period 1997-99 is chosen because it spans Russia's economic crisis that hit in 1998. One effect of the crisis was a severe depreciation in the ruble, which gives the example the interesting feature of major change in the exchange rate. The two year period 1997-99 is used because the crisis hit in August 1998, such that much of the crisis' economic effects (on domestic prices and exchange rates, among other variables)

did not play out until 1999.

During 1997-99, Russia had a 30 percent tariff on imported poultry, though with the condition that a minimum tariff be applied of 0.3 European Currency Units (ECUs) per kilo of imports. Another qualification is that in 1999, Russia received food aid from the United States and EU, including some poultry. Russia's receipt of food aid can be viewed as a policy decision, which affected domestic prices. As explained in Liefert (2006), uncertainty concerning the effects and interplay of the minimum per unit tariff and food aid is such that one could represent the net policy effect two different ways: (1) by applying the minimum tariff to all poultry imports; and (2) applying the ad valorem rate to all imports, but cut the tariff rate from 30 to 15 percent. In decomposing the change in the price gap between the domestic and border price using this specific example, Liefert (2006) presents decomposition results for both policy representations. In this paper, we present results for a drop in the tariff from 30 to 15 percent, mainly because it gives a more interesting illustration of the decomposition procedure.

The first step in generating the decomposition results is, using equation (7), to compute the PTE ($e$) between the landed price [$P^w X (1 + t)$] and the producer price $P^d$. The value is 37 percent. Table 1 gives the decomposition results, which incorporate this transmission value. The column $\dot{V}$ gives the actual percent change in $P^d$ and the variables that determine $P^d$ (computed from OECD's database for Russian PSEs, OECD). The column shows that from 1997 to 1999, the real $P^d$ for Russian poultry rose 27 percent. The real border price $P^w$ (expressed in ECUs) fell 17 percent, and the real ruble/ECU exchange rate X rose 137 percent. The 50 percent drop in $t$ results from the decline in the tariff rate from 30 to 15 percent as discussed in the previous paragraph.

The other columns measure the degree to which changes in these variables change $P^d$, measured by the percent change in $P^d$. The three columns under "$e + k = 1$" give the effects on $P^d$

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based on the assumption that transmission of the change in the landed price to producer price is complete. Through the direct price effect, the drop in $P^w$ decreases $P^d$ by 22 percent, while the rise in X increases $P^d$ by 97 percent. The aggregate direct price effect is to raise $P^d$ 75 percent.

The fall in the tariff rate has the explicit policy effect of reducing $P^d$ 18 percent. The drop in $P^w$ has the implicit policy effect of reducing $P^d$ 5 percent, while the rise in X has the implicit policy effect of increasing $P^d$ 22 percent. The aggregate policy effect is a decline in $P^d$ of 1 percent. The combined effect of changes in all variables if transmission were complete is to increase $P^d$ 74 percent.

The column "$-k$" measures the incomplete transmission effect on $P^d$ which results from changes in variables that affect $P^d$ interacting with incomplete transmission. The fall in $P^w$ reduces $P^d$. Because of incomplete transmission, $P^d$ declines less than it would with complete transmission. The failure of $P^d$ to drop by the potential maximum has the attributable effect of raising $P^d$ by 17 percent. Likewise, the rise in X increases $P^d$. Yet, because of incomplete transmission, $P^d$ rises less than it could. The failure of $P^d$ to increase by its potential maximum has the attributable effect of reducing $P^d$ by 75 percent. The halving of the tariff rate t decreases $P^d$. However, because of incomplete transmission, 11 percentage points of the potential drop in $P^d$ also does not materialize. The aggregate effect of the changes in $P^w$, X, and t combining with incomplete transmission (not caused by any apparent policies that fix domestic prices) is to lower $P^d$ by 47 percent.

The column "$e$" gives the net effect of changes in the causal variables on $P^d$. Figures in this column equal the values in the column "combined effect" under "$e + k = 1$" and the column "$-k$." The results show that the net attributable effect of the drop in $P^w$ is to decrease $P^d$ by 10 percent; the net attributable effect of the rise in X is to increase $P^d$ 44 percent; while the net attributable effect of the decline in t is to decrease $P^d$ 7 percent. The total net effect is to raise $P^d$ 27 percent. Note that

throughout the decomposition, the dominant factor in changing $P^d$ is the large increase in X (which reflects major depreciation of the Russian ruble).

Table 1 also gives decomposition results for $\dot{P}^d$ using the WB decomposition procedure, which we can compare to results using our method. The WB decomposition results attributable to $\dot{P}^w$ and $\dot{X}$ conceptually are most similar to our results from the direct price effect, and the actual decomposition calculations from these two columns are somewhat close. The main reason our decomposition net results for $\dot{P}^w$ and $\dot{X}$ are lower than those from the WB procedure is because our decomposition has the incomplete transmission effect attributable to the changes in $P^w$ and X.

The result in the table for "$t$" in the WB decomposition gives the effect on $P^d$ from change in the nominal protection coefficient $(1 + t^p)$. The WB result attributed to $\overgroup{(1 + t^p)}$ of -93 percent differs substantially from our result for $\dot{t}$ (the tariff rate) of -7 percent. One might think that this difference occurs mainly because the WB procedure computes the effect on $P^d$ from $\overgroup{(1 + t^p)}$ while our approach computes the effect from just $\dot{t}$. This, however, is not the case. Equation (13) gives the effect on $P^d$ attributable to $\dot{t}$ in the form of the effect from $\overgroup{(1 + t)}$. The easiest way to demonstrate this is as follows. $\overgroup{(1 + t)} = \dfrac{t\,\dot{t}}{1 + t}$. Assume in equation (13) that only $t$ changes, and that transmission is complete such that $k = 0$. This results in terms C, E, and F dropping out. The sole remaining term D reduces to $\dfrac{t\,\dot{t}}{1 + t}$.

There are two main reasons for the large difference between the WB's calculation of the

effect on $P^d$ from $\overbrace{(1+t^p)}^{\bullet}$ and our calculation of the effect on $P^d$ from $\overset{\bullet}{t}$. First, the WB approach

misstates the value of $\overbrace{(1+t^p)}^{\bullet}$ because it calculates the term as a residual and thereby attributes to

the term all the interactive multiplicative relationships between the variables (as discussed

previously). The changes in the variables in our Russian poultry example are large such that the

multiplicative terms are also substantial in size. Second, the WB approach includes in $\overbrace{(1+t^p)}^{\bullet}$ the

incomplete transmission effect, which we attribute largely to deficient market infrastructure. If in

the WB decomposition procedure, the effect on $P^d$ from $\overbrace{(1+t^p)}^{\bullet}$ is intended to measure the effect of

changes in agriculture-targeted policies alone, such as those involving market intervention, the

procedure could misvalue the effect on $P^d$ (and perhaps strongly so).

## 4. Conclusion

This paper presents a method for decomposing changes in agricultural producer prices, the

key variables in the decomposition analysis being trade prices, exchange rates, and trade policies.

Demonstration of the method using the Russian poultry price over 1997-99 shows that the main

cause of change in the price was the large depreciation in the ruble, a consequence of the severe

economic crisis that hit the country in 1998. Many developing and transition economies have

highly fluctuating exchange rates. The decomposition method presented in this paper could be used

to test the hypothesis that the main cause of changes in these countries' agricultural commodity

prices is exchange rate volatility. Another hypothesis, also supported by the Russian empirical

example, which the decomposition method could help test is that an important factor in affecting

countries' prices is incomplete transmission of changes in trade prices and exchange rates to

domestic prices, where the incomplete transmission is mainly caused not by policy, but rather by

undeveloped market infrastructure.

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Table 1
Decomposition of Change in Producer Price for Russian Poultry, 1997-99

| Variable $(V)$ | $\dot{V}$ | Contribution of $\dot{V}$ to $\dot{P}^d$ | | | | | |
| | | $e+k=1$ | | | $-k$ (incomplete trans-mission effect) | $e$ (net effect) | WB decomp |
| | | direct price effect | policy effect | combined effect | | | |
| | | *Percent* | | | | | |
| $P^w$ | -17 | -22 | -5 | -27 | 17 | -10 | -17 |
| $X$ | 137 | 97 | 22 | 119 | -75 | 44 | 137 |
| $t$ | -50 | na | -18 | -18 | 11 | -7 | -93 |
| | | | | | | | |
| $P^d$ | 27 | 75 | -1 | 74 | -47 | 27 | 27 |

Source: For $\dot{V}$, database for Russian PSEs (OECD), and PlanEcon and Bureau of Labor Statistics for the Russian and foreign (U.S.) producer price indices used to move from nominal prices and exchange rate to real values. For contribution of $\dot{V}$ to $\dot{P}^d$, own calculations.

Note: The WB decomp column gives results based on the World Bank decomposition method. The figure associated with $t$ in this column gives the effect of change in the nominal protection coefficient, as measured by $(1+t^p)$. "na" means not applicable.