Emerging Asia and International Food Inflation

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Abstract

An empirical model of the pass-through of international to domestic food inflation is proposed. The inflation rates and exchange rates of China and India are found to be significant in explaining imported food inflation in Colombia, 10,000 miles away. Notwithstanding the recent increase in international food inflation, the pass-through was not the reason for food inflation to increase in Colombia in 2007, yet the pass-through and also draughts may blur the real cause of long-term macroeconomic inflation: monetary policy.

JEL Classification: E58; E17; Q18.

Keywords: Food inflation; imported food inflation; monetary policy.

1 Introduction

Strong forces point to a raise in food inflation that is to last for the long term. The increase in per capita incomes in China and India and also the effect of higher per capita incomes on food-consumption habits are having a strong and lasting effect on the relative price of food. The change in consumption habits consists of an increase in the demand for meat relative to the demand for cereals. Increased relative demand for meat raises the relative price of cereals because the cattle-raising technology requires that every increase in meat output be met with a larger increase in cereals. Another force increasing the demand for cereals is the emerging bio-fuel technology.

Besides these demand forces, an additional force causing tightness in food markets from the supply side is a slowdown in productivity growth in agriculture.[1]

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[1] King et. al. (2008) give evidence of this productivity slowdown.

Imported food inflation in Colombia can be explained as a linear combination of food inflation in China and India. These two countries are key in international markets of relevant food products. For instance, they are amongst the first ten countries in the list of consumers, producers, importers and exporters of foods such as wheat and rice.[2]

Food inflation in Asia is rising sharply (Figure 1, Panels A and B, dark line), and the recent appreciations of the renminbi and the rupee mean larger increases in food inflation measured in dollars (Figure 4, Panels A and B, gray line).[3]

The effect of food inflation in China and India on international food inflation is evident even in imported food inflation in Colombia. Panel C shows the effect of dollar-measured food inflation in Asia on dollar-measured imported food inflation in Colombia. The effect of Asia is more clear when attempting to explain imported food inflation in Colombia with the inflation rate of food products in advanced countries. Panel D shows that a linear combination of food inflation in the US and Germany does not help explain Colombia's imported food inflation.

Is international food inflation the cause of macroeconomic inflation in emerging markets? Not necessarily. The case of Colombia illustrates that even in the presence of high international food inflation, exchange rate appreciation has helped offset the pass-through of international food inflation onto domestic inflation (Figure 2). During 2007, the strong appreciation of the exchange rate made imported food inflation measured in pesos *negative* (Panel B).

The cause of the raise in food inflation in Colombia during 2007 must then lie elsewhere. The two remaining candidates are the weather and the stance of monetary policy.

Consider the weather. In the long term food inflation is anchored in CPI inflation and in the short term food inflation jumps and drops according to the well-known microeconomic cob-web theorem (Figure 3). Poor rainfall and high food inflation are generally followed by good crops and food inflation lower than overall inflation (this is shown in the peaks and troughs in food inflation in Panel A and also in Panel B).[4] During 2007, however, after a period of relatively poor rainfall, food inflation remained above CPI inflation. This suggests that the rainfall deficit was not the only cause of the raise in food inflation.

Consider monetary policy. Figure 4 shows the policy interest rate in real terms and a measure

[2] See King *ob. cit.*

[3] The increase in dollar-measured food inflation is even more probematic for the countries that peg their currencies to the dollar as they have to "import" the loose stance of US monetary policy.

[4] Following Gómez, Uribe and Vargas (2002), the el Niño indicator, is the seasonally adjusted measure of rainfall below an ah-hoc cut off level.

of the output gap. Although an evaluation of the stance of monetary policy is beyond the scope of this paper, the real policy rate and the output gap seem consistent with increasing inflation. The dangerous role of the weather, besides short terms spurs in inflation, is that it can blur our perception of the macroeconomic, long-term cause of inflation.

As said above, in 2007 the pass-through did not explain the raise in food inflation. The situation is different in 2008. The most recent data shows that in 2008 international food inflation is another cause of the raise in food inflation. Imported food inflation[5] reached 33.2% in April (Figure 2, Panel A). This spur in international inflation could not be offset by exchange rate appreciation (Figure 2, Panel B). In 2008 domestic-currency-measured international inflation turned positive. Thus, 2008 is a year when the pass-through can be a factor adding fuel to the increase in food inflation.

In this paper a model of the effect of international inflation on domestic inflation is proposed. The model is estimated for the case of Colombia. The paper has 4 sections including this introduction. Section 2 presents the model, Section 3 the estimations, Section 4 concludes.

2 The Model

The transmission mechanisms are described in Diagram 1. The main demand forces in food markets originate in China and India, two countries that are important centers for price discovery in key food markets. Combining food inflation in China and India with these countries' exchange rates, we obtain Chinese and Indian food inflation in US dollars (see Diagram). Asian food inflation measured in dollars explains imported food inflation in Colombia.

Next, a linear combination of imported and exported food inflation, measured in pesos, helps explain the domestic country's food inflation. An increase in imported food inflation is inflationary because it increases both the cost of imported final food products and the cost of inputs in the production of final food products. An increase in exported food inflation is inflationary because it increases the opportunity cost of domestically produced food products, consumed domestically but potentially exportable.

The model consists of two behavioral equations, (1) and (2), and three linking equations (3), (4) and (5):

$$\pi_{j,t}^{IMPORTS*} = \sum_{i=0}^{n} \theta_i \pi_{i,t}^{FOOD*} + f_t + \varepsilon_t^2 \tag{1}$$

[5] Measured by the PPI for food products in dollars.

$$\pi_{j,t}^{FOOD} = \beta_0 \pi_{j,t-1}^{FOOD} + (1-\beta_0)\pi_{j,t}^{TRADE} + \beta_1 y_t + \sum_{i=0}^{n} \gamma_i \phi_{t-i} + \varepsilon_t^1 \quad (2)$$

$$\pi_{j,t}^{TRADE*} \equiv \omega \pi_{j,t}^{IMPORTS*} + (1-\omega)\pi_{j,t}^{EXPORTS*} \quad (3)$$

$$\pi_{j,t}^{TRADE} \equiv \pi_{j,t}^{TRADE*} + s_{j,t}, \quad (4)$$

$$\pi_{j,t}^{FOOD*} \equiv \pi_{j,t}^{FOOD} - s_{j,t} \quad (5)$$

where:

$\pi_{j,t}^{IMPORTS*}$ is inflation in the domestic country's food import prices measured in US dollars.

$\pi_{j,t}^{EXPORTS*}$ is inflation in the domestic country's food export prices measured in US dollars.

ω is the weight of the domestic country's food import prices in the domestic country's price index of food traded goods.

$\pi_{j,t}^{TRADE*}$ is inflation in the price index of the domestic country's food traded goods measured in US dollars.

$\pi_{j,t}^{TRADE}$ is inflation in the price index of the domestic country's food traded goods measured in domestic currency.

$\pi_{j,t}^{FOOD*}$ is inflation in country j's food component of the Consumer Price Index (CPI) measured in US dollars.

$\pi_{j,t}^{FOOD}$ is inflation in country j's food component of the CPI measured in domestic currency.

$s_{j,t}$ is the rate of depreciation of the exchange rate of country j vis a vis the US dollar (the exchange rate is defined as the number of units of domestic currency per unit of foreign currency).

y_t is the output gap of the domestic country, and

ϕ_t is an indicator of El Niño phenomenon.

Expression (1) is the *imported food inflation equation.* Following the model proposed by Sjaastad and Scacciavillani (1996) for the price of gold, this equation expresses inflation in imported food products as a function of food inflation in the relevant countries and a set of fundamentals, f_t.

Expression (2) is the *domestic food inflation equation.* It is a Phillips curve for food inflation that incorporates supply shocks in agriculture and inflation in traded food products.[6] According to (2), food inflation depends on three factors: inflation of food traded goods, demand pressures

[6] Basically, this equation adds inflation of traded food products to the food inflation equation in Gómez, Uribe and Vargas (2002).

as captured by the output gap, and supply shocks given by the indicator of El Niño phenomenon. The coefficients in the nominal variables add to one so that the natural rate hypothesis holds.

In equation (3), inflation of the domestic country's traded food products is a linear combination of inflation in imported and exported food products.

In equation (4), the domestic currency measure of inflation is obtained adding the rate of depreciation of the exchange rate to the US-dollar measure of inflation of traded goods.

In equation (5), the US dollar measure of inflation in China and India is obtained by subtracting the rate of depreciation of the exchange rate of country of each country to the domestic currency measure of food inflation.

3 Results

3.1 Imported food inflation

In the estimation, the countries that were significant in explaining imported food prices in Colombia were China and India.[7] Countries whose food inflation was not significant in explaining Colombia's imported food inflation were the US, Germany,[8] and Brazil.

The relative price of food in Venezuela, $z^R_{VEN,t}$ served as a fundamental.[9] The relative price of food in the United States, Germany, China, India and Brazil were not significant.

The results for the *imported food inflation equation* are:

$$\pi^{IMPORTS*}_{COL,t} = (1 - 0.584)\pi^{FOOD*}_{CHN,t-3} + \underset{(0.151)}{0.584}\pi^{FOOD*}_{IND,t} + \underset{(0.126)}{0.300}z^R_{VEN,t} + \varepsilon^2_t \tag{6}$$

Estimation method: Newey West GMM-IV.

Sample: Monthly data for the period 2001M5-2007M12.

Standard error: 0.0151.

Durbin Watson: 2.020.

The estimation was robust to different samples. Instruments were used for Chinese and Indian food inflation in US dollars because the US exchange rate changes both countries' dollar-measured

[7] Venezuela was important only when the regression did not include the relative price of food in Venezuela as a fundamental.

[8] Gernamy's food inflation was used as a proxy for European food inflation.

[9] The relative price of food is $P^R_t = P^{FOOD}_t/P_t$, where P^{FOOD}_t is the price index of food products in the CPI and P_t is the CPI. This relative price was incorporated in the regression as deviation form the Hodrick-Prescott filter.

inflation. Chinese and Indian food inflation in domestic currency served as instruments. The sum of the coefficients on the right hand side variables was constrained to one.[10]

A regression for the price of food exports did not give significant results. The reason seems to be that food exports are more concentrated in a few products and the prices of these different products do not show any correlation. In contrast, food imports are more diversified. The first six imported (exported) food products account for 60.3% (89.2%) of food imports (exports). A model for the price of food exports would consist of a separate model for the price of each export product with a different set of relevant countries in each case. This is beyond the scope of the present paper.

3.2 Domestic food inflation

Equation (7) shows the estimation of the *domestic food inflation equation*:

$$\pi^{FOOD}_{COL,t} = \underset{(0.048)}{0.771}\pi^{FOOD}_{COL,t-1} + \underset{(0.048)}{0.228}\pi^{TRADE}_{COL,t} + \underset{(0.393)}{0.603}y_t \tag{7}$$

$$+\underset{(0.153)}{0.146}\phi_t + \underset{(0.159)}{0.302}\phi_{t-1} - \underset{(0.164)}{0.169}\phi_{t-2} - \underset{(0.162)}{0.386}\phi_{t-3} + \underset{(0.152)}{0.352}\phi_{t-4} + \varepsilon^F_t \tag{8}$$

Estimation method: Restricted least squares.

Sample: Quarterly data for the period 1990Q1-2008Q1.

Standard error: 0.077.

Durbin Watson: 2.663.

The estimation restricts the sum of the coefficients in the nominal variables to one. This restriction is not rejected at the margin with a p-value of 0.080. The hypothesis of all coefficients in the indicator for El Niño phenomenon being zero is rejected with a p-value of 0.014.[11]

It is also illustrative to estimate the effect of imported and exported food prices on food inflation independently:

$$\pi^{FOOD}_{COL,t} = \underset{(0.050)}{0.775}\pi^{FOOD}_{COL,t-1} + \underset{(0.052)}{0.168}\pi^{IMPORTS}_{COL,t} + \underset{(0.025)}{0.056}\pi^{EXPORTS}_{COL,t} + \underset{(0.409)}{0.574}y_t \tag{9}$$

$$+\underset{(0.155)}{0.151}\phi_t + \underset{(0.160)}{0.302}\phi_{t-1} - \underset{(0.166)}{0.165}\phi_{t-2} - \underset{(0.165)}{0.379}\phi_{t-3} + \underset{(0.156)}{0.344}\phi_{t-4} + \varepsilon^F_t$$

[10] The International Monetary Fund (IMF) constructs a commodity index for food products. The index may not be relevant for the case of a particular country and especially it does not seem relevant in explaining imported food inflation in Colombia. The products and weights used in this index are found in IMF (2007, page 5). The weights are much different from those of the same products in Colombia's food imports.

[11] Note that the sign of the indicator for El Nino is opposite to that in Gómez Uribe and Vargas (2002). In this version of the equation the indicator is defined as a positive number and hence, on impact, a draught increases food inflation.

Estimation method: Restricted least squares.

Sample: Quarterly data for the period 1990Q1-2008Q1.

Standard error: 0.078.

Durbin Watson: 2.667.

The hypothesis of the coefficients on the nominal variables adding up to one passes with a p-value of 0.160 and the hypothesis of the coefficients on El Niño indicator being all zero is rejected with a p-value of 0.011.

The estimated coefficients on exported and imported food inflation in this equation enables us to calibrate the weight of imported food inflation for the estimation of equation (7), the coefficient ω, as $0.168/(0.168 + 0.056) = 0.75$.

4 Conclusion

The most urgent policies related to the problem of food inflation are certainly those related with the countries requiring food assistance. Having said that, policies that can tackle the problem in a longer term perspective are those related with food agriculture. Relative prices need to change in response to the new market conditions and this is the way the market can elicit a healthy response of supply (along the supply curve). In addition, productivity growth in agriculture (shifts in the supply curve) can help decrease the relative price of food and can have beneficial income effects in poorer countries.

Climatic effects such as El Niño can have important effects on food prices, but these effects are typically short lived. When climatic changes coincide with strong domestic demand and expansionary monetary policy, the policy markers' perceptions of the real cause of long-lasting macroeconomic inflation are blurred. It is all too easy to say that an inflation spur was due to international food inflation or to the weather.

Short-term supply shocks in agriculture should not be contained because this policy would transmit supply instability in food agriculture to the macro economy. However, if the change in relative prices is to last for the long term, monetary policy must attempt to allow for the change in relative prices to take place without compromising overall price stability. This necessitates that nonfood inflation must fall below the long-run target for total CPI inflation.

Further research would deal in detail with a disaggregation among food products.

5 References

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[4] Organization for Economic Cooperation and Development and Food and Agriculture Organization of the United Nations. "OECD-FAO Agricultural Outlook 2008-2017." 2008.

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Diagram 1. Transmission mechanisms from international inflation to imported inflation

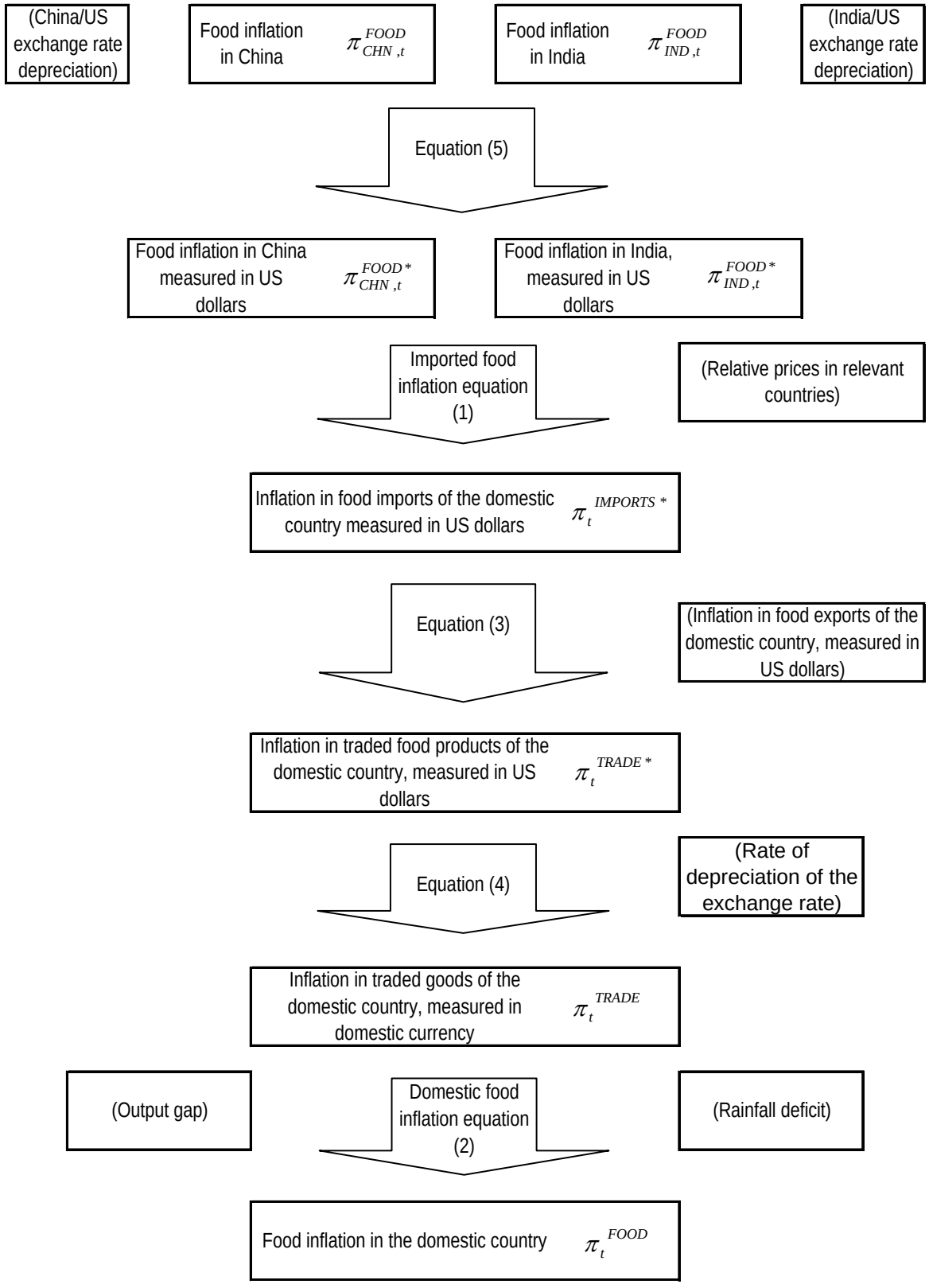

Figure 1. International food inflation and the role of China and India

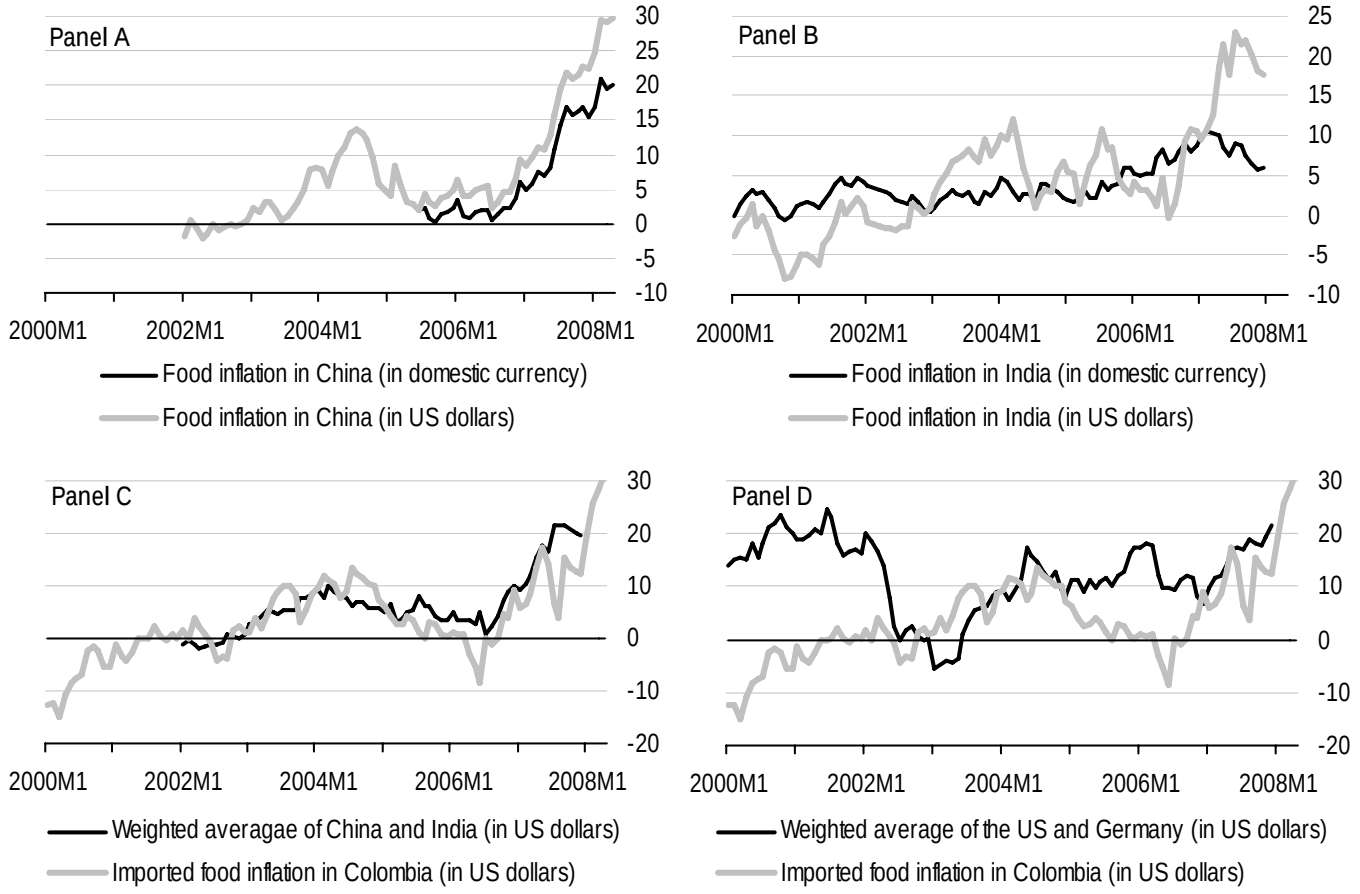

Figure 2. International food inflation and the pass-through

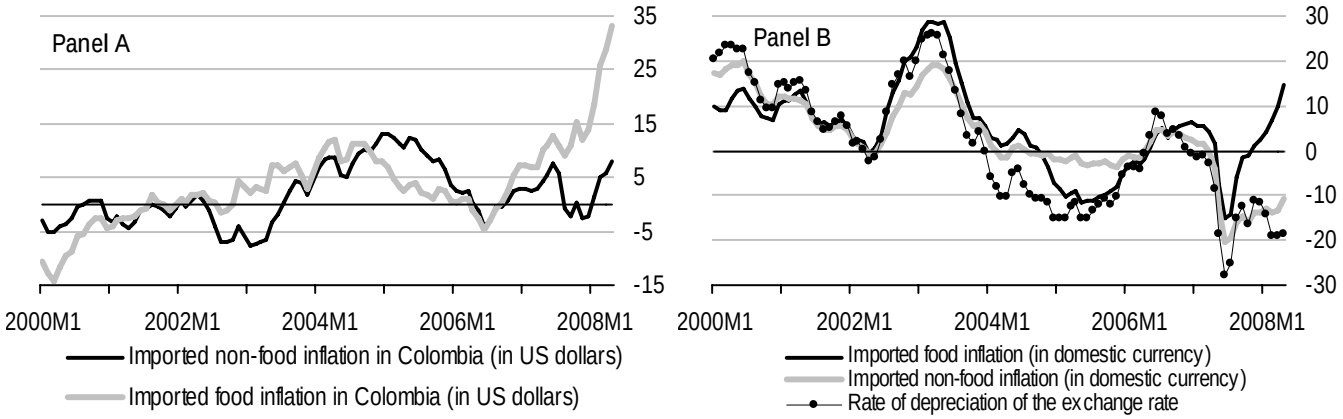

Figure 3. Food inflation and CPI inflation

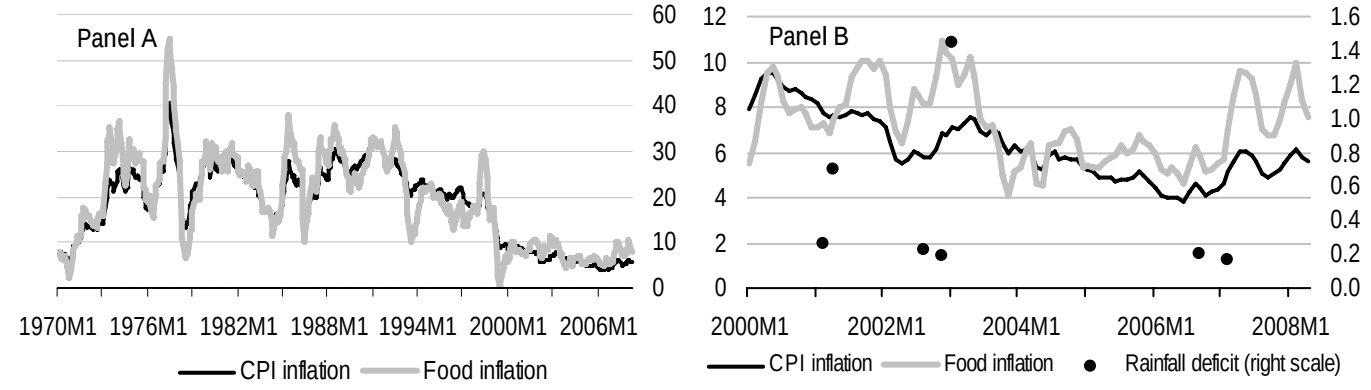

Figure 4. The stance of monetary policy