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## Inflation in Developing Asia: Demand-Pull or Cost-Push?

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# **Inflation in Developing Asia: Demand-Pull or Cost-Push?**

Juthathip Jongwanich and Donghyun Park

September 2008

Asian Development Bank





ERD Working Paper No. 121

# **INFLATION IN DEVELOPING ASIA: DEMAND-PULL OR COST-PUSH?**

**JUTHATHIP JONGWANICH AND DONGHYUN PARK**

SEPTEMBER 2008

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## **FOREWORD**

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## CONTENTS

Abstract	vii
I. Introduction	1
II. Inflation in Developing Asia: A First Look	2
III. The Model, Data, and Econometric Procedure	6
IV. Sources of Inflation: Variance Decomposition Analysis	8
V. Pass-through of Oil and Food Price Shocks to Asia's Inflation	11
A. Pass-through of Oil Price Shock to Domestic Prices	11
B. Pass-through of Food Price Shock to Domestic Prices	17
VI. Conclusion and Policy Inferences	24
Appendix: Impulse Response Functions for Producer Prices, Consumer Prices, and Real GDP in Nine Developing Asian Economies	26
References	35





## **ABSTRACT**

This paper empirically examines the relative importance of different sources of inflation in developing Asia. In particular, it tests the widely held view that the region's current inflation surge is primarily the result of external price shocks such as oil and food shocks. In addition, this paper also estimates the degree of pass-through of external price shocks to domestic prices. Our central empirical result is that contrary to popular misconception, Asia's inflation is largely due to excess aggregate demand and inflation expectations rather than external price shocks. This suggests monetary policy will remain a powerful tool in the fight against inflation in Asia. Another significant finding is that the pass-through of the external price shocks to domestic prices has been limited so far. However, the removal of government subsidies is likely to lead to greater pass-through in the future. The resulting inflationary pressures provide a further rationale for tightening monetary policy.



## **I. INTRODUCTION**

Rising inflation has emerged as by far the biggest macroeconomic challenge confronting developing Asia in 2008 and will remain a challenge in the coming year. In fact, inflation as measured by consumer price indices (CPI) gathered momentum throughout 2007 and accelerated sharply in the first half of 2008 throughout the region. Higher inflation is engulfing virtually all of developing Asia, although the exact magnitude of the increase in inflation differs across countries and subregions. For the region as a whole, inflation is projected to rise to 7.8% in 2008, up sharply from 4.3% in 2007 and 3.3% in 2006. The benign paradigm of strong growth and subdued inflation seems to have been shattered.

The obvious question to ask is, What has changed? The equally obvious answer is the spike in international commodity prices, particularly food and oil prices. Indeed according to an increasingly popular diagnosis for developing Asia's new inflation problem, the region is suffering from a bout of cost-push inflation. The sheer speed of the recent rise in commodity prices and hence input costs gives a great deal of credibility to the cost-push diagnosis. If higher food and oil prices are indeed what underlie Asia's inflation, the scope for anti-inflationary monetary tightening, which works by dampening aggregate demand, would come at a steep cost in terms of foregone growth impacts. There is a very real risk that the cost-push diagnosis will influence regional monetary authorities and become an excuse for inaction against inflation.

The central objective of this paper is to examine the validity of the cost-push diagnosis of inflation through rigorous empirical analysis. The fundamental question addressed here is whether developing Asia's inflation is really a case of cost-push inflation about which monetary authorities can do very little, or, are there other factors at play. The impressive economic growth in developing Asia over the past decade and the growth acceleration from 2005 to 2007 took place with low inflation. This high growth with low inflation allowed monetary policy to be accommodative and may have lulled monetary authorities into complacency. Is it possible that developing Asia's inflation may be of the demand-pull variety in which excess aggregate demand leads to rising prices? The answer to that question has enormous implications for monetary policy in the region.

The answer uncovered through rigorous econometric analysis is that developing Asia's inflation is largely homegrown and due to excess aggregate demand and inflationary expectations. Surging aggregate demand has generated relentless upward price pressures. Aggregate supply, or the economy's productive capacity, could not meet the incremental demand in many Asian countries. While external food and oil price shocks have contributed to inflationary pressures, our empirical evidence firmly rules out the widely held view that Asia's rising inflation is mostly due to exogenous external shocks beyond the region's control. For the region as a whole, excess aggregate demand and inflationary expectations jointly account for about 60% of CPI inflation. Our evidence is consistent with the stylized fact of accelerating growth accommodated by easy monetary policy in the region in the past year and at present. In particular, the region's recent robust growth makes it entirely conceivable that overheating of the economy due to unsustainable demand growth fueled by cheap credit and expansionary monetary policies, coupled with exchange rate policy favoring undervaluation may have helped to bring about the current outbreak of high inflation.

In addition to our central objective of determining the relative importance of demand-pull versus cost-push inflation, an additional objective of the paper is to evaluate the extent to which the oil and food shocks have actually translated into domestic inflation. While our evidence speaks out loudly and clearly against the popular belief that external shocks are solely to blame for the region's current inflationary woes, it also reveals that those shocks have played a supportive role. However, partly due to government subsidies and trade restrictions, the estimated pass-through of external shocks to domestic prices is still limited in most of developing Asia. There is, however, a clear regionwide trend toward the reduction of subsidies, largely due to the fiscally unsustainable costs of subsidies in light of high market prices. Such prospective reduction of subsidies will significantly exacerbate inflation in many Asian countries in the near future. In addition, our finding that the pass-through of external price shocks has been substantially greater for producer prices than consumer prices also implies greater pass-through to consumer prices in the coming months. Therefore, both subsidy reduction and greater pass-through of producer costs to consumer prices imply that cost-push inflationary pressures are set to intensify throughout Asia in the near future.

The policy implication that flows from our key findings is that monetary policy will remain effective and relevant in fighting inflation in developing Asia. Since our evidence indicates that excess aggregate demand and inflation expectations explain a major part of the region's inflation, raising policy interest rates and changing the stance of monetary policy toward tightening is necessary in order to dampen demand and anchor inflationary expectations. Although the global food and oil shocks are exogenous external shocks largely beyond the region's control, decisively and preemptively defusing the risk of deeply entrenched long-term inflation is well within the control of the region's central banks. Furthermore, monetary policy itself is likely to have contributed to the formation of inflationary pressures. More precisely, loose monetary policies throughout the region, evident in the negative real interest rates that have become evident since late 2007 in most of the nine developing Asian countries considered in this chapter, have stoked aggregate demand to unsustainable levels.

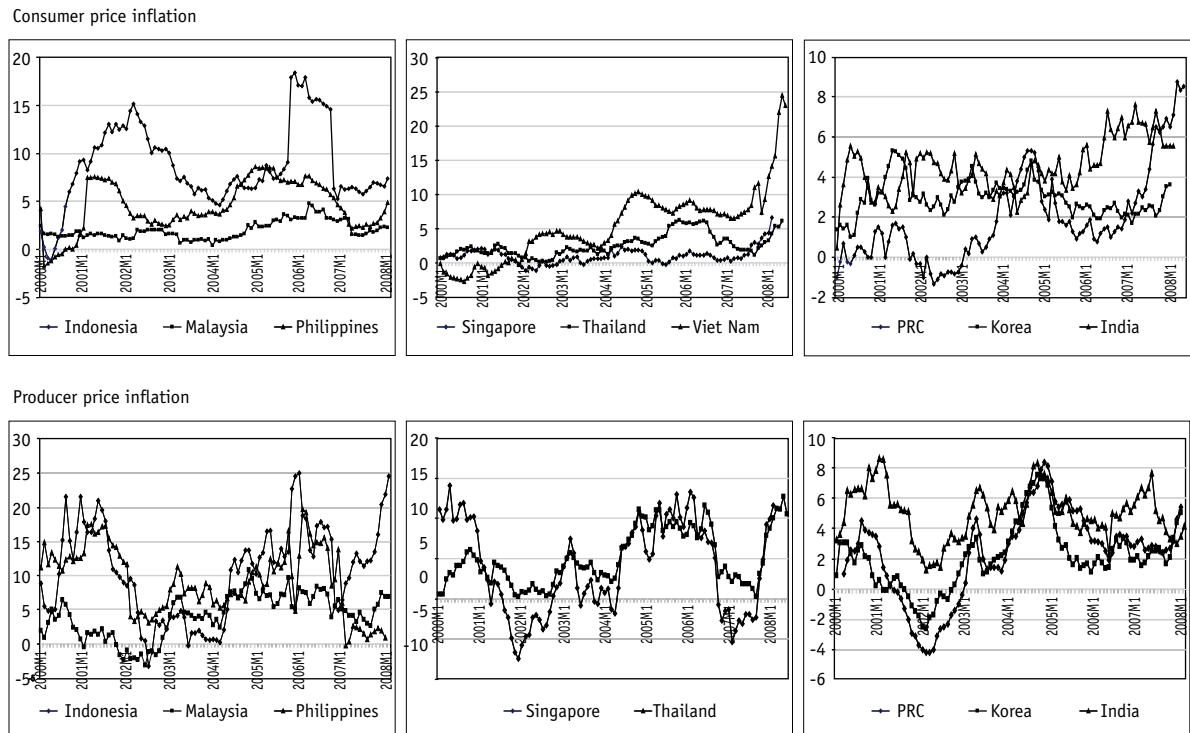
The rest of this paper is organized as follows. Section II briefly discusses the movements of inflation in developing Asia. The empirical methodology we use to estimate the sources of inflation and extent of pass-through are presented in Section III. This section also discusses the transmission mechanism that transforms external shocks into domestic inflation. Section IV reports and discusses the central empirical findings of this chapter, which pertain to assessing the relative importance of external oil and food price shocks in explaining Asia's inflation. Section V reports and discusses additional empirical results, which relate to the pass-through of global food and oil prices to domestic prices. The final section highlights the paper's key findings along with the policy implications.

## **II. INFLATION IN DEVELOPING ASIA: A FIRST LOOK**

Producer and consumer price inflation measures in developing Asia have increased noticeably since early 2007. In Viet Nam, the consumer price inflation accelerated to almost 25% year-on-year in early 2008 while in the People's Republic of China (PRC) the consumer price inflation jumped to almost 9% in the second quarter of 2008, from less than 2% in 2006 (Figure 1). In the first quarter of 2008, Indonesia's inflation surged to almost 7.6%. Producer prices have risen even faster than consumer prices in almost all regional countries. This is especially true in Indonesia, where the producer price inflation rose to 25% year-on-year in 2008Q1, compared to 10% in early

2007. In Thailand and Singapore, producer price inflation rose to 10%, from only 2.5% and –3.4%, respectively, during the same period.

**FIGURE 1**  
**CONSUMER AND PRODUCER PRICES INFLATION, 2000–2008 (PERCENT)**



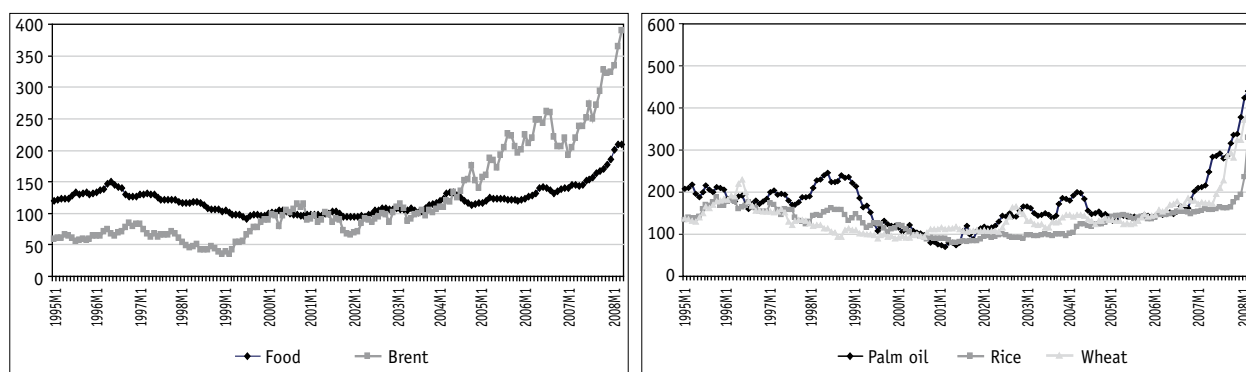
Source: International Financial Statistics online database, downloaded June 2008.

The spike in Asia's inflation is almost perfectly coincident with the spike in commodity prices. The Brent crude oil price registered a new record high of \$140 per barrel in early 2008, up from less than \$60 in early 2007. The run-up in oil prices has been driven mostly by the fundamentals of demand and supply (ADB 2008b). Surging global demand and the inability of global supply to keep pace has generated relentless upward price pressures. The resulting reduction of surplus capacity, which can absorb and cushion shocks, has also led to greater price volatility by amplifying the effects of even the smallest demand and supply shocks. Financial speculation may exacerbate temporary short-lived price spikes and thus contribute to increased volatility.

Food prices have increased sharply since 2007, particularly the prices of rice, palm oil, and wheat. They rose by 62%, 94%, and 107% in the first quarter of 2008, compared to 39% for overall food prices. The price of maize, which is a close substitute for wheat, also increased by 30%, while prices of other edible oils (e.g., soybean oil and coconut oil) rose by almost 90%. While the causes of the run-up in the price of staple foods are complex, there are four fundamental drivers (ADB 2008b). Rapid economic growth in emerging economies, particularly the PRC and India, put upward pressure on prices of a variety of food commodities. Demand has simply outpaced supply. A sustained decline in the United States (US) dollar since 2004 has added to upward price pressure on dollar-denominated commodities—particularly on crude petroleum—which has fueled a search

for hedges against a weak dollar. The combination of high oil prices and legislative mandates to raise production of biofuel substitutes for gasoline and diesel fuel established a price link between feed stocks (such as corn and vegetable oils) and fuel prices. Financial speculation arising from low interest rates has also helped push up commodity prices.

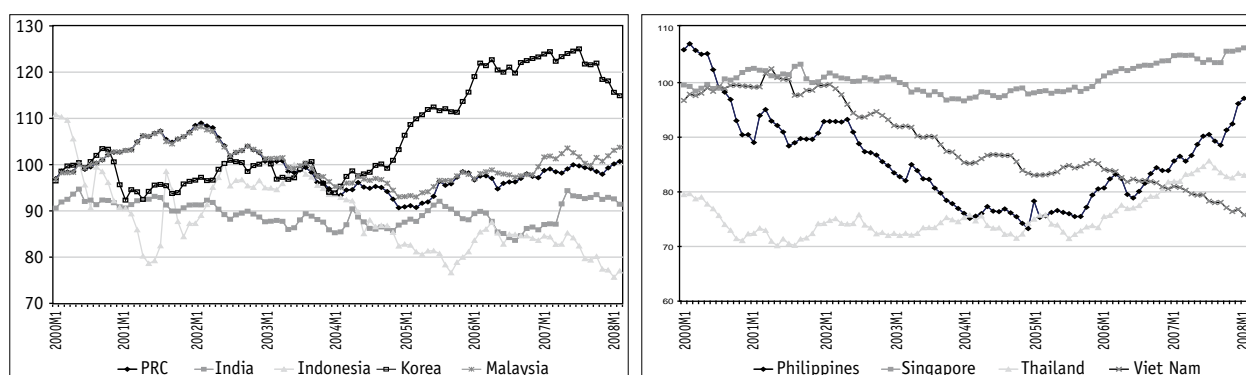
**FIGURE 2**  
**FOOD AND FUEL PRICES, 1995:M1–2008:M4 (2000=100)**



Source: International Financial Statistics online database, downloaded June 2008.

One factor that has limited the impacts of oil and food price spikes to domestic inflation in many Asian countries is the appreciation of the nominal exchange rate, especially against the US dollar. In the Philippines, the nominal effective exchange rate (NEER) appreciated by 25% during 2005–2008:M2, while in PRC, Malaysia, Singapore, and Thailand, the appreciation was around 10% during this period. In Republic of Korea, NEER appreciated sharply by 33% during 2005–2007:M7 before depreciating by 8% in 2007:M7–2008:M2. Viet Nam was an exception in the sense that its NEER depreciated by almost 10% during 2005–2008:M2.

**FIGURE 3**  
**NOMINAL EFFECTIVE EXCHANGE RATES, 2000M1–2008M2**

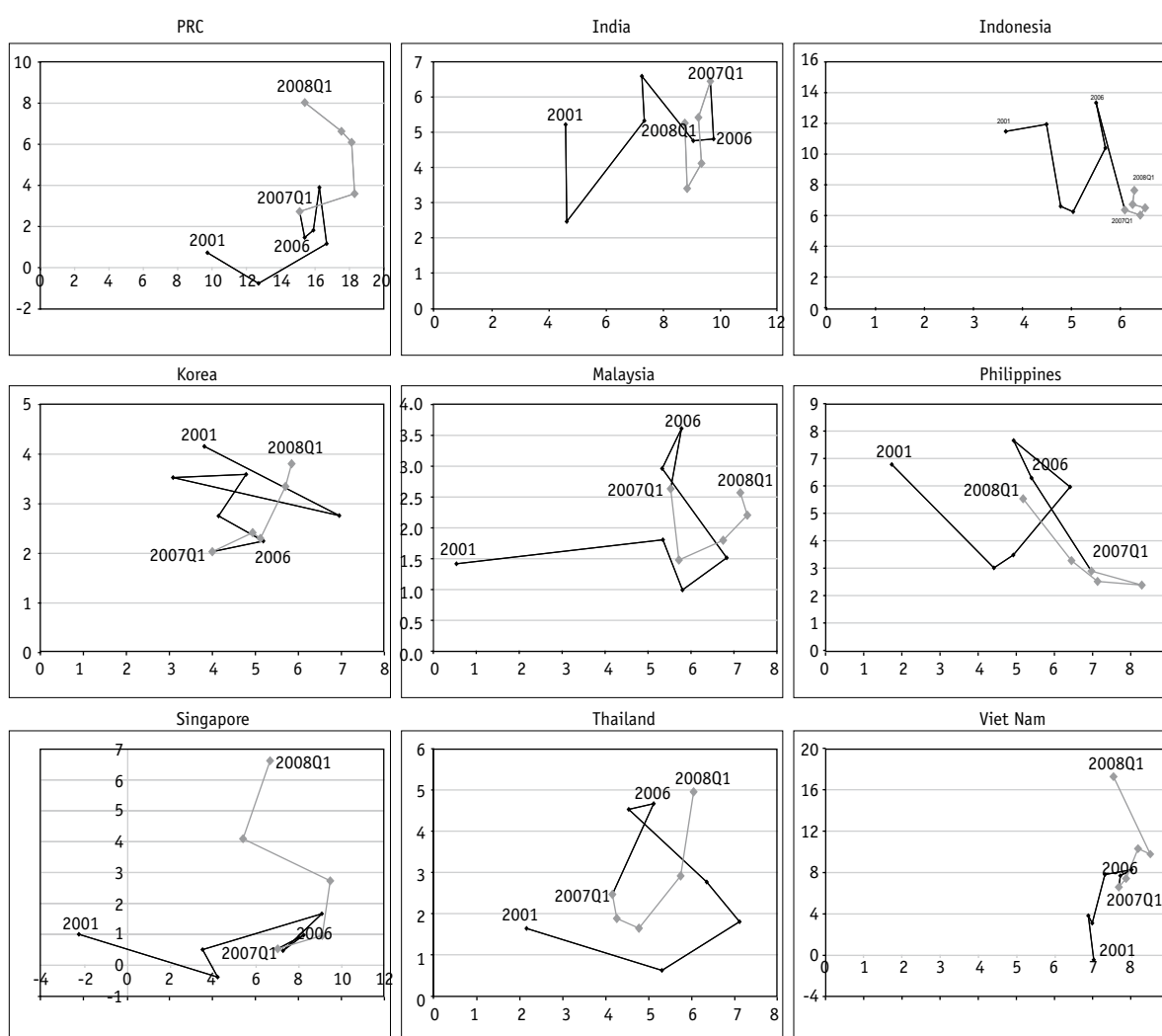


Note: An increase reflects exchange rate appreciation.

Sources: International Financial Statistics online database, downloaded June 2008 for PRC, Malaysia, Philippines, and Singapore; staff calculations for other countries.

So far, the oil and food price shocks have not perceptibly harmed economic growth in developing Asia. Figure 4 shows that a rise in inflation in Indonesia, Korea, Malaysia, and Thailand during 2006–2008Q1 was accompanied by an increase in growth. The growth rate of these countries was around 5–7%, higher than the average growth rate during 2001–2005. The growth slightly declined in India, Singapore, Viet Nam, and Philippines by 1–2 percentage points but the growth rate was still higher than 6% in the first three countries and around 5% for the Philippines. Compared to other emerging economies, e.g., Latin America (3.1%) and developing Europe (5.4%), the growth rate in developing Asia was still impressive. While the region's inflation is expected to reach 7.8% and 6.0% in 2008 and 2009, respectively, its growth rate will still be around 7.5% and 7.2% (ADB 2008b).

**FIGURE 4**  
**INFLATION AND GROWTH IN DEVELOPING ASIA, 2001–2008Q1**



Note: The X-axis is GDP growth and the Y-axis is consumer price inflation.

Sources: International Financial Statistics online database and CEIC Data Company, Ltd. database, downloaded June 2008.



### III. THE MODEL, DATA, AND ECONOMETRIC PROCEDURE

The empirical analysis of this section seeks to identify the sources underlying developing Asia's inflation, in particular the relative importance of demand-pull factors versus cost-push factors. An additional objective is to empirically examine the extent to which the food and oil price shocks have been passed through to domestic prices. This section briefly lays out the model used to carry out the two analyses. Our sample consists of nine regional economies, namely, PRC, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand, and Viet Nam. A vector autoregression (VAR) model is estimated and a recursive Cholesky orthogonalization is applied to identify the primitive shock in the VAR. This approach is used to model the dynamic interrelationship between the price variables in the distribution chain. The ordering and choice of variables is motivated by the idea that prices are revised at each of three different stages (i.e., imports, production, and consumption), which together make up a stylized distribution chain of goods and services. The model controls for external shocks and demand pressure. The model applied here is based on McCarthy (1999), Bhundia (2002), and Duma (2008)<sup>1</sup> but is extended to include food prices.

In this model, inflation at each stage, namely import, producer, and consumer prices, is composed of seven components. The first two components, oil ( $\pi^{oil}$ ) and food ( $\pi^{food}$ ) price inflation, are the effect of international supply shocks to inflation (referred to here as cost-push inflation). The third component, output gap ( $y$ ), is to proxy demand shock, while the effect of exchange rate shock ( $e$ ) on inflation is captured in the fourth component. The fifth and sixth are the effects of shocks to inflation at the previous stage of the chain and the effect of shocks at that stage of the distribution chain. In the model, import price inflation ( $\pi^{im}$ ) affects consumer price inflation ( $\pi^c$ ) directly, and indirectly through its effects on producer/wholesale price inflation ( $\pi^p$ ). The last component is the expected inflation at each stage, which is based on information available at period  $t-1$ . The seven components can be written as follows:

$$\begin{aligned}\pi^{oil} &= E_{t-1}(\pi_t^{oil}) + \varepsilon_t^{oil} \\ \pi^{food} &= E_{t-1}(\pi_t^{food}) + a_1 \varepsilon_t^{oil} + \varepsilon_t^{food} \\ y_t &= E_{t-1}(y_t) + b_1 \varepsilon_t^{oil} + b_2 \varepsilon_t^{food} + \varepsilon_t^y \\ \Delta e_t &= E_{t-1}(\Delta e_t) + c_1 \varepsilon_t^{oil} + c_2 \varepsilon_t^{food} + c_3 \varepsilon_t^y + \varepsilon_t^{\Delta e} \\ \pi_t^{im} &= E_{t-1}(\pi_t^{im}) + d_1 \varepsilon_t^{oil} + d_2 \varepsilon_t^{food} + d_3 \varepsilon_t^y + d_4 \varepsilon_t^{\Delta e} + \varepsilon_t^{im} \\ \pi_t^p &= E_{t-1}(\pi_t^p) + e_1 \varepsilon_t^{oil} + e_2 \varepsilon_t^{food} + e_3 \varepsilon_t^y + e_4 \varepsilon_t^{\Delta e} + e_5 \varepsilon_t^{im} + \varepsilon_t^p \\ \pi_t^c &= E_{t-1}(\pi_t^c) + f_1 \varepsilon_t^{oil} + f_2 \varepsilon_t^{food} + f_3 \varepsilon_t^y + f_4 \varepsilon_t^{\Delta e} + f_5 \varepsilon_t^{im} + f_6 \varepsilon_t^p + \varepsilon_t^c\end{aligned}$$

<sup>1</sup> McCarthy (1999) examines the pass-through of exchange rate and import prices to domestic producer and consumer inflation across nine developed countries, namely, Belgium, France, Germany, Japan, Netherlands, Sweden, Switzerland, United Kingdom, and US during 1976Q1–1998Q4. Bhundia (2002) estimates the exchange rate pass-through in South Africa during 1976Q2–2000Q3 while Duma (2006) examines the pass-through of oil price hike, import prices, and exchange rate in Sri Lanka during 2003M1–2007M7.

where  $\varepsilon_t^{oil}$ ,  $\varepsilon_t^{food}$ ,  $\varepsilon_t^y$  and  $\varepsilon_t^{\Delta e}$  are the shocks corresponding to supply, demand, and exchange rate shocks.  $\varepsilon_t^{im}$ ,  $\varepsilon_t^p$  and  $\varepsilon_t^c$  are the shocks emerging from import, producer, and consumer price inflation, and  $E$  is the expectation.<sup>2</sup>

The transmission mechanism of the model in determining sources of inflation and the pass-through is as follows. Suppose there is an exogenous shock from international oil prices. In the model, international food prices would immediately adjust (quarterly basis in this study). Changes in international oil and food prices would affect aggregate demand, while the exchange rate would respond to oil and food price hikes as well as changes in aggregate demand. In other words, the exchange rate is adjusted as a result of changes in the balance of payment position. Changes in international oil and food prices, together with changes in the exchange rate, then immediately affect import prices. This would result in an immediate impact on producer and consumer price inflation, in addition to effects of aggregate demand. Import prices affect consumer prices in two ways, directly since some imported products are consumed directly, and indirectly through producer prices. In the next period, changes in consumer prices would feed back to aggregate demand, the exchange rate, import demand, and producer prices through their effect on expected inflation. This process also describes a food price shock, except that changes in international food prices would affect international oil prices in future periods. Note that in this model, the degree of endogeneity increases as the order is moved down. This may create the drawback of the recursive structure because prices can feed back to aggregate demand within a period of one quarter, the frequency of the data set. Thus, alternative orderings of variables should be estimated to check for robustness of the results.

The model is estimated for the period 1996Q1–2008Q1. In the PRC and Viet Nam, the estimation period is during 1999Q1–2008Q1 because of a lack of quarterly producer price index (PPI) and quarterly gross domestic product (GDP), respectively. For Indonesia and Malaysia, because of a lack of information on import prices, the estimation covers the period 2000Q1–2008Q1. Dubai; spot UK Brent; and the average of UK Brent, Dubai, and West Texas Intermediate are used to proxy raw oil data. Three food prices, namely wheat, rice, and palm oil, are covered in this study. Wheat price in the US Gulf Coast and rice price in Bangkok are used to proxy international wheat and rice prices, respectively. The palm oil price quoted in Malaysia is used to proxy international palm oil prices. The bilateral and NEER (trade-weight) are applied in the model to check the sensitivity of the results. The measure of import prices (measured in domestic currency) is varied among countries. In Thailand, the unit value of imports is applied, while in Korea and Singapore, the actual data of import prices are used. In India, Indonesia, and Malaysia, a deflator derived from imports of goods and services in quarterly GDP is used. It is important to note that import prices are excluded from the PRC's and Viet Nam's estimation while producer prices are also excluded from the latter because of data limitation. The exclusion of these variables may lead to the underestimation of the pass-through of external shocks into inflation in these countries.

In this study, aggregate demand is proxied by output gap, which is the gap between actual and potential output (the level of output consistent with nonaccelerating inflation). The actual

<sup>2</sup> In fact, the formation of inflationary expectations could have both backward-looking and forward-looking components (Mankiw et al. 2003 and Ball 2000). However, previous studies such as McCarthy (1999), Bhundia (2002), and Duma (2008) found that backward-looking expectations better explain domestic prices in developing Asia. In addition, we need to recognize that in developing Asia, there is a lack of reliable forward-looking indicators as those in industrial countries with well-developed financial systems.

output is real GDP while the potential output is proxied by the trend of real GDP, derived from Hodrick-Prescott Filter. Other methods, such as exponential smoothing and Kalman filter, also provide virtually identical results, but the Hodrick-Prescott filter is selected here since it has performed best in terms of both explanatory and predictable power and diagnostic tests. Potential output is an exogenous variable in the model. Therefore, changes in the output gap purely reflect movements of aggregate demand. An increase in this variable thus implies an upward pressure of aggregate demand. In particular, a value of the output gap that is greater than 1 reflects excess aggregate demand.

The oil, wheat, rice, palm oil, consumer and producer prices, bilateral exchange rate, and NEER of PRC, Malaysia, Philippines, and Singapore; the import prices of Korea, Singapore, and Thailand; and the industrial production index of the PRC are obtained from the International Monetary Fund's International Financial Statistics (IFS). Gross domestic product is from the CEIC Data Company, Ltd. database, while NEER of India, Indonesia, Korea, Thailand, and Viet Nam are obtained from country sources.

Based on the augmented Dickey-Fuller test, all variables were found to be nonstationary  $I(1)$ , with an exception of output gap ( $y$ ), which exhibits stationary  $I(0)$ . No cointegration was found between the variables with the output gap entering as stationary variable. Thus, the VAR model was estimated in first differences to avoid the spurious regression problem. The diagnostic tests, composed of AR root test (stability condition), auto correlation LM test, normality test, and White heteroskedasticity test are applied. A visual inspection of the residuals is also performed to ensure that there are no major outliers. The lag length is aided by using the lag length criteria provided by Akaike and Schwarz Information criterion and diagnostic tests.

The relative importance of cost-push versus demand-pull factors in determining producer and consumer price inflation is explored through variance decomposition, which separates the variation in endogenous variables (producer and consumer price inflation) into the component shocks in the VAR model. In order to measure pass-through coefficients, impulse response functions are applied. Impulse response functions trace out the dynamic effects on prices originating from a one-time shock to the system, and accounts for disturbances of the other endogenous variables. Thus, the pass-through coefficients of oil (food) prices are obtained by dividing the cumulative impulse responses of each price index after  $j$  months by the cumulative response of the oil price after  $j$  months to the oil (food) price shock.

#### **IV. SOURCES OF INFLATION: VARIANCE DECOMPOSITION ANALYSIS**

In this section, domestic inflation in nine developing Asian economies is decomposed into cost-push and demand-pull factors. Cost-push factors consist of international oil and food prices while the main demand-pull factors are excess aggregate demand, proxied by the output gap, and inflationary expectations, which are a function of lagged domestic inflation. Whether or not inflation is of the cost-push or demand-pull variety has vast implications for monetary policy. In the case of cost-push inflation, i.e., a situation where domestic inflation is driven by rising input costs of goods and services, a marked economic slowdown and rising unemployment is likely to accompany higher domestic inflation. Tightening monetary policy in the face of such negative supply shocks would come at a steep cost. This is because tightening reduces aggregate demand, and exacerbates economic slowdown. Therefore, the cure could be worse than the disease. In contrast, if inflation is

driven by an increase in aggregate demand beyond production capacity (i.e., demand-pull inflation), tightening monetary policy would be more effective. Tightening would reduce aggregate demand and thus dampen increases in the prices of goods and services, especially nontraded goods.

However, when inflationary expectations are taken into account, monetary policy could play an important role in containing inflationary pressure, regardless of the source of the inflationary shock. There is always a risk that inflationary expectations could get entrenched and lead to a cost-price spiral. The stagflation experience of industrialized countries in the 1970s, kicked off by a supply-side shock—the 1973–1974 oil shock—shows that this is not idle speculation but a very real risk. These observations imply that monetary policy could play a major role in curbing inflationary pressure, even in the face of a negative supply shock. In short, decomposition of domestic inflation into its sources, including inflationary expectations, would help monetary authorities to identify appropriate monetary policy responses. The effectiveness of monetary policy would be more limited if the sources of inflation are mainly external cost-push factors rather than demand-pull factors. But even then monetary policy would not be completely impotent since cost-push factors can also cause inflation expectations.

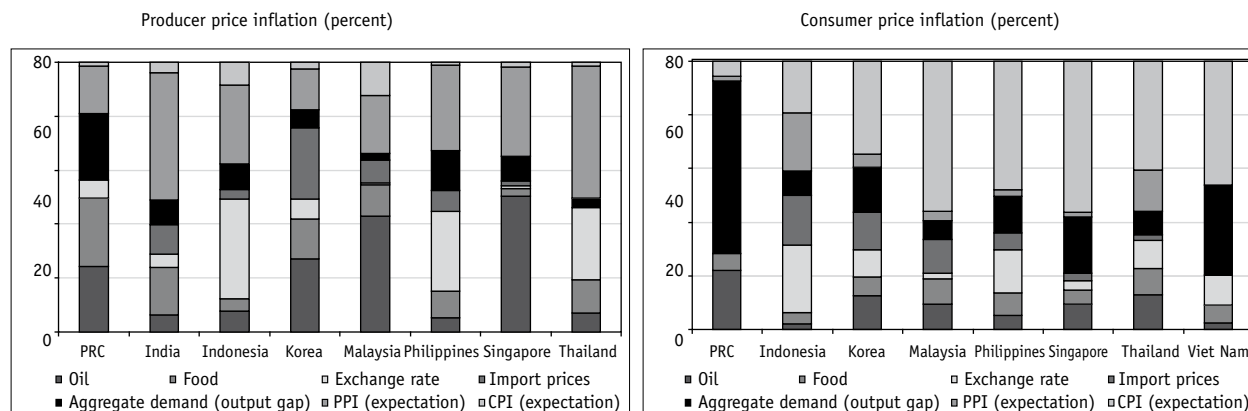
The results of the model estimation show that two factors unrelated to external price shocks, namely excess aggregate demand and inflationary expectations (represented by the appropriately lagged dependent variable—consumer price inflation), can account for much of the consumer price inflation in the nine countries. More than 60% of consumer price inflation variation in the PRC results from demand pressure, and 34% and 21% in Viet Nam and Singapore. Inflationary expectations explain more than 45% of consumer price variations in the latter two countries. For the other countries, excess aggregate demand accounts for less than 17% of consumer price inflation, but inflationary expectations account for almost 40–50%. The two nonexternal factors can thus jointly explain about 60% of consumer price inflation in the region as a whole.

External cost-push factors<sup>3</sup> appear to be more important in explaining producer price inflation than consumer price inflation (Figure 5). These factors account for about 50% of the variation in producer price inflation in the PRC, Korea, Malaysia, and Singapore. In countries where exchange rates are relatively stable (such as in Malaysia and Singapore), international oil prices account for about one half of producer price inflation. In Singapore, which has the highest oil dependency among the nine countries, oil prices explain 50%. In Indonesia, Philippines, and Thailand, the exchange rate explains much of producer price inflation. In Indonesia, the exchange rate accounts for almost 40% of producer price inflation, and 29% and 27% for Philippines and Thailand, respectively. In India, more than 50% of producer (wholesale) price inflation is explained by the two nonexternal factors, in particular inflationary expectations (using the appropriately lag of producer price inflation), while external shocks accounted for about 25%.

Overall, international price shocks account for less than 30% of total variation in consumer price inflation. As was the case for producer prices, the international oil price is the main external determinant of consumer price inflation in PRC, Korea, Singapore, and Thailand. In the PRC, oil price inflation explains 22% of consumer price inflation. Food prices are also important in explaining consumer price inflation in these countries, especially Malaysia and Thailand. Movements in the international food price index accounts for about 10% of CPI inflation in both countries. In the PRC and Singapore, food price inflation shocks explain about 5–6% of CPI inflation.

<sup>3</sup> Note that to capture the overall movements of food prices, prices of rice, wheat, and palm oil are replaced by an overall international food price index provided by IFS (downloaded June 2008).

**FIGURE 5**  
**VARIANCE DECOMPOSITIONS**



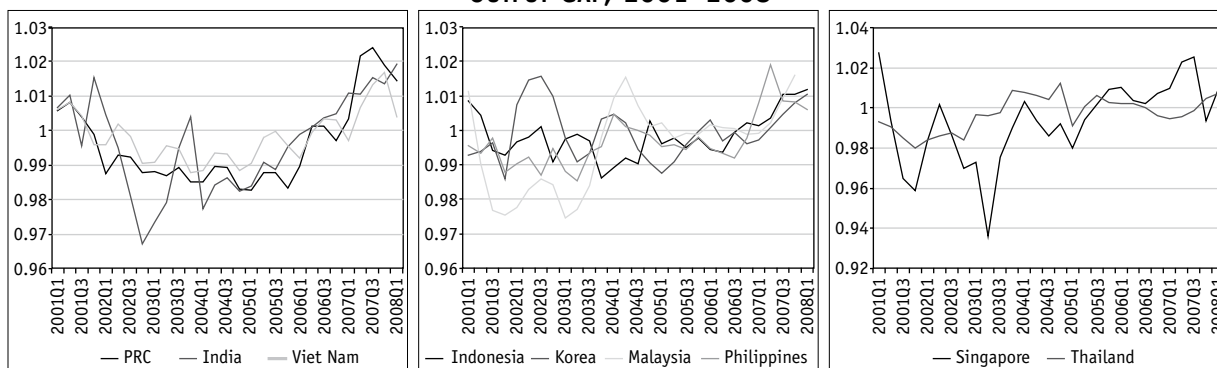
PPI = producer price index, CPI = consumer price index.  
 Source: Staff estimates.

The variance decomposition performed has amply demonstrated the importance of factors unrelated to the external price shocks, mainly excess aggregate demand and inflationary expectations, in explaining the recent surge of inflation in developing Asia. The unsustainably high output growth that has taken place between 2005 and 2007 was in part fueled by an excessively expansionary monetary policy in many developing Asian countries. Figure 6 shows that the output gap has expanded since 2005 in many countries. In the PRC and India, the ratio of actual GDP to the trend of GDP increased from 0.98 in 2005 to almost 1.02 in 2008. The fact that the ratio exceeded 1 in the two countries since 2006 suggests that aggregate demand has exceeded the rate of utilization of production capacity, which is consistent with nonaccelerating inflation. Easy monetary policy contributed to the formation of higher inflationary expectations. Demand pressure also built up in Viet Nam in 2005–2007, and the ratio still exceeded 1 in 2008Q1. This suggests that demand pressure was still responsible for inflationary pressures in Viet Nam. Aggregate demand pressure has also built up in Indonesia, Korea, Malaysia, Philippines, and Singapore since late 2006. The output gap ratio exceeded 1 in these five countries in 2006. However, in Singapore, the rise in oil and food prices caused a decline in aggregate demand in late 2007 and brought down the output gap ratio toward 1. In contrast to other countries, Thailand did not experience any significant demand pressures. This reflects the slow recovery of private investment and the overhang of political uncertainty. The ratio of actual GDP to the trend of GDP peaked in early 2005 above 1.1 but then fell back gradually to below 1 by the third quarter of 2006.

Expansionary monetary policies and sustained balance of payments surpluses leaked into domestic liquidity in many Asian countries. This helped fuel aggregate demand expansion and an increase in the output gap ratio. Figure 7 clearly shows that both nominal and real lending rates declined in the nine countries during 2001–2006. Even though countries such as PRC, India, Korea, Singapore, Thailand, and Viet Nam hiked their nominal interest rates since 2007 in response to international oil and food price hikes, real interest rates still fell due to an even higher increase in inflation. The real lending rate was negative in PRC, Singapore, Thailand, and Viet Nam in 2007–2008Q1. This indicates that monetary policy responses have lagged behind price developments. Another sign of loose monetary policy that helped stoke demand is the growth of the broad money supply (M2) in

the early part of this decade. In Viet Nam, M2 grew by around 30% while in the PRC and India, M2 grew by more than 15%. The rise in oil and food prices provoked some tightening of monetary policy more recently. Money supply growth declined in 2007–2008Q1, resulting in a decline in the output gap ratio.

**FIGURE 6**  
**OUTPUT GAP, 2001–2008**



Note: Output gap is measured by the deviation of quarterly GDP from its trend, which is derived from Hodrick-Prescott Filter.

Source: Staff estimates.

## V. PASS-THROUGH OF OIL AND FOOD PRICE SHOCKS TO ASIA'S INFLATION

The preceding section has shown that excess aggregate demand and inflationary expectations were the immediate catalysts for Asia's inflation. Nevertheless, the evidence also indicates that external factors still account for a substantial part of the region's inflation. In this context, an important issue is the extent to which two major external cost-push shocks—the recent run-up in international oil and food prices—have actually passed through to domestic prices. The higher the pass-through, the greater will be the impact of the oil and food shocks on inflation in Asia. The results that emerge from our empirical analysis of pass-through are reported and discussed below.

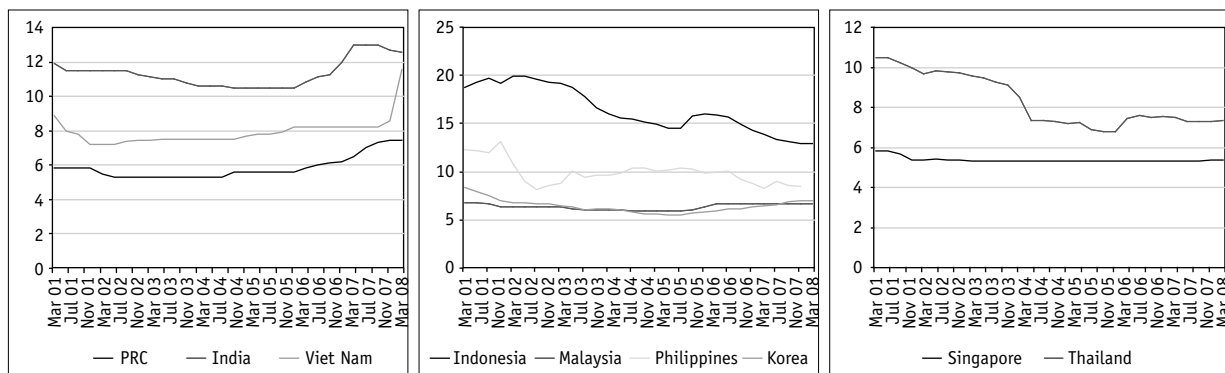
### A. Pass-through of Oil Price Shock to Domestic Prices

There are three key transmission channels through which changes in oil prices would affect domestic prices. The first is costs of production, which would increase since oil is a vital input for production of a wide range of goods and services. In particular, it is used for transportation in businesses of all types. The second is energy prices, whereby higher oil prices also cause, to varying degrees, increases in other energy prices, depending on the ability to substitute other energy sources for petroleum. Such price increases would result in higher production costs. The third is wages, where depending on the nature of the labor market, nominal wage may be adjusted according to higher inflationary expectations, adding pressure to production costs.<sup>4</sup> Our empirical analysis yields three central results.

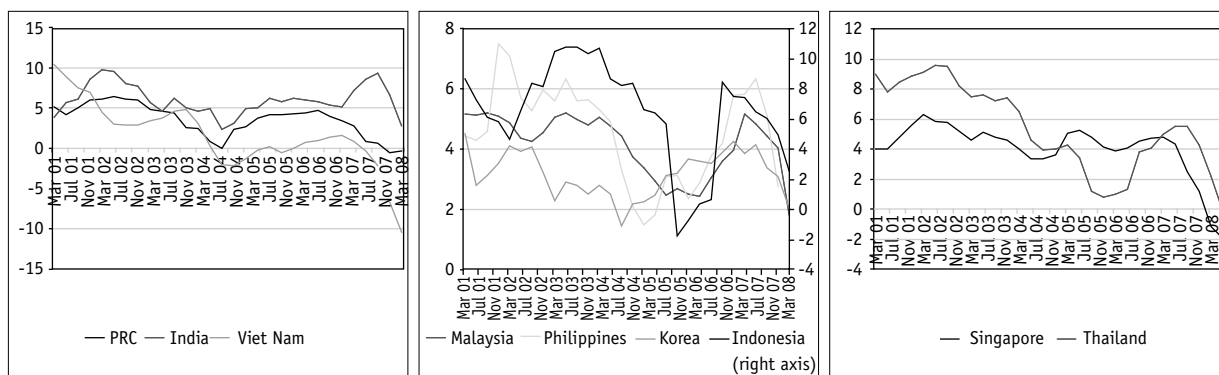
<sup>4</sup> Note that when nominal wages are inflexible, most of the macroeconomic adjustments to an oil shock would take the form of higher unemployment rather than higher inflation.

**FIGURE 7**  
**NOMINAL AND REAL INTEREST RATES AND MONEY SUPPLY GROWTH, 2001–2008 (PERCENT)**

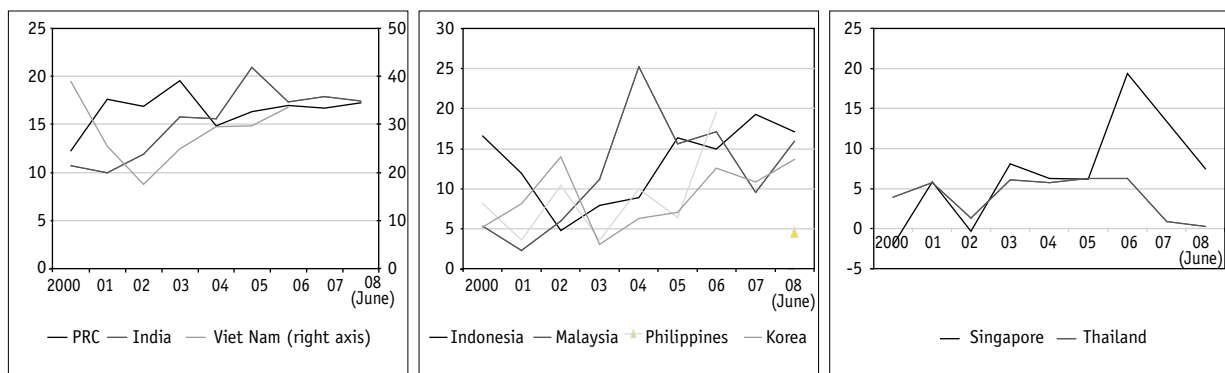
Nominal interest rate



Real interest rate



M2 Growth



Note: Nominal interest rate is lending rate while real interest rate is lending rate adjusted by consumer price inflation.

The direction of real policy rate and real lending rate is similar.

Source: CEIC Data Company, Ltd., downloaded 2 September 2008.

First, the pass-through of oil prices to producer prices tends to be higher in oil-exporting rather than oil-importing countries, reflecting the sharp increase in the opportunity cost of home oil consumption relative to export. In Malaysia, the pass-through gradually increases from 0.08% in the first quarter to reach a cumulative total of 0.15% in the fourth quarter. Cumulative pass-through refers to the total pass-through after a specified time period. For example, if the pass-through after one quarter is -0.03 and the pass-through during the second quarter is 0.08, then the cumulative pass-through after two quarters is 0.05. In Indonesia and the PRC, which produce substantial amounts of oil (Table 1), the cumulative pass-through increases to around 0.15% after a year, in response to a 1% increase in oil prices. For other oil-importing countries, the cumulative pass-through of oil prices to producer prices is around 0.07% after a year. Singapore is an exceptional case in the sense that the high pass-through to producer prices is due to high intensity of oil use in total energy consumption. While the intensity of oil use in total energy consumption was almost 90% in Singapore, it was less than 55% for all of the other countries (Table 1).

Second, the impact of crude oil price increases on domestic prices is diluted along the distribution chain. The pass-through coefficients that measure the response to oil price shocks tend to be lower for consumer prices than producer prices. The gap between these two price indices in each country depends on the ability of firms to pass higher costs onto consumers. For example, in the face of intense market competition, private producers may cut their profit margins instead of immediately charging higher prices to consumers. Government policy measures, i.e., fuel subsidies, electricity subsidies, and other policies such as administered price policy designed to control living costs, reduce or delay the pass-through of oil price increases to consumer price inflation. Figure 8 shows that the gap between pass-through to producer prices and pass-through to consumer prices is rather narrow in the Philippines and Thailand, compared to the other countries.

Third, the degree of oil price pass-through to consumer prices is higher for countries with limited fuel subsidies. Within a group of four countries with comparable energy efficiency levels, pass-through to consumer prices is higher in the Philippines and Thailand (about 0.04% after a year) than in Malaysia and Indonesia (less than 0.02%). Although the level of energy efficiency is relatively low in the PRC, India, and Viet Nam (total energy consumption to GDP in 2005 was 30% in the PRC and around 20% in India and Viet Nam) fuel price subsidies limit the impact of oil price increases on consumer prices. In the PRC, the pass-through to consumer prices is negative after two quarters, and turns slightly positive in the third and fourth quarters. This reveals that controls and government intervention in decisions on pricing may have cushioned the consumers from the full burden of rising fuel costs. Similarly, in India and Viet Nam, the pass-through coefficient is negative in the first quarters but turns slightly positive after 1 year. Korea is an exceptional case in the sense that the low pass-through to consumer prices is due to superior energy efficiency (i.e., total energy consumption to GDP in 2005 was 11%) rather than fuel subsidies.



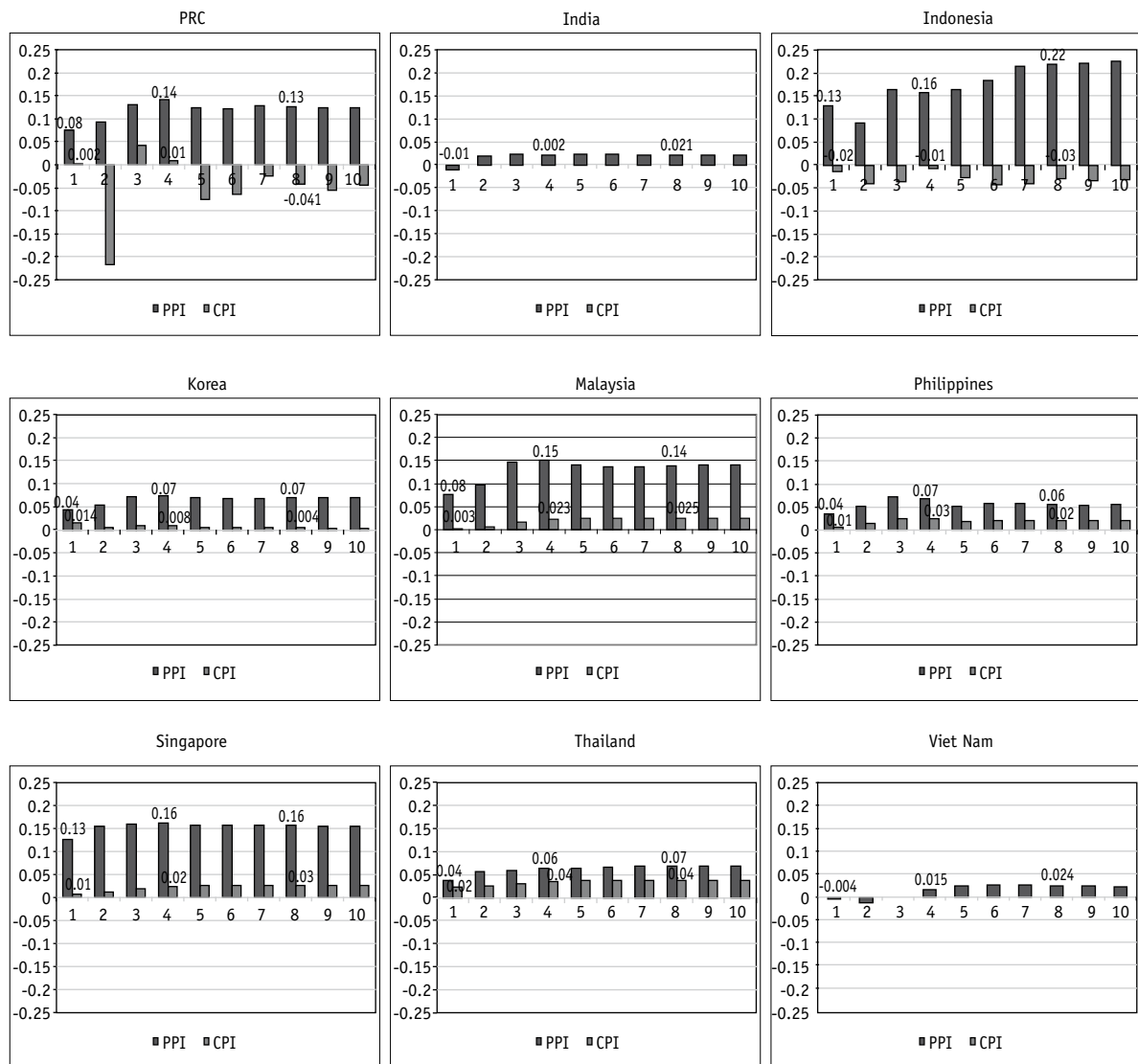
TABLE 1  
OIL DEPENDENCY AND ENERGY EFFICIENCY FOR SELECTED ECONOMIES,  
1995, 2003, AND 2005

REGION/COUNTRY	OIL SELF-SUFFICIENCY			INTENSITY OF OIL USE (PERCENT)			ENERGY EFFICIENCY		
	1995	2003	2005	1995	2003	2005	1995	2003	2005
<b>United States</b>	-0.6	-0.7	-0.8	37.8	39.5	40.1	12.4	9.0	8.1
<b>Euro Zone</b>	<b>-0.6</b>	<b>-0.6</b>	<b>-0.6</b>	<b>43.5</b>	<b>41.3</b>	<b>40.8</b>	<b>6.9</b>	<b>6.2</b>	<b>5.3</b>
<b>Japan</b>	-1.0	-1.0	-1.0	55.7	49.8	48.2	3.9	5.2	5.0
<b>East Asia* excluding Japan</b>	<b>-0.1</b>	<b>-0.4</b>	<b>-0.5</b>	<b>26.0</b>	<b>24.3</b>	<b>23.7</b>	<b>47.9</b>	<b>30.9</b>	<b>29.9</b>
PRC	-0.1	-0.4	-0.5	20.1	22.6	20.5	47.9	30.9	29.9
Hong Kong, China	-1.0	-1.0	-1.0	62.7	61.4	60.2	4.4	6.0	5.8
Korea, Rep. of	-1.0	-1.0	-1.0	66.0	51.6	48.6	12.3	14.3	11.7
Taipei, China	-1.0	-1.0	-1.0	54.5	46.2	45.0	10.5	13.8	12.6
<b>Southeast Asia*</b>	<b>0.0</b>	<b>-0.2</b>	<b>-0.3</b>	<b>57.7</b>	<b>49.0</b>	<b>47.8</b>	<b>15.1</b>	<b>20.7</b>	<b>18.4</b>
Indonesia	0.9	0.0	-0.2	51.8	50.4	48.9	16.1	20.0	18.7
Malaysia	0.7	0.5	0.3	56.4	39.9	39.7	16.5	23.3	18.6
Philippines	-1.0	-1.0	-0.9	72.1	54.4	52.5	13.0	15.8	13.5
Singapore	-1.0	-1.0	-1.0	95.3	88.3	87.9	14.1	18.2	17.3
Thailand	-0.9	-0.8	-0.8	67.2	53.2	52.8	12.6	22.6	20.6
Viet Nam	0.8	0.6	0.5	9.4	13.8	14.6	24.5	24.7	23.1
<b>South Asia*</b>	<b>-0.6</b>	<b>-0.7</b>	<b>-0.8</b>	<b>30.6</b>	<b>34.5</b>	<b>31.5</b>	<b>28.8</b>	<b>22.4</b>	<b>19.2</b>
India	-0.6	-0.7	-0.7	28.7	33.7	30.8	32.1	23.7	20.1
Sri Lanka	-1.0	-1.0	-1.0	68.9	81.9	82.6	11.2	11.0	9.0
<b>Pacific*</b>	<b>2.5</b>	<b>0.2</b>	<b>2.1</b>	<b>77.0</b>	<b>80.5</b>	<b>81.6</b>	<b>10.3</b>	<b>15.8</b>	<b>11.7</b>
<b>Central Asia*</b>	<b>0.0</b>	<b>1.5</b>	<b>1.8</b>	<b>28.7</b>	<b>20.8</b>	<b>19.8</b>	<b>118.6</b>	<b>99.4</b>	<b>67.2</b>
<b>World</b>	<b>-0.1</b>	<b>-0.1</b>	<b>-0.1</b>	<b>39.0</b>	<b>37.7</b>	<b>36.6</b>	<b>12.3</b>	<b>11.5</b>	<b>10.3</b>

Note: The oil self-sufficiency index is oil production less consumption, divided by consumption; a positive number indicates some degree of self-sufficiency. If there is no domestic oil production, the index is equal to -1. Intensity of oil use in energy consumption is petroleum consumption divided by total energy consumption. Energy intensity of GDP is total energy consumption in (1,000) British thermal units per \$1 of GDP (in 2000 prices).

Source: *International Energy Annual 2003* (Energy Information Administration 2005).

**FIGURE 8**  
**CUMULATIVE COEFFICIENTS OF OIL PRICE PASS-THROUGH (PERCENT)**



PPI = producer price index, CPI = consumer price index.

Note: The Y-axis reflects pass-through coefficients, obtained by dividing the cumulative impulse responses of each price index after  $j$  months by the cumulative response of the oil price after  $j$  months of the oil price shock. This could be interpreted as the percentage change in domestic prices (producer and consumer), resulting from a percentage change in oil prices. X-axis is the time period, which is on a quarterly basis in the study.

Source: Staff estimates.

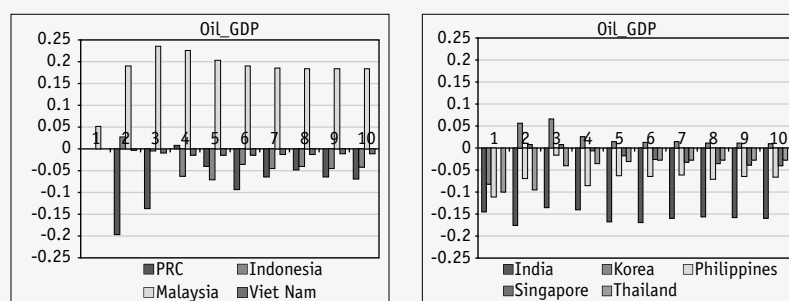
### Box 1 GROWTH IMPACT OF OIL PRICE SHOCK

High oil prices have adversely affected economic growth in Korea, Singapore, Philippines, and Thailand, with pronounced impact in the two latter countries. In these two countries, a 1% rise in oil prices is associated with 0.1% decline in real GDP in the first quarter, compared to a negligible effect in Singapore (Figure 5). The pass-through of oil price shock in the Philippines and Thailand is complete after 1 year, with the negative impact declining to 0.07% and 0.04%, respectively, in response to a 1% increase in oil prices. In Singapore, the pass-through of oil price shocks to real GDP is relatively low and takes almost 2 years to complete. The negative impact, which appears in the fourth quarter, is only around 0.01% and increases to 0.04% in the second year. In Korea, the economy adjusts quickly. The pass-through coefficient is  $-0.08$  in the first quarter, and becomes negligible in the first and second year. The relatively low negative impact of oil price increases on Korea and Singapore is due to high levels of oil and energy efficiency (Table 1).

The economies of the PRC and India slow down somewhat in response to higher oil prices. In India, real GDP declines by almost 0.15% in response to a 1% increase in oil prices. Such negative pass-through effect is complete within 2 years, with a negative coefficient of 0.16. The negative effects of oil price rises on the PRC are comparable to those in India in the second and third quarters. However, due to the lower level of oil self-sufficiency in both countries, the negative pass-through effects tend to be diluted more quickly (Table 1).

As a net oil-exporting country, oil price increases appear to have an immediate and positive impact on GDP growth in Malaysia. The pass-through coefficient to real GDP is 0.05 in the first quarter and accelerates to 0.2 in the second quarter. The effects tend to be complete after six quarters and the pass-through coefficient is 0.18. In contrast to Malaysia, in Viet Nam, the impact of oil price rises on GDP seems negligible. The relatively high level of energy dependency limits the positive impact of oil price increase to GDP. Real GDP in Indonesia tends to increase only in the second quarter by 0.03% but the pass-through becomes negative after the third quarter onward due to high levels of oil imports. Indonesian oil self-sufficiency has declined significantly over the past decade, and since 2004 the country has become a net oil importer (in 2007, net oil imports accounted for 2.2% of GDP).

**BOX FIGURE 1**  
**CUMULATIVE IMPACTS OF OIL PRICE SHOCK TO GDP**



Note: Since potential output measured as the trend of real GDP and is kept as an exogenous variable in the model, changes in the output reflects changes in aggregate demand (i.e., real GDP).

Source: Staff estimates.

## B. Pass-through of Food Price Shock to Domestic Prices

This subsection examines the impact of the global food price shock on domestic prices in the nine Asian countries. Food is not a homogeneous product so we analyze three specific food products that are particularly important for the region, namely rice, wheat and palm oil. Three key results emerge from our empirical analysis.

First, the pass-through to producer prices is higher in food-exporting countries than in food-importing countries. The higher pass-through will provide farmers in those countries with incentives to expand their production. This result is consistent with the findings of the special chapter in *Asian Development Outlook Update 2008* (ADB 2008b), which finds a substantial degree of transmission from world food prices (rice in particular) to domestic food prices. Among rice-exporting countries, namely, Thailand (35% of global rice exports), India (17%), and PRC (3%), producer prices increase by a cumulative total of 0.02–0.06% after 1 year in response to a 1% rise in the world rice price. In contrast, the pass-through coefficients are negative for Indonesia, Philippines, and Singapore. The pass-through of palm oil prices to producer prices is higher in Indonesia and Malaysia than in the other countries. In Indonesia, producer prices rise by 0.08% in the first quarter and rise by a cumulative total of 0.2% after 1 year. In Malaysia, producer prices rise by 0.02% in the first quarter and a cumulative total of 0.04% after 1 year. For the other countries, producer prices increase by less than 0.03% after 1 year in response to a 1% rise in palm oil prices. The pass-through of wheat prices in India, a net wheat exporter, is an exception. The pass-through is limited as a result of government subsidies. Note that a slight decline of the pass-through to producer prices in many countries results from a supply response to food price increases.

Second, palm oil pass-through coefficients tend to reflect the low share of vegetable oils in the consumption basket,<sup>5</sup> and the pass-through coefficients to consumer prices for palm oil tend to be lower than for rice or wheat. The exceptions are the PRC and India, where wheat has a lower pass-through. The average per capita consumption of palm oil and vegetable oils among the nine countries was 3.2 kg and 9.5 kg, respectively, compared to 39 kg for wheat and 102 kg for rice (Table 2). In Viet Nam, for example, the cumulative pass-through of rice prices to consumer prices is 0.08% after 1 year, compared to 0.02% for wheat and 0.01% for palm oil. In Thailand, the cumulative pass-through of palm oil, wheat, and rice prices to consumer prices after 1 year are 0.002%, 0.01%, and 0.07%, respectively.

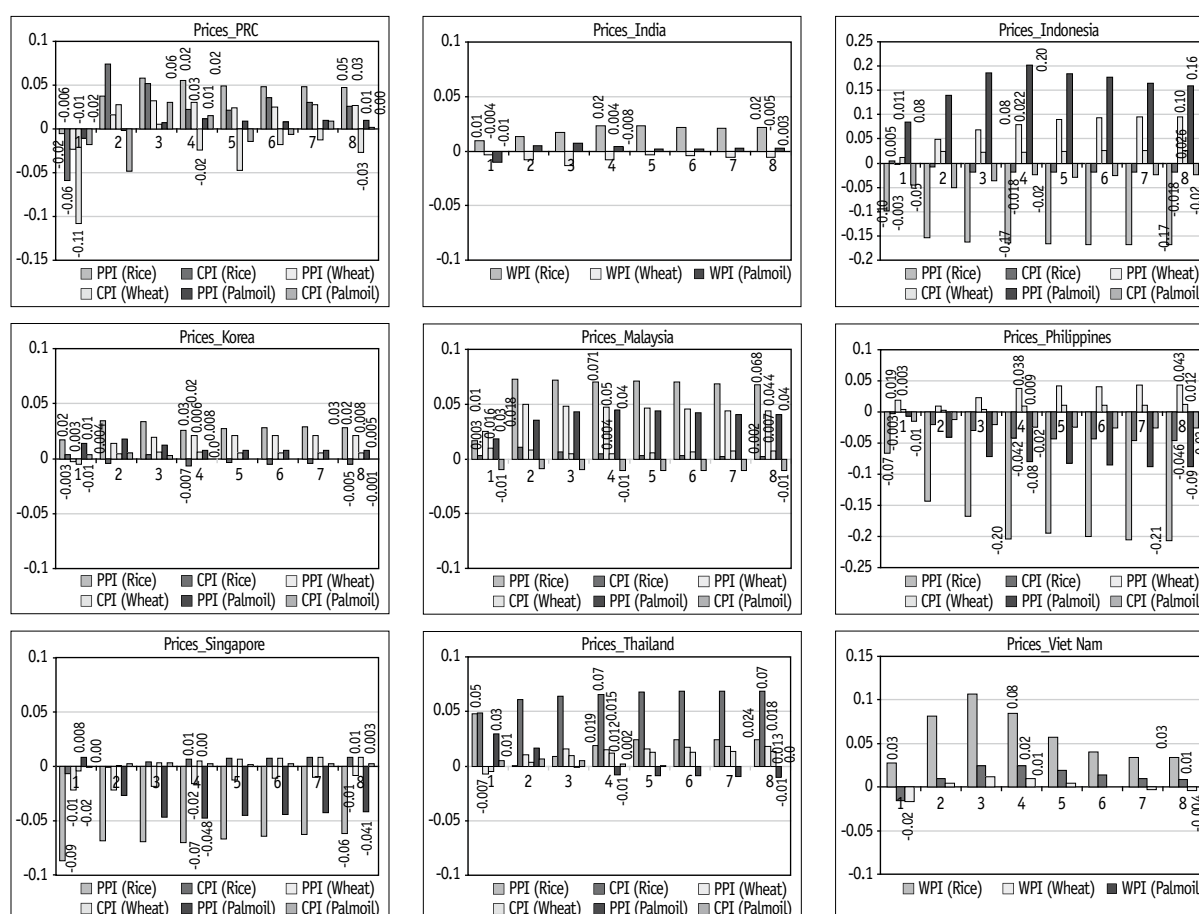
Third, food subsidies limit the degree of pass-through to consumer prices in many Asian countries. While the per capita rice consumption of the Philippines and Indonesia is relatively high at 110 kg and 141 kg, respectively, which is comparable to PRC, Thailand, and Viet Nam (Table 2), high subsidy levels limit the pass-through.<sup>6</sup> The pass-through coefficient is also negative or very low for Korea and Malaysia. This is a result of both a small share of rice in the consumption basket and some rice subsidies. For wheat, there is negative pass-through to wholesale prices in India and a very limited pass-through to consumer prices in Malaysia. Since the two countries are relatively heavy wheat consumers (i.e., more than 60 kg/capita), it is likely that the limited pass-through is largely due to government policies that impede the adjustment of domestic prices to international

<sup>5</sup> Note that the share of food expenditure in the consumption basket in the CPI is a better indicator in explaining the degree of food pass-through to domestic prices. However, with data limitations, this study uses consumption per capita to proxy the importance of each food product in the consumption basket.

<sup>6</sup> See Special Report—Food Prices and Inflation in Developing Asia: Is Poverty Reduction Coming to an End? (ADB 2008a).

wheat price rises. In Indonesia and Malaysia, government policies such as export taxes and price controls on cooking oils limit the pass-through of palm oil prices to consumer prices. The per capita consumption of palm oil in these two countries was around 6–8 kg, which is higher than the average of 3.2 kg for the nine Asian countries.

**FIGURE 9**  
**CUMULATIVE COEFFICIENTS OF FOOD PRICE PASS-THROUGH (PERCENT)**



Note: X- and Y-axis are the same as Figure 8.  
 Source: Staff estimates.

**TABLE 2**  
**CONSUMPTION PER CAPITA OF KEY AGRICULTURE PRODUCTS FOR SELECTED COUNTRIES, 1995–2003**

	WHEAT			RICE			PALM OIL		
	1995	2000	2003	1995	2000	2003	1995	2000	2003
PRC	79.3	74.1	61.4	91.3	87.6	78.5	1.1	1.0	1.5
India	63.6	57.2	63.6	80.7	74.7	71.1	0.8	3.1	3.4
Indonesia	21.3	19.4	17.3	146.5	148.9	141.1	7.1	7.7	7.9
Korea	48.7	52.9	48.4	95.3	87.8	77.7	1.2	1.9	2.7
Malaysia	65.6	35.6	65.6	86.8	86.1	70.8	7.5	6.1	6.2
Philippines	31.5	27.0	29.7	94.3	106.4	110.6	0.8	1.6	1.0
Singapore	-	-	-	-	-	-	-	-	-
Thailand	9.2	10.5	11.5	105.6	106.3	104.4	2.5	2.7	2.6
Viet Nam	6.0	8.1	10.1	163.0	169.6	169.1	0.0	0.0	0.0
Asia	69.2	66.4	63.5	87.1	84.3	79.4	1.7	2.3	2.7
Latin America	51.5	49.0	52.5	22.8	26.2	26.0	1.5	1.6	1.9
Developing countries	62.3	60.2	58.6	71.4	69.4	65.7	1.9	2.3	2.7
World	71.0	68.4	67.0	57.6	56.8	54.2	1.6	2.0	2.2

- data not available.

Source: Food and Agriculture Organization website (available: <http://faostat.fao.org/site/502/DesktopDefault.aspx?PageID=502>).

**Box 2**  
**GROWTH IMPACT OF FOOD PRICE SHOCK**

Being rice exporters, PRC, India, Thailand, and Viet Nam would experience increases in real GDP as a result of higher rice prices. In Thailand, a major global exporter, real GDP would increase by 0.24% after a year. A lower response of producer (wholesale) price in India and Viet Nam would result in a lower increase in real GDP. In contrast, rice-importing countries suffer negative effects on their real GDP. The real GDP of Malaysia, a major importer, would decline more than other countries to 0.13% after a year, compared to less than 0.07% in other countries. Interestingly, Korea experiences a positive impact on its real GDP. This is due to a very low level of net imports, with even net exports in some years.

As a net wheat exporter, India would experience increases in real GDP in response to higher wheat prices, and the coefficient tends to be higher than the coefficient for higher rice prices. Real GDP would increase by 0.08% after a year. The price of wheat is highly correlated with the price of other cereals, particularly maize.<sup>1</sup> As a result, higher wheat prices also have a positive impact on the real GDP of some maize-exporting countries such as the PRC and Thailand. In these two countries, real GDP gradually increases by almost 0.15% after 1 year. In Indonesia, Malaysia, Philippines, and Viet Nam, real GDP tends to decline in the first and second quarters before increasing slightly in response to producer price increases. In Singapore, real GDP falls by 0.1% after 1 year in response to higher wheat and maize prices. This is a larger negative impact than in any other country.

Being major global exporters of palm oil, Indonesia and Malaysia experience increases in real GDP as a result of higher prices. Real GDP tends to increase higher in Indonesia due to faster adjustment of producer prices. After one year, real GDP in Indonesia rises by 0.05%, compared to 0.02% in Malaysia. Thailand, which is also a net exporter, sees its real GDP slightly increase in the first and second quarter. In India, due to relatively high consumption per capita of palm oil (3.5 kg/capita) and vegetable oils (9.9 kg/capita), real GDP declines by almost 0.15% after one year.<sup>2</sup>

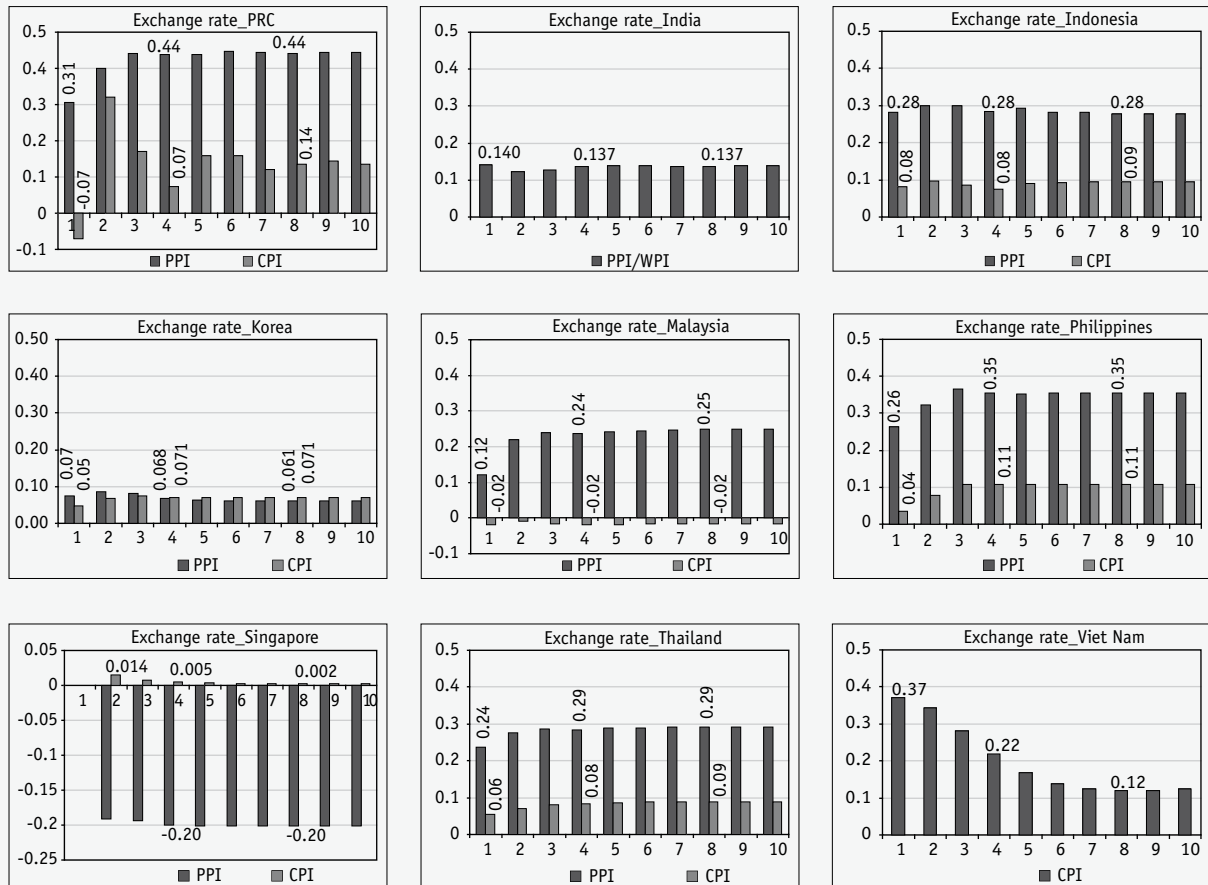
*continued.*

<sup>1</sup> During 1995M1–2008M4, the correlation coefficient between world wheat and maize was almost 0.9.

<sup>2</sup> Data on consumption (kilograms) of agriculture products per capita is not available for Singapore, but with Singapore having no agriculture production base, the negative impact of agriculture price rises tends to be higher there than in other countries.

Box 2. *continued.*

**BOX FIGURE 2**  
**CUMULATIVE IMPACTS OF FOOD PRICE SHOCK TO GDP**



Note: Potential output, measured as the trend of real GDP, is kept as an exogenous variable in the model, hence changes in the output reflects changes in aggregate demand (real GDP).

Source: Staff estimates.



**Box 3**  
**PASS-THROUGH OF EXCHANGE RATES TO DOMESTIC PRICES**

Since the exchange rate has important implications for monetary policy, the degree of exchange rate pass-through to domestic prices in nine developing Asian countries is examined here. In the VAR model, exchange rate shock is assumed to enter into the model as an exogenous variable in the first period (when there is a depreciation of the US dollar) but in the following periods, it is allowed to interact with other variables endogenously. In other words, changes in domestic demand and domestic prices would influence movements of the exchange rate in the following periods.

The estimation result shows that the exchange rate pass-through<sup>1</sup> is higher than the pass-through of oil and food shocks for both producer and consumer prices. This is probably because the exchange rate affects all import prices. As was the case for fuel and food prices, the pass-through to producer prices is higher than consumer prices. There are two key channels through which the exchange rate affects producer and consumer prices. First, the exchange rate affects the cost of imported inputs and finished products and thus the overall price level of tradables. The second, indirect effect would occur through changes in domestic demand or via changes in inflation expectations of wage bargainers and price setters.

The pass-through coefficients of producer prices are comparable in Indonesia, Malaysia, and Thailand but the speed of the pass-through is faster in the former than the latter two countries (Box Figure 3). A 1% depreciation of the exchange rate leads to a 0.12% increase in producer prices in Malaysia in the first quarter, while producer prices rise by 0.24% and 0.28% in Thailand and Indonesia, respectively. After 1 year, the exchange rate pass-through is around 0.25–0.30% in these three countries. However, in terms of consumer prices, the pass-through is comparable in Thailand and Indonesia (0.08% over a year), but turns out to be negative in Malaysia.

Korea and India show a low degree of exchange rate pass-through, but a faster speed of adjustment. For producer prices, the exchange rate pass-through is complete in the first quarter, with coefficients of 0.07 in Korea and 0.14 in India. For consumer prices, the pass-through is complete after three quarters, with coefficient of 0.07 in Korea. Singapore is an exceptional country with negative pass-through to producer prices and a very low degree of pass-through to consumer prices.<sup>2</sup>

For the PRC, Philippines, and Viet Nam, the pass-through coefficients of both producer and consumer prices are higher than the above countries. After 1 year, producer prices increase by 0.44% and 0.36% in the PRC and Philippines, respectively. Consumer prices in the PRC increase by 0.07% after a year, and 0.22% in Viet Nam. The pass-through to consumer prices is lower in Philippines than in the other two countries.

*continued.*

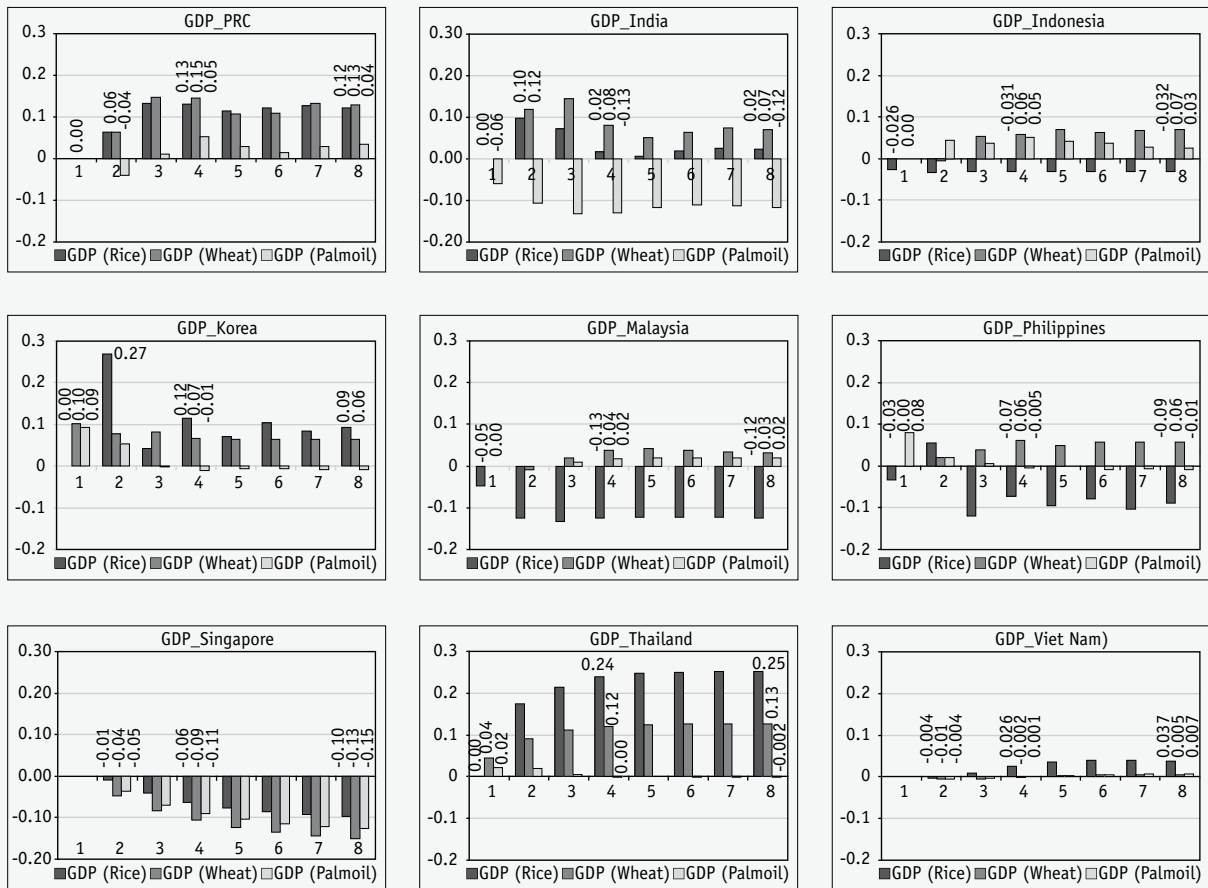
<sup>1</sup> This result is based on the nominal effective exchange rate.

<sup>2</sup> The result is insensitive to exchange rate chosen (bilateral or nominal effective exchange rate).

Box 3. *continued.*

The results of this study are comparable to those of other studies. For example, Choudhri and Hakura (2001)<sup>3</sup> find the negative pass-through in Singapore (−0.13 for 1 year) in response to a 1% depreciation of the exchange rate, and a very low pass-through in Malaysia (0.05). Hausman et al. (2000) found a low exchange rate pass-through in Singapore (0.02), Thailand (0.03), and India (0.07), but a relatively high pass-through in the PRC (0.3), Indonesia (0.4), and Philippines (0.35).

**BOX FIGURE 3**  
**CUMULATIVE COEFFICIENTS OF EXCHANGE RATE PASS-THROUGH**



Note: X- and Y-axis are the same as Figure 8.  
Source: Staff estimates.

<sup>3</sup> Choudhri and Hakura (2001) apply the first difference of log-linear relationship between consumer prices, lag consumer price, nominal effective exchange rate, and foreign prices. Hausman et al. (2000) apply the error correction model to estimate the same relationship as Choudhri and Hakura (2001) for selected developed and developing countries during 1990–1999.

## **VI. CONCLUSION AND POLICY INFERENCES**

The central finding emerging from the empirical analysis of this paper is that developing Asia's current inflation surge is largely due to two factors unrelated to the external oil and food price shocks, namely excess aggregate demand and inflationary expectations. This finding stands in sharp contrast to the prevailing misconception that the region's rising inflation is beyond the control of monetary policy, because it is mostly the result of the recent global food and oil price shocks. The popularity of this view is partly due to the almost perfect coincidence of the spike in commodity prices and the spike in Asia's inflation. This provides regional policymakers with an excuse for not raising interest rates since monetary tightening tends to be much less effective against cost-push inflation as opposed to demand-pull inflation.

The specific evidence that our analysis yields is that external food and oil price shocks explain less than 30% of Asia's CPI inflation, while excess aggregate demand and inflationary expectations account for about 60%. At a minimum, such evidence implies that the region's current inflation is not entirely due to outside forces beyond the region's control. In light of the stylized facts of Asia's recent macroeconomic performance, i.e., years of uninterrupted rapid growth, it should come as no surprise that excess aggregated demand plays a role in the region's soaring inflation. The importance of overheating demand as a source of inflation is especially evident in the PRC. The recent evolution of the output gap indicates that excess aggregate demand has in fact been growing in many countries in the region. The influential role played by inflationary expectations in Asian inflation should also come as no surprise. Years of lax monetary policies by Asian central banks helped stoke aggregate demand and fueled inflationary pressures. The generally accommodative stance of monetary policy has given rise to widespread expectations of higher prices.

Our econometric analysis of the pass-through of global food and oil prices to domestic prices indicate that subsidies have limited the extent of pass-through in many countries. Nevertheless, there is a clear regionwide trend toward the reduction of subsidies, largely due to the fiscally unsustainable costs of subsidies in light of high international market prices. Those costs will eventually force those countries that still retain substantial subsidies to align their food and fuel prices more closely with international prices. Such prospective reduction of subsidies will significantly exacerbate inflation in many Asian countries. Our finding that the pass-through of external price shocks has been substantially greater for producer prices than consumer prices also implies greater pass-through in the coming months. Producers tend to pass on higher input costs to consumers only after a time lag. Therefore, both subsidy reduction and greater pass-through of producer costs to consumer prices imply that cost-push inflationary pressures are set to intensify throughout Asia in the near future.

Our central finding, that excess aggregate demand and inflationary expectations are at least as important as external shocks as sources of Asian inflation, has vast implications for monetary policy in the region. In particular, it means that monetary tightening will continue to be a powerful tool for fighting inflation in Asia. Since domestic demand contributes substantially to aggregate demand and hence inflation, especially in the PRC, higher interest rates and other monetary contraction measures can exert their usual anti-inflationary effect by cooling down demand. Monetary policy can also have a more direct and immediate impact on inflationary expectations, which are to a large degree shaped by the basic stance of monetary policy. The prospects of greater cost-push inflationary pressures in the near future further strengthen the case for firmly anchoring inflationary expectations through preemptive and decisive tightening of monetary policy.

Effectiveness of monetary policy also depends on exchange rate policy. The movement of exchange rate must be in line with tightening monetary policy, i.e., the exchange rate should be allowed to appreciate to reduce the domestic cost of imports. Intervention in foreign exchange market to keep the exchange rate undervalued would limit the effectiveness of tightening monetary policy in anchoring inflation expectations and clipping inflationary pressures, especially in countries where the pass-through of exchange rate movements to domestic prices is relatively high.

Monetary tightening, while urgently needed to contain inflation before it gets out of control, is not without significant risks. In particular, the G3 slowdown will have adverse repercussions for the export and growth performance of developing Asia. Therefore, there is a downside risk that monetary policy may reinforce a contraction even after demand had already begun to slacken. However, it is important not to exaggerate those risks. The more urgent priority for monetary authorities right now is to contain inflationary expectations rather than curb domestic demand. The region's growth prospects remain fundamentally strong even after fully factoring in the G3 slowdown. Therefore, such risks do not diminish or compromise the broader policy message that jumps out from this paper, which is that there has to be a reshifting of the basic monetary policy stance toward tightening throughout developing Asia. For far too long, Asian monetary policy has been lax and accommodative of excessive aggregate demand.

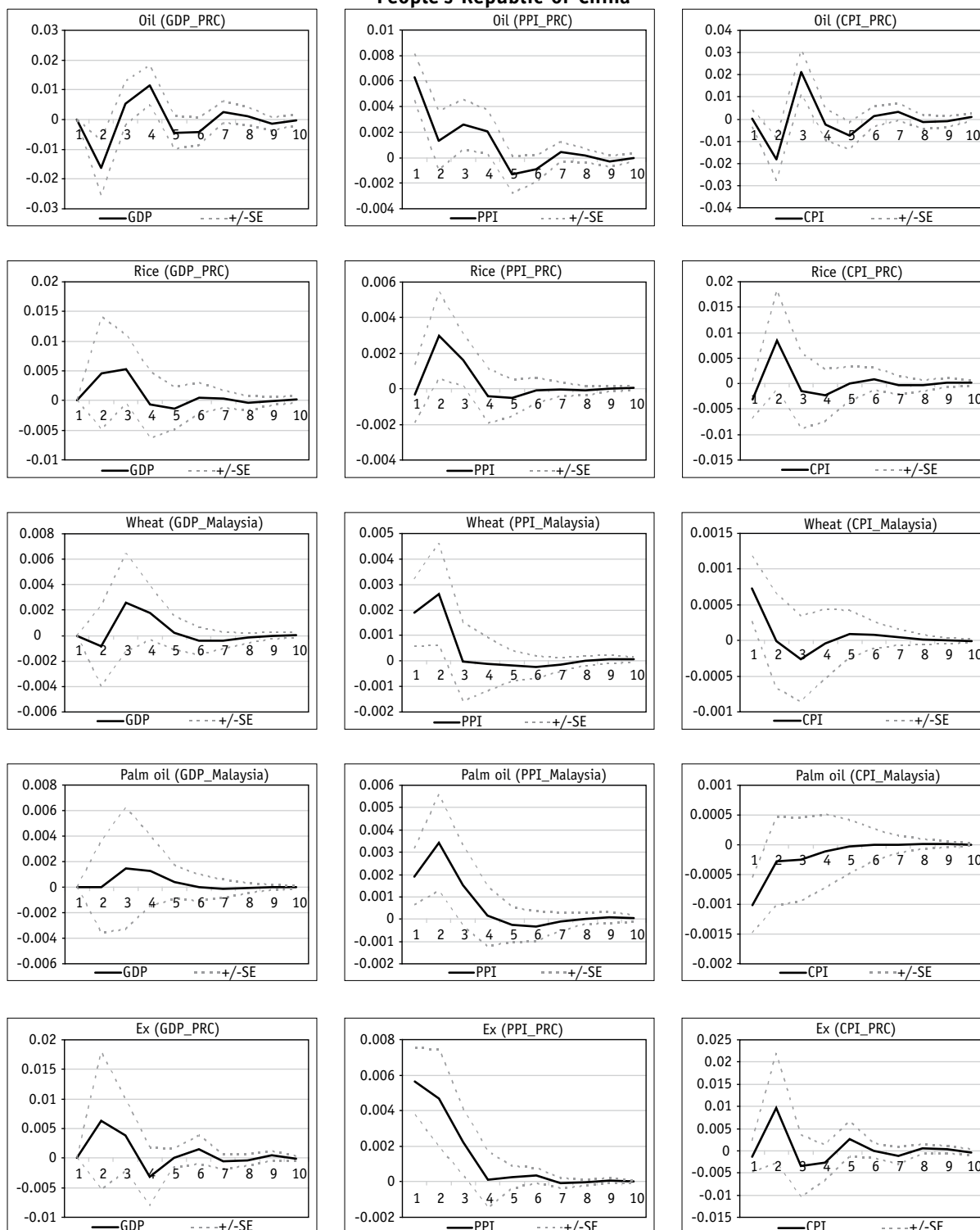
One big reason for this is that since the end of the Asian crisis, priority has been to boost economic growth, all the more so since the region did not face an inflation problem. Loose monetary policy has fueled the backward-looking inflation expectations that our analysis found to be such an important source of Asia's inflation. Looking ahead, monetary policy accommodative of the food and oil price shocks will give rise to forward-looking inflation expectations that will reinforce the already high backward-looking inflation expectations. This truly frightening prospect gives the region's central banks every reason to wake up to the importance of subduing inflation before it becomes entrenched and inflicts lasting damage on the economy.

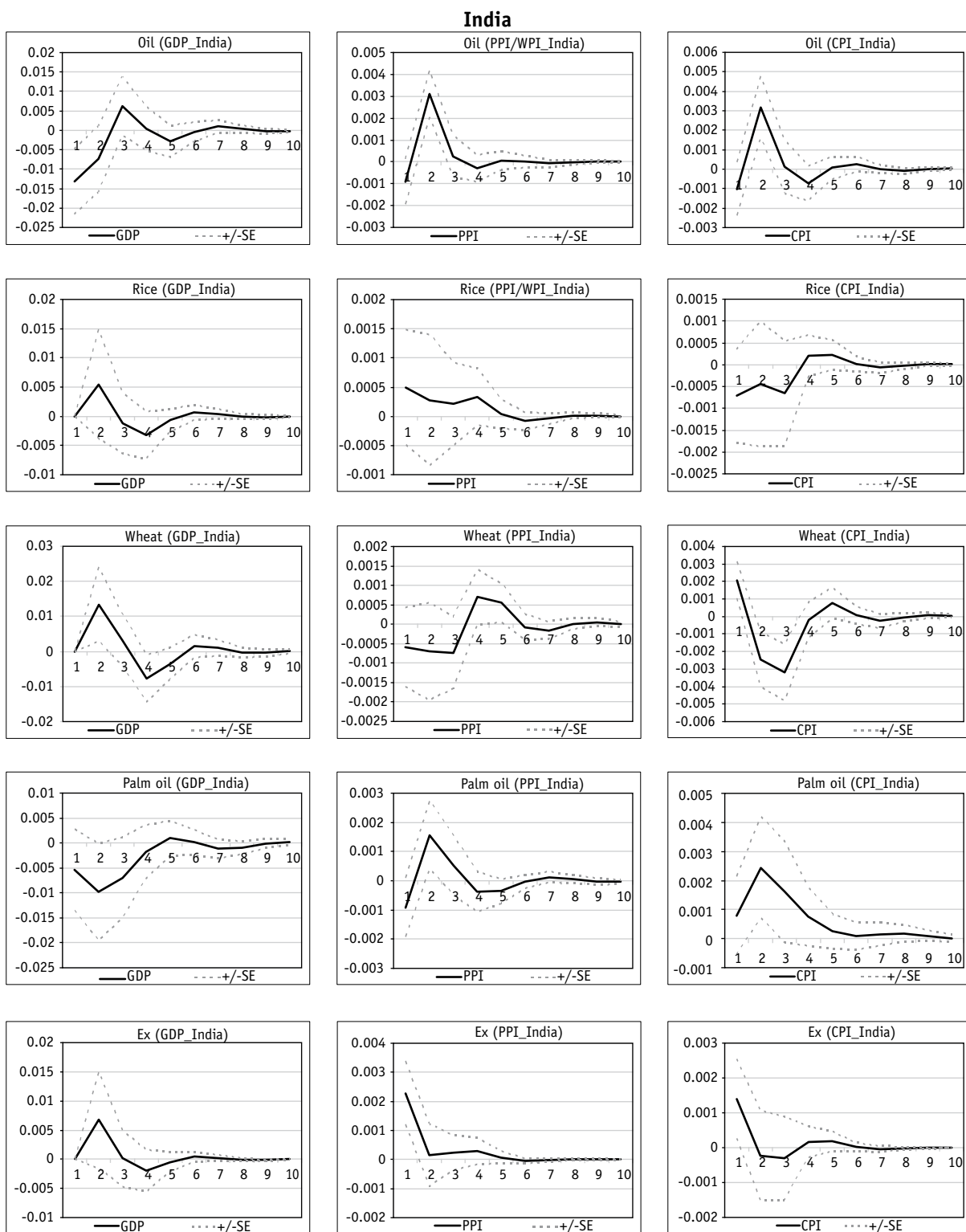
In truth, the growth tradeoff facing Asian central banks today is an unusually favorable one. This is because the growth prospects of developing Asia remain fundamentally robust. The loss of output due to anti-inflationary tightening will somewhat dent the region's growth but is unlikely to push the region into recession. Central banks may come to rue not acting today as a rare missed opportunity to fight inflation at a manageable cost. However, given the enormous desire for growth in Asia, it would still take a great deal of political courage to decisively tighten policy. Finally, our central finding that external factors can at best account for only part of Asia's inflation should temper the collective regional tendency to blame uncontrollable outside forces and use them as an excuse for inaction. Instead the region should view the homegrown nature of its inflation as an opportunity for effective action against a serious but controllable problem.

## APPENDIX

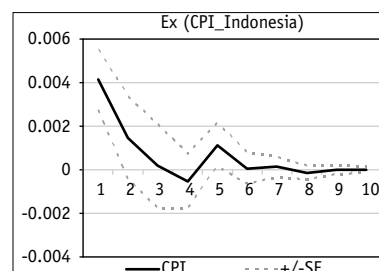
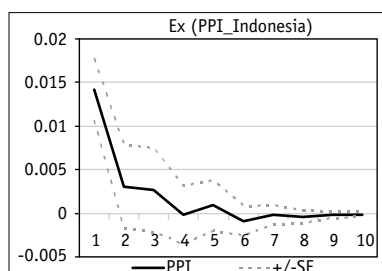
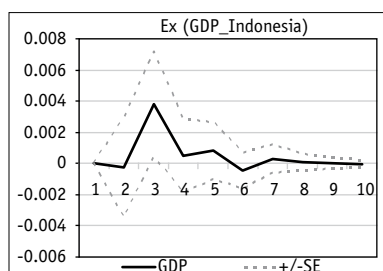
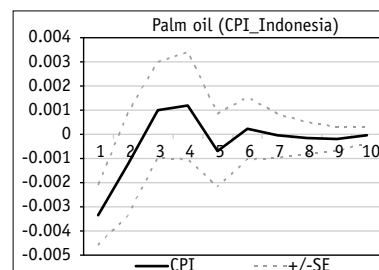
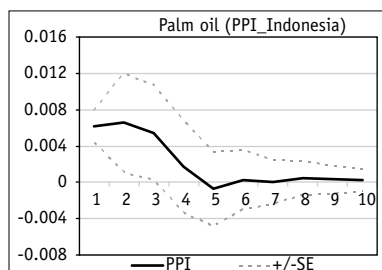
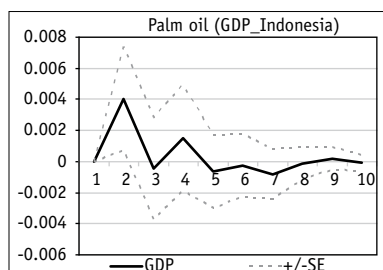
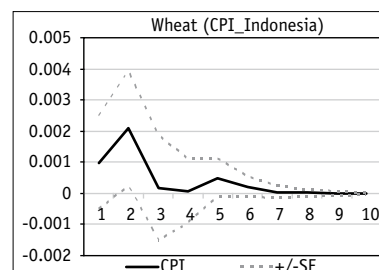
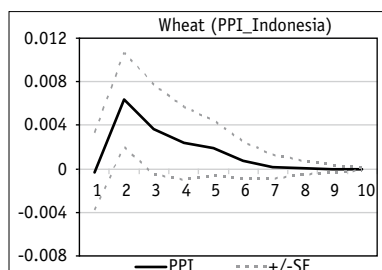
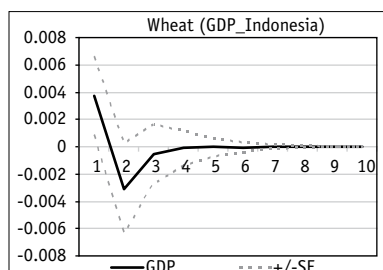
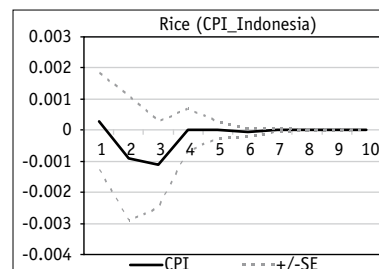
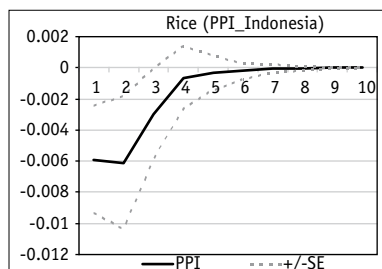
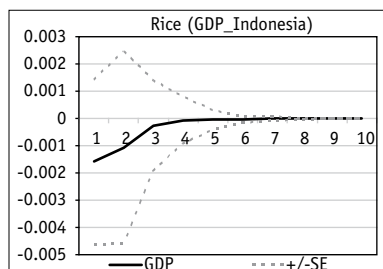
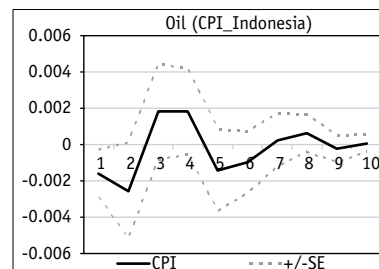
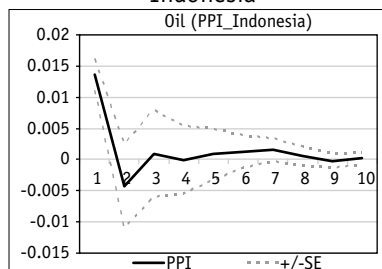
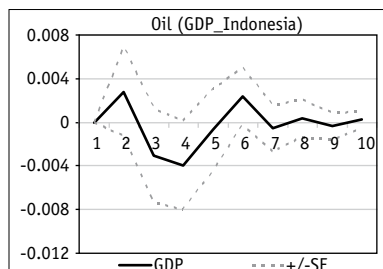
### IMPULSE RESPONSE FUNCTIONS FOR PRODUCER PRICES, CONSUMER PRICES, AND REAL GDP IN NINE DEVELOPING ASIAN ECONOMIES

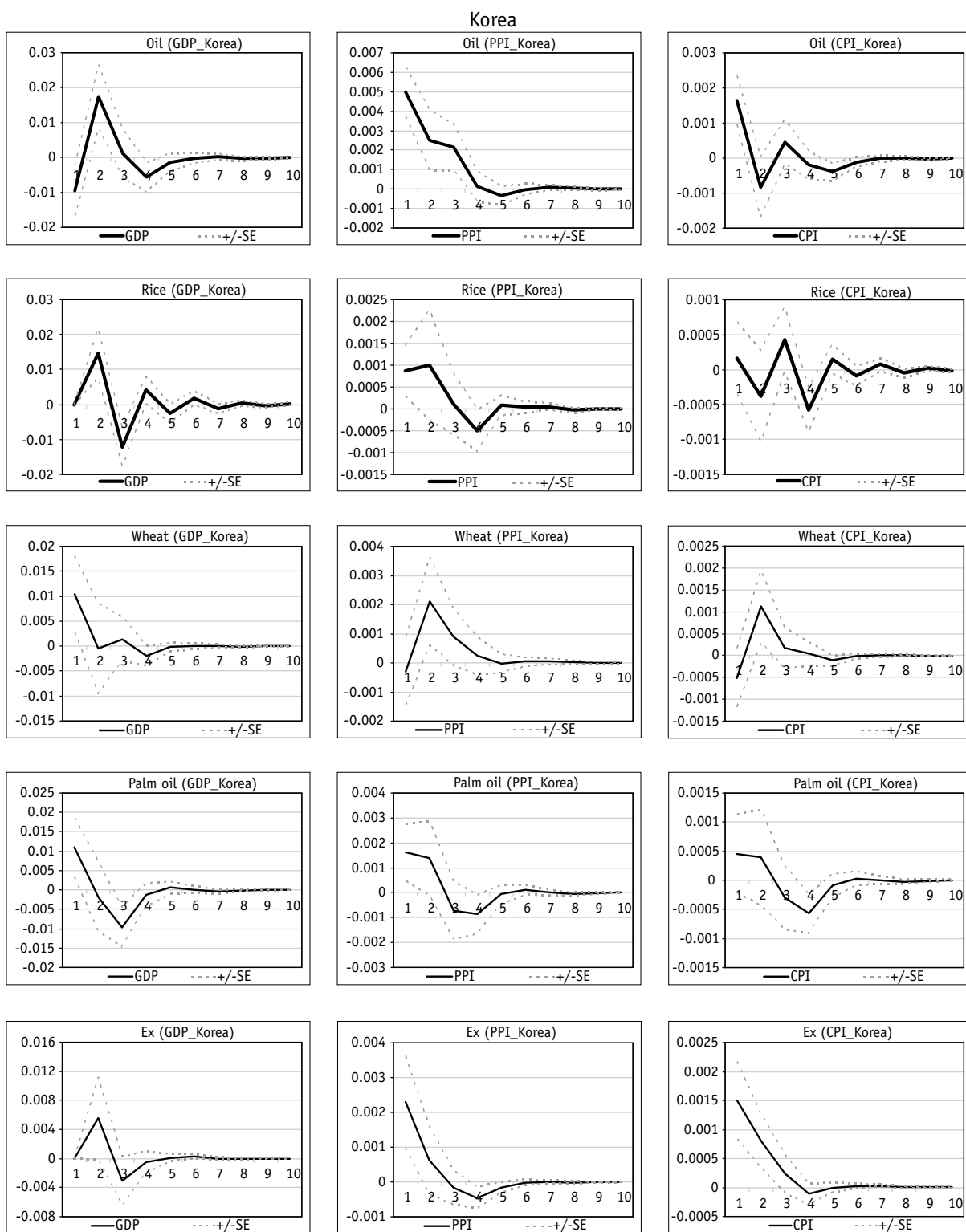
#### People's Republic of China



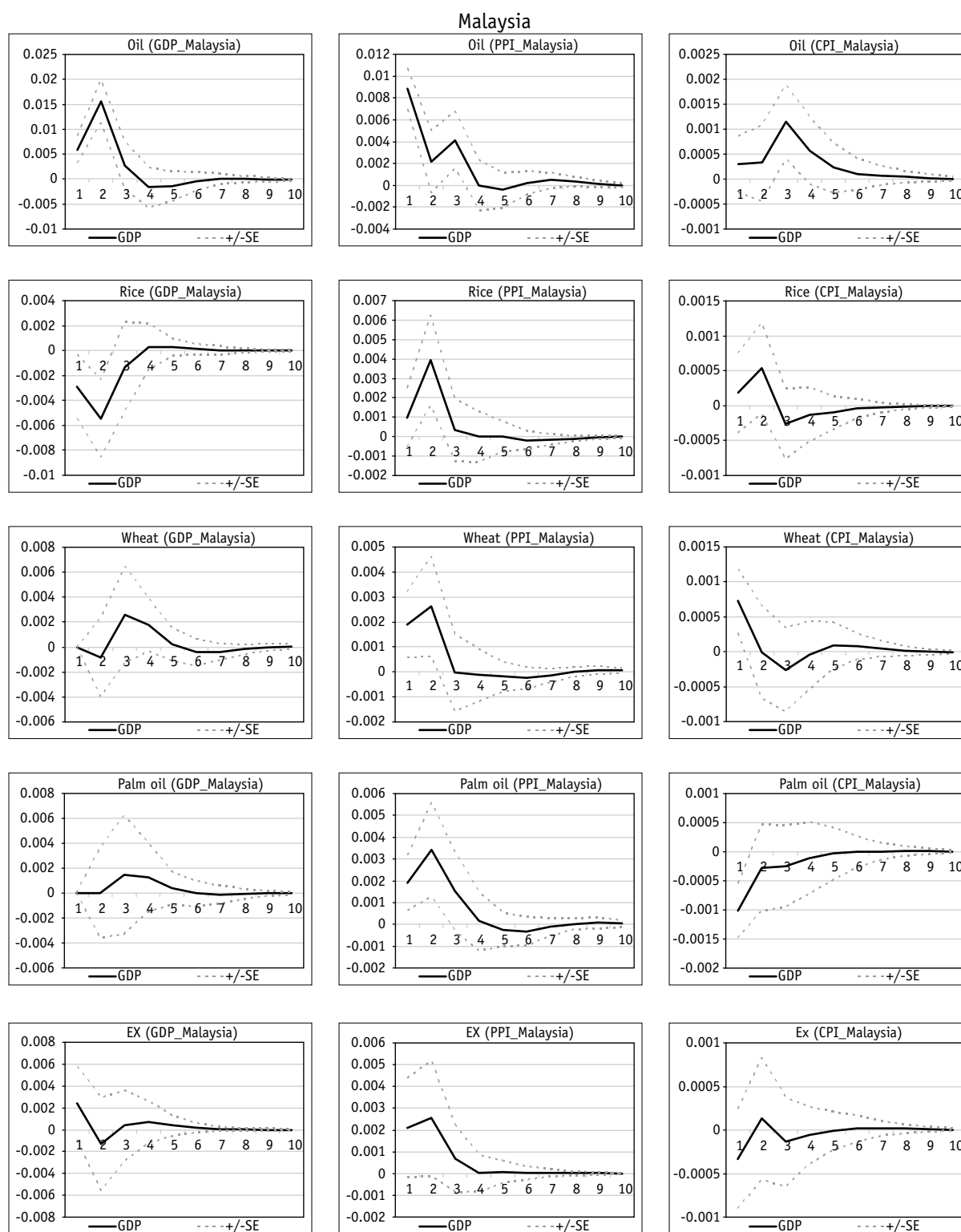


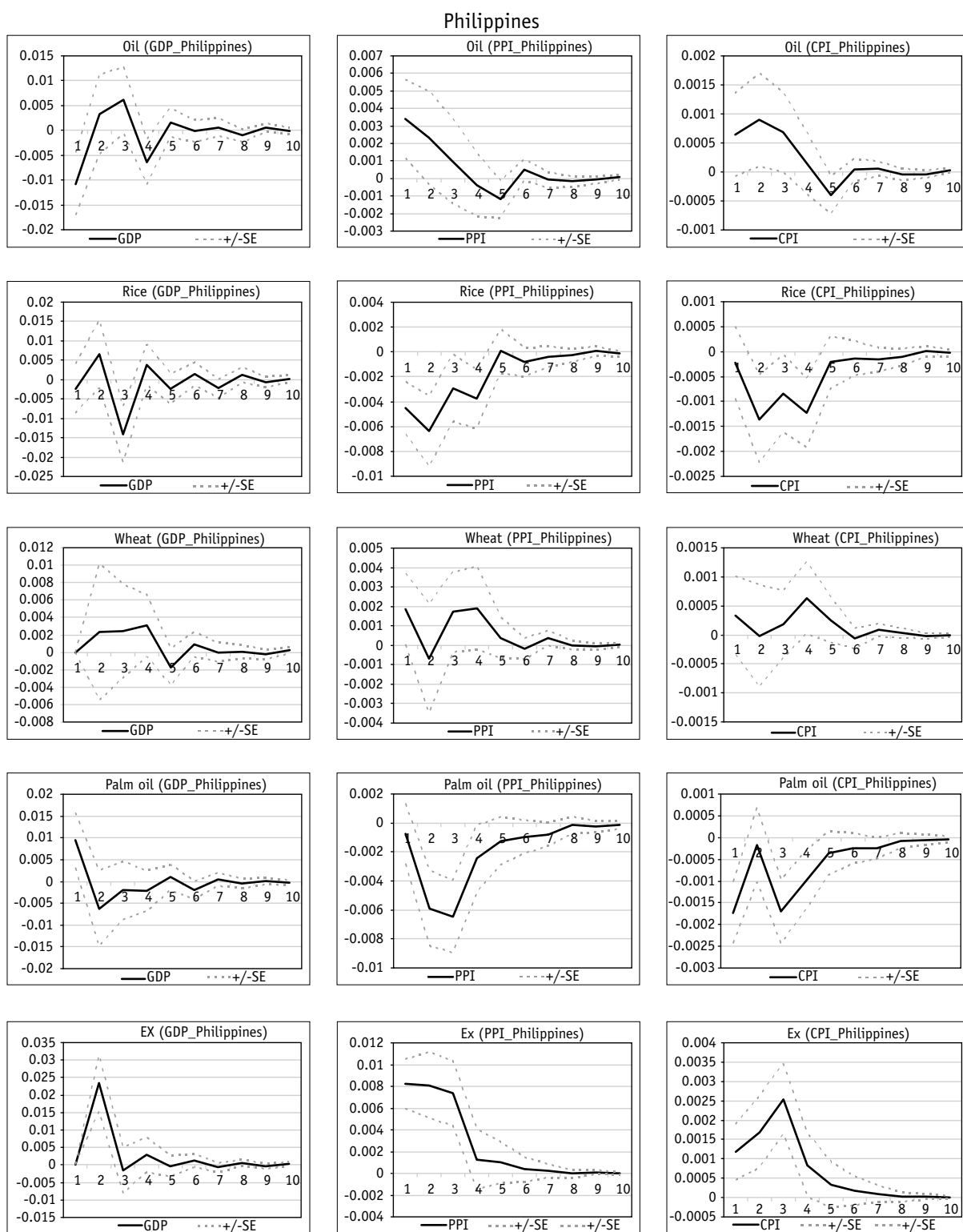
### Indonesia

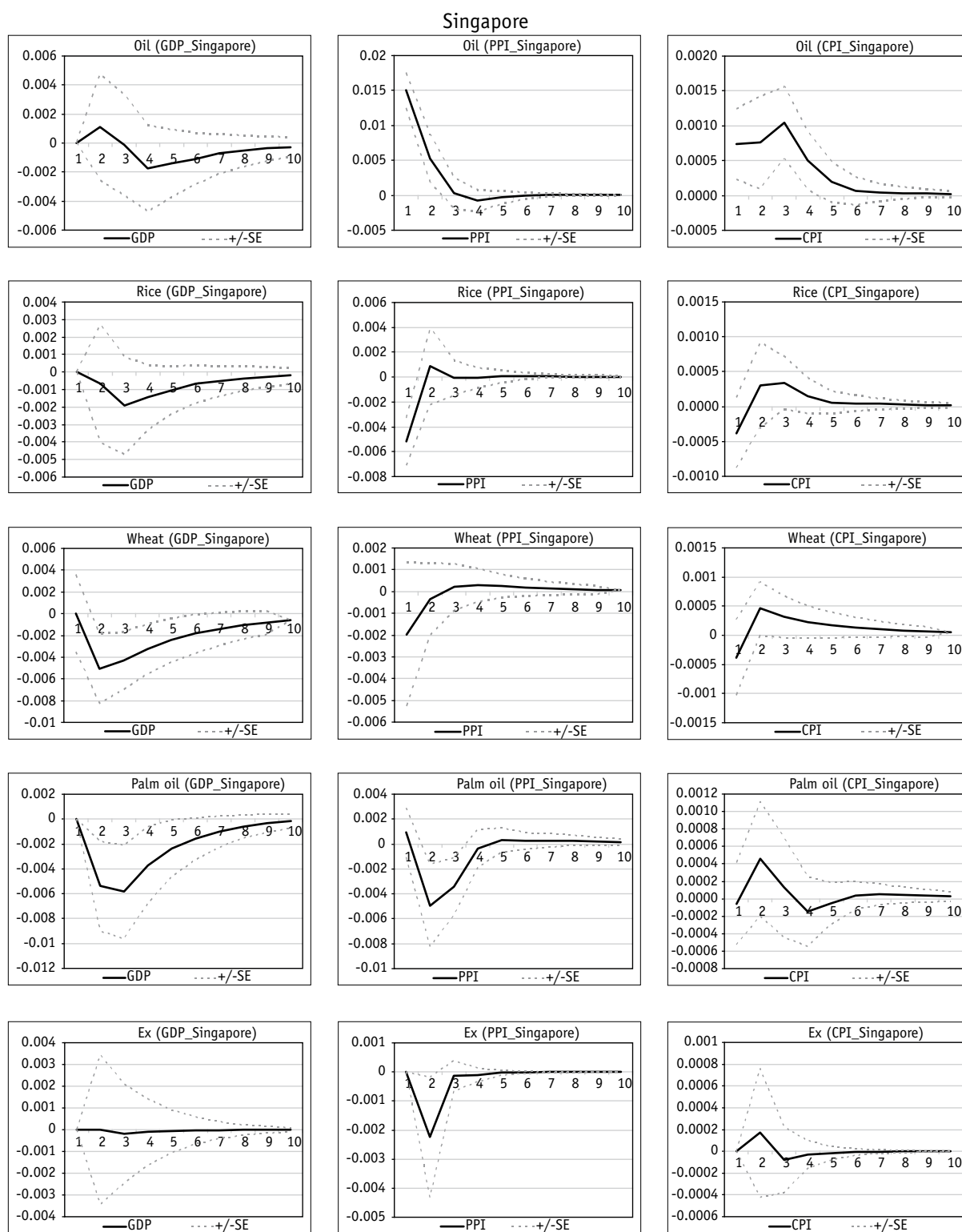


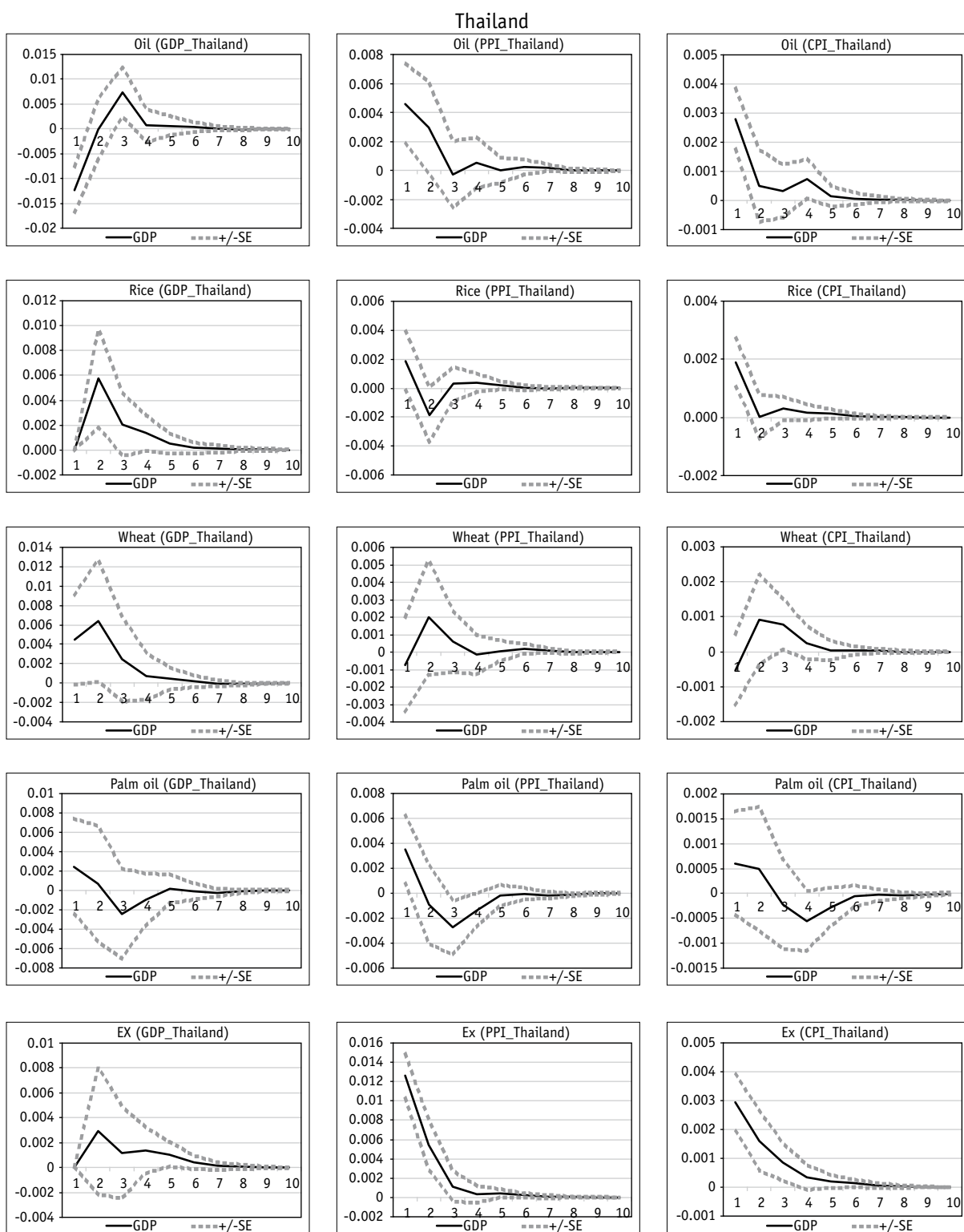




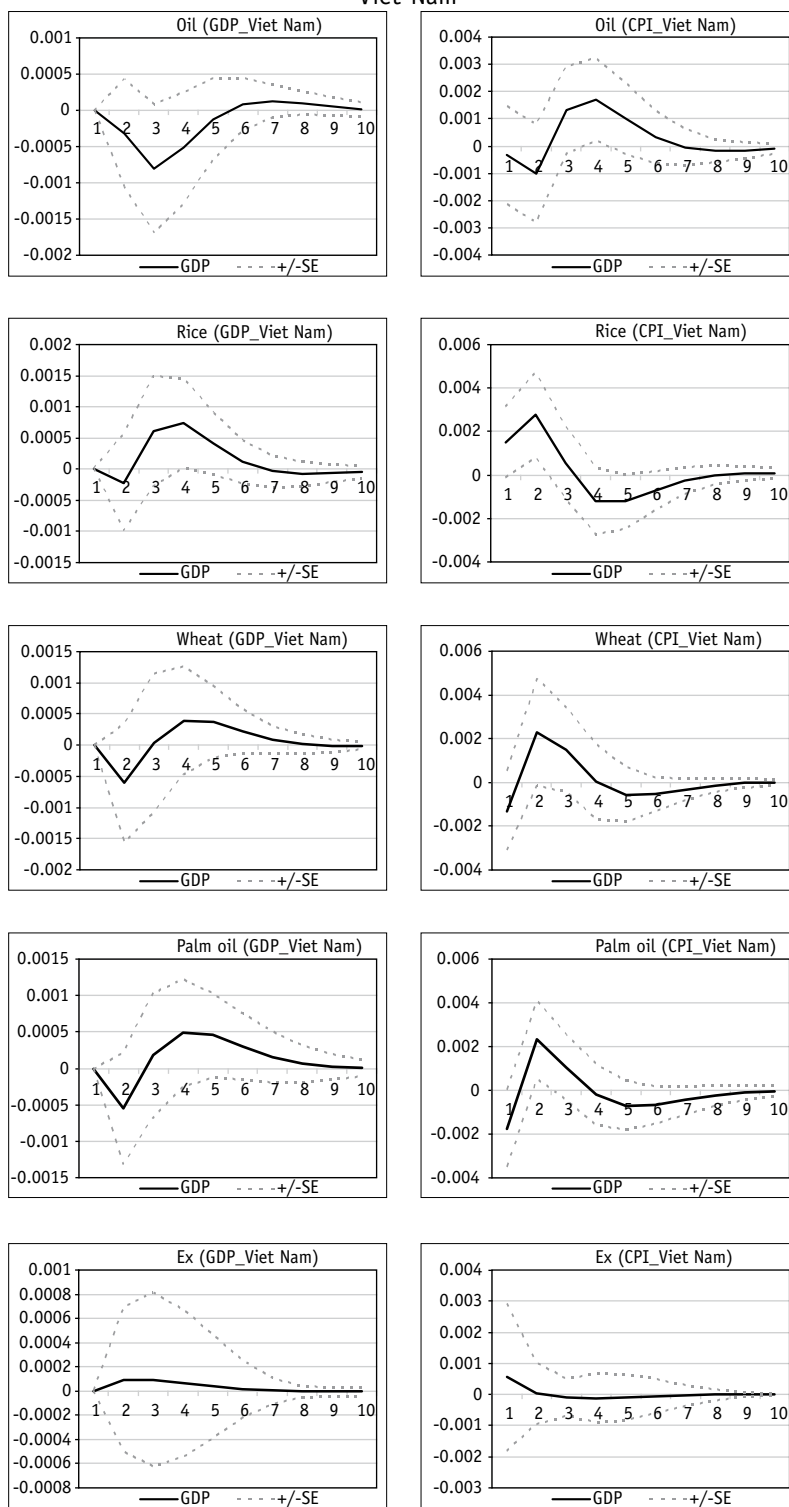








Viet Nam



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## **About the Paper**

Juthathip Jongwanich and Donghyun Park empirically examine the sources of inflation in developing Asia. They find that the region's current inflation surge is largely homegrown and due to excess aggregate demand and inflation expectations, rather than external commodity price shocks. This suggests that the region can and should use monetary policy decisively and preemptively to tame inflation before it becomes entrenched and harms long-term growth.

## **About the Asian Development Bank**

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two thirds of the world's poor. Nearly 1.7 billion people in the region live on \$2 or less a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance. In 2007, it approved \$10.1 billion of loans, \$673 million of grant projects, and technical assistance amounting to \$243 million.