BOFIT Discussion Papers
11 • 2016

Hongyi Chen, Michael Funke and
Andrew Tsang

The diffusion and dynamics of producer prices, deflationary pressure across Asian countries, and the role of China

Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Zuzana Fungáčová

BOFIT Discussion Papers 11/2016
12.9.2016

Hongyi Chen, Michael Funke and Andrew Tsang: The diffusion and dynamics of producer prices, deflationary pressure across Asian countries, and the role of China

ISBN 978-952-323-127-6, online
ISSN 1456-5889, online

Suomen Pankki
Helsinki 2016

Contents

Hongyi Chen, Michael Funke and Andrew Tsang

The diffusion and dynamics of producer prices, deflationary pressure across Asian countries, and the role of China

Abstract

Persistent producer price deflation in China and other Asian economies has become a genuine concern for policymakers. In June 2016, China's producer prices were down 12.7 percent from their peak in 2011, following a 52-month stretch of consecutive negative producer price readings (March 2012 to June 2016). Given problems with overcapacity and heavy corporate debt burdens, the incessant decline in producer prices has eroded corporate profitability, dampened fixed investment and depressed growth overall. This paper analyzes the determinants of producer price declines across eleven Asian economies, finding that the recent synchronous and protracted producer price deflation has been driven by weak production growth, low commodity prices, spillover effects from China, and, to a lesser extent, exchange rate pass-through. With China at the heart of the region's producer price deflation challenge, we consider the structural adjustments needed in China to cope with the decline and head off deflationary threats.

Keywords: producer prices, international spillovers, deflation, Asia.
JEL Classification: C23, C32, E31.

Hongyi Chen, orcid.org/0000-0002-1627-2380. Hong Kong Institute for Monetary Research, HONG KONG. E-mail: hchen@hkma.gov.hk.

Michael Funke, orcid.org/0000-0003-0683-253X. Hamburg University, Department of Economics and CESifo Munich, GERMANY. E-mail: michael.funke@uni-hamburg.de.

Andrew Tsang, orcid.org/0000-0002-5320-4002. Hong Kong Institute for Monetary Research, HONG KONG. E-mail: ahctsang@hkma.gov.hk.

1 Introduction

The unrelenting downward trajectory of producer prices across Asia has become a serious macro concern for economic policymakers in the region. Weak aggregate demand has resulted in a feedback loop that exacerbates deflationary pressures and risks triggering a deflationary spiral. The graph below (Figure 1) shows significant heterogeneity across Asia's eleven largest countries, with the aggregate producer price indices at their lowest average point in six years. South Korea, Taiwan and Singapore succumbed to deflationary pressures about three years ago, and today only Indonesia still exhibits producer price inflation. China, of course, lies at the heart of the region's deflation challenge, notching up 52 consecutive months of falling factory-gate prices between March 2012 and June 2016.

China's current persistent deflationary trend and Japan's similar performance in the 1990s are rare in modern history. As of June 2016, China's producer prices were down a cumulative 12.7 percent from their peak in 2011. The recent acceleration in the rate of deflation is its own cause for alarm. As recently as September 2014, the producer price index (PPI) showed a mere 1.8 percent drop. In December 2015, the decline was still only 5.9 percent. Even India, with an otherwise robust economy, slipped into producer price deflation in 2015.

As it is unclear whether the recent synchronous and protracted of producer price deflation in Asian economies reflects spillover within the region or common factors and similar development of local factors, we apply the spillover index proposed by Diebold and Yilmaz (2009) to measure the spillover among the Asian economies, and investigate possible determinants of the Asian producer price deflation using a dynamic panel model.

Under our pessimistic deflationary scenario, falling producer prices in Asia reduce corporate profits, employment and consumer demand. As the drag on global demand intensifies, tepid economic growth in Europe and Japan is further depressed and the US recovery cools. Today we can already see some aspects of this scenario baked in: China's cost-insensitive state-owned enterprises (SOEs) continue to conduct business as usual in the face of low prices and excess demand. This behavior crowds efficient private firms from the market, so falling producer prices effectively prevent the needed rebalancing of market share to allow productivity gains.

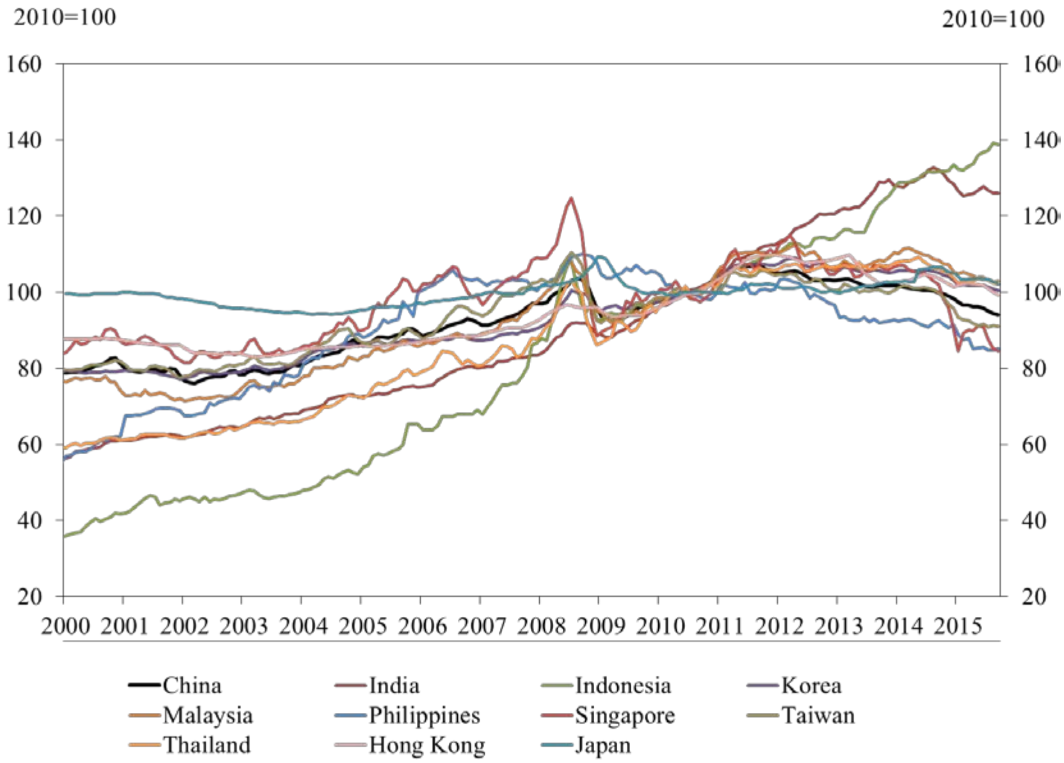
A corollary issue here is that producer price deflation eventually filters down to affect the consumer price index (CPI), which, at the time of writing was still in positive territory (even if it had reached a five-year low). The high correlation between changes in the PPI and CPI has been identified in the long-term historical data (Eichengreen et al., 2016; ADO, 2016). Although Borio et al. (2015), using CPI data, find evidence that contradicts the traditional view of the adverse impact of deflation on growth, Eichengreen et al. (2016) provide fairly strong empirical evidence confirming the negative spiral between PPI deflation and growth. In any case, producer price deflation is a critical policy issue with significant regional and global implications. Tackling the deflationary threat is a central challenge for monetary policymakers.[1]

The remainder of the paper is organized as follows. Section 2 presents some stylized facts. Section 3 considers how Asia's PPI decline is likely transmitted across countries. Section 4 covers the estimation results for our PPI model, identifying possible reasons for the PPI decline. Given the centrality of China in addressing the region's PPI deflation challenge, Section 5 reviews China's policy options for coping with the PPI decline. Section 6 concludes.

2 PPI inflation in Asian economies

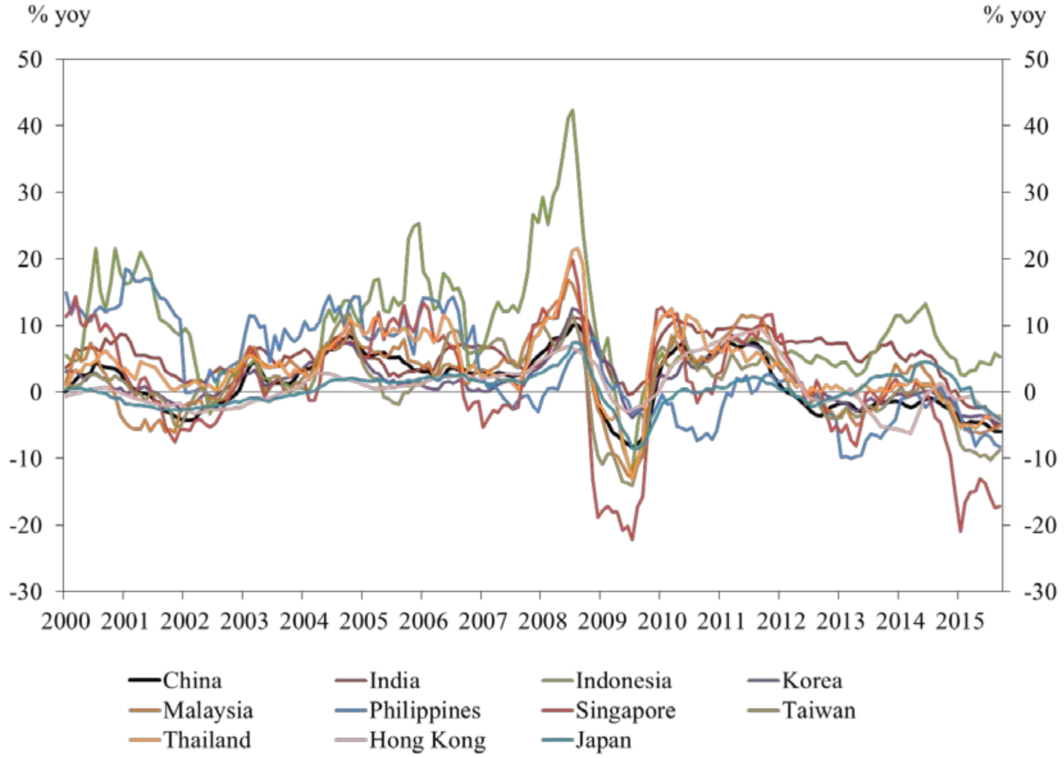
To identify the main characteristics of PPI inflation in Asian economies, we consider a sample of PPI inflation in eleven Asian economies from January 2000 (after the Asian Financial Crisis) to December 2015. Monthly PPI year-on-year inflation readings in the sample period show similar trends for these Asian economies (Figure 1).

Figure 1 PPI inflation in Asian economies
(A) PPI level



[1] For a summary description of the problem, see Asian Development Bank (2016), pp. 22-29.

Figure 1 PPI inflation in Asian economies
(B) Year-on-year PPI growth rates



Note: The charts show the monthly PPI index (2010=100) and PPI inflation (year-on-year basis) of Asian countries from January 2000 to December 2015. For Hong Kong's PPI inflation, we perform linear interpolation using quarterly PPI inflation.
Sources: Various national sources, IMF Data (IFS).

PPI inflation in all Asian economies shows a time-varying trend. The year-on-year PPI changes remain in positive territory up to the Global Financial Crisis (GFC), when there is a sharp drop. We see a structural break in 2012 that signals the arrival of the current period of prolonged weakness. While the sharp PPI deflation during late 2008 to 2009 is readily explained by the GFC, the reasons for the recent unusually synchronous and protracted decline are harder to fathom.[2]

[2] To put this in perspective, the average monthly y-o-y changes in PPI were -2.5% for the US and -2.9% for the Euro Area during September 2008 to December 2009. In the same period, the average monthly y-o-y change in PPI for our eleven Asian economies was only -0.8%. In contrast, the average monthly y-o-y change PPI deflation in our eleven Asian economies during January 2012 to December 2015 was -1.4%, while the figures for the US and Euro Area were -0.4% and -0.2%, respectively.

Table 1 Correlations of PPI inflation among Asian economies

	CN	HK	ID	IN	JP	KR	MY	PH	SG	TH	TW
CN	1	0.75	0.55	0.70	0.66	0.84	0.89	0.37	0.81	0.86	0.85
HK	0.75	1	0.33	0.62	0.47	0.77	0.68	0.05	0.49	0.57	0.58
ID	0.55	0.33	1	0.30	0.64	0.45	0.54	0.34	0.59	0.67	0.50
IN	0.70	0.62	0.30	1	0.48	0.71	0.61	0.18	0.63	0.62	0.67
JP	0.66	0.47	0.64	0.48	1	0.57	0.71	0.12	0.56	0.60	0.61
KR	0.84	0.77	0.45	0.71	0.57	1	0.78	0.31	0.62	0.72	0.66
MY	0.89	0.68	0.54	0.61	0.71	0.78	1	0.18	0.82	0.81	0.83
PH	0.37	0.05	0.34	0.18	0.12	0.31	0.18	1	0.44	0.36	0.33
SG	0.81	0.49	0.59	0.63	0.56	0.62	0.82	0.44	1	0.85	0.80
TH	0.86	0.57	0.67	0.62	0.60	0.72	0.81	0.36	0.85	1	0.79
TW	0.85	0.58	0.50	0.67	0.61	0.66	0.83	0.33	0.80	0.79	1

Note: Correlations are calculated using monthly PPI inflation (on year-on-year basis) within the sample period of 2000–2015.
Sources: Authors' calculations based on various national sources.

Table 1 shows fairly high (over 0.5) correlations of PPI inflation for most of our sample economies. The exceptions are correlations between the Philippines and Indonesia and the other Asian economies. While the volatilities of PPI inflation in the Philippines and Indonesia are higher than in other economies, the trend for PPI inflation is similar to that of other Asian economies. The high correlations among Asian economies support our initial observation that the PPI inflation of Asian economies show a common trend. They also suggest that the common trend, particularly the recent PPI deflation in Asian economies, may be driven by common factors. The correlations between China and other Asian economies are very high ranging around 0.7 to 0.9 (again, with the exceptions of the Philippines and Indonesia, which are still relatively high at 0.37 and 0.55, respectively). Thus, we might also posit PPI inflation in other Asian economies is affected by spillover effects from China. We consider common factors and spillover effects in our econometric analysis in Section 4, but first we explore the extent to which producer prices reflect idiosyncratic behavior linked to individual countries and the extent to which producer price dynamics reflect spillovers across countries.

3 Measuring international producer price spillovers

In this section, we describe our spillover methodology and empirical findings. The approach of Diebold and Yilmaz (2009) measures the intensity of interdependence across countries that allows for decomposition of spillover effects by source and recipient.[3] Diebold-Yilmaz indexing builds on the well-known notion of forecast error variance decompositions. It allows an assessment of the contributions of shocks to variables to the forecast error variances of both the respective and the other variables in the system. The starting point for the analysis is the following *p*-order, *N*-variable VAR:

(1) $$x_t = \sum_{i=1}^{p} \theta_i x_{t-1} + \varepsilon_t \ ,$$

where x_t is an $N \times 1$ verctor of *N* endogenous variables, θ_i are $N \times N$ parameter matrices and $\varepsilon_t \sim N(0, \Sigma)$ is an $N \times 1$ vector of iid disturbances. Assuming covariance stationarity, the VAR can be transformed into the MA(∞) representation

(2) $$x_t = \sum_{j=0}^{\infty} A_j \varepsilon_{t-j} \ ,$$

where the $N \times N$ coefficient matrices A_j are recursively defined as

(3) $$A_j = \theta_1 A_{j-1} + \theta_2 A_{j-2} + \cdots + \theta_p A_{j-p} \ ,$$

where A_0 is the $N \times N$ identity matrix and $A_j = 0$ for $j < 0$.

In defining our spillover measures, we are interested in the *H*-step-ahead forecast at time *t*. The associated variance decompositions then allow the fraction of the *H*-step-ahead forecast error variance x_i owing to shocks in x_j , $\forall j \neq i$, for each *i* to be measured. Diebold and Yilmaz (2009) employ Cholesky decompositions, which yield variance decompositions depending on

[3] Among the first applications of the methodology proposed by Diebold & Yilmaz (2009), we find McMillan and Speight (2010) who analyze market co-movements across the USD/EUR and other euro exchange rates. Bubák, Kocenda & Žikeš (2011) employ the Diebold-Yilmaz approach for studying volatility spillovers among several central European currencies and the EUR/USD exchange rate. Diebold and Yilmaz (2011) measure spillovers in equity returns and equity return volatilities in the Americas. The issue of Asian financial markets is discussed in Fujiware and Takahashi (2012), who use the spillover method to assess the interlinkages across Asian financial markets. In the same vein, Zhou et al. (2012) analyze volatility spillovers between the Chinese and select world equity markets between 1996 and 2009. Measured in terms of volatility spillovers, they find an increasing influence of the Chinese stock market on other stock markets since about 2005. Antonakakis et al. (2014) use the methodology to examine the dynamic relationship between changes in oil prices and the economic policy uncertainty index for a sample of net oil-exporting and net oil-importing countries.

the ordering of the variables. To resolve the dependency on ordering, Diebold and Yilmaz (2012) extend the approach with the generalized VAR framework of Koop et al. (1996) and Pesaran and Shin (1998), in which variance decompositions are invariant to the ordering of the variables. The calculation of robust spillover measures is accomplished by averaging the results over all possible permutations of the system.[4]

The variance decompositions yield an $N \times N$ matrix $\phi(H) = \left[\phi_{ij}(H)\right]_{i,j=1,\cdots N}$, where each entry gives the contribution of variable *j* to the forecast error variance of variable *i*. The main diagonal elements contain the (own) contributions of shocks to the variable *i* to its own forecast error variance, while the off-diagonal elements show the (cross) contributions of the other variables *j* to the forecast error variance of variable *i*. When employing the generalized impulse response functions, the own- and cross-variable variance contribution shares do not sum to one, i.e. $\sum_{j=1}^{N} \phi_{ij}(H) \neq 1$. Thus, for each entry of the variance decomposition matrix $\tilde{\phi}_{ij}(H) = \phi_{ij}(H)/\sum_{j=1}^{N} \phi_{ij}(H)$ with $\sum_{j=1}^{N} \tilde{\phi}_{ij}(H) = 1$ and $\sum_{i,j=1}^{N} \tilde{\phi}_{ij}(H) = N$ by construction. These assumptions allow us to summarize the information on various spillovers as a single number, i.e. the total spillover index:

$$(4) \qquad TS(H) = 100 \times \frac{\sum_{i,j=1,i\neq j}^{N} \tilde{\phi}_{ij}(H)}{N}$$

The index $TS(H)$ gives the average contribution of spillovers from shocks to all other variables to the total forecast error variance in percent. The index is invariant to rescaling of the variables. This approach also allows us to obtain a more differentiated picture by calculating directional spillovers. Specifically, the directional spillovers from all other variables *j* to variable *i* are measured as

$$(5) \qquad DS_{i\leftarrow j}(H) = 100 \times \frac{\sum_{j=1,i\neq j}^{N} \tilde{\phi}_{ij}(H)}{N}.$$

Likewise, the directional spillovers from variable *i* to all other variables *j* to variable *i* are calculated as

$$(6) \qquad DS_{i\rightarrow j}(H) = 100 \times \frac{\sum_{j=1,i\neq j}^{N} \tilde{\phi}_{ji}(H)}{N}.$$

[4] We refer the reader to Diebold and Yilmaz (2009, 2012) for a detailed exposition of the algorithm. For further reading, we suggest Gaspar (2012), who gives a good overview on the spillover literature.

In a nutshell, the set of directional spillovers provides a decomposition of total spillovers into those coming from (or to) a particular variable.

Table 2 Producer price spillovers across countries based on 6-step-ahead forecasts

		From											
		CN	**IN**	**ID**	**KR**	**MY**	**PH**	**SG**	**TW**	**TH**	**HK**	**JP**	**From others**
To	**CN**	67.2	0.2	2.0	0.7	22.2	1.0	0.8	0.7	2.3	2.1	0.7	33
	IN	17.1	59.2	2.7	0.7	10.8	1.9	2.1	1.2	2.5	1.7	0.1	41
	ID	17.6	2.8	65.8	2.0	6.3	0.1	0.2	2.2	2.9	0.1	0.1	34
	KR	27.5	5.6	7.7	30.4	20.0	2.2	2.9	1.6	1.4	0.7	0.0	70
	MY	24.2	0.8	3.3	1.4	64.4	3.0	0.1	0.6	0.8	0.2	1.2	36
	PH	19.1	0.6	1.8	9.9	1.3	59.3	2.4	0.3	1.7	1.1	2.5	41
	SG	29.9	0.7	6.9	1.3	37.1	0.8	17.7	1.3	3.9	0.0	0.4	82
	TW	25.8	4.7	3.2	1.3	28.9	0.3	3.2	28.3	1.7	1.9	0.8	72
	TH	26.1	0.1	18.7	2.4	21.9	2.6	2.4	0.8	24.2	0.2	0.8	76
	HK	7.8	1.3	1.1	0.9	4.6	1.3	1.9	1.7	0.7	77.9	1.8	22
	JP	19.3	3.4	8.6	2.0	29.7	2.5	2.0	0.1	4.3	0.1	28.0	72
	To others	214	20	56	22	183	16	18	11	22	8	8	TS = 52.5%

Notes: The dataset covers the period from 2000M1 through 2015M12. The quarterly data for HK have been interpolated using the CPI index. The spillover index has been calculated for the PPI y-o-y growth rate. The optimal VAR lag length $p = 2$ has been determined using the AIC and BIC information criteria. Vietnam was not been included because the sample period only starts in 2006.

Table 3 Producer price spillovers across countries based on 12-step-ahead forecasts

		From											
		CN	**IN**	**ID**	**KR**	**MY**	**PH**	**SG**	**TW**	**TH**	**HK**	**JP**	**From others**
To	**CN**	59.5	5.5	5.4	1.6	17.5	1.1	1.0	2.5	1.6	4.0	0.5	41
	IN	20.5	45.3	3.6	2.1	12.2	2.7	1.6	0.9	4.3	4.4	2.5	55
	ID	25.0	6.5	44.8	7.4	4.9	0.2	1.2	3.4	5.2	0.6	0.7	55
	KR	34.4	4.6	6.1	19.8	19.5	3.2	5.9	2.4	0.9	3.1	0.1	80
	MY	23.4	6.5	8.1	2.2	48.7	3.0	0.4	3.3	1.8	1.7	0.9	51
	PH	35.2	0.8	1.6	8.1	1.4	41.2	1.4	1.5	4.8	1.7	2.2	59
	SG	27.3	9.3	8.6	4.1	25.3	0.6	11.4	2.0	9.8	0.6	0.9	89
	TW	24.4	4.9	10.3	3.9	22.6	1.3	2.2	22.5	3.6	3.6	0.6	77
	TH	29.1	9.1	14.8	5.2	16.0	1.9	1.8	1.1	18.3	0.8	1.9	82
	HK	10.1	9.6	2.1	1.9	4.2	2.2	3.1	5.1	0.9	59.9	0.7	40
	JP	23.6	2.7	6.4	6.5	30.5	3.6	1.9	0.2	2.7	0.2	21.8	78
	To others	253	59	67	43	154	20	21	23	36	21	11	TS = 64.3%

Notes: See Table 2.

The spillover table may be interpreted as follows. The ij^{th} entry is the estimated contribution to the forecast error variance of country *i*'s PPI y-o-y growth rates resulting from innovations to country *j*. Hence, the off-diagonal column sums (labeled "To others") or row sums ("From others"), when totaled across countries, give the numerator of the spillover index. Similarly, the column sums or row sums (including diagonals), when totaled across countries, give the denominator of the spillover index. In other words, the spillover table provides an input-output decomposition of the spillover index. We learn from Table 1, for example, that innovations to China's PPI y-o-y growth rates are responsible for 29.9% and 25.9%, respectively, of the error variance in forecasting Singapore's and Taiwan's PPI growth rates six months ahead, but only 7.8% of the error variance in forecasting Hong Kong's PPI growth rates six months ahead. One observation that stands out is that spillovers from Malaysia are higher than spillovers from other countries. Also worth highlighting are the facts that spillovers from Hong Kong to all other countries are tiny and that the deflationary producer price spillovers from Japan are generally negligible. Distilling the various cross-country spillovers into a single spillover index, the main take-away from Table 2 appears in the lower right-hand corner of the table – 52.2% of forecast error variance comes from spillovers. The aforementioned findings imply moderate spillovers on average. To scrutinize our findings, we extended the forecast horizon to twelve periods in Table 2. As expected, comparison of the results in Table 2 and Table 3 shows that spillovers increase in magnitude for $h = 12$.

Overall, our results underline the importance of a fine-grained approach in studying the dynamics of producer prices. Such an approach is the research objective in the next section of the study.

4 Econometric model estimates

As shown in Figure 1, the recent declines in Asian PPI appear in 2012, with a sharp drop beginning in the second half of 2014. Notably PPI deflation occurs during 2015 in all Asian economies, except Indonesia. Unlike the PPI deflation episode of late 2008 to 2009, which was mainly driven by the impact of GFC, recent PPI deflation in Asian economies is long-lived. As noted in the first section, the synchronous nature of the PPI decline suggests common factors or spillover effects may be involved. This section aims to discuss the key drivers of the decline and set the stage of the policy options discussion in the next section.

We now consider how the mechanisms through which aggregate producer prices in our eleven Asian economies are affected by demand and supply shocks. In principle, firms adjust their producer prices (i) in response to exchange rate movements, (ii) because of changes in marginal cost, and/or (iii) because of markup adjustments (firms may adjust their markup to keep the foreign currency export price stable when they are pricing in the foreign currency). Turning to the econometric specification, we combine these elements in the following baseline pass-through panel model:

$$(7) \quad \Delta P_{i,t} = \beta_0 + \beta_1 \Delta P_{i,t-1} + \beta_2 \Delta E_{i,t-1} + \sum_j \beta_3^j \Delta E_{i,t-1} D_{i,t-1}^j + \beta_4 \Delta Y_{i,t-1} + \beta_5 \Delta P_{i,t-1}^{Input}$$
$$+ \sum_j \beta_6^j \Delta P_{i,t-1}^{Input} D_{i,t-1}^j + \beta_7 \Delta P_{t-1}^{China} + \beta_8 U_{t-1}^{China} + \beta_9 GFC_t + \beta_{10} \Delta S_{i,t-1} + \varepsilon_{i,t} \ ,$$

where $\Delta P_{i,t}$ is the y-o-y growth rate of PPI in country *i* at time *t*, $\Delta E_{i,t}$ is the y-o-y growth rate of the nominal effective exchange rate, $D_{i,t}^j$ are dummy variables of country-specific exchange rate regimes. Equation (7) provides a closer look at the determinants of Asian producer prices. The interaction of $D_{i,t}^j$ and $\Delta E_{i,t}$ enable us to explore structural differences across countries arising from country-specific exchange rate regimes, $\Delta Y_{i,t}$ is the y-o-y growth rate of production in country *i*, and is included to control for fluctuations in factor demand.[5] One feature of equation (7) is that import price shocks are not restricted to those resulting from exchange rate movements, but include commodity price shocks. The variable $\Delta P_{i,t}^{Input}$ is the y-o-y growth rate of an input price index (proxied by the global commodity price index multiplied by exchange rate of country *i*). Notably, we single out the interaction of $D_{i,t}^j$ and $\Delta P_{i,t}^{Input}$. This enables us to explore the different impact of input prices among different exchange rate regimes across countries. ΔP_t^{China} and U_t^{China} measure spillovers of the PPI y-o-y growth rate and a measure of China's policy uncertainty, which leads into the long-standing debate on the role of globalization in imposing subdued inflation patterns even in countries enjoying buoyant economic growth. GFC_t is the dummy variable for global financial crisis (September 2008 to March 2009). $\Delta S_{i,t}$ is the y-o-y growth rate of representative stock index of country *i*. ε_{it} is an i.i.d. error term. Moreover, all the regressions include fixed effects. All regressors are included with a one-period lag to reduce potential simultaneity bias.

Contrary to the much-studied exchange rate pass-through literature analyzing the transmission of exchange rate shocks to import prices and CPI (Gagnon and Ihrig, 2004), we investigate the degree to which currency changes are transmitted to domestic producer prices. This assumes exchange rates transmit or absorb the external inflation pressure to domestic producer prices. Given that exchange rates first pass through to import prices, which in turn affect producer prices, we gauge the ultimate pass-through of exchange rates to producer prices, taking observed

[5] The degree of exchange rate pass-through is a key determinant of an optimal exchange rate policy regime. See e.g. Devereux and Engel (2003, 2007).

changes in import prices as given. This exchange rate pass-through approach allows for broad interpretation as import price shocks include those resulting from exchange rate movements and commodity price shocks.

The PPI has two main drivers: input cost and production cost. Input cost is determined by global commodity prices. For instance, the recent PPI deflation in all Asian economies may share decline in global commodity prices as a common factor. Global commodity prices showed small increases or decline after 2012, but then plunged in the second half of 2014. The low point in 2015, which was around 30 percent below the 2012 average, reflected low oil prices. The similar development in global commodity prices and PPI inflation bolsters the view that this commodity price shock has been a determinant of recent PPI deflation. Production is expected to directly affect production cost. High production growth thus indicates high demand for industrial output. Given the demand effects, there should have higher price for production output. As we saw in Section 3, the spillover effects within Asian economies are high. When China sneezes, everybody else catches pneumonia. Thus, this spillover effect from China should be included in the model to capture China's PPI development and the risk imposed on other Asian economies. A dummy variable for GFC period is also included to control the impact of GFC. Finally, the change in stock prices is included in the model as a control for level of risk. A decrease in stock prices indicates higher risk that might lead to lower PPI inflation.

This paper draws upon monthly data from 2000 to 2015 for eleven Asian countries, and uses the following data definitions and sources. The macroeconomic data, including the data for the producer price index and industrial production are taken from national sources and dated back using data from IMF Data's International Financial Statistics (IFS). The Bank for International Settlements (BIS) broad indices for nominal effective exchange rate (NEER) are used in the model for capturing the exchange rate impact on PPI inflation. The dummy variables for exchange rate regime are created based on IMF's four-group classification (hard-peg, soft-peg, floating and residuals) for de facto exchange rate regime. The classification appears in the IMF's annual report on exchange rate arrangements and exchange restrictions. The input price is proxied by the global commodity price index (in US dollars) multiplied by the exchange rate of country *i*, rebased to an index with the same base period (2005=100) as global commodity price index. In other words, the input price is the commodity price in local currency and changes in this variable represent the dynamic combination of the effects of changes in commodity price and exchange rate of local currency. A higher y-o-y change in the input price translates to a higher commodity price in the local currency. Specifically, the higher the IMF commodity price index or higher the value of exchange rate per USD (i.e. local currency depreciates), the higher value of commodity price in the local currency.

To examine the spillover effect from China to other Asian economies, the model includes two variables: spillovers of China's PPI inflation and spillovers of China policy uncertainty. Direct spillover effects are proxied by multiplying China's PPI inflation by the country's import share from China, which the data source of PPI inflation was described above. For impact of China's policy uncertainty on each of the Asian economies, the China Policy Uncertainty Index (CPUI) multiplied by the import share from China is included in the model. The CPUI may be downloaded from the Economic Policy Uncertainty website.[6] It is a news-based index constructed from counting newspaper articles on China's policy-related economic uncertainty.[7] A higher index reading implies greater uncertainty and an expectation that PPI inflation will be lower. The import share from China is calculated by dividing the nominal value of import from China by the total value of import. As a large portion of the Hong Kong's imports from China are for re-export purposes, Hong Kong's share from Hong Kong is calculated according to the share of retained imports. For the import share from China, the figure for China uses the import share of the remaining countries outside the estimation sample. The import data are from national sources. For changes in stock prices, the y-o-y changes of the representative stock indexes[8] downloaded from Bloomberg are used.

Our panel model, a dynamic panel with fixed effects, uses the Kiviet method (Kiviet,1995; Bun and Kiviet, 2001). The Kiviet method is a least squares dummy variable (fixed effects) estimator (LSDV) that corrects for bias in the estimation of dynamic panel model. Bun and Kiviet (2001) suggest that the corrected LSDV method is an asymptotic consistent estimator and yields a lower mean squared error than with IV or GMM methods.[9]

---

[6] Accessed at http://www.policyuncertainty.com/china_monthly.html.

[7] The news articles appeared in the *South China Morning Post* (SCMP), Hong Kong's leading English-language newspaper. The method follows our news-based indexes of economic policy uncertainty for the United States and other countries.

[8] Indexes used are as follows: China – Shanghai Composite Index; Hong Kong – Hang Seng Index; Indonesia – Jakarta Composite Index (JCI); India – Sensex Index; Japan – Nikkei Index; Korea – Korea Composite Stock Price Index (KOSPI); Malaysia – Kuala Lumpur Composite Index (KLCI); Philippines – Philippine Stock Exchange (PSE) Composite Index; Singapore – Straits Times Index (STI); Thailand – Stock Exchange of Thailand (SET) Index; Taiwan – Taiwan Stock Exchange Weighted Index.

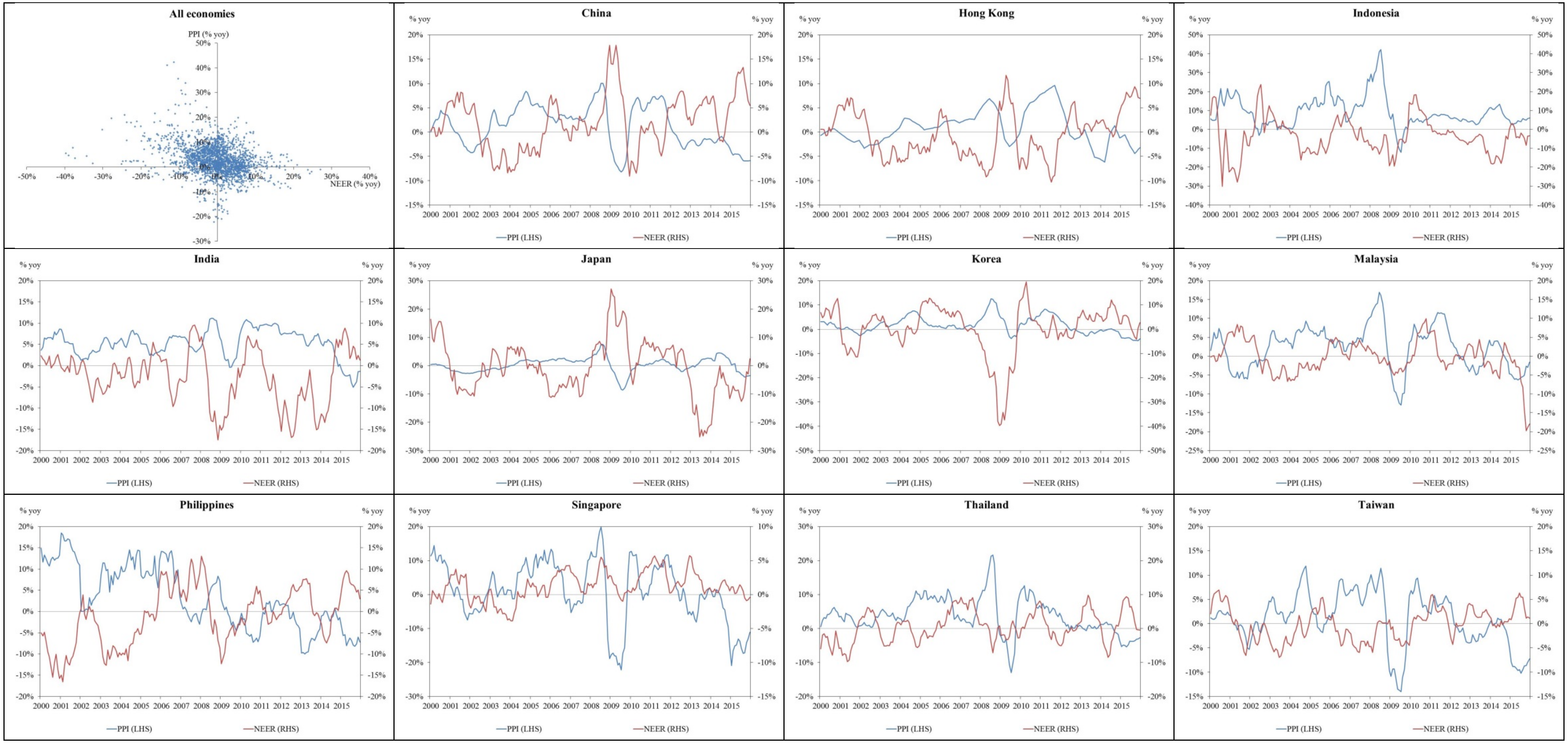
[9] Making use of the asymptotic bias derived by Nickell, Kiviet (1995) proposes a direct bias correction method. His innovation is to approximate the unknown bias with a two-stage procedure. Empirical estimates are derived in the first round, and an empirical estimate of the bias is derived in the second. The motivation for the procedure lies in the well-known fact that the LSDV estimator is biased, but has a much smaller variance compared to instrumental variables estimators. Alternatively, GMM estimators may be used. The asymptotic properties of GMM are well established in the econometric literature. However, these are asymptotic results that do not necessarily hold for a small sample as shown by Guggenberger (2008). Furthermore, the efficiency of the GMM estimator relies heavily upon a fixed T and N going to infinity. Such conditions do not apply to our sample.

Table 4 Dynamic panel regression of year-on-year PPI growth, Jan 2000–Dec 2015

Model	1	2	3	4	5	2a	3a	4a	5a
PPI_{t-1}	0.881 ***	0.889 ***	0.891 ***	0.904 ***	0.906 ***	0.882 ***	0.884 ***	0.898 ***	0.902 ***
	(0.012)	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.011)	(0.009)	(0.009)
$NEER_{t-1}$	-0.028	-0.021	-0.024 *	-0.021 ***	-0.027 ***	-0.031 **	-0.036 ***	-0.024 ***	-0.026 ***
	(0.017)	(0.016)	(0.014)	(0.005)	(0.004)	(0.015)	(0.013)	(0.005)	(0.006)
$NEER_{t-1}$*Dummy(Hard $Pegs_{t-1}$)	0.034	0.035	0.037 *	0.030 **	0.046 ***	-0.045 ***	-0.039 ***	-0.042 ***	-0.031 ***
	(0.025)	(0.023)	(0.021)	(0.013)	(0.013)	(0.014)	(0.011)	(0.006)	(0.008)
$NEER_{t-1}$*Dummy(Soft $Pegs_{t-1}$)	-0.019	-0.047 **	-0.035 *	-0.023	-0.021 *	-0.030	-0.020	-0.023	-0.022
	(0.023)	(0.020)	(0.019)	(0.016)	(0.012)	(0.030)	(0.030)	(0.020)	(0.016)
$NEER_{t-1}$*Dummy($Floating_{t-1}$)	0.025	0.024	0.026 *	0.014	0.015	0.035 **	0.038 ***	0.018 *	0.014
	(0.018)	(0.016)	(0.014)	(0.010)	(0.013)	(0.016)	(0.014)	(0.010)	(0.015)
IP_{t-1}	0.011 ***	0.009 ***	0.009 ***	0.003	-0.003	0.009 ***	0.008 ***	0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)
Commodity $Price_{t-1}$	0.026 ***	0.032 ***	0.030 ***	0.024 ***	0.022 ***	0.040 ***	0.039 ***	0.027 ***	0.023 ***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Commodity $Price_{t-1}$*Dummy(Hard $Pegs_{t-1}$)						-0.031 ***	-0.031 ***	-0.023 ***	-0.020 ***
						(0.004)	(0.003)	(0.004)	(0.004)
Commodity $Price_{t-1}$*Dummy(Soft $Pegs_{t-1}$)						-0.003	-0.006	-0.004	2.8E-04
						(0.009)	(0.009)	(0.010)	(0.010)
Commodity $Price_{t-1}$*Dummy($Floating_{t-1}$)						-0.006 *	-0.006 **	-0.001	0.001
						(0.003)	(0.003)	(0.004)	(0.005)
China PPI_{t-1}*Import share from $China_{t-1}$		-0.261 ***	-0.265 ***	-0.140 ***	-0.126 ***	-0.278 ***	-0.274 ***	-0.140 **	-0.136 **
		(0.086)	(0.090)	(0.042)	(0.044)	(0.097)	(0.098)	(0.062)	(0.063)
China Policy Uncertainty $Index_{t-1}$*Import share from $China_{t-1}$			-5.5E-05 **	-3.4E-05 **	-2.0E-05		-5.2E-05 **	-3.3E-05 **	-1.8E-05
			(2.5E-05)	(1.4E-05)	(1.4E-05)		(2.5E-05)	(1.4E-05)	(1.4E-05)
Dummy for GFC_t				-0.018 ***	-0.016 ***			-0.018 ***	-0.015 ***
				(0.005)	(0.004)			(0.005)	(0.004)
Stock $Price_{t-1}$					0.007 ***				0.007 ***
					(0.003)				(0.003)
No. of Countries	11	11	11	11	11	11	11	11	11
No. of Observations	2,112	2,112	2,112	2,112	2,112	2,112	2,112	2,112	2,112

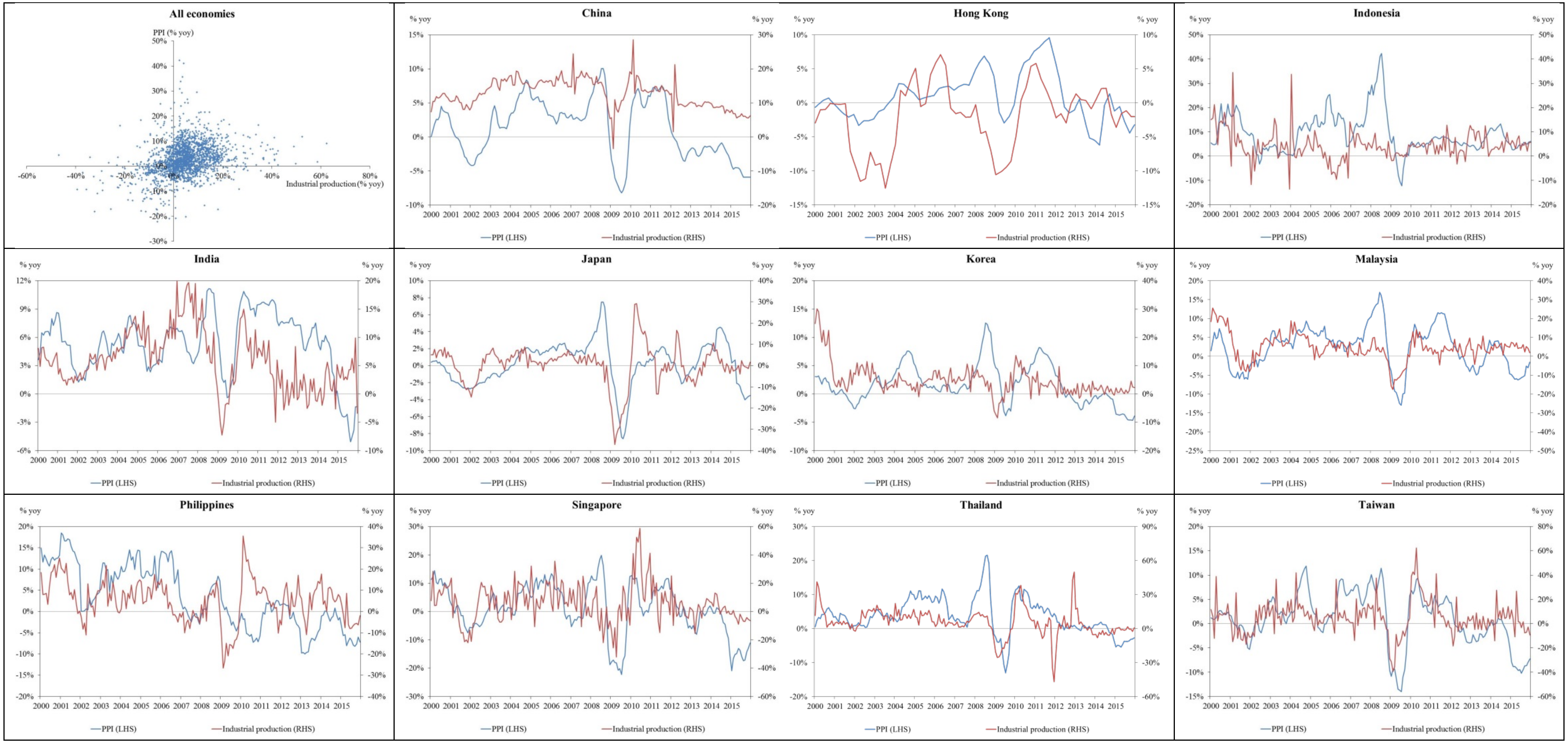
Notes: The dynamic panel regression is estimated by LSDV using the Kiviet K1 method. ***, **, and * respectively indicate significance at the 1%, 5%, and 10% levels. Standard errors are given in the parenthesis underneath coefficient estimates. All variables are in year-on-year growth, except import share from China, China Policy Uncertainty Index and Dummy for GFC. For the import share from China, the figure for China uses the import share of the remaining countries outside the estimation sample. The China Policy Uncertainty Index is in level. Dummy for GFC: Dummy=1 if during September 2008 to March 2009, 0 otherwise.

Figure 2 PPI and NEER for Asian economies



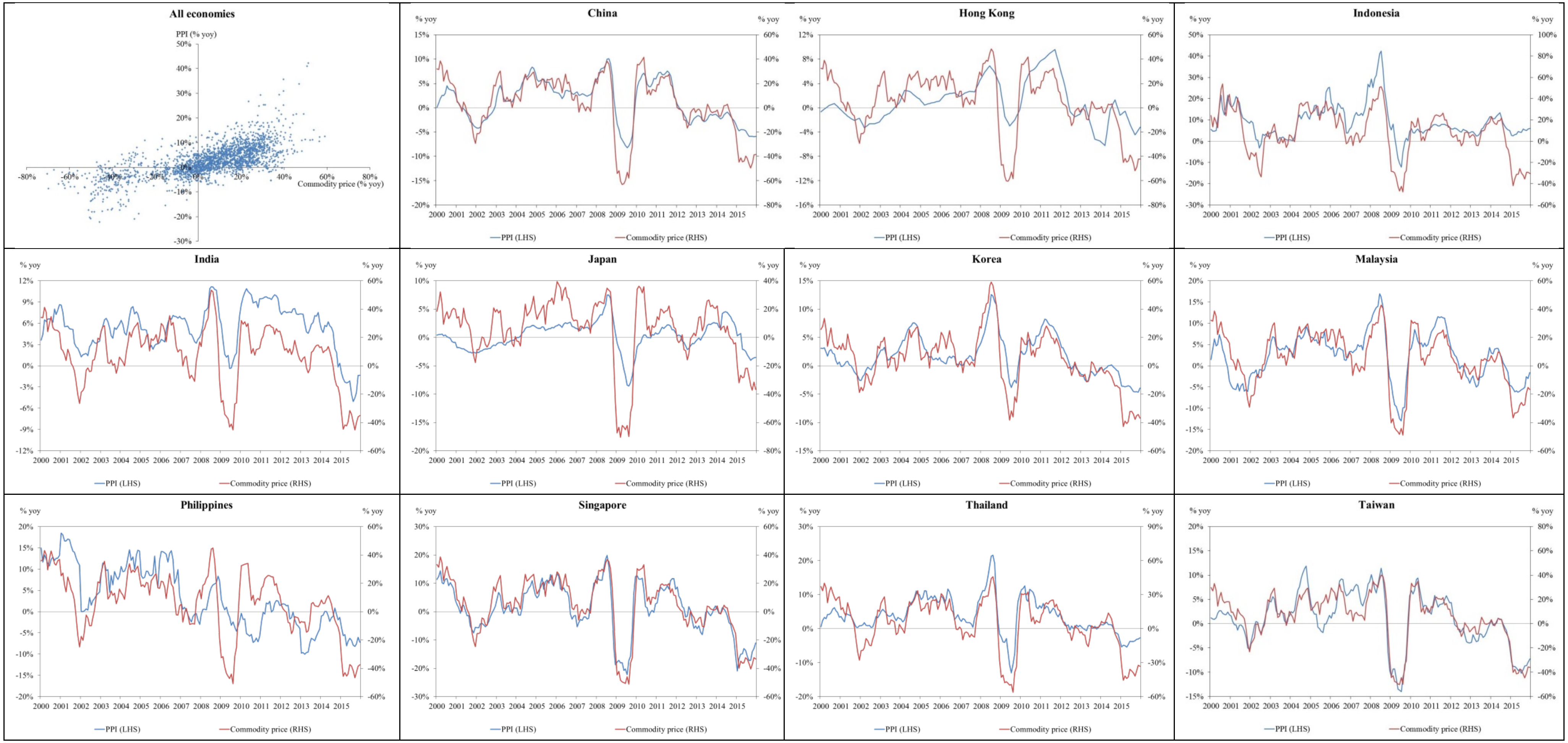
Sources: Various national sources, IMF Data (IFS) and BIS.

Figure 3 PPI and industrial production for Asian economies



Sources: Various national sources and IMF Data (IFS).

Figure 4 PPI and commodity prices for Asian economies



Note: The commodity price is given in local currency, calculated based on the global commodity price index (USD) multiplied by exchange rate of country i, rebased to an index with the same base period (2005=100) as global commodity price index.

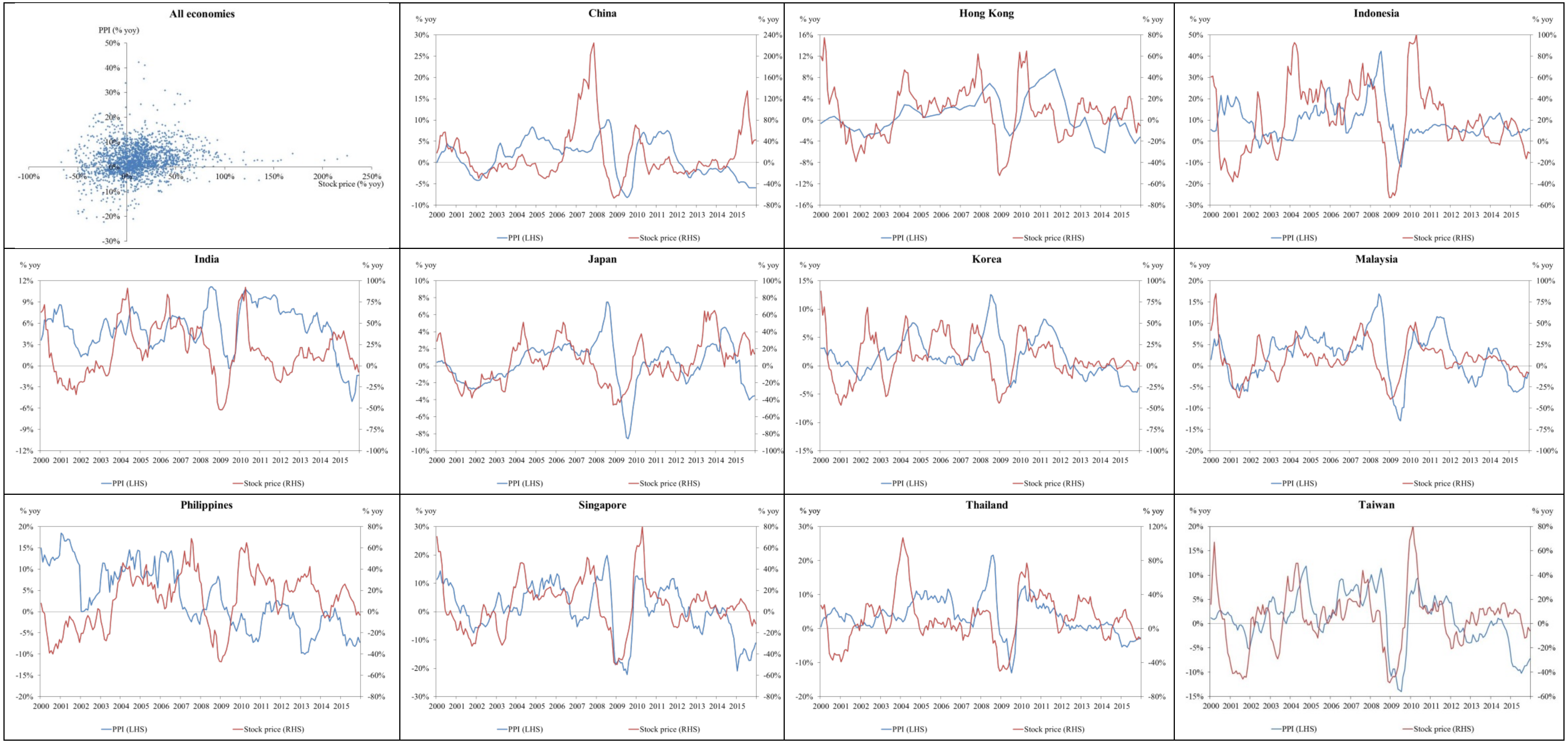
Sources: Various national sources, IMF Data (IFS).

Figure 5 PPI and China policy uncertainty index for individual Asian economies

Note: The China Policy Uncertainty Index is adjusted by import share from China for each Asian economy.

Sources: Various national sources, IMF Data (IFS) and Economic Policy Uncertainty website (http://www.policyuncertainty.com/china_monthly.html).

Figure 6 PPI and stock prices of Asian economies



Note: Representative stock indexes used are as follows: China – Shanghai Composite Index; Hong Kong – Hang Seng Index; Indonesia – Jakarta Composite Index (JCI); India – Sensex Index; Japan – Nikkei Index; Korea – Korea Composite Stock Price Index (KOSPI); Malaysia – Kuala Lumpur Composite Index (KLCI); Philippines – Philippine Stock Exchange (PSE) Composite Index; Singapore – Straits Times Index (STI); Thailand – Stock Exchange of Thailand (SET) Index; and Taiwan – Taiwan Stock Exchange Weighted Index.

Sources: Various national sources, IMF Data (IFS), and Bloomberg.

Table 4 reports the estimation results. Model 1 is the basic model, including the explanatory variables for lagged PPI inflation, change in NEER, industrial production growth and change in commodity price in local currency only. In this model, lagged PPI inflation and changes in industrial production and commodity price are significant, but the change in NEER is insignificant. Model 2 adds the spillover effect from China (China's PPI inflation multiplied by import share from China), which is statistically significant. Model 3 adds a new explanatory variable, spillover of China policy uncertainty, with both the new variable and change in NEER significant. Model 4 includes the dummy for GFC, on top of Model 3. The dummy for GFC is significant, but industrial production becomes insignificant. Model 5 further includes the change in stock price, our risk indicator. In Model 5, the change in stock price is significant, but the spillover of China policy uncertainty becomes insignificant. Model 2a to Model 5a add the interactive dummy variables of exchange rate regime multiplied by the change in commodity price to Model 2 to Model 5. The results are similar between both sets of models when the interactive dummy variables are added. Summarizing the results from different models, lagged PPI is significant in every model and show high coefficients ranging between 0.88–0.91. This result confirms the use of the dynamic panel model as the PPI inflation can be explained by its lagged term.

The exchange rate sensitivity is rather low and sometimes insignificant (Models 1 and 2). The results confirm that the higher the change in NEER, the lower the PPI inflation. This finding is consistent with the relationship shown in Figure 2 (the relationship for the whole region and that by country). Exchange rate sensitivity depends on whether the exchange rate regime uses a floating, a hard peg or a soft peg. Low exchange rate sensitivity may be explained by slow trade growth. Since 2010, growth in global trade has slowed significantly. Given that many Asian countries are highly open economies, the slowdown in world trade has weighed heavily on their exports. The post-GFC trade slowdown may be attributed to anemic advanced economy growth. It may also be attributed to the maturation of global value chains reducing the elasticity of trade flows to world GDP. During the 1990s, trade liberalization and a decline in shipping times and cost and encouraged rapid fragmentation of production across countries. With maturing supply chains, this trade growth has lost momentum.[10] As a result, trade has become less sensitive to world GDP and effective exchange rate changes.

[10] Some supply chains may even have begun to shorten again as higher-value added activity moved to emerging markets. World trade data can be found at http://www.cpb.nl/en/data. The study by Auer and Mehrotra (2015) also demonstrates that real integration through the supply chain matters for domestic price dynamics in the Asia-Pacific region.

Some recent studies have sought to test the proposition of Taylor (2000) that global competition reduces the extent to which exporting firms can pass through exchange rate movements into the domestic currency prices charged to importers. This proposition since has found considerable empirical support (see e.g. Olivei, 2002; Gagnon and Ihrig, 2004). This decline seems to be due to both a shift of imports away from commodities to manufacturing goods, which tends to have lower pass-through rates, and a general decline in the exchange rate pass-through across all product categories.[11]

Our industrial production growth variable, which is positive and significant in some models, indicates that higher production growth pushes up PPI inflation. Accordingly, the recent PPI deflation is in line with the decline in industrial production among Asian economies (Figure 3). However, this variable is insignificant if the dummy for GFC is included in the models. The significant GFC effects may capture most of the significance of industrial production growth. As expected, the dummy for GFC is significant and negative, reaffirming other evidence that PPI inflation suffered a significant negative impact from the global turmoil financial and economic conditions during the GFC period.

The change in input prices, proxied by commodity price in local currency, is significant in all models. The positive relationship between PPI inflation and change in input prices is confirmed by the estimation results. This result also confirms that recent PPI deflation has been driven by the sharp decline in commodity prices (Figure 4). Adding the interactive dummy variables for exchange rate regime multiplied by commodity price change, the commodity price change is significantly different if there is hard peg. The floating exchange regime in Models 2a and 3a shows significantly different effects with respect to changes in commodity prices. The spillover from China PPI inflation is significant in all the models including this effect, indicating the spillover effect from China is one of the determinants of Asian PPI inflation. This confirms the results shown in Section 3.

The spillover of China policy uncertainty is also significant, confirming that PPI deflation in Asian economies may be partly explained by the risk spillover from China (the development of China policy uncertainty can be found in Figure 5). However, this effect is insignificant when the change in local stock prices is included in the model. The risk of the individual country is captured by stock price variable and the change in stock price is significant in the model. The

[11] This interpretation rests on the assumption that the regressors are weakly exogenous to the system. Testing for weak exogeneity using Wu-Hausman tests indicates that this condition is met. The test entails regressing the explanatory variables on a set of variables that are clearly exogenous and then testing whether the residuals from this regression have any explanatory power in addition to the variables already included in the empirical framework.

change in local stock price may be a better proxy for the risk of an individual country as it captures both local risks and risk spillover from other countries. In general, the PPI inflation has the positive correlation with changes in stock prices, although there are exceptions for some economies in 2015 (Figure 6).

Overall, the recent PPI deflation in Asian economies may be explained by the similar development in local factors such as exchange rate pass-through, production growth, and risk factor (stock price), as well as the common factors such as the sharp drop in commodity prices. The spillover effect from China is also a key determinant of Asian economies. This suggests that economic trends and China’s policy responses will be crucial to the development of Asian PPI readings. In the following section, we discuss the prospects for China’s PPI deflation and consider the policy options for coping with PPI decline in Asian economies.

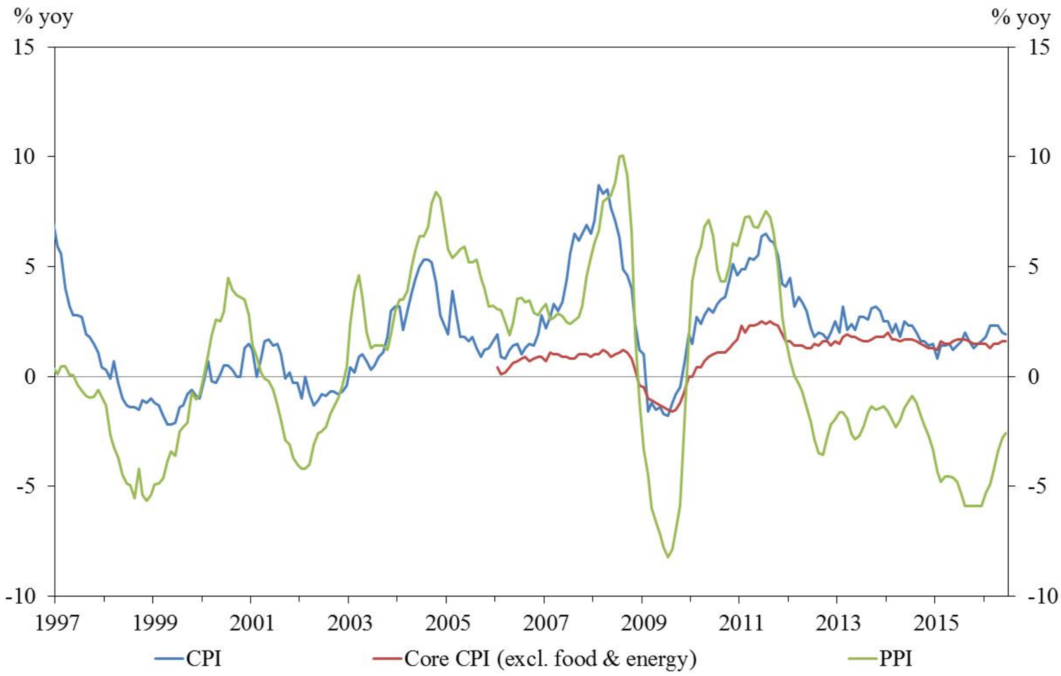
5 The slippery slope of Chinese deflation

China is at the heart of the region’s PPI deflation challenge. With entrenched PPI deflation, financial markets seriously concerned that PPI deflation results in a feedback loop, whereby deflationary PPI pressure intensifies and eventually causes consumer price deflation. Should this happen, it will have serious negative impacts on the Chinese economy and the world economy in general.

5.1 Fundamental problems of the Chinese economy

While it may be linguistically and semantically convenient to lump PPI deflation and CPI deflation together, it makes little sense otherwise. There is a persistent gap between China’s PPI and CPI series since 2011. PPI declined for 52 consecutive months between March 2012 and June 2016, while the CPI and (in particular, the core CPI) remained solidly in positive territory. Although this divergence is a bit different from Japan’s PPI deflation episode in the 1990s, it is highly unusual for China. China’s PPI and CPI moved in tandem in the aftermath of the 1997 Asian financial crisis and the 2008 global financial crisis, both periods in which China experience deflationary episodes.

Figure 7 CPI vs. PPI dynamics in China, Jan 1997 – Jun 2016



Source: National Bureau of Statistics of China.

While the divergence since 2011 shows that producer prices no longer seem to signaling impending future deflation, it is hardly to time to signal an all-clear. CPI and core CPI inflation are still positive, but CPI inflation has drifted below 2 percent. The June 2016 CPI inflation reading was 1.9 percent. Although PPI deflation is moderating, it was still -2.6 percent in June. A Bloomberg survey found that respondents still expected PPI to decline a further 1.5 percent in 2017 before rising 0.2 percent in 2018.[12] With such weak aggregate demand, it remains a challenge for firms to raise factory-gate prices or boost profits. CPI deflation remains a potential challenge.

Indeed, the deceptively innocent appearance of the current divergence of CPI and PPI deflation is what makes it such a pernicious threat. As PPI inflation drops, slipping into CPI deflation becomes ever easier. Brief PPI deflation episodes are quite tolerable in some circumstances. For example, PPI deflation may be a symptom of encouraging underlying developments such as productivity gains that enable the economy to produce more goods and services at lower cost and thereby raise consumers' real incomes. It could also reflect declining global commodity prices. On the other hand, PPI deflation could signal bad times ahead if demand is running chronically below the economy's industrial capacity, causing a negative output gap and reducing profits. In such circumstances, firms may cut prices and wages, weakening demand further. Moreover, debt aggravates the cycle. As prices, profits and incomes fall, the real value of debt rises,

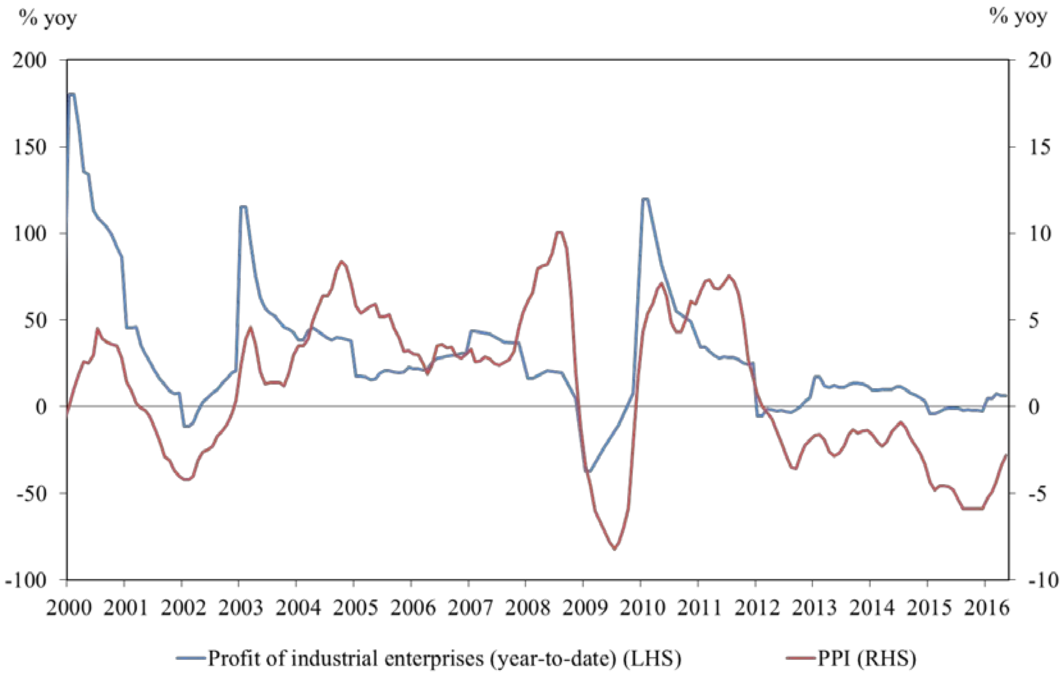
[12] Bloomberg News (2016), "China Factory-Gate Deflation Eases in New Signal Rebound Endures," July 10, 2016.

forcing borrowers to cut other spending as they pay down debt. Such conditions are fertile ground for a downward economic spiral with ever-gloomier economic expectations.

The Chinese economy's three biggest problems at the moment are declining corporate profits, overcapacity, and excessive debt. These three problems are interconnected, self-reinforcing, and particularly severe in the case of SOEs. If the government fails to act quickly to address these issues, PPI deflation will only intensify, which could lead to CPI deflation that makes China's problems even worse.

Figure 8 shows that corporate profit growth and PPI inflation are positively correlated, i.e. declining producer prices lead to declining profitability.[13] With slowing economic growth, profit growth of corporations, regardless of ownership structure, declines. For SOEs, profit growth on average turns negative and many SOEs encounter losses (Figure 9). The hardest hit is sectors suffering from overcapacity. Almost all companies in this category have recently drifted into negative profit growth (Figure 10).

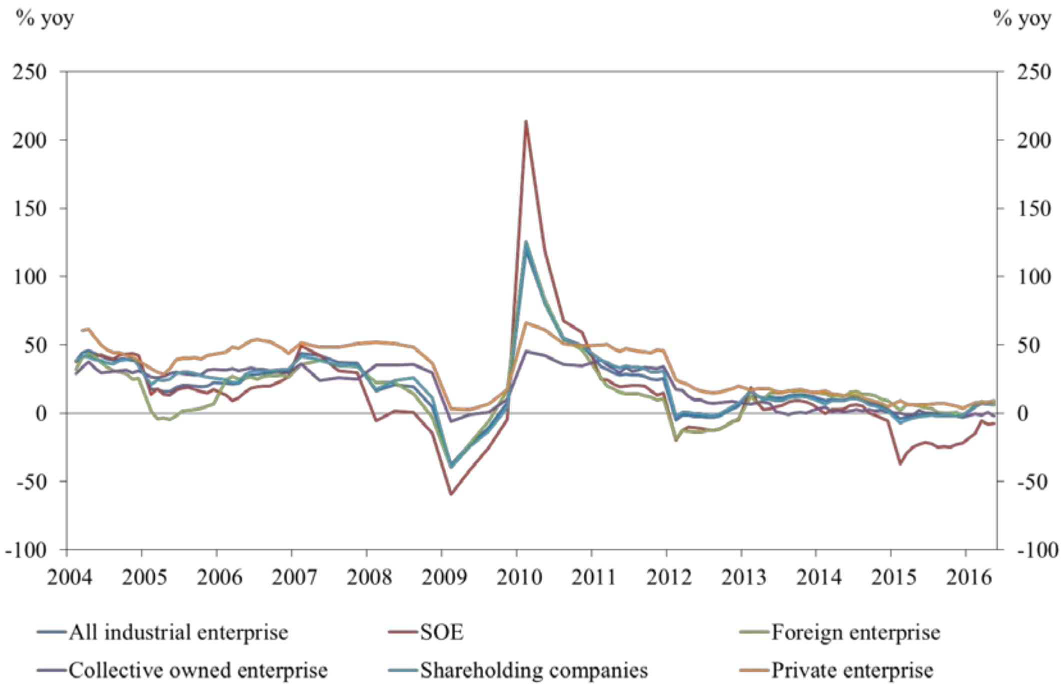
Figure 8 PPI dynamics and profitability of Chinese firms, Jan 2000 – May 2016



Notes: Total profit refers to the operation results in a certain accounting period. It is the balance of various incomes minus various spending in the course of operation, reflecting total profits and losses of enterprises in a reporting period (year-to-date figures in monthly basis). The enterprises included in the sample vary over time. From 2011, enterprises with revenues of more than RMB 20 million a year from their main operating activities are included in the sample. Before 2011, the revenue floor was RMB 5 million.
Source: National Bureau of Statistics of China.

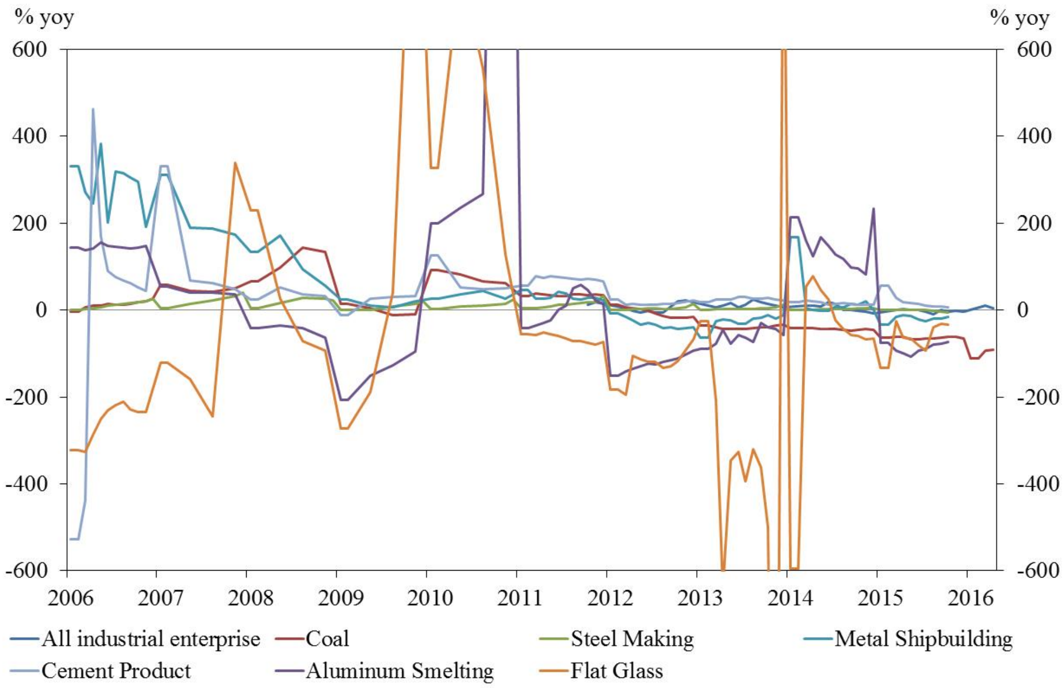
[13] Some uncoupling is visible since 2011. Since 2012, lower costs have allowed companies to stabilize profits at a low level, even as producer prices continued to fall. In other words, firms have acclimatized to some extent to declining producer prices.

Figure 9 Profitability of Chinese firms by ownership, Jan 2004 – May 2016



Note: Profit figures are year-to-date figures on a monthly basis.
Source: National Bureau of Statistics of China.

Figure 10 Profitability of Chinese firms in industries with overcapacity , Jan 2006 – May 2016

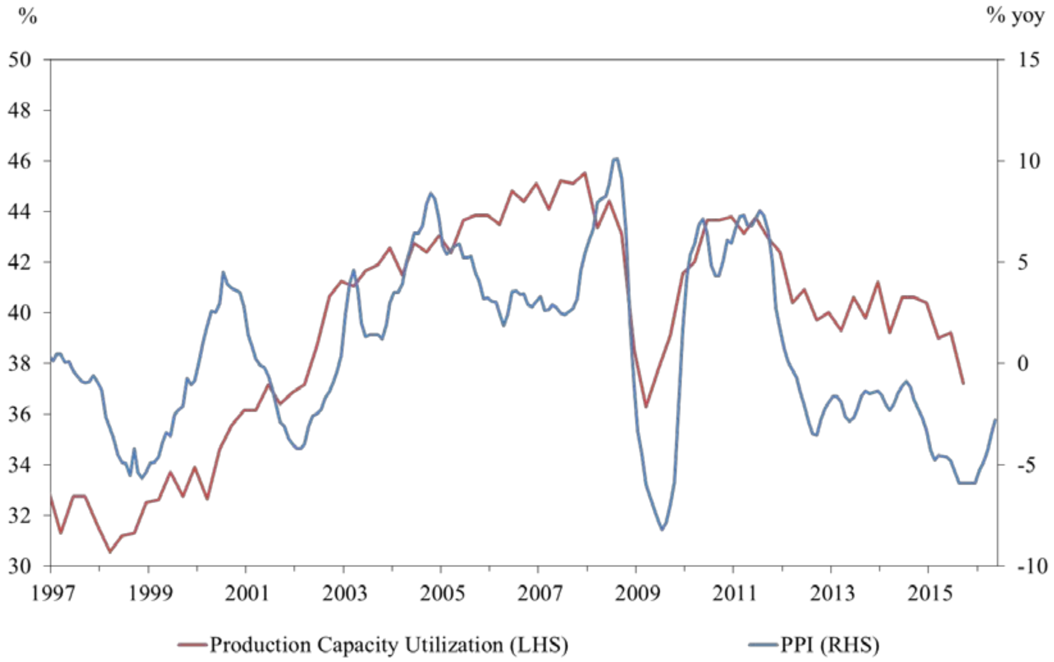


Note: The profit figures are year-to-date figures on a monthly basis. For easier comparison, extreme figures (over 600%) are not shown.
Source: National Bureau of Statistics of China.

Figure 11 shows that production capacity utilization and PPI inflation/deflation are positively correlated. After the Asian financial crisis, China joined the WTO and went through a real estate boom that produced a period of increasing production capacity utilization. The drop in production utilization during the global financial crisis of 2008 was short-lived due to the government's four trillion RMB stimulus package. Production utilization began to fall again in 2012. In each of these episodes, PPI growth rate moved in tandem with the production utilization index.

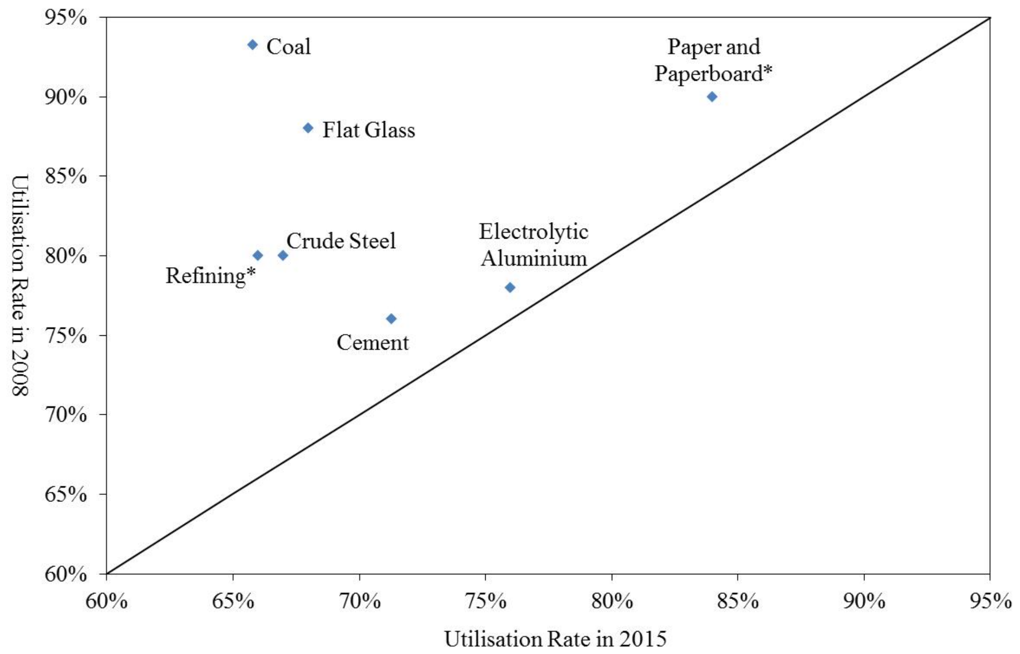
The recent economic slowdown includes reduced construction activity, which drives related industries such as steel, cement, and flat glass. China's overcapacity problems are made explicit under such conditions, revealing both the lack pricing power on the part of firms and the persistent decline in PPI. Figure 12 shows seven industries with overcapacity problems that first encountered problems at start of global financial crisis in 2008. In late 2008, however, the Chinese government rolled out an RMB 4 trillion stimulus package for the real economy and provision of matching funds totaling RMB 10 trillion to stabilize the banking sector. Much of the stimulus money and new borrowing went to investment, especially SOEs involved in infrastructure development, housing, and energy. This created additional production capacity and led to even lower capacity utilization rates when the economy slowed again in 2012.

Figure 11 Production capacity utilization and PPI, Jan 1996 – May 2016



Note: Production capacity utilization is the diffusion index in 5000 Industrial Enterprises Survey conducted on a quarterly basis by the People's Bank of China. The latest available figures for production capacity utilization are from September 2015.
Sources: National Bureau of Statistics of China and People's Bank of China.

Figure 12 Capacity utilization rates in selected Chinese industries, 2008 and 2015



Notes: Capacity here is defined as the ratio of actual output to production capacity in percentage. Utilization rate figures for refining and paper and paperboard are for 2014.
Sources: European Union Chamber of Commerce in China and Roland Berger Strategy Consultants (2016), *Overcapacity in China – An Impediment to the Party's Reform Agenda*, Beijing; UBS (2016a), "The Economic and Financial Impacts of Excess Capacity Reduction," Hong Kong; and CEIC.

China's overcapacity is concentrated in six industries: coal mining, iron & steel, cement, flat glass, aluminum smelting, and shipbuilding. Table 5 shows that these six industries accounted for 10.4 percent of the industrial employment (or about 17 million workers) and around 12 percent of industrial value added in 2015. Coal and steel accounted for more than 82 percent of both the total industrial employment and industrial value-added of the six sectors. UBS put the 2015 capacity utilization rates of the coal industry at about 65.8 percent and the steel industry at about 67 percent (UBS, 2016). The six industries together represented 14.8 percent of total industrial assets, but generated just 2.3 percent of total industrial profits and accounted for 31.6 percent of total losses.

Table 6 shows that the overall 2015 profit margin of these six overcapacity industries was only 1.3 percent, and that 26.5 percent of the firms in these six industries posted losses. The return on equity (ROE) was only 3.0 percent and return on assets (ROA) 1 percent. Total liabilities amounted to RMB 10 trillion, of which RMB 8.7 trillion was classified as debt and RMB 4.9 trillion as bank loans. The six industries together accounted for 17.7 percent of total industrial liabilities. UBS estimates that companies in these overcapacity industries with earnings before tax and interest lower than their interest payments held 25–30 percent of the total debt, so the potential bad debt would be of similar magnitude (UBS, 2016). Heavy debt burdens also erode the ability to invest, however. In 2015, the coal and steel industries accounted for only 1.5 percent of total fixed asset investment.

Table 5 Economic indicators of overcapacity industries

Sector share (% of total, 2015)	Industrial employment	Non-farm employment	Industrial value-added	GDP	FAI	Industrial profits	Industrial loss-making	Industrial assets	Industrial liabilities
Overall industrial sector	100	29.4	100	33.8	39.9	100	100	100	100
Coal mining & dressing	4.7	1.4	3.7	1.3	0.7	0.7	10.7	5.4	6.6
Ferrous metal smelting & pressing	3.9	1.1	6.6	2.2	0.8	0.8	15.3	6.6	7.8
Cement production	0.9	0.3	-	-	-	0.4	2.5	1.4	1.6
Flat glass production	0.1	0.0	-	-	-	0.0	0.4	0.1	0.2
Aluminum smelting	0.3	0.1	-	-	-	0.0	1.5	0.6	0.9
Shipbuilding	0.6	0.2	-	-	-	0.3	1.1	0.6	0.8
Total 6 excess-capacity sectors	10.4	3.1	10.3	3.5	1.5	2.3	31.6	14.8	17.7

Notes: Table replicated from UBS report “The Economic and Financial Impacts of Excess Capacity Reduction.”
Source: UBS (2016a), *The Economic and Financial Impacts of Excess Capacity Reduction*, Hong Kong.

Table 6 Financial indicators of selected overcapacity industries

(as of 2015)	Assets (RMB tn)	Liabilities (RMB tn)	Debt (RMB tn)	Bank loan (RMB tn)	Liability-asset ratio (%)	Profit margin (%)	Share of loss makers (%)	ROE (%)	ROA (%)
Overall industrial sector	100	56.2	45.6	27.9	56.2	5.8	13.2	14.5	6.4
Coal mining & dressing	5.4	3.7	3.2	1.8	67.9	1.8	31.5	2.5	0.8
Ferrous metal smelting & pressing	6.6	4.4	3.8	2.2	66.7	0.8	21.9	2.4	0.8
Total 6 excess-capacity sectors	14.8	10	8.7	4.9	67.3	1.3	26.5	3.0	1.0

Note: Table replicated from UBS report “The Economic and Financial Impacts of Excess Capacity Reduction.”
Source: UBS (2016a), “The Economic and Financial Impacts of Excess Capacity Reduction,” Hong Kong.

Lower capacity utilization rates have eroded producer prices, thereby compounding the effects of higher debt levels. Firms in industries marked by low capacity utilization also lack sufficient retained earnings for R&D, which prevents them from moving up the value chain. This self-perpetuating negative spiral is an obvious obstacle for future growth.[14]

The recent rapid accumulation of debt in the Chinese economy has become a major concern for policymakers. BIS estimates put China’s total non-financial debt at about 255% of

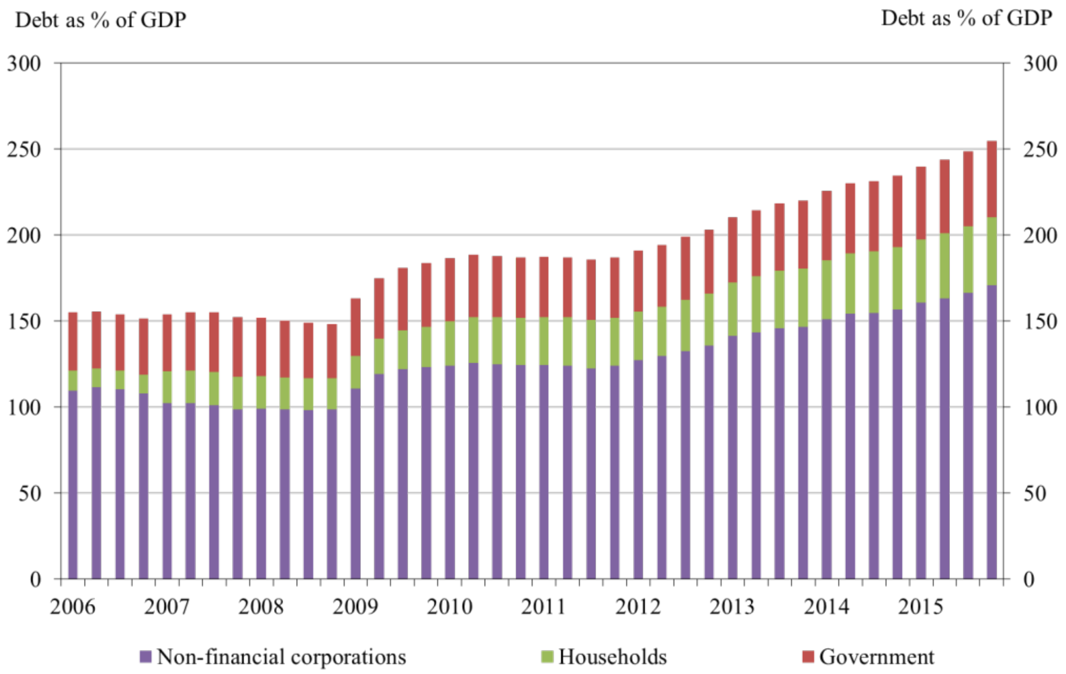
[14] The analysis in Borio et al. (2016) suggests that when considering the macroeconomic implications of financial booms and busts, it is important to go beyond the well-known and very real aggregate demand effects and to examine also what happens on the supply side of the economy. In particular, credit booms tend to undermine productivity growth by inducing labor reallocations toward lower productivity growth sectors. Thus, the PPI decline may not indicate that the economy has hit a rough patch, but instead may signal the advent of a period of prolonged weakness.

GDP in 2015 (BIS, 2016). Of that, government debt corresponded to about 44 percent of GDP, household debt about 40 percent of GDP, and non-financial corporate debt more than 171 percent of GDP (Figure 13). The relatively low household debt suggests an underdeveloped consumer credit market, which means an accommodative monetary stance will have a larger impact on firms' fixed investment than household consumption.

This enormous amount of debt eventually will have to paid down or forgiven. History suggests that the process of deleveraging is painful. In China's case, the rapid build-up of debt is a relatively recent phenomenon. Most of it has accumulated after 2008, when the Chinese government loosened policy and began pumping credit through the economy to fight off the effects of the global financial crisis. Most of the new credit went to SOEs. Figure 14 shows that SOE debt-to-asset ratios soared after 2008, while those of private enterprises declined. According to the IMF, SOEs in 2015 accounted for about 55 percent of corporate debt, but only about 22 percent of total output (Lipton, 2016). This is much smaller than their share of total corporate debt. Thus, SOEs are far less profitable than private enterprises.

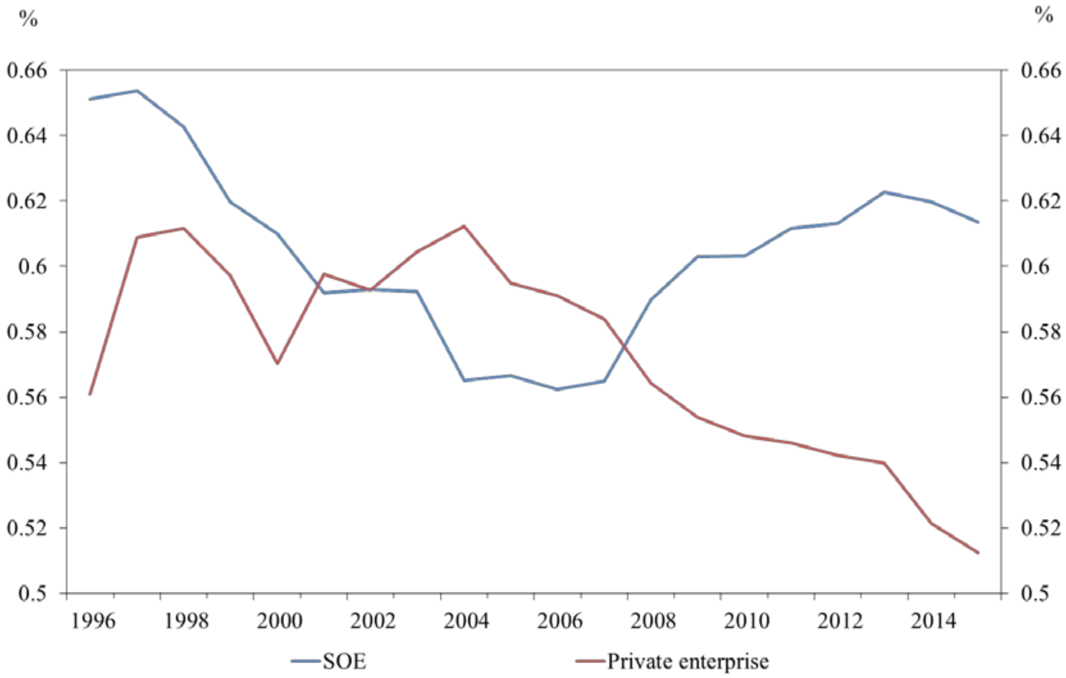
The rapid pace of SOE credit growth also makes a benign outcome ever less likely. Looking at the economy as a whole, the incremental capital output ratio has skyrocketed in recent years, which means that new investment is much less efficient in producing additional output. The leverage level of zombie firms reaches as high as 71.6 percent (Wang et al., 2016).

Figure 13 Chinese debt by sector, Q1 2006 – Q4 2015



Source: Bank for International Settlements.

Figure 14 SOE and private enterprise debt-to-asset ratios, 1996 – 2015



Sources: National Bureau of Statistics of China and People's Bank of China.

With declining corporate profits, overcapacity, high debt levels and high corporate leverage, the Chinese economy risks drifting into a debt-deflation spiral. We now consider the policy options available for avoiding zero lower bound quicksand.[15]

5.2 Structural reform and Chinese authorities: a bridge too far?

The general view is that China's macro policies should be geared to stabilizing short-term growth, while addressing medium- and long-term structural problems. In the following, we consider the available supply-side reforms and fiscal and monetary policies for softening a possible hard landing.

The central issues in supply-side reform are reducing overcapacity, improving efficiency, and raising SOE profitability. Measures to deal with these problems help reduce debt levels and leverage. A recent estimate found that 1.8 million workers will have to be laid off if industrial overcapacity is shut down (Lu, 2016). If workers made redundant in support industries are included, the total number of workers to be relocated amounts to about 3 to 3.5 million (UBS, 2016).

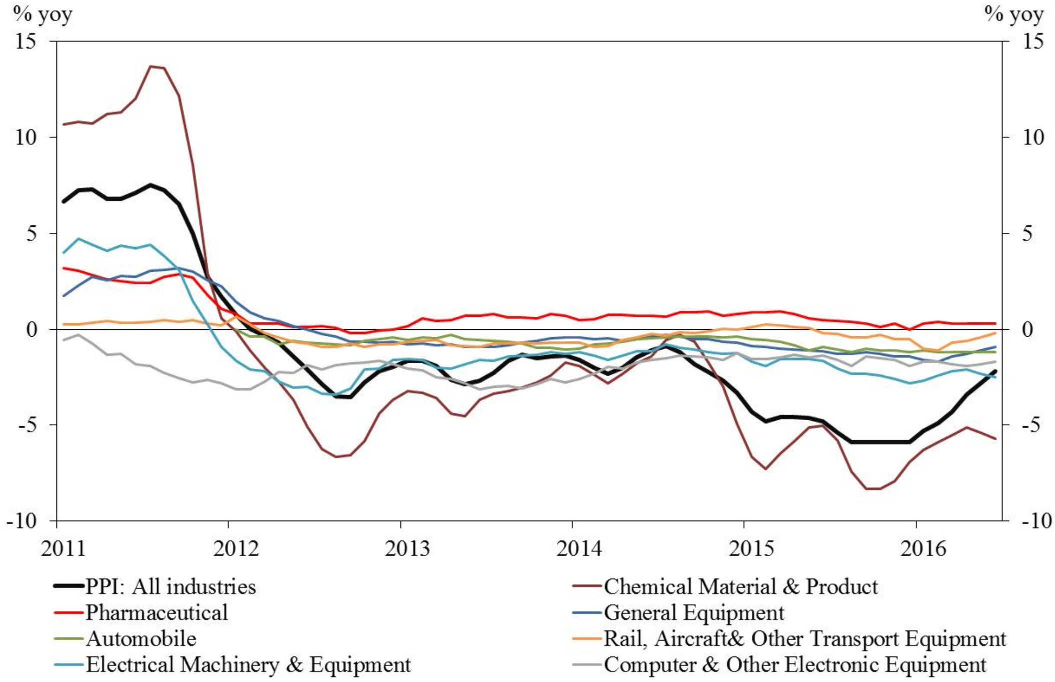
[15] Gertler and Hofmann (2016) revisit the long-run link between credit growth and financial crises. Their analysis reveals that the credit-crisis nexus is stronger in regimes characterized by low inflation and liberalized financial systems.

Reducing overcapacity is a daunting task for the government, which explains why efforts to reduce overcapacity have been difficult and slow. If history is any guide, however, the Chinese government will resolve this issue. In late 1990s, for example, the government successfully relocated 30 million redundant workers in the final round of SOE reform and privatization. With even more resources in hand today and a much larger economy, the government should also succeed this time.

Market-based measures are available to the government in resolving the overcapacity problem. For example, instead of issuing administrative orders that firms in overcapacity sectors shut down, the government could tighten the soft budget constraints of non-profitable SOEs and use mergers and acquisition to take capacity out of the market. This approach is not only likely to be more cost efficient and humane than administrative orders, it helps develop more dynamic firms and puts in place a market-based mechanism for economic restructuring. The restructuring of US steel industry is a good example here.

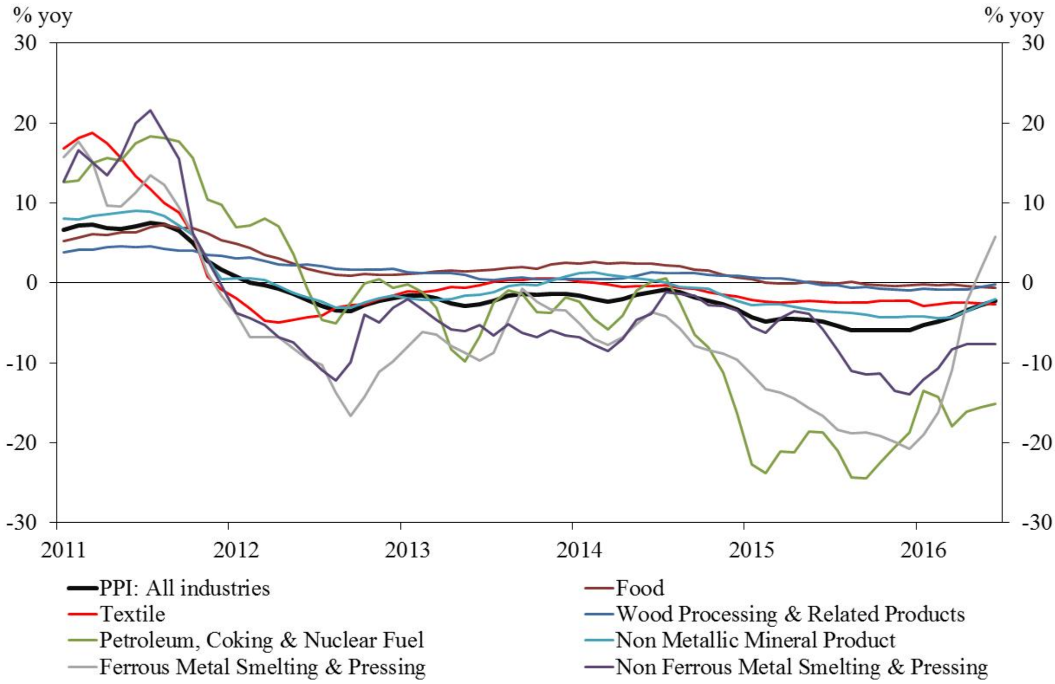
Regarding deleveraging, we see from Figure 14 that private sector leverage consistently declined since 2008, while SOE leverage has risen. This not only shows that most of the credit supply from the stimulus package went to SOEs, but also that SOEs are less capable than their profitable counterparts in the private sector in coping with debt. To reduce SOE leverage, the government could tighten overall credit growth. This is very difficult in a slowing economy, however. Such a move could even increase leverage in firms that rely on bank credit for their continuing operation. A much-discussed alternative is to swap debt for equity. The government has used this on a trial basis, only to find it generates perverse incentives. Firms may choose not to pay down debt and seek instead a bailout in the form of a debt-equity conversion. The third option is to close down non-profitable zombie firms. Zombie firms waste huge amounts of resources and create huge potential risk for the banking system. The challenge for the government here is similar to that of dealing with overcapacity – closing zombie firms creates a need to relocate redundant workers. Perhaps even more politically thorny is the issue of deciding which zombie firms go to the chopping block and which are spared.

Figure 15 Declining producer prices in high- and medium-high-tech industries, Jan 2011 – May 2016



Note: The classification of high/low technology is using the OECD classification of manufacturing industries based on R&D intensity.
Source: National Bureau of Statistics of People's Republic of China.

Figure 16 Declining producer prices in high- and medium-high-tech industries, Jan 2011 – May 2016



Note: The classification of high/low technology is using the OECD classification of manufacturing industries based on R&D intensity.
Source: National Bureau of Statistics of China.

Other aspect of supply-side reform involves finding ways for the government to reduce distortions in e.g. prices, taxes, and credit supply in order to create proper incentives for private sector investment, particularly R&D investment that allows firms to climb the technology ladder. Measures here include reducing corporate taxes and encouraging bank lending to the real sector of the economy. Small and medium-sized enterprises (SMEs), in particular, should enjoy targeted R&D incentives. Although all industries exhibit PPI deflation, low-tech industries face the most deflationary pressure. Low-tech businesses are already fairly competitive, so they may have less pricing power and lower profit margins. So again, the importance of moving up the technology ladder is highlighted (Figure 15 and 16).

Structural reforms and creation of knowledge-based economies are hardly trivial tasks. Governments around the world struggle with these goals and regularly fail. With globalization of production chains and the world economy, the cyclical rise and fall of regional economies has accelerated. Many of the specific problems of the falling part of clustering, that is old industrial areas, are related to path dependency and lock-ins. A good example here is the decades-long transformation of the Ruhr region in Germany. It involves managing change from traditional industry-based, resource- and material-intensive economic activity toward a knowledge-based resource-efficient economy. The coal mines and hot metal furnaces that transformed the region into Europe's industrial engine a century ago were shut down, eliminating roughly 500,000 jobs in the Ruhr region. State and local governments invested in R&D and education, transformed abandoned steelworks into industrial parks, and seeded new start-ups. Despite two decades of redevelopment effort, unemployment across the Ruhr Valley's main cities remains well above the national average and growth remains chronically weaker than in other German regions. Even optimists acknowledge that it will take decades for the area's technology-driven industries to boost employment (Hospers, 2004).

5.3 Short-term policy responses

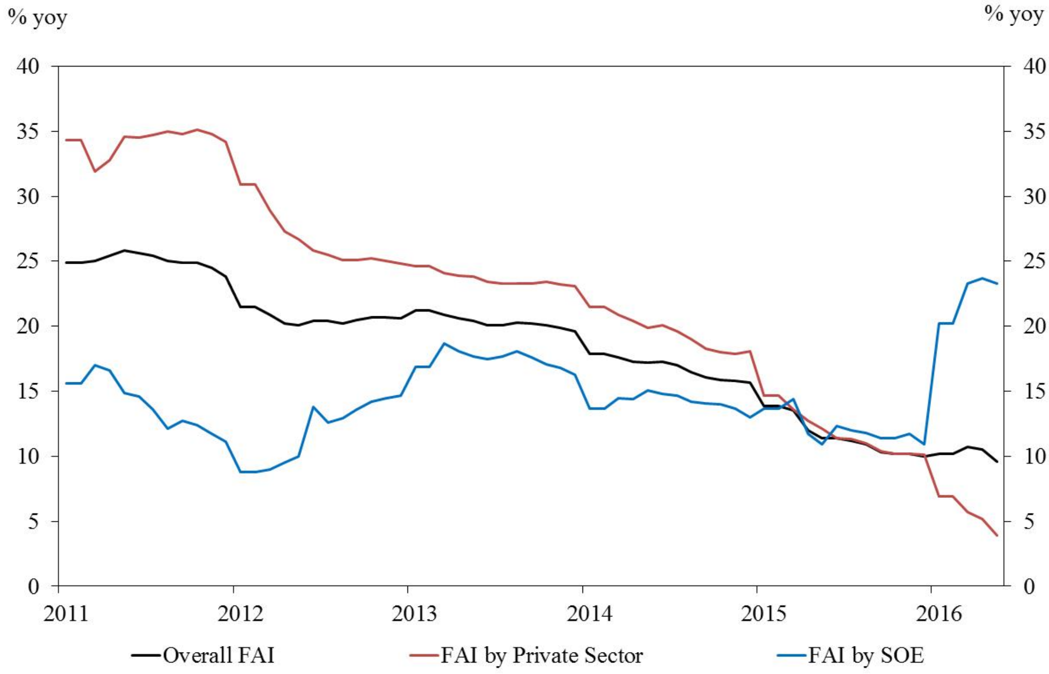
The Chinese economy faces strong headwinds in the short term, including lower growth of fixed asset investment (FAI). Notably, growth in private sector FAI has declined very fast, while the relatively high growth of FAI by SOEs has been sustained largely through government policies aimed at stabilizing economic growth (Figure 17).[16] Given these conditions, we now consider what an appropriate fiscal and monetary policy mix might look like.

[16] A data reclassification by National Bureau of Statistics of China may have contributed to the recent sharp divergence of private and SOE investment. See UBS (2016b), "Why Has Private Investment Plunged in China?" Hong

On the fiscal side, the government has room to maneuver. Government debt to GDP is only 44 percent, and primary budget deficit is below 3 percent of GDP. The government also has a wide range of options for investing in infrastructure projects, education, and medical services. The main issue for the government is thus finding ways to invest efficiently in improving the quality of services and create a basis for future economic growth.

On the monetary side, the People's Bank of China (PBoC) has kept ample liquidity in the banking system through its Medium-term Lending Facility (MLF) and Standing Lending Facility (SLF). It has also reduced reserve requirements and lowered benchmark interest rates. Given the rather loose monetary stance, policymakers seem confounded by the persistence of PPI deflation and the drop in CPI inflation to below 2 percent.

Figure 17 Overall vs. private fixed asset investment in China, Jan 2011 – May 2016



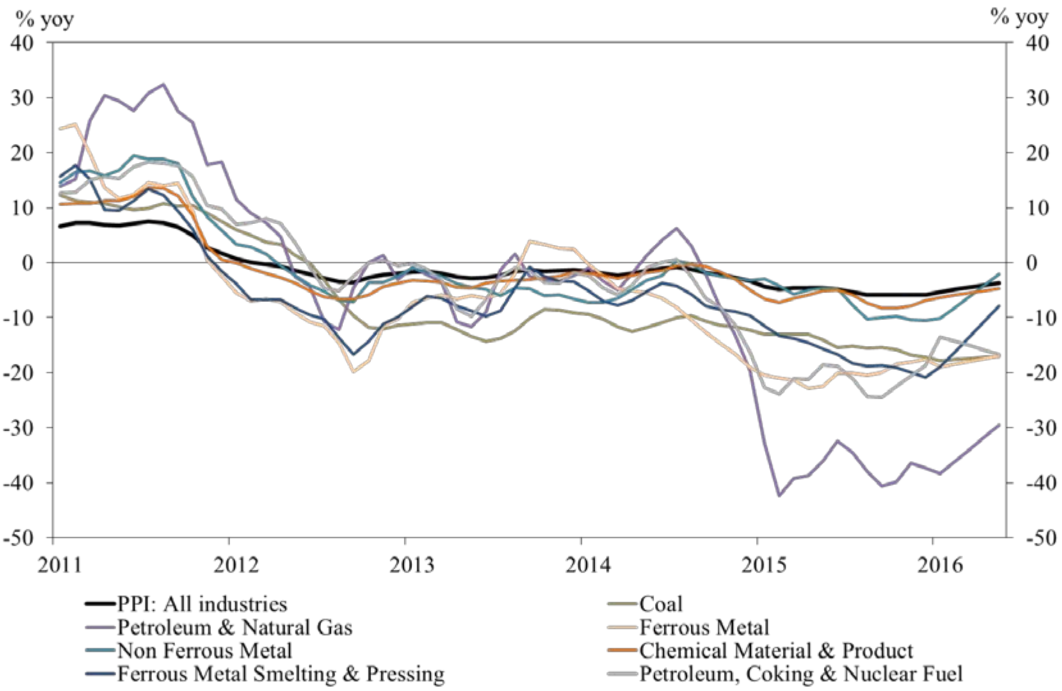
Source: National Bureau of Statistics of People's Republic of China.

According to theory, monetary easing affects the economy via two channels. In the first channel, an interest rate cut triggers an inter-temporal substitution effect, whereby households (firms) find it more worthwhile to consume (invest) today than tomorrow. In the second channel, a wealth effect strengthens purchasing power. The leverage ratios in Figure 14, however, suggest that China's monetary stimulus has not worked according to theory. Due to China's underdeveloped

Kong. The article highlights declining profits as the key determining factor for declining private investment expenditures.

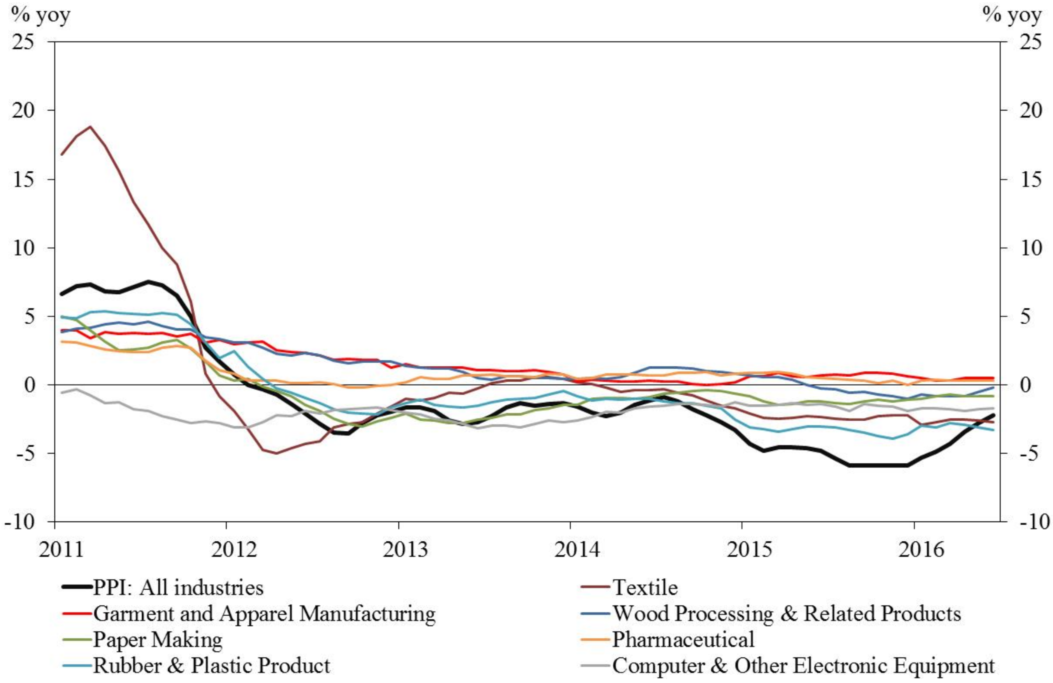
consumer credit market, corporate investment has benefitted disproportionately from monetary easing. While such investment stimulates GDP growth in the short run, the resulting redundant capacity depresses growth in the long run. Monetary easing measures also do little to shore up PPI growth. Cost-insensitive SOEs are kept in business, despite low producer prices and excess capacity. Their presence crowds more efficient private firms out of the market. In other words, expansionary monetary policy may actually undermine the corrective process and lead to a persistent misallocation of capital. Indeed, this phenomenon is evident from the disaggregate pattern of PPI deflation – the biggest declines are recorded in industries with the most SOEs (Figures 18 and 19). If this is so, injecting liquidity to rebalance the economy may be counterproductive in China's case.

Figure 18 Declining producer prices in industries with a high share of SOEs, Jan 2011 – May 2016



Note: The classification of high/low share of SOEs is determined using employment data. An industry where over 40% of the workforce is employed by SOEs (percentage of sum of SOE employees and private employees; ratio is the average over 2005–2014) is classified as an industry with high share of SOEs. An industry with less than 10% of the workforce employed by SOEs is classified as an industry with a low share of SOEs.
Source: National Bureau of Statistics of China.

Figure 19 Declining producer prices in industries with a low share of SOEs, Jan 2011 – May 2016



Note: The classification of high/low share of SOEs is determined using employment data. An industry where over 40% of the workforce is employed by SOEs (percentage of sum of SOE employees and private employees; ratio is the average over 2005–2014) is classified as an industry with high share of SOEs. An industry with less than 10% of the workforce employed by SOEs is classified as an industry with a low share of SOEs.
Source: National Bureau of Statistics of China.

Moreover, devaluation of the effective RMB exchange rate would not necessarily offset domestic deflationary pressures. Global trade growth has slowed significantly since 2010, and given many Asian countries have highly open economies, the slowdown in world trade has weighed heavily on their exports. While the post-GFC trade slowdown may be attributed to anemic growth in advanced economies, but could also reflect the maturation of global value chains reducing the elasticity of trade flows to world GDP. During the 1990s, trade liberalization and declines in shipping times and cost encouraged rapid fragmentation of production across countries. With maturing supply chains, this trade growth has lost momentum.[17] As a result, trade has become less sensitive to world GDP and effective exchange rate changes. Using China data, a recent paper by Kee and Tang (2016) shows that domestic value added increased substantially for Chinese firms and was insensitive to exchange rate changes. Weakening the RMB's purchasing power could also damage consumer confidence and domestic consumption. Even so, an expenditure-switching effect is possible with a substantial currency depreciation against China's main trading partners. Finally, the Chinese government needs to clearly express its economic goals

[17] Some supply chains may even have begun to shorten again as higher value-added activity moved to emerging markets.

and improve its messaging. Policy uncertainty has been a key driver in rapid decline in private investment (Wang et al., 2016).

The above assessment largely comports with PBoC commentary.[18] In their monetary policy reports, the PBoC consistently points to such factors as overcapacity, weak demand, and declining global commodity prices as drivers of PPI deflation and reduced CPI inflation.

6 Conclusions

The recent PPI deflation episode in Asian economies has been synchronous and protracted since 2012. Synchronous PPI growth is partly confirmed by the spillover index of Diebold and Yilmaz (2009, 2012), with the empirical results showing fairly high spillover readings (between 53% and 64%) of PPI growth among the Asian economies.

The empirical results from our dynamic panel model suggest that the recent PPI deflation in Asian economies can also be explained by similar developments of local factors. While PPI growth is less sensitive to exchange rate fluctuations, exchange rate pass-through still plays a role in determining the PPI growth. A similar development in production growth and stock prices (used here to capture risk), as well as common factors such as the sharp drop commodity prices and the spillover effect from China are the key determinants of recent Asian PPI deflation.

The empirical results confirm that China lies at the heart of the region's PPI deflation challenge. While CPI and core CPI inflation are still positive in China, the rapid slowdown in Chinese economic growth calls for policies that stabilize short-term growth and address medium- and long-term structural problems. Over the short term, the Chinese authorities still have room to maneuver in pursuing expansionary fiscal policy and an accommodative monetary stance. However, injecting additional liquidity to rebalance the economy may be counterproductive without structural reforms in place. Moreover, exchange rate devaluation remains ineffective as a policy tool because producer prices are insensitive to exchange rate changes.

Unless China's three fundamental economic issues – declining corporate profits, overcapacity, and debt – are addressed, PPI deflation may continue and lead to CPI deflation and a downward deflationary spiral. These three fundamental problems are most serious in the case of SOEs. Therefore, in addition to prudent fiscal and monetary policies, China should consider supply-side reforms such as tightening overall credit growth, debt-to-equity conversion schemes,

[18] People's Bank of China (2014), *Q4 2014 Monetary Policy Report*, p. 55, and People's Bank of China (2015), *Q3 2015 Monetary Policy Report*, p. 57.

shutting down zombie firms, or some reasonable combination of these measures, in a way that reduces overcapacity and debt levels, while improving the efficiency and profitability of SOEs.

SOEs have been significant contributor to China's economic growth since the start of reforms in 1978. The current problem, however, is how to restore the dynamism of SOEs. Supply-side reforms to reduce overcapacity will require relocation and retraining of redundant workers, as well as the painful process of deciding which zombie firms get shuttered and which get restructured. Principal-agent problems only add to the difficulty in restructuring SOEs, and corporate governance is required to enhance the effectiveness of structural reforms. Therefore, the Chinese authorities have to make hard choices in restructuring or shuttering SOEs, with a trade-off between preserving order in the short run and keeping the engine of growth running in the long run.

In addition to a new round of SOE reforms, supply-side reforms will involve measures to reduce distortions in prices, taxes, and credit, as well as create proper incentives for private-sector investment. China particularly needs R&D investment so that its firms can climb the technology ladder and generally lift the economy.

In the past six months, CPI inflation has been consistently positive and quite stable and China's PPI deflation has been getting smaller. Thus, China is unlikely to face overwhelming deflationary pressures in the very near future. Nevertheless, comprehensive supply-side reforms combined with moderately expansionary demand policies are needed to help China to avoid a hard landing and prevent the threat of further deflation in other Asian economies.

References

Antonakakis, N., Chatziantoniou, I. and G. Filis (2014), “Dynamic spillovers of oil price shocks and economic policy uncertainty,” *Energy Economics* 44, pp. 433–447.

Asian Development Bank (2016), Asian Development Outlook 2016, Manila.

Auer, R. and A. Mehrotra (2014), “Trade Linkages and the Globalization of Inflation in Asia and the Pacific,” Journal of International Money and Finance 49, pp. 129–151.

BIS (2016), BIS Statistical Bulletin June 2016, Basel.

Bloomberg News (2016), “China Factory-Gate Deflation Eases in New Signal Rebound Endures,” July 10, 2016.

Borio, C., M. Erdem, A. Filardo and B. Hofmann (2015), “The Cost of Deflations: A Historical Perspective,” BIS Quarterly Review, March 2015.

Borio, C., Kharroubi, E., Upper, C. and F. Zampolli (2016), “Labour Reallocation and Productivity Dynamics: Financial Causes, Real Consequences,” BIS Working Paper No. 534, Basel.

Bubák, V., Kocenda, E. and F. Zikeš, F. (2011), “Volatility transmission in emerging European foreign exchange markets,” Journal of Banking & Finance 35, pp. 2829–2841.

Bun, M.J.G. and J.F. Kiviet (2001), “The Accuracy of Inference in Small Samples of Dynamic Panel Data Models,” Tinbergen Institute Discussion Papers 01–006/4, Tinbergen Institute.

Devereux, M. and C. Engel (2003), “Monetary Policy in the Open Economy Revisited: Price Setting and Exchange Rate Flexibility,” Review of Economic Studies 70, pp. 765–783.

Devereux, M. and C. Engel (2007), “Expenditure Switching versus Real Exchange Rate Stabilization: Competing Objectives for Exchange Rate Policy,” Journal of Monetary Economics 54, pp. 2346–2374.

Diebold, F.X. and K. Yilmaz (2009), “Measuring financial asset return and volatility spillovers, with application to global equity markets,” Economic Journal 119, pp. 158–171.

Diebold, F.X. and K. Yilmaz, K. (2011), “Equity market spillovers in the Americas,” in: Alfaro, R. (Ed.) Financial Stability, Monetary Policy, and Central Banking, Vol. 15 of Central Banking, Analysis, and Economic Policies Book Series, Santiago de Chile, pp. 199–214.

Diebold, F.X. and K. Yilmaz (2012), “Better to give than to receive: Predictive directional measurement of volatility spillovers,” International Journal of Forecasting 28, pp. 57–66.

Eichengreen, B., D. Park and K. Shin. (2016), “Deflation in Asia: Can the Dangers Be Dismissed?” ADB Economics Working Paper No. 490, Manila.

Fujiware, I. and K. Takahashi (2012), “Asian financial linkage: Macro-finance dissonance,” Pacific Economic Review 17, pp. 136–159.

Gagnon, J. and J. Ihrig (2004), “Monetary Policy and Exchange Rate Pass-Through,” International Journal of Finance and Economics. 9, pp. 315–338.

Gaspar, R.M. (2012), “Comment on ‘Better to give than to receive’ by Francis X. Diebold and Kamil Yilmaz,” International Journal of Forecasting 28, pp. 67–69.

Gertler, P. and B. Hofmann (2016), “Monetary Facts Revisited,” BIS Working Paper No. 566, Basel.

Guggenberger, P. (2008), “Finite Sample Evidence Suggesting a Heavy Tail Problem of the Generalized Empirical Likelihood Estimator,” Econometric Reviews 26, pp. 526–541.

Hospers, G. (2004), “Restructuring Europe's Rustbelt: The Case of the German Ruhrgebiet,” Intereconomics: Review of European Economic Policy 39, pp. 147–156.

Kee, H.L. and H. Tang (2016), “Domestic Value Added in Exports: Theory and Firm Evidence from China,” American Economic Review 106(6), pp. 1402–36.

Kiviet, J.F. (1995), “On bias, inconsistency, and efficiency of various estimators in dynamic panel data models,” Journal of Econometrics, vol. 68, no. 1, pp. 53–78.

Koop, G., Pesaran, M.H. and S.M. Potter (1996), “Impulse response analysis in nonlinear multivariate Models,” Journal of Econometrics 74, pp. 119–147.

Lipton, D. (2016), “Rebalancing China: International Lessons in Corporate Debt,” June 11, 2016, Shenzhen China.

Lu, Z. (2016), “The Economic and Financial Impacts of Excess Capacity Reduction,” Peterson Institute for International Economics’ China Economic Watch, July 5, 2016.

Olivei, G.P. (2002), “Exchange Rates and the Prices of Manufacturing Products Imported into the United States,” New England Economic Review, first quarter, pp. 3–18.

People’s Bank of China (2014), Q4 2014 Monetary Policy Report, Beijing.

People’s Bank of China (2015), Q3 2015 Monetary Policy Report, Beijing.

Pesaran, H.H. and Y. Shin (1998), “Generalized impulse response analysis in linear multivariate models,” Economic Letters 58, pp. 17–29.

Taylor, J. (2000), “Low Inflation, Pass-through, and the Pricing Power of Firms,” European Economic Review 44, pp. 1389–1408.

UBS (2016a), “The Economic and Financial Impacts of Excess Capacity Reduction,” Hong Kong.

UBS (2016b), “Why Has Private Investment Plunged in China?” Hong Kong. See https://neo.ubs.com/shared/d1zrWTIXar/

Wang X., Y. Ji, Y. Tan and Y. Huang (2016), “The State Advances While the Private Sector Retreats: Effects of Policy Uncertainty on Corporate Leverage in China,” presentation slides, July 2016 Shanghai.

Zhou, X., W. Zhang, and J. Zhang (2012), “Volatility spillovers between the Chinese and world equity markets,” Pacific-Basin Finance Journal 20, pp. 247–270.

BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.

2015	No 1	Qing He, Liping Lu and Steven Ongena: Who gains from credit granted between firms? Evidence from inter-corporate loan announcements Made in China
	No 2	Ke Pang and Pierre L. Siklos: Macroeconomic consequences of the real-financial nexus: Imbalances and spillovers between China and the U.S.
	No 3	V.V. Mironov, A.V. Petronevich: Discovering the signs of Dutch disease in Russia
	No 4	Joshua Aizenman: The internationalization of the RMB, capital market openness, and financial reforms in China
	No 5	Yu-Fu Chen, Michael Funke and Kunyu Tao: Financial market reform – A new driver for China's economic growth?
	No 6	Jarko Fidrmuc and Iikka Korhonen: Meta-analysis of Chinese business cycle correlation
	No 7	Jarko Fidrmuc, Zuzana Fungáčová and Laurent Weill: Does bank liquidity creation contribute to economic growth? Evidence from Russia
	No 8	Elena Deryugina, Olga Kovalenko, Irina Pantina and Alexey Ponomarenko: Disentangling loan demand and supply shocks in Russia
	No 9	Michael Funke, Petar Mihaylovski and Haibin Zhu: Monetary policy transmission in China: A DSGE model with parallel shadow banking and interest rate control
	No 10	Riikka Nuutilainen: Contemporary monetary policy in China: A move towards price-based policy?
	No 11	Iftekhar Hasan, Nada Kobeissi, Haizhi Wang and Mingming Zhou: Banking structure, marketization and small business development: Regional evidence from China
	No 12	Linlin Niu, Xiu Xua and Ying Chen: An adaptive approach to forecasting three key macroeconomic variables for transitional China
	No 13	Heiner Mikosch and Stefan Neuwirth: Real-time forecasting with a MIDAS VAR
	No 14	Alexander Libman and Björn Vollan: Anti-Western conspiracy thinking and expectations of collusion: Evidence from Russia and China
	No 15	Mikhail Stolbov: Causality between credit depth and economic growth: Evidence from 24 OECD countries
	No 16	Kefei You: What drives China's outward FDI? A regional analysis
	No 17	José R. Sánchez-Fung: Estimating the impact of monetary policy on inequality in China
	No 18	Christian Hattendorff: Economic concentration and finance: Evidence from Russian regions
	No 19	Alexey Porshakov, Elena Deryugina, Alexey Ponomarenko and Andrey Sinyakov: Nowcasting and short-term forecasting of Russian GDP with a dynamic factor model
	No 20	Qing He, Iikka Korhonen, Junjie Guo and Fangge Liu: The geographic distribution of international currencies and RMB internationalization
	No 21	Haining Wang, Zhiming Cheng and Russell Smyth: Does consuming more make you happier? Evidence from Chinese panel data
	No 22	Mikhail Mamonov and Andrei Vernikov: Bank ownership and cost efficiency in Russia, revisited
	No 23	Rui Mao and Yang Yao: Fixed exchange rate regimes, real undervaluation and economic growth
	No 24	Elena Deryugina, Alexey Ponomarenko, Andrey Sinyakov and Constantine Sorokin: Evaluating underlying inflation measures for Russia
	No 25	Christian Dreger, Jarko Fidrmuc, Konstantin Kholodilin and Dirk Ulbricht: The Ruble between the hammer and the anvil: Oil prices and economic sanctions
	No 26	Zuzana Fungáčová, Riikka Nuutilainen and Laurent Weill: Reserve requirements and the bank lending channel in China
	No 27	Simo Leppänen, Laura Solanko and Riitta Kosonen: Could climate change affect government expenditures? Early evidence from the Russian regions
	No 28	Mariarosaria Comunale: Current account and REER misalignments in Central Eastern EU countries: an update using the macroeconomic balance approach
	No 29	John Fernald, Eric Hsu and Mark M. Spiegel: Is China fudging its figures? Evidence from trading partner data
	No 30	Jyri Kinnunen and Minna Martikainen: Expected returns and idiosyncratic risk: Industry-level evidence from Russia
	No 31	John P. Bonin and Dana Louie: Did foreign banks "cut and run" or stay committed to Emerging Europe during the crises?
	No 32	Anna Krupkina and Alexey Ponomarenko: Deposit dollarization in emerging markets: modelling the hysteresis effect
	No 33	Paul-Olivier Klein and Laurent Weill: Is it worth issuing bonds in China? Evidence from stock market reactions
2016	No 1	Guonan Ma and Wang Yao: Can the Chinese bond market facilitate a globalizing renminbi?
	No 2	Iikka Korhonen and Riikka Nuutilainen: A monetary policy rule for Russia, or is it rules?
	No 3	Hüseyin Şen and Ayşe Kaya: Are the twin or triple deficits hypotheses applicable to post-communist countries?
	No 4	Alexey Ponomarenko: A note on money creation in emerging market economies
	No 5	Bing Xu, Honglin Wang and Adrian van Rixtel: Do banks extract informational rents through collateral?
	No 6	Zuzana Fungáčová, Anastasiya Shamshur and Laurent Weill: Does bank competition reduce cost of credit? Cross-country evidence from Europe
	No 7	Zuzana Fungáčová, Iftekhar Hasan and Laurent Weill: Trust in banks
	No 8	Diana Ayala, Milan Nedeljkovic and Christian Saborowski: What slice of the pie? The corporate bond market boom in emerging economies
	No 9	Timothy Frye and Ekaterina Borisova: Elections, protest and trust in government: A natural experiment from Russia
	No 10	Sanna Kurronen: Natural resources and capital structure
	No 11	Hongyi Chen, Michael Funke and Andrew Tsang: The diffusion and dynamics of producer prices, deflationary pressure across Asian countries, and the role of China

BOFIT Discussion Papers
http://www.bof.fi/bofit_en • email: bofit@bof.fi
ISSN 1456-4564 (print) // ISSN 1456-5889 (online)