

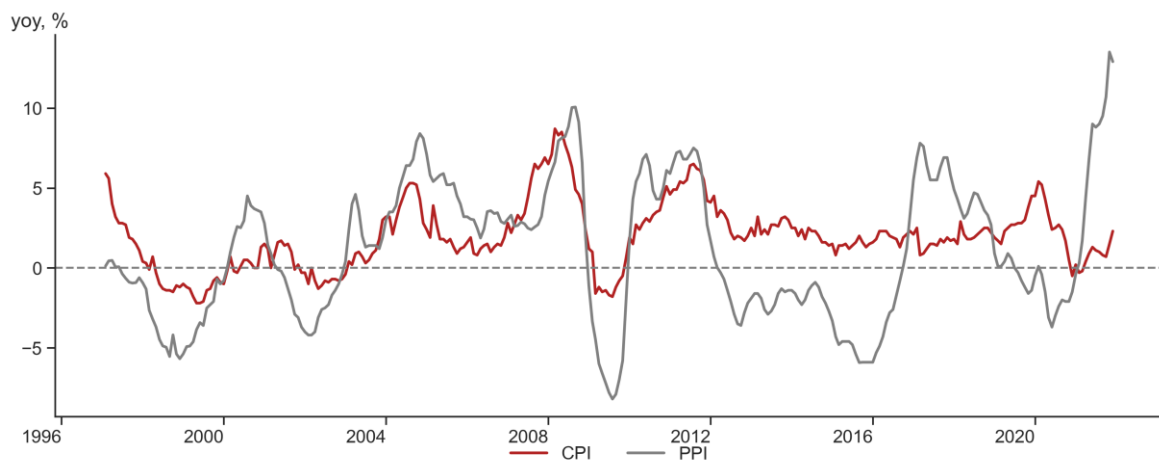
Should China's PPI and CPI Inflation Divergence be a Concern?¹

26 January 2022

I. Introduction

1. China's PPI and CPI inflation has diverged again in 2021. PPI inflation began to pick up in June 2020, accelerated H1 2021 and surged to a historical high of 13.5 percent in October. However, the pass-through to consumer prices has been muted so far. Headline CPI inflation has remained low, staying below 1 percent for most months in 2021 (Figure 1).² In this analytical note, we explore the main sources of and drivers behind the different trajectories of PPI and CPI inflation, empirically estimate the magnitude of potential pass-through, and discuss their outlook and macroeconomic impact.

Figure 1. China's CPI and PPI Inflation



Source: Wind; AMRO staff calculations

II. Sources of the Divergence

¹ Prepared by Zhiwen Jiao; reviewed by Chaipat Poonpatpibul; and authorized by Hoe Ee Khor (Chief Economist). The views expressed in this note are the authors' and do not necessarily represent those of AMRO or AMRO management.

² Core CPI inflation (excluding food and energy) has generally hovered at around 1.2 percent in H2 2021 after a moderate increase in H1 2021.

2. The different trajectories of PPI inflation and CPI inflation could come from two sources: the compositions and weights of items in the two baskets, and the different dynamics of those items.

3. Based on our estimation, the compositions of PPI and CPI baskets in China differ markedly.³ The PPI basket does not include services, but they account for over one-third of the weight in the CPI basket. Consumer goods, which are broadly overlapping items, account for only around a quarter of the PPI basket, but make up about 63 percent of the CPI basket (Table 1).

Table 1. Estimates of Compositions of CPI and PPI Baskets in China

CPI weights		PPI weights	
	2015 base		2015 base
Goods	62.9	Goods for consumption	25.4
Services	37.3	Food	9.7
Food (incl.tobacco and liquor)	30.0	Clothing	3.2
Clothing	8.5	Daily-use articles	6.0
Housing	20.0	Durable goods	6.4
Household articles and services	4.7	Goods for production	74.6
Transportation and Communication	10.4	Mining and quarrying	3.8
Education, culture and recreation	14.2	Raw materials	19.7
Health and medical care	10.3	Manufactured goods	51.0
Other articles and services	1.9		

Source: Wind; AMRO staff estimation

Note: 1/ as PPI and CPI weights are based on estimates, the sum of main components is not exactly equal but close to 100.

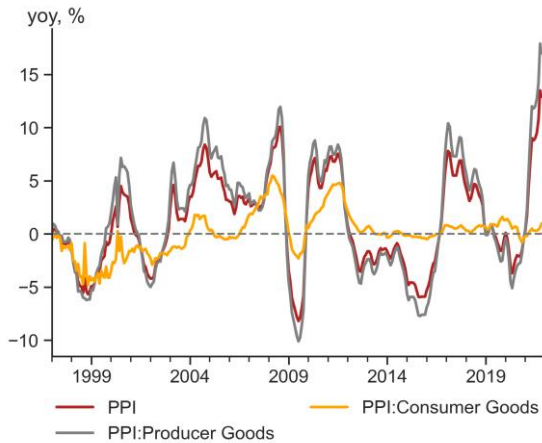
4. The price dynamics of the main components of PPI and CPI are quite different, and the trends of PPI inflation and CPI inflation are often dominated by highly volatile items.

- For PPI, the prices of goods for production tend to swing significantly, driven by prices of commodities, raw materials, and resource-intensive manufactured goods. On the other hand, price fluctuations for consumer goods have been much more moderate, especially since 2011. As a result of the large price swings, coupled with large weights, price movements of goods for production have accounted for most of the fluctuations in the overall PPI inflation (Figure 2).
- CPI inflation and its fluctuations have been largely driven by food prices, which have in turn been significantly and disproportionately affected by movements in the price of pork (Figures 3-5). The prices of services have contributed only modestly to fluctuations in CPI inflation, given their much lower volatility.
- Based on our estimates, PPI inflation of goods for production contributed about 7.3 percentage points to the 7.4 percent increase in PPI inflation in the first 10 months of 2021. In contrast, the sharp decline in pork prices reduced CPI inflation by about 0.7 percentage point in the same period to just around 1 percent. Without the drag from pork prices, CPI inflation would have been around 2 percent in H2 2021, the average

³ The National Statistics Bureau of China (NBS) does not release the weights of items in the CPI and PPI baskets. In order to obtain estimates for the weights of the main components, we regress the aggregate index on its component indices. The NBS has changed the base year to 2020 for both CPI and PPI. However, we still use monthly data from 2016 to 2020, whereby 2015 is used as the base year, to minimize estimation errors from the small sample.

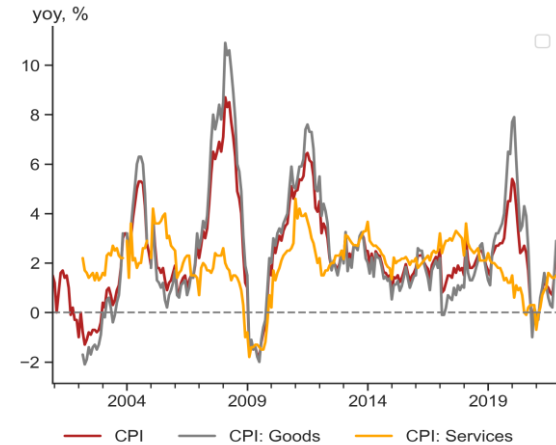
level of CPI inflation in the past 10 years. Even in such a case, the gap between PPI inflation and CPI inflation would still have been large by historical standards.

Figure 2. PPI and its Main Categories



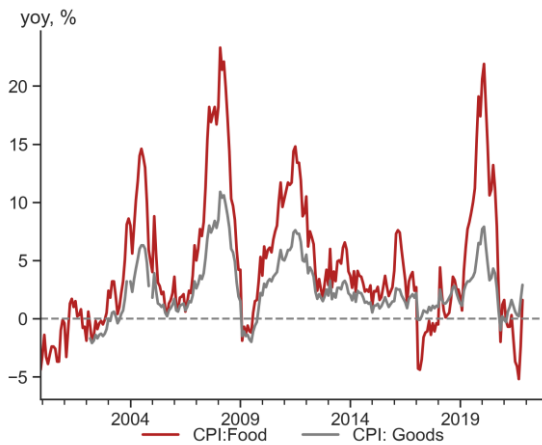
Source: Wind; AMRO staff calculations

Figure 3. CPI and its Main Categories



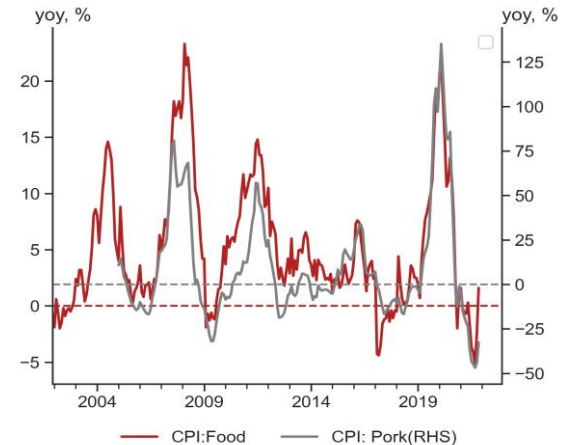
Source: Wind; Haver; AMRO staff calculations.

Figure 4. Inflation of Goods and Foods



Source: Wind; AMRO staff calculations

Figure 5. Inflation of Food and Pork



Source: Wind; Haver; AMRO staff calculations

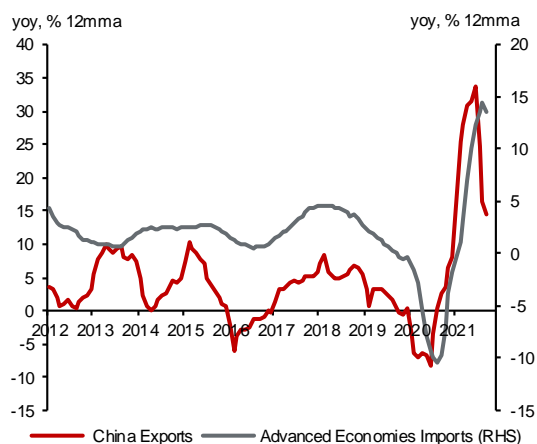
III. Current State of Transmission

5. The impact of PPI inflation on CPI inflation depends on its persistence and magnitude, as well as the pace of transmission. PPI inflation persistence depends largely on the drivers, while the pace of transmission mainly depends on market structures and supply and demand conditions.

6. The current high PPI inflation was due to both demand and supply side factors. On the demand side, China's production has been catering to the surge in orders from abroad, as most countries were still struggling to normalize production in 2021 while demand has surged due to unprecedented fiscal and monetary stimuli in advanced economies (Figure 6). Domestically, real estate developers also accelerated construction work in the first half of

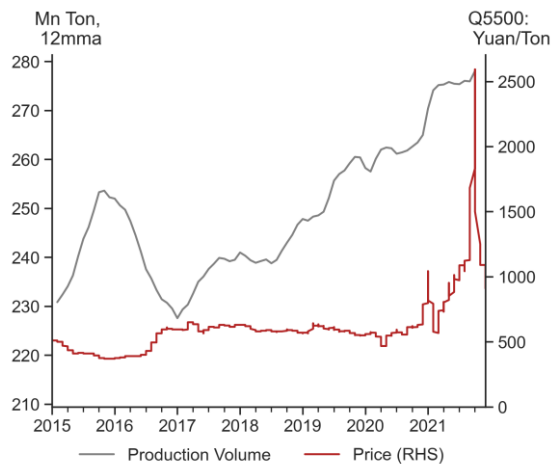
2021 to expedite the recycling of cash flows to meet new regulatory requirements. Consequently, these heightened production activities have led to a sharp increase in the demand for energy and raw materials.

Figure 6. Real Growth in China's Exports and Advanced Economies' Imports



Source: Haver; AMRO staff calculations

Figure 7. Coal Price and Production Volume



Source: Wind; AMRO staff calculations

7. The global supply of oil and gas did not adjust adequately to meet rising demand. The OPEC and its allies (OPEC+) did not increase their oil production in response to steeply rising oil prices and international calls to boost production.⁴ Besides, the supply of oil and gas was also affected by lower level of maintenance of oil and gas fields during the COVID-19 crisis, bad weather, and logistics bottlenecks. Due to China's significant reliance on imports of oil and gas, rising global energy prices contributed significantly to China's rising PPI inflation.

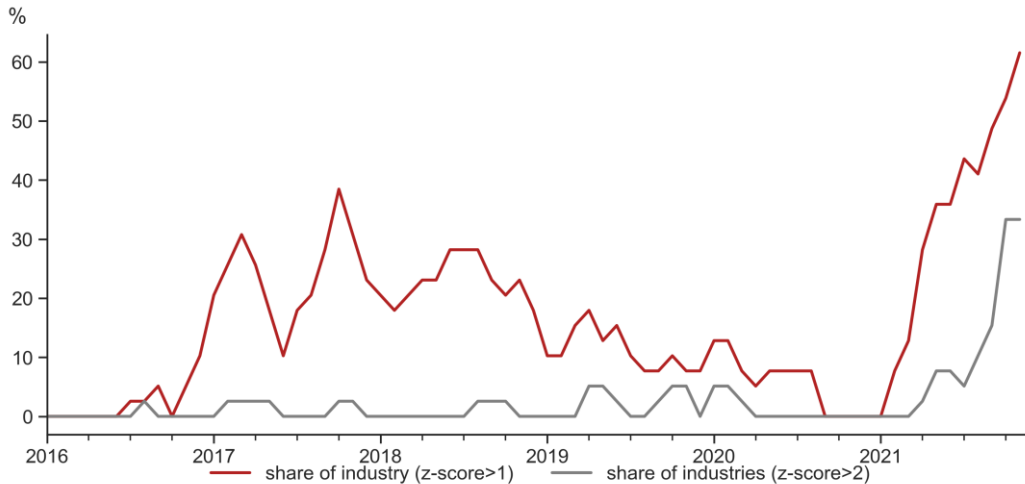
8. Domestic supply-side factors in China have also contributed to the increase in PPI. Amid rising demand due to the global recovery, production of energy and resource intensive products were hampered by the need to comply with China's long-term policy measures to curb carbon emissions and reduce energy intensity, which led to higher prices. One example is the coal industry, which supplies about 93 percent of China's total consumption of coal. The price of thermal coal more than quadrupled to about CNY2600/ton by mid-October of 2021 from around CNY600/ton in early 2021, but production volume of thermal coal remained relatively flat (Figure 7) and imports of thermal coal declined by 20.1 percent in the first nine months of 2021. Coal prices only started to decline after the government repeatedly intervened in the market to normalize surging prices by imposing price caps and boosting production domestically.

9. The rise of PPI inflation has become more broad-based but is still much less so for downstream industries. The high inflation pressure has started to spread to more downstream industries. As of October 2021, the share of industries with PPI inflation above one and two standard deviations over the past five years' average has increased to 54 percent and 36 percent respectively, significantly higher than the levels seen in the 2016-2017

⁴ This could reflect their cautious attitudes about the supply and demand conditions in the medium term, including significant uncertainties and concerns over the prospects of future investment in the energy industry amid global efforts to accelerate decarbonization.

episode of high PPI inflation, indicating that inflation pressure this time around is more acute and widespread (Figure 8). However, inflation in downstream industries in general has remained much lower than in upstream industries, implying they have absorbed most of the rising cost pressures (Figure 9).

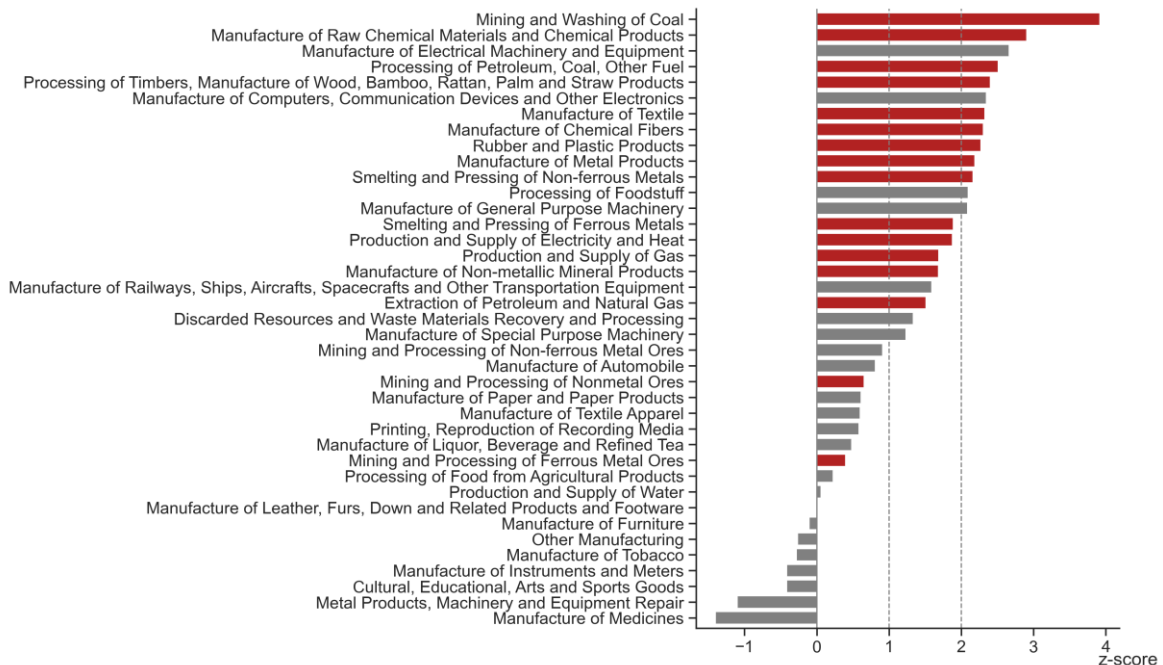
Figure 8. Percentage of Industries with High PPI inflation



Source: Wind; AMRO staff calculations

Note: z-core is calculated by using data for PPI inflation by industry from 2016-2021.

Figure 9. Z Score of PPI inflation by Industry in October 2021



Source: Wind, AMRO staff calculations

Note: z-core is calculated by using data for PPI inflation by industry from 2016-2021.

10. There are signs of more consumer goods companies starting to raise prices to ease rising cost pressure (Table 2). So far, the price hike announcements seem to have come from companies that produce food and daily-use goods. This indicates that

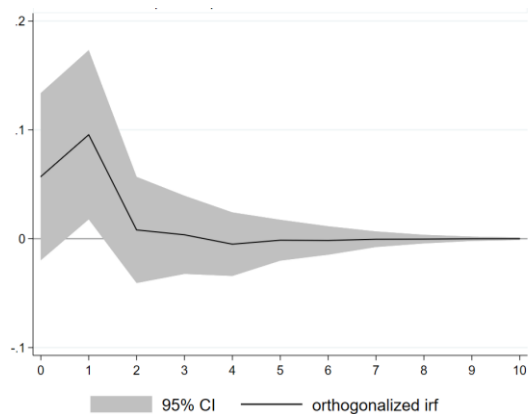
transmission to CPI inflation could become somewhat more visible going forward, although the magnitude still depends on the persistence of rising cost pressure and demand conditions.

IV. The Magnitude of Transmission

11. In order to better understand the transmission between PPI and CPI inflation, we performed a SVAR model estimation. In the model, CPI and PPI were treated as dependent variables, and the CRB Commodity Index and nominal effective exchange rate (NEER) were used as control variables.⁵ We used data from the post-GFC period (January 2010 to September 2021) for the model estimation given that the Granger Causality test showed that PPI inflation Granger caused CPI inflation during this period.

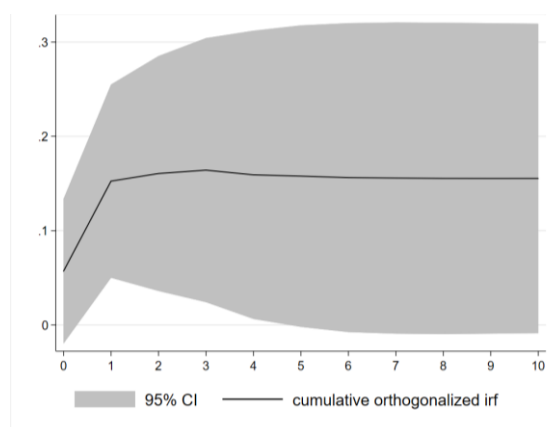
12. The impulse response analysis shows that the transmission from PPI inflation to CPI inflation on average was small and not persistent in the post-GFC period. One standard deviation increase in PPI inflation only leads to less than 0.1 standard deviation increase in CPI inflation. The impact dies down quickly, approaching zero after three months (Figure 10). Cumulatively, one standard deviation increase in PPI inflation can cause 0.16 standard deviation increase in CPI inflation (Figure 11), or equivalently, one percentage point increase in PPI inflation will, on average, lead to an increase of about 0.2 percentage point in CPI inflation.⁶

Figure 10. Impulse Response of CPI Inflation to PPI Inflation in China



Source: AMRO staff estimation

Figure 11. Cumulative Impulse Response of CPI Inflation to PPI Inflation in China



Source: AMRO staff estimation

V. Outlook: From Divergence to Convergence

⁵ Unit root tests show that the year-on-year growth rates of these series are all non-stationary, so we differenced them to attain stationarity. The order of variables and constraints on contemporaneous covariance matrix of error terms of the model is based on the Granger test. The order of lags of the SVAR model is two based on information criteria.

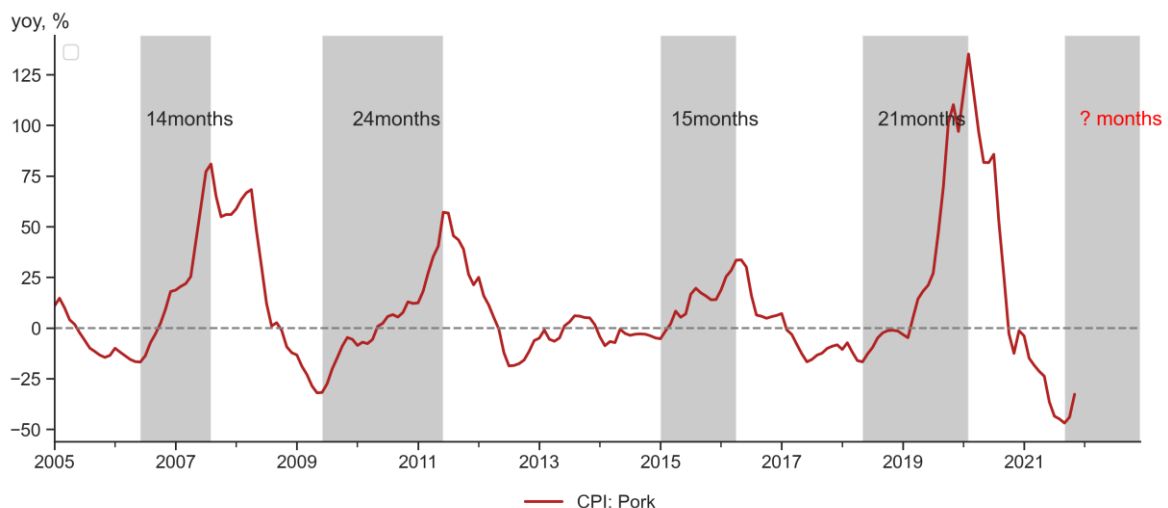
⁶ For robustness, we also conducted a bootstrap 5-year rolling window dynamic causality test based on a LA-VAR-based time-varying Granger causality test proposed by Shi, Phillips and Hum (2018, 2020). This causality test allows for endogenously determined changing points in any causal relation while at the same time treating trends in a way that does not require pretesting or prior removal of trend components. It also allows for potential heteroscedasticity in the testing process, an aspect which has largely been ignored in the existing literature. The result shows that PPI inflation does not always have a statistically significant causal relationship with respect to CPI inflation.

13. China's PPI inflation will likely be on a declining trend in 2022. This is due to a high base effect, more flexible supply adjustment supported by improved policy coordination in China⁷, a slowdown in the real estate sector, and a resumption of production capacities in other countries once COVID infections are brought more under control. Moreover, external demand will likely moderate on the back of waning fiscal and monetary stimuli in advanced economies next year.

14. In the medium term, better policy coordination and clarity on carbon reduction and green transition policies will likely enable the energy and resource intensive sectors to adjust production more flexibly to market conditions. More flexible supply adjustments will help mitigate sharp increases in price pressure. However, the strong commitment to carbon neutrality indicates that production of energy and resource-intensive products is unlikely to increase significantly. Prices of energy and resource-intensive products could therefore still stay at relatively high levels in the medium term, although they will moderate due to declining demand in the longer term.

15. In contrast to PPI inflation, CPI inflation will continue to rise, particularly in the first half of 2022. Several factors will support this trend. First, the low base effect will add about 1-2 percentage points to headline CPI inflation in the first three quarters in 2022. Second, pork prices have already troughed and started to increase. Previous pork price cycles show that the up-cycles in pork prices tend to last one to two years (Figure 12). It is likely that pork prices will continue to rise for the whole year in 2022. Third, a catch-up in the recovery of consumption will provide stronger support for core CPI inflation. Finally, the transmission from PPI inflation will become more visible for some categories of goods such as food and goods for daily use, although the overall impact will be limited as discussed in the section earlier.

Figure 12. Pork Price Cycles in China



Source: Wind; AMRO staff calculations

⁷ The Chinese government has taken various measures to mitigate rising price pressure to boost production in the short term as well as to establish/improve the policy framework for longer term stability of supply of key products. For example, the NDRC has been promoting long-term contracts for coal and allowed for a wider range for electricity tariffs.

VI. Conclusion

16. The divergence between PPI inflation and CPI inflation in China is not an uncommon phenomenon; and the gap between the two is expected to narrow in 2022.

Large price swings of fuel, raw materials, and certain categories of goods due to significant mismatches of demand and supply, as well as the significant differences in the composition of the two indices, are the underlying factors for the divergence. The competitive market environment in the downstream industries has also buffered significant inflationary pressure from upstream, resulting in a small transmission to CPI inflation. Although the transmission could become more visible in some categories of goods in 2022, its overall impact on CPI inflation will likely be limited. As short-term supply factors gradually fade and government measures to support supply adjustments take greater effect, the gap between PPI and CPI inflation will narrow in 2022.

17. Notwithstanding, it remains important to be mindful of further inflation developments.

The prices of fuel and certain categories of goods for production could still remain elevated in 2022. PPI inflation will likely decline only moderately in the first half of 2022. This means that downstream industries will continue to face high-cost pressure and their profit margins will continue to be squeezed, putting continued pressure on growth and employment. Therefore, it is still important for policy makers to closely monitor the developments of PPI inflation, and, if necessary, take some measures to mitigate the cost burden on downstream industries, particularly on SMEs.

Appendix: Table 2. Examples of Companies' Announcements on Product Prices

Company Name	Business	Announcement	Announced Date	Effective Date
C&S	The company is the first A-share listed household paper enterprise in China, specializing in the production of household paper series products.	Adjust the prices of products starting 2022	2021-10-28	2022-01-01
HENGSHUN VINEGAR	The company is the largest manufacturer of soy sauce and acetate in China.	Hike prices by 5%-15% for some products	2021-11-02	2021-11-20
JIAJIA FOOD	The company is a large-scale condiments producer, integrating research and development, production and marketing. Its main business is in soy sauce, edible plant oil and other condiments.	Hike prices by 3%-7% for soya source, oyster sauce, cooking wine and vinegar products	2021-11-04	2021-11-16
ZUMING BEAN PRODUCTS	The company specializes in bean products, drinks (protein drinks), egg products, jelly, starch and starch products, and canned food.	Hike prices by 15%-20% for some vegetable protein-based beverages	2021-11-08	2021-11-15
KEMEN	The company is a leading private food enterprise in the noodle industry.	Hike prices for some products	2021-11-12	2021-12-01
FULING ZHACAI	The company is a leading producer for pickled mustard.	Hike prices by 3%-19% for some products	2021-11-14	2021-11-12
SANQUAN FOOD	The company is mainly engaged in the production of fast-frozen dumplings, quick-frozen dumplings, quick-frozen scorpions, fast-frozen sides such as fast-fried rice noodles.	Adjust promotion policy and hike prices by 3%-10% for some products	2021-11-18	
QIANWEI CENTRAL KITCHEN	The company's main business is the production and sale of quick-frozen noodles and rice products for catering enterprises.	Hike prices by 2%-10% for some frozen grain products	2021-12-01	2021-12-25

Source: Wind; company announcements; newsreports; AMRO staff compilation

References

- He Liping, Fan Gang, Hu Jiani. 2008. PPI inflation and CPI inflation: which causes which? *Economic Research Journal*, Vol 11.
- Otero, Jesus, Baum, Christopher and Hurn, Stan, 2021, TVGC: Stata module to perform Time-Varying Granger Causality tests. <https://EconPapers.repec.org/RePEc:boc:bocode:s458916>
- Phillips, P. C. B., Shi, S., & Hurn, S. 2018. Change detection and the causal impact of the yield curve. *Journal of Time Series Analysis*. <https://eprints.soton.ac.uk/423026/>
- Shi, S., Hurn, S., & Phillips, P. C. 2020. Causal change detection in possibly integrated systems: Revisiting the money–income relationship. *Journal of Financial Econometrics*, 18(1), 158-180. <https://academic.oup.com/jfec/article-abstract/18/1/158/5370328>