https://doi.org/10.1142/xxxxxxxxxxxx_0018

Chapter 18

WHAT MAKES CHINA'S INFLATION SO DIFFERENT?

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Abstract

In this chapter, we characterize China's inflation time series at different frequencies and compare the results with those of other advanced and emerging economies. This chapter first provides a comprehensive picture of inflation in China based on quarterly data from 1993Q1 to 2022Q2. Then, we examine the characteristics of China's inflation rate and compare them with those from OECD countries and additional developing nations. There are three major findings in this chapter. First, China has sustained a fast economic growth with low inflation rate, exhibiting a negative correlation, which is not observed in both advanced and emerging economies. Second, more volatile inflation does not lead to higher inflation rate in China. In contrast, we observe positive relationship in other countries. Lastly, while China's CPI inflation does not exhibit a strong correlation with that of others, its PPI is highly correlated with that of the US since 1996.

Introduction

Inflation has been an essential topic in the context of macroeconomic studies (Bernanke and Mishkin, 1997; Bryan and Cecchetti, 1993, 1994; Friedman, 1968; Reis and Watson, 2010). For instance, in addressing the price puzzle in a vector autoregressive (VAR) model setting, Sims (1992) and Bernanke *et al.* (2005) suggest improved measurement and factor-augmented models, respectively. Regarding the Phillips curve, Hazell *et al.* (2022) observe a flattening pattern in the US, while Stock and Watson (2020) argue it persists with filtered data. In examining the stationarity property of inflation rates, Lucas Jr (1972), Sargent (1971), and Culver and Papell (1997) found mixed results across countries, while Hendry (2001) notes UK's inflation is non-stationary. Finally, Cogley and Sargent (2001, 2015) and Cogley *et al.* (2010) explore inflation's mean, volatility, and persistence, with mixed findings across different measures and time periods.

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As a conventional key macroeconomic indicator, it has been extensively explored in the literature. Nevertheless, most of the conclusions are drawn based on developed economies only. The existing literature only focuses on the inflation targeting (IT) regime in developing countries. Thus, there is lack of studies about the inflation and its dynamic with other macroeconomic variables in emerging economies. As the second largest economy in terms of economic size, China received more attention in the literature compared with its counterparts (Chen *et al.*, 2017; Gerlach and Peng, 2006; Mehrotra *et al.*, 2010; Narayan *et al.*, 2009; Scheibe and Vines, 2005; Zhang and Murasawa, 2012). Nonetheless, there is no complete investigation of the characteristics of China's inflation as well as its dynamic with other macroeconomic variables. Also, the comparison with other advanced and emerging economies is not well discussed.

Since 1978, China's open-door policy marks its modern economic history. From 1980 to 2020, China's average real GDP growth is almost 10%, while its inflation is maintained constantly low at 4.9%.[1] High GDP growth with low inflation rate seems to be the ideal economic situation to any economy. On the other hand, it

is also common that many countries are practicing inflation targeting (IT) regime to address the overheating economy. Therefore, it seems that there is a tradeoff between economic development and inflation for most countries in world, including developing countries, such as Brazil, Mexico, and India. This triggers the question of what makes China's inflation so different from other countries? Interestingly, Nakamura *et al.* (2016) found that such unique relationship between economic growth and inflation in China in fact is attributed to the data quality issue. In particular, they show that inflation and output growth reported by the government are the smoothed version of actual statistics. In particular, inflation of China was overstated during the 1990s and understated in the 2000s, while the output growth was understated during the 1990s and overstated in the 2000s. This implies that the dynamics between inflation and output growth has been changing over time.

Furthermore, China's macroeconomic pattern has always been compared with countries like Japan. From 1950s to 1970s, Japan embraced substantial economic growth, while its economy stagnated in the next decades. In the context of China, it has consistently achieved a significantly strong economic growth rate over the past few decades. Nevertheless, economists have been pessimistic toward China's recent economic performance as it suffers from deflation and relatively low economic growth as a developing country. The inflation in Japan has been extensively discussed in the literature (Toyoda, 1997; Dees *et al.*, 2009; De Veirman, 2009; Smith, 2008). Therefore, we aim to characterize the macroeconomic patterns of China leveraging on the historical findings in Japan. In the context of emerging economies, IT proposed by Bernanke and Mishkin (1997) is one of the most important topics in the literature (Brito and Bystedt, 2010; Gonçalves and Salles, 2008). It has been further extended to the context of China by Lin and Ye (2019) and Xiong (2012).

To provide a more comprehensive picture of inflation in China, we first collect annual data from 1987 to 2021 at aggregate level. Then, we compare the essential properties of China's inflation data

with those of OECD and other emerging economies. Furthermore, we conclude that the characteristics of China's inflation and its dynamic with key macroeconomic variables such as GDP growth are vastly different from the observations of both advanced and emerging economies. On one hand, China's inflation exhibits an I(1) process, which is consistent with the unit root hypothesis in the literature (Ball *et al.*, 1990; Nelson and Schwert, 1977). Also, it has sustained a fast economic growth with low inflation rate, which shows some similarities with that of other emerging economies. On the other hand, unlike both advanced and emerging economies, which have a positive relationship between inflation and economic growth, indicating a tradeoff between the two variables, China exhibits an inverse relationship. In particular, the tradeoff coefficient of –0.95 based on a time series regression suggests that an increase of GDP growth by 1% leads to almost the same amount of decrease in inflation rate, suggesting positive effect of economic growth on its domestic price level.

Overall, we find a negative and significant correlation between output growth and inflation in China at national level in this chapter. Nevertheless, the results are rather true instead of controversial in the context of China. First, China's economic growth leads to higher supply and hence, lower price level, within China and across the world. This is found to be the impact of China's growth on itself, as well as the world by Wang *et al.* (2021). Hence, this chapter contributes to the literature by exploring the underlying reasons about China's unique inflation patterns.

Next, our analysis shows no significant link between the volatility of inflation and the inflation rate itself within China, whereas a positive correlation exists between these two variables in other countries. This extends the findings of Narayan *et al.* (2009), who reported a negative correlation between inflation volatility and the inflation rate in China's earlier years. Our results suggest that this negative correlation has weakened over time.

Lastly, we discover that China's CPI inflation rate shares a weaker correlation with the global inflation landscape. Conversely, other major economies, such as the US, exhibit a robust correlation with

countries that are either geographically proximate or economically connected. However, an interesting finding is that China's PPI inflation is highly correlated with that of the US since 1996.

The remainder of this chapter is structured as follows. In section "Data and Facts", we provide a comprehensive description of the data and facts, including an analysis of mean, volatility, persistence, unit root hypothesis, and a comparison of the inflation rate in China with those of other countries. In addition, we also discuss about the disaggregate level data in China. Section "Tradeoff between Economic Growth and Inflation" investigates tradeoff relationship between inflation and GDP growth and section "Correlation of Inflation Rates across Countries" explores the corss-country correlation of inflation rates. Lastly, section "Conclusion" concludes.

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Data and Facts

Aggregate level

This chapter first aims to investigates China's inflation pattern at aggregate level. We first collect data of aggregate CPI, on a yearly basis (Previous Year = 100). The sample period is from 1987 to 2021. The dataset is collected from the World Bank database. We then split the full sample into three groups of subsamples, namely, 1987–1999, 2000–2010, and 2011–2021. Figure 1 presents the trend of aggregate CPI inflation over the sample period. Overall, China's inflation has been consistently low after joining the World Trade Organization (WTO) in 2001. We observe volatile fluctuations in 1980s and 1990s. Besides, we observe large dips in inflation around 2008 and 2021 from Figure 1. These are mainly due to the global financial crisis in 2008 and the outbreak of COVID-19 in 2019. On the other hand, the impact of the global financial crisis on China's inflation is significantly more substantial compared to that of the pandemic in 2019. However, the inflation bounced back quickly after the global financial crisis, while the negative impact of the pandemic is more persistent.

The results are corroborated by Table 1, where it displays the summary statistics for both inflation and GDP growth during both

Figure 1. China's CPI inflation from 1993 to 2022.

full sample and subsample periods. According to Batta *et al.* (2014), it is crucial to identify the fundamental characteristics of the inflation rate within a country, as it can differ from one country to another.

We observe that the average of inflation has been around 4.9% throughout the full sample period, implying a reasonably low domestic inflation rate. On the other hand, the GDP growth is around 9.1% on average from 1987 to 2021, a super high growth rate. During the subsample of 2000–2010, we observe an even lower average of inflation rate of 2.0%, associated with a larger mean of GDP growth rate of 10.4%, again showing a high GDP growth with a low inflation rate. Similarly, during 2011–2021, the mean inflation rate is still reasonably small (2.4%), while that of the GDP growth rate is 7.0%, showing a modest slowdown of the economy. On average, the inflation rate of China has been low over time, while the GDP growth has been consistently high. More specifically, China achieves a high economic growth even during the global financial crisis in 2008, while the pandemic since 2019 causes sizeable impact on its economic performance.

Table 1. Descriptive statistics in China and OECD countries.

		CPI Inflation				GDP Growth			
Country	Statistics	1987–2021	1987–1999	2000–2010	2011–2021	1987–2021	1987–1999	2000–2010	2011–2021
China	Mean	4.9	9.4	2.0	2.4	9.1	9.8	10.4	7.0
	SD	6.2	8.3	2.2	1.2	2.8	3.3	1.8	1.8
	Median	2.6	7.2	1.6	2.2	9.2	9.9	10.0	7.0
	AR(1) w/ constant	0.7	0.5	0.0	0.5	0.6	0.5	0.5	0.1
	AR(1) w/o constant	0.8	0.8	0.5	0.9	1.0	1.0	1.0	1.0
S Korea	Mean	3.6	5.6	3.1	1.6	5.4	8.1	5.1	2.7
	SD	2.3	2.3	0.8	1.1	3.8	4.5	2.3	1.3
	Median	2.9	5.7	2.8	1.3	5.2	9.3	5.2	2.9
US	Mean	2.6	3.3	2.5	2.0	2.5	3.4	2.0	2.1
	SD	1.2	1.1	1.2	1.2	1.8	1.3	1.9	2.0
	Median	2.7	3.0	2.8	1.8	2.7	3.7	2.7	2.3
India	Mean	7.3	9.3	6.1	6.2	6.0	5.9	6.5	5.4
	SD	3.0	2.7	3.0	2.4	2.9	2.3	2.1	4.2
	Median	6.7	9.0	4.3	5.1	6.5	5.9	7.9	6.5
Emerging	Mean	27.6	73.5	4.2	3.2	5.0	6.0	5.1	3.6
	SD	207.0	349.8	3.8	2.7	4.1	4.4	3.7	3.8

(*Continued*)

Table 1. (*Continued*)

		CPI Inflation				GDP Growth			
Country	Statistics	1987–2021	1987–1999	2000–2010	2011–2021	1987–2021	1987–1999	2000–2010	2011–2021
	SD excluding Brazil	4.9	6.3	3.8	2.6	4.1	4.4	3.8	3.7
	Median	3.8	6.4	3.5	2.8	5.2	6.2	5.3	4.1
OECD	Mean	10.1	23.1	3.6	2.0	2.7	3.2	2.7	2.1
	SD	60.5	99.6	5.0	2.2	3.3	2.8	3.6	3.4
	SD excluding outliers	4.4	6.3	2.1	1.3	3.0	2.5	2.8	3.4
	Median	2.5	4.5	2.6	1.7	2.8	3.4	2.9	2.2
		1960–1990	1961–1970	1971–1980	1981–1990	1960–1990	1961–1970	1971–1980	1981–1990
	Mean	5.5	5.4	9.1	2.1	6.2	9.6	4.5	4.5
	SD	4.4	1.3	5.7	1.4	3.5	3.3	2.7	1.0
	Median	4.9	5.3	8.0	2.1	5.0	10.9	4.5	4.5
Japan	AR(1) w/ constant	0.6	–0.2	0.4	0.7	0.5	–0.4	0.0	0.2
	AR(1) w/o constant	0.8	1.0	0.8	1.0	0.9	0.9	0.7	1.0

Note:
1. The statistics are computed based on annual data from 1987 to 2021.

Also, Table 1 presents the standard deviation of both inflation and GDP growth, indicating the changes of volatility over time. Before 2000, the inflation was extremely volatile, which is consistent with our findings in Figure 1. Also, the inflation volatility of 2.2 during 2000–2010 is almost doubled compared to that of 2011–2021, suggesting that the global financial crisis in 2008 led to higher volatility of price changes compared to the pandemic in 2019. In contrast, the GDP growth after 2000 was relatively stable as the standard deviations in 2000–2010 and 2011–2021 were 1.8 and 1.8, respectively. This indicates that the inflation in China is relatively more volatile compared to the GDP growth.

In addition, we observe that the AR(1) coefficient (with constant) is 0.7 for the full sample, which implies that the inflation is persistent in China. The persistence measure then declines from 0.5 before 2000 to 0 in the 2000s. Nevertheless, the persistence of 0.5 during 2011 and 2021 shows an increasing explaining power of the past inflation on the current values. Conversely, the past value of GDP growth from 1987 to 2021 explains about 62% of the current GDP growth. Furthermore, the persistence declines over time as it drops from 0.6 to 0.1 from 1987–1999 to 2011–2021.

Comparison with the OECD countries

Inflation in advanced economies or Western countries has been studied extensively. Hendry (2001) explores main determinants of inflation in the UK. He finds that factors such as excess demand for goods and services, world price inflation, and nominal money growth are essential to inflation, while excess money, debt, and labor demand are not important. Also, Bataa *et al.* (2014) found that France experiences significant changes in mean inflation, and the mean volatility of inflation in Italy, Japan, and the US varies over time. Furthermore, outliers in the inflation data seem to be severe in Canada, while those of Germany and the UK show seasonality.

The conventional Phillips curve theory implies that there must be a tradeoff between inflation and GDP growth. In other words,

high economic growth must be accompanied with high inflation. In fact, Artis *et al.* (1995) found that there were a total of nine complete inflation cycles in the UK. Nevertheless, this relationship does not exist in China based on its historical data. Since the Phillips curve relationship is developed empirically based on advanced economies, here we first investigate the statistics in OECD countries.[2] In Table 1, we also display the descriptive statistics of CPI inflation and GDP growth in OECD countries.[3]

As shown in Table 1, we observe that the average inflation in OECD countries from 1987 to 2021 is 10.09%, which is more than two times greater than that of China. In contrast, the average GDP growth in those advanced economies is three times lower compared to the growth rate in China. Based on the subsamples after 2000, we also find that when the GDP growth is high during 2000–2010 (2.7%), its corresponding inflation rate is relatively higher (3.6%) compared to its counterpart. Similarly, lower GDP growth rate in 2011–2021 (2.1%) leads to lower inflation rate (2.0%).

Besides, we observe that the volatility of inflation in OECD countries is the highest in the 1980s and 1990s. Then, it substantially declined to 5.0 during 2000–2010. Furthermore, the volatility does not rise substantially during 2011–2021, suggesting that the pandemic in 2019 does not affect inflation volatility significant. These are consistent with the findings in China. However, the volatility of GDP growth is lower than inflation from 2000 to 2021, which shows different patterns compared to that of China.

Ciccarelli and Mojon (2010) show that OECD countries share a common factor that accounts for nearly 70% of their variance, using the data from 1960 to 2008. This clearly implies that global inflation is an important factor in determining national inflation. Conversely, we observe significantly different patterns of inflation in China, again indicating the unique features of China's inflation.

Comparison with other emerging countries

Unlike advanced economies, we have found that China does not have strong tradeoff relationship. Nevertheless, these unique

characteristics of China may be due to its nature as an emerging economy.[4] Thus, we include the descriptive statistics for other emerging economies in Table 1 as well.[5]

Overall, we observe high inflation rate together with high GDP growth from 1987 to 2021. After 2000, we observe higher GDP growth (5.1% and 3.6%) among emerging economies compared to the average inflation rate (4.2% and 3.2%) in 2000–2010 and 2011–2021, respectively. Moreover, the impact of global financial crisis on inflation in 2008 is also greater than the effect of pandemic in 2019. This implies that China shares a common pattern with its counterparts. On the other hand, we still observe a weak tradeoff between economic growth and inflation among these developing countries. Particularly, when the GDP growth is 5.1% during 2000–2010, its corresponding inflation rate is 4.2%. Similarly, when the GDP growth is relatively lower during 2011–2021, we observe lower inflation rate of 3.2%. This does not align with China's tradeoff pattern. Instead, it is consistent with the findings in OECD countries.

This similarity with OECD countries could primarily stem from the IT policy that has been implemented in some of the developing countries. Among the 36 developing countries, 13 of them including Brazil, Mexico, and South Korea adopted the inflation targeting (IT) policy by the end of 2004, while the remaining 23 countries including Argentina, China, and Singapore are the non-targeters. Gonçalves and Salles (2008) question the effectiveness of the IT policy. They find that IT fails to control the inflation and inflation volatility in developed countries. Although it brings down the inflation in developing countries, the economic growth volatility in those countries declined at the same time. Similarly, Brito and Bystedt (2010) also show that IT does not lead to disinflation in developing countries. Furthermore, they find evidence of lower output growth after IT being implemented. Additionally, Xiong (2012) claims that the People's Bank of China adopts informal IT policy.

In addition, the volatility of inflation reaches its lowest level during 2000–2010, again suggesting sizeable positive impact of global financial crisis on inflation. Also, the volatility of inflation becomes lower during the pandemic, which is consistent with findings in both

China and OECD countries. Lastly, the GDP growth does not fluctuate drastically in different country groups.

Comparison with Japan

China's macroeconomic pattern has always been compared with countries like Japan. Japan achieved fast economic growth since the 1950s until the economic bubble burst in 1990. Afterwards, it struggled with deflation as well as low or negative economic growth. Recently, China's inflation dropped to zero in June 2023 and the producer prices also declined substantially. Since most countries in the world are suffering from high inflation, this indicates China's weak domestic demand. Hence, it is crucial to examine whether China's economy is following a similar path of recession as seen in Japan after the 1990. In Table 1, we also present the descriptive statistics of CPI inflation and GDP growth in Japan during 1960 and 1990. This is the period when Japan embraced fast economic growth.

Overall, we observe that the average GDP growth in Japan from 1960 to 1990 is 6.2% which is greater than the inflation of 5.5%. This reflects the common pattern shared among developing economies including China. Particularly, the economic growth rate is 9.6% in the 1960s, while the inflation rate is relatively lower (5.4%). Nonetheless, Japan encountered extremely high inflation rate of 9.1% in the 1970s, associated with low GDP growth of 4.5%. Interestingly, its inflation quickly declined to 2.1% while maintaining almost the same rate of economic growth (4.5%). This indicates that the tradeoff relationship does not exist in Japan during its early stage of the economy.

De Veirman (2009) found that Japan experienced recession in the past decades while it had low inflation. This questions the existence of Phillips curve in Japan in recent years. His findings indicate a gradual flattening of the Phillips curve. Similarly, the empirical results of the New Keynesian Phillips curve (NKPC) in Japan during 1980 and 2006 also show insignificant Phillips curve coefficient (Dees *et al.*, 2009). Additionally, we observe that Japan has slightly

different macroeconomic pattern compared with of China. Unlike China, Japan encountered high inflation during its developing phase of the economy, while China sustains a consistently low inflation rate when its economy is booming.

Based on the statistics, we conclude that different country groups may exhibit different tradeoff pattern between inflation and economic growth. Specifically, both the GDP growth and inflation rate among advanced economies are generally low. In contrast, emerging economies always achieve higher economic growth with relatively low inflation rate. Moreover, Japan shares similar pattern with the emerging economies during 1960 and 1990, even though such pattern varies in the subsamples. Interestingly, China exhibits similar tradeoff pattern compared with other emerging economies. However, such pattern does not remain in the subsamples.

Unit root hypothesis

In Table 2, we present the outcomes of the unit root tests conducted for diffrenrt inflation measures and their first-differenced counterparts, as well as the real GDP growth in China. The CPI, RPI, PPI, and growth data are specifically collected on a quarterly basis, from 1993Q1 to 2023Q2, whereas the two Core CPI data are from 2006Q1 to 2023Q2. We conduct both Augmented Dickey–Fuller (ADF) test and Phillips–Perron (PP) tests with different specifications to examine the unit root hypothesis.

We observe from Table 2 that all price indices including CPI, RPI, and PPI display strong unit root features as it does not pass both ADF and PP tests, clearly indicating its non-stationary nature in China. This is consistent with the unit root hypothesis in the literature as inflation is assumed to have unit root in the context of Western countries (Crowder and Hoffman, 1996; Crowder and Wohar, 1999; Evans and Lewis, 1995; King and Watson, 1994; Ng and Perron, 2001). Furthermore, the outcomes of the unit root tests for its first-differenced counterparts show that CPI inflation of China follows an I(1) process. On the other hand, the real GDP growth is a stationary process that passes all our unit root tests.

Table 2. Unit root tests.

Variables	Test	Test Statistic	1%	5%	10%
CPI Inflation	ADF	–1.59	–3.50	–2.89	–2.58
	PP	–2.18	–3.50	–2.89	–2.58
CPI Inflation (First Differenced)	ADF	–6.66	–3.50	–2.89	–2.58
	PP	–6.67	–3.50	–2.89	–2.58
Core CPI (excl. Food)	ADF	–2.32	–3.56	–2.92	–2.59
	PP	–1.54	–2.61	–1.95	–1.61
Core CPI (excl. Food) (FD)	ADF	–4.47	–3.56	–2.92	–2.59
	PP	–4.67	–2.61	–1.95	–1.61
Core CPI (excl. Energy & Food)	ADF	–1.90	–3.56	–2.92	–2.59
	PP	–1.14	–2.61	–1.95	–1.61
Core CPI (excl. Energy & Food) (FD)	ADF	–4.58	–3.56	–2.92	–2.59
	PP	–4.69	–2.61	–1.95	–1.61
RPI	ADF	–1.67	–3.50	–2.89	–2.58
	PP	–1.87	–2.60	–1.95	–1.61
RPI (FD)	ADF	–7.03	–3.50	–2.89	–2.58
	PP	–6.92	–2.60	–1.95	–1.61
PPI	ADF	–2.63	–3.50	–2.89	–2.58
	PP	–2.90	–2.60	–1.95	–1.61
PPI (FD)	ADF	–6.65	–3.50	–2.89	–2.58
	PP	–6.73	–2.60	–1.95	–1.61
Real GDP Growth	ADF	–16.85	–3.50	–2.89	–2.58
	PP	–17.17	–3.50	–2.89	–2.58

Notes:

1. The data are collected on a quarterly basis, from the CEIC database.
2. The sample period for CPI, RPI, and PPI inflation rates are from 1993Q1 to 2023Q2.
3. The sample period for the two Core CPI inflation rates are from 2006Q1 to 2023Q2.
4. The sample period for Real GDP Growth rate is from 1993Q1 to 2023Q2.
5. In addition, we also conduct unit root tests with different specifications for all the three variables. The results are consistent with our findings in the table.

Alternative aggregate measures

Besides CPI inflation, there are also other alternative inflation measures in the literature. Clark (2001) provides a comprehensive summary of alternative inflation measures. Particularly, core inflation is

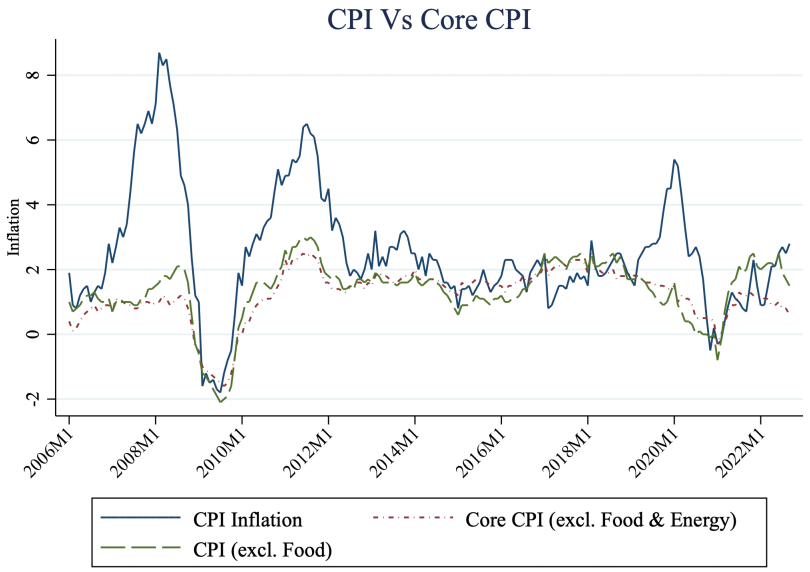

Figure 2. CPI and core CPI inflation rates in China from 2006 to 2022.

another common inflation measure which excludes food and energy as prices in those sectors have been highly volatile. Besides, other measures such as CPI excluding energy or the eight most volatile components of the overall index also have been discussed. In Figure 2, we illustrate the monthly CPI inflation together with Core CPI Inflation excluding Food and Energy Prices, as well as CPI inflation excluding Food prices only.

Obviously, CPI inflation is more volatile than the Core CPI inflation, suggesting that the big part of volatility in inflation comes from the shocks to food and energy prices. Given the fact that core CPI inflation follows a similar pattern to inflation figures that exclude only food, food prices could be the main contributing factor of China's CPI inflation and its volatility. Additionally, the CPI inflation is more sensitive to external shocks including the 2008 Global Financial Crisis, China's economic stimulus package in 2008 and 2009, and the pandemic outbreak in 2021.

Beside CPI inflation, there are also Retail Price Index (RPI) and Producer Price Index (PPI) which are also commonly used as a

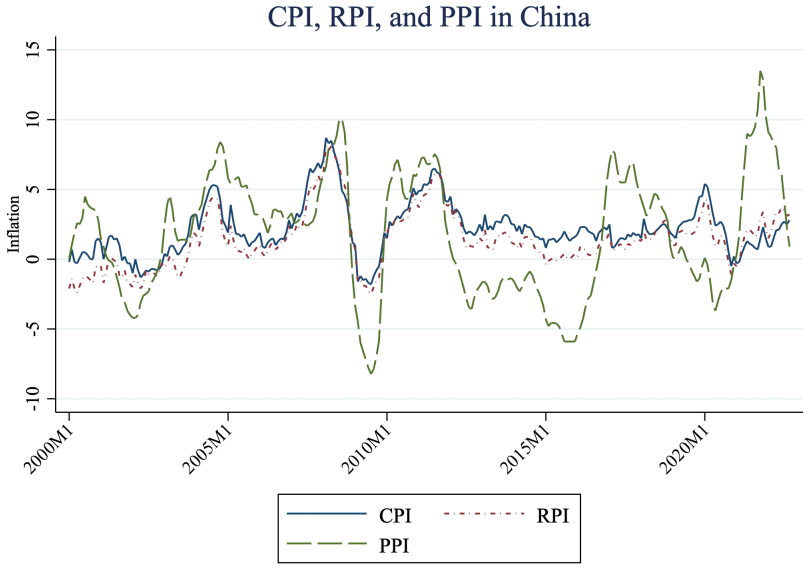

Figure 3. CPI, RPI, and PPI inflation rates in China from 2000 to 2022.

reference of price level. In Figure 3, we display the inflation rates induced by CPI, RPI, and PPI from 2000M1 to 2022M9.

The figure illustrates that CPI and RPI inflation rates closely track each other over time. For much of the period, RPI inflation tends to be slightly lower than CPI inflation. Meanwhile, although PPI inflation exhibits a similar trend to the other two inflation rates, it shows greater volatility.[6]

Besides, we also link China's PPI to other countries' PPI. As shown in Figure 4, a striking fact is that China's PPI is highly correlated with the PPI in the US starting from 1996 with a correlation coefficient of 0.88. Before 1996, the correlation between China's PPI and the US PPI is –0.31.

Disaggregate level data

Subsequently, we analyze the properties of China's inflation data, at both sector and city levels. To examine city-level inflation, we

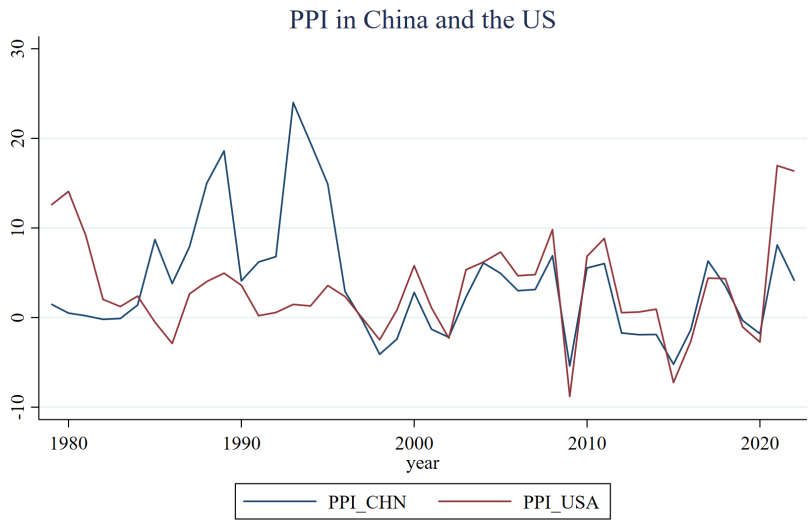

Figure 4. PPI in China and US from 1978 to 2022.

have collected monthly CPI data spanning from 1994M1 to 2022M10. For the sectoral analysis, we have compiled sectoral CPI data from 2000M1 to 2022M11. Both inflation rates are available at the CEIC database.

We first present the descriptive statistics for China's regional inflation data in Table 3.[7]

Based on the full sample result, it is evident that we observe more volatile inflation in Central and West regions of China. Furthermore, inflation rate in the East region is relatively lower compared to that of the other two regions.[8] Next, we divide the dataset into four subperiods, each spanning five years. Overall, inflation has shown fewer fluctuations over time. Specifically, it was most unstable between 2005 and 2010 and has been the least volatile in the last five years. Likewise, the average rate of inflation has also declined over time.

Given the diverse economic characteristics of cities across China, it is crucial to examine the correlation between city-level inflation rates to uncover potential spatial or economic interdependencies among different cities in China. In addition, we also present the cor-

Table 3. Descriptive statistics for China's regional inflation.

Region	Mean	SD	Period
Eastern	2.07	2.05	
Central	2.18	2.20	2000M1–2022M10
Western	2.19	2.36	
Eastern	0.77	2.20	
Central	1.07	2.44	2000M1–2005M10
Western	1.01	2.47	
Eastern	2.30	2.64	
Central	2.75	3.03	2005M2–2010M1
Western	2.79	3.34	
Eastern	3.19	1.50	
Central	3.11	1.50	2010M2–2015M1
Western	3.38	1.67	
Eastern	2.04	1.12	
Central	1.93	1.14	2015M2–2022M10
Western	1.82	1.12	

relation of CPI inflation across China's 36 major cities from 2000 to 2022 in Table A2 in Appendix.[9]

Besides, Stock and Watson (2016) investigate the sectoral inflation by a univariate/multivariate unobserved components/stochastic volatility outlier adjustment (UCSVO) model. In Table 4, we also explore the characteristics of sectoral inflation in China by presenting the summary statistics. Table 4 shows that the inflation rate is the highest in the Food sector, followed by the Residence sector. On the other hand, the price level in the Clothing and Household sectors are relatively small. In addition, we observe negative values for the inflation rate in the Transport and Communication sector, indicating deflation in the sector.

Additionally, prices within the Food sector show considerable variability over time. This is largely attributed to the perishable nature of food products, which tend to experience high inflation and volatility. This finding is consistent with our argument that the food prices are the main contributing factor of CPI inflation and its

Table 4. Descriptive statistics of sectoral inflation in China from 2000 to 2022.

Sectors	Mean	SD	Min	Max	Median
Food	4.13	5.59	–6.26	20.97	2.95
Clothing	0.16	1.78	–3.08	3.96	–0.04
Household	0.36	1.61	–2.80	3.38	0.79
Residence	2.46	2.40	–5.82	7.42	2.34
Transport and Communication	–0.72	2.51	–6.77	8.03	–0.75
Medicine	1.67	1.69	–1.57	7.03	1.52
Recreational, Educational, Cultural Article & Service	0.89	1.41	–4.73	3.78	1.12

volatility in the comparison between CPI inflation and Core inflation in Figure 2. Furthermore, despite the observed decrease in prices within the Transport and Communication sector, the inflation rates remain volatile. The deflation occurring in this sector can be interpreted as the declining prices in the communication industry. Lastly, the price level in the Recreational, Educational, Cultural Article and Service remains stable as the products in the sector are defined as luxury goods instead of necessities.[10]

Tradeoff between Economic Growth and Inflation

In this section, we investigate the tradeoff between economic growth and inflation among different country groups by leveraging on a simple panel regression of CPI inflation rate on GDP growth rate. The benchmark panel regression for our empirical study is as follows:

$$\pi_{it} = \beta + \alpha_{it} y_{it} + \varepsilon_{it} \quad (1)$$

where π_{it} is the CPI inflation in country i at year t and y_{it} is the corresponding GDP growth. In addition, we also examine the

cross-sectional regression for China using its quarterly data. The regression is expressed as

$$\pi_t = \alpha + \alpha_t y_t + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3 + \varepsilon_t \quad (2)$$

where D_1, D_2, and D_3 are quarter dummies from quarter 1 to quarter 3. The empirical results based on the regression models are presented in Table 5.

In column (1) of Table 5, the coefficient associated with China's GDP growth is significantly negative, indicating an inverse relationship between CPI inflation and GDP growth in China. In particular, when the real GDP growth rises by 1%, China's CPI inflation drops by 0.9%. To eliminate any potential issues caused by the I(1) process of CPI inflation, we also conduct the Dynamic OLS (DOLS) in column (2) of Table 5. Again, we obtain significantly negative coefficient associated with the GDP growth. In addition, the R^2 increases from 0.54 in column (1) to 0.83 in column (2), indicating stronger explaining power of our regression.

Using cross-country data, we do not find this significant negative correlation among real GDP growth and inflation in OECD countries, emerging economies and Japan (during 1960–1990) in columns (3)–(5) of Table 5. In the regressions using first-differenced (FD) data from columns (7)–(11), only Japan during the period of 1960–1990 exhibits a similar pattern to China.

In addition, we also examine the tradeoff within three sets of subsamples in Table 6. Overall, different from the negative correlation between inflation and GDP growth in China, we do not observe significant tradeoff relationship between inflation and GDP growth in OECD countries after 2000, while the tradeoff theory exists in emerging economies from 2000 to 2021. The result remains after including both OECD and emerging economies in the tradeoff regression. Interestingly, from 2011 onwards, we observe significant tradeoff between economic growth and inflation. While OECD countries still exhibit weak relationship between the two variables, we obtain substantially steeper slope coefficient for emerging

Table 5. Tradeoff regression.

Dependent variable	CPI Inflation						First-Differenced				
	China	DOLS	OECD	Emerging	Japan	All	China	OECD	Emerging	Japan	All
GDP Growth	–0.948***	–1.471***	–0.051	–2.025	–0.361	–0.569	–0.091***	–0.060	–1.708	–0.727***	–0.668
	(–11.727)	(–6.096)	(–0.444)	(–1.001)	(–1.564)	(–1.025)	(–3.217)	(–0.902)	(–1.030)	(–4.545)	(–1.143)
Quarter 1	–26.982***						–3.095***				
	(–10.809)						(–3.041)				
Quarter 2	1.007						2.078***				
	(1.016)						(2.733)				
Quarter 3	–5.066***						–0.941*				
	(–4.650)						(–1.947)				
Observations	121	118	1,210	467	30	1,677	120	1,173	453	29	1,626
R-squared	0.54	0.83	0.00	0.01	0.080	0.00	0.087	0.003	0.002	0.434	0.00

Notes:

1. For China, we use quarterly data from 1993Q1 to 2021Q4.
2. For the rest of the world, we use annual data from 1987 to 2021.
3. For Japan, we use annual data from 1960 to 1990.
4. The panel results are based on clustered robust standard error.
5. We present t-statistics in the parentheses below the coefficients.
6. We conduct the Dynamic OLS (DOLS) by including the first-differenced, lead, and lag terms of inflation in column (2) due to potential I (1) process of inflation.

Table 6. Tradeoff regression: Subsamples.

	CPI Inflation			First-Differenced		
	2000–2021			2000–2021		
Dependent variable	OECD	Emerging	All	OECD	Emerging	All
GDP Growth	0.038	0.092**	0.054*	0.088***	0.059**	0.078***
	(0.972)	(2.230)	(1.733)	(4.988)	(2.308)	(5.500)
no. of Obs.	814	307	1,121	777	293	1,070
R-squared	0.02	0.01	0.02	0.03	0.01	0.02

Note:
1. The results are based on clustered robust standard error.
2. We present t-statistics in the parentheses below the coefficients.

Table 7. The relationship between inflation and volatility.

	Average CPI Inflation			
Dependent variable	OECD	Emerging	All	China Provincial
Inflation Volatility	0.459***	0.991***	0.437***	–0.255
	(4.928)	(3.868)	(3.696)	(–0.646)
Observations	22	22	22	88
R-squared	0.548	0.428	0.406	0.006

Note:
1. The results are based on sample period from 2000 to 2021.
2. We present t-statistics in the parentheses below the coefficients.
3. The dependent is average CPI inflation across countries China Provinces.
4. Volatility of inflation is defined as the standard deviation (SD) of CPI inflation across countries/provinces in China.
5. We control for quarter effect for China's provincial regression.
6. Average CPI inflation and inflation volatility are cointegrated.

economies. This indicates that developing countries have been facing more tradeoff between GDP growth and price level in recent years. Again, even though the tradeoff coefficient for the OECD countries becomes more significant, the small magnitude of it implies a relatively flat relationship between inflation and GDP growth in advanced countries.

Besides, we also aim to investigate the relationship between inflation and its volatility across various groups of countries in Table 7. It is evident that there exists a significant positive relationship between inflation and its volatility across OECD and emerging economies. The results remain for full sample regression in column (3). In order to investigate the relationship within China, we have to leverage on its provincial level data from 2000Q1 to 2021Q3. In column (4), we obtain insignificant coefficient associated with China's inflation volatility, indicating no relationship between inflation and its volatility measure.[11]

Correlation of Inflation Rates across Countries

While examining the relationship between CPI inflation and GDP growth in China shows unique patterns, we also explore how its inflation rates correlate with those of other countries or regions. In Table 8, we first present the correlation of CPI inflation across selected countries. Interestingly, China's CPI inflation does not show strong correlation with most of the countries or regions. It is intuitive that the correlation between China's CPI inflation rates and those of Hong Kong is fairly strong (0.68), yet it is surprising to find a weak correlation between China's CPI inflation and that of the US (0.37). Furthermore, we also observe weak correlation between the inflation rates of China and its neighboring countries include Japan (0.25) and Singapore (0.32). On the other hand, there is a noticeable strong relationship between the inflation rates of the US and other major economies, including Canada (0.79), France (0.84), and the UK (0.72). In summary, although geographical proximity and economic connections are key factors in establishing the correlation between inflation rates among major economies, China's CPI inflation exhibits a lower correlation with others.

Table 9 shows the correlation of PPI inflation across countries. We observe synchronization of the PPI across countries, that is, PPI is highly correlated in most countries. In addition to the US, China's

Table 8. Correlation of CPI inflation rates across countries/regions.

	CHN	AUS	AUT	BRA	CAN	DEU	FRA	GBR	SGP	HKG	IND	JPN	KOR	MEX	NOR	USA
CHN	1.00															
AUS	0.38	1.00														
AUT	0.40	0.24	1.00													
BRA	0.56	0.35	0.53	1.00												
CAN	0.16	0.76	0.38	0.29	1.00											
DEU	0.36	0.02	0.89	0.53	0.31	1.00										
FRA	0.45	0.71	0.66	0.46	0.78	0.55	1.00									
GBR	0.32	0.58	0.58	0.60	0.75	0.55	0.77	1.00								
SGP	0.32	0.23	0.71	0.30	0.27	0.57	0.54	0.53	1.00							
HKG	0.68	0.31	0.54	0.63	0.35	0.57	0.50	0.72	0.48	1.00						
IND	0.30	0.09	0.23	0.24	0.06	0.25	0.22	0.51	0.43	0.63	1.00					
JPN	0.25	0.17	0.41	0.54	0.44	0.51	0.39	0.65	0.32	0.71	0.29	1.00				
KOR	0.45	0.37	0.53	0.59	0.48	0.56	0.64	0.74	0.42	0.66	0.62	0.52	1.00			
MEX	0.40	0.66	–0.06	0.14	0.47	–0.14	0.46	0.37	–0.06	0.34	0.27	0.10	0.33	1.00		
NOR	0.25	0.75	–0.01	0.21	0.63	–0.06	0.47	0.44	–0.01	0.30	0.15	0.23	0.28	0.81	1.00	
USA	0.37	0.66	0.65	0.47	0.79	0.57	0.84	0.72	0.49	0.44	0.07	0.43	0.58	0.36	0.45	1.00

Note:

1. The correlation coefficients are computed based on annual data from 1987 to 2021.

Table 9. Correlation of PPI inflation rates across countries.

	CHN	AUS	CAN	DEU	FRA	GBR	SGP	JPN	KOR	NOR	USA	ARG	COL	POL	THA
CHN	1.00														
AUS	0.61	1.00													
CAN	0.66	0.74	1.00												
DEU	0.43	0.81	0.79	1.00											
FRA	0.51	0.83	0.84	0.98	1.00										
GBR	0.69	0.81	0.76	0.87	0.89	1.00									
SGP	0.81	0.85	0.85	0.77	0.84	0.82	1.00								
JPN	0.62	0.86	0.81	0.80	0.81	0.84	0.80	1.00							
KOR	0.82	0.63	0.78	0.68	0.72	0.86	0.77	0.69	1.00						
NOR	0.71	0.74	0.87	0.85	0.87	0.88	0.84	0.80	0.87	1.00					
USA	0.86	0.78	0.88	0.75	0.81	0.84	0.93	0.82	0.85	0.89	1.00				
ARG	–0.03	0.23	0.37	0.40	0.36	0.23	0.11	0.34	0.12	0.27	0.16	1.00			
COL	0.44	0.74	0.79	0.88	0.89	0.74	0.71	0.65	0.71	0.81	0.75	0.36	1.00		
POL	0.39	0.62	0.74	0.88	0.89	0.75	0.69	0.59	0.72	0.78	0.64	0.29	0.88	1.00	
THA	0.73	0.70	0.50	0.57	0.62	0.76	0.70	0.59	0.73	0.71	0.77	–0.10	0.56	0.44	1.00

Note:

1. The correlation coefficients are computed based on annual data from 2000 to 2022.

PPI also closely related to its neighboring countries, such as Singapore (0.81), South Korea (0.82), and Thailand (0.73). We then investigate the correlation of China's PPI with advanced countries and emerging and developing countries. Compared to emerging and developing countries, China's PPI shows higher correlation with advanced countries in general. It is obvious to find a remarkably close correlation between China's PPI and that of other major countries, including Australia (0.61), Canada (0.66), the UK (0.69), Japan (0.62), and Norway (0.71). However, the relationship between PPI inflation of China and that of Argentina (–0.03), Colombia (0.44), and Poland (0.39) is relatively weaker. Auer *et al.* (2017) support the PPI synchronization among countries by OECD country data. They argue that cross-country PPI synchronization is mainly driven by common sectoral shocks and amplified by input–output linkages.

Conclusion

Based on a time series regression, we observe that the relationship between inflation and GDP growth in China is different from that of OECD and other emerging economies. Specifically, the inflation and GDP growth exhibit statistically significant inverse relationship, which contradicts the conventional tradeoff theory between GDP growth and inflation. While the results are controversial, they are not surprising to us. Particularly, the lower price level associated with high economic growth in China reflects the "China price effect" as the price level declines due to increase of aggregate supply.

As a developing economy, China has been sustaining markedly high GDP growth while keeping the inflation low and stable. It is essential to investigate their tradeoff coefficient in recent years. Nakamura *et al.* (2016) leverage on micro-level data and found that in the 2000s, the inflation in China was understated while the GDP growth was overstated by the government. Thus, we suggest that future studies should examine the dynamics of inflation and its economic performance within China using more detailed disaggregate-level data.

Endnotes

1. The statistics are computed based on the dataset collected from the CEIC database.
2. OECD countries in this chapter include Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United States (US), and the United Kingdom (UK).
3. We also provide the average inflation and GDP growth among OECD countries in Figure A1 in the Appendix. In addition, we also divide the OECD countries into European countries and non-European countries and display the plots in Figures A2 and A3. Overall, there is no significant differences across the two subgroups.
4. Emerging economies in the paper include China, Botswana, Brazil, Hong Kong, Indonesia, India, South Korea, Malaysia, Malta, Oman, Singapore, Thailand, Vietnam, and South Africa.
5. We also provide the average inflation and GDP growth among emerging economies in Figure A4 in the Appendix. Overall, the average inflation rate is similar for both OECD and emerging economies. Thus, any differences in the patterns can be attributed to the heterogeneity across country groups.
6. In addition, we also illustrate alternative price indices based on online data in Figures A5 and A6 in the Appendix. Specifically, the iCPI inflation illustrated in Figure A5 exhibits less volatility compared to CPI inflation, as we do not observe the sharp decline in iCPI inflation during the 2019 pandemic. Additionally, changes in iCPI inflation occur one or two periods earlier than those in CPI inflation, indicating that online prices respond more quickly than the traditional prices captured in the CPI data. In Figure A6, we present the data collected by Cavallo *et al.* (2018). It is evident that both CPI and online inflation rates move at the same direction, even though the online inflation rate demonstrates higher volatility.
7. The data are collected from 36 major cities in China, which are subsequently divided into three regions based on their geographical locations. The regions are as follows:

East region: Beijing, Changchun, Dalian, Fuzhou, Guangzhou, Haikou, Hangzhou, Harbin, Jinan, Nanjing, Ningbo, Qingdao, Shanghai, Shenyang, Shijiazhuang, Shenzhen, Tianjin, and Xiamen.
Central region: Changsha, Hefei, Nanchang, Taiyuan, Wuhan, and Zhengzhou.
West region: Chengdu, Chongqing, Guiyang, Hohhot, Kunming, Lanzhou, Lhasa, Nanning, Urumqi, Xi'an, Xining, and Yinchuan.

8. This finding is supported by the regression results presented in Table A1 in the Appendix. In particular, the coefficients associated with Eastern Region dummy are significantly negative or the full sample and for most of the subsamples.
9. The table demonstrates that the correlation coefficients for each pair of cities are significantly high, with the notable exception of Lhasa, which displays negative values. This indicates that the inflation rates across different cities in China are rather homogeneous and hence, they can be summarized into one common factor.
10 Furthermore, we also examine the correlation among sectoral inflation rates in Table A3 in the Appendix. Interestingly, it is evident that the inflation rate in the Housing sector shows weak correlation with other sectors, suggesting that property prices in China are not the primary drivers of the overall price level. This finding contradicts to the prevailing assumption commonly held.
11. Narayan *et al.* (2009) found negative relationship between the two measures using China's provincial data from 1987M1 to 2006M1. We extend the sample period by using quarterly inflation data at provincial level. It turns out that the negative relationship no longer exists in recent years. However, it is still vastly different from the positive correlation that we observe from the rest of the world.

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Appendix

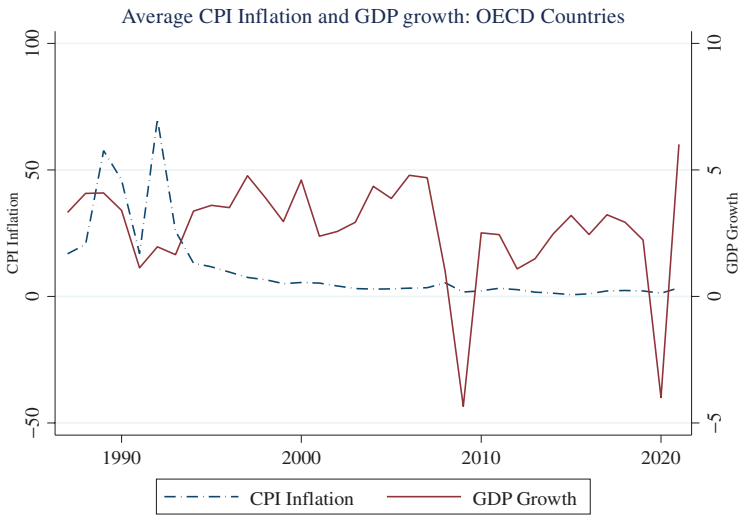

Figure A1. Average inflation and GDP growth in OECD countries from 1987 to 2022.

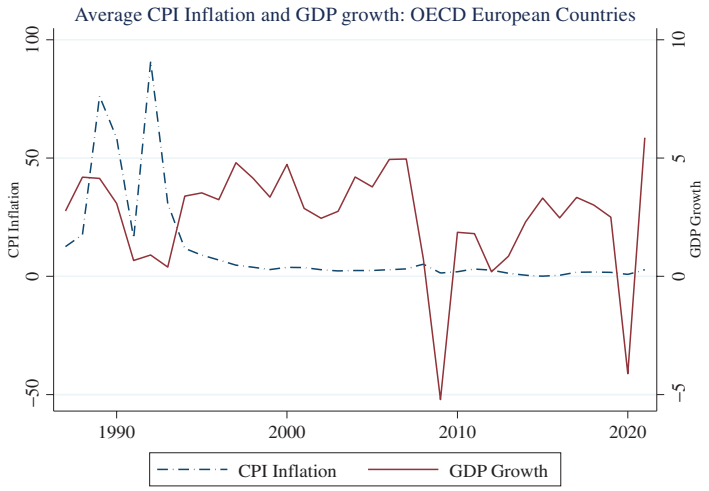

Figure A2. Average inflation and GDP growth in OECD EU countries from 1987 to 2022.

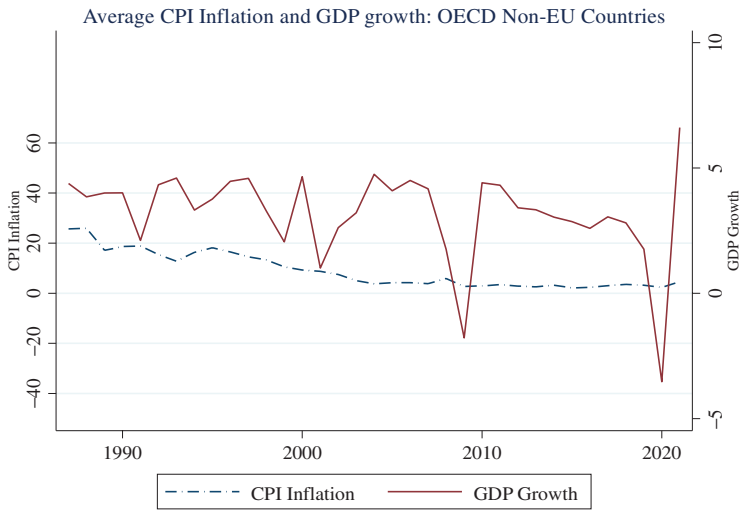

Figure A3. Average Inflation and GDP Growth in OECD Non-EU Countries from 1987 to 2022.

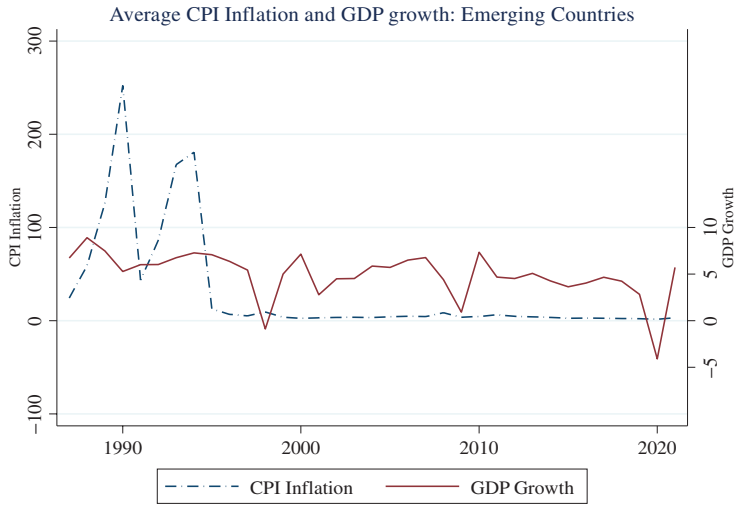

Figure A4. Average inflation and GDP growth in emerging countries from 1987 to 2022.

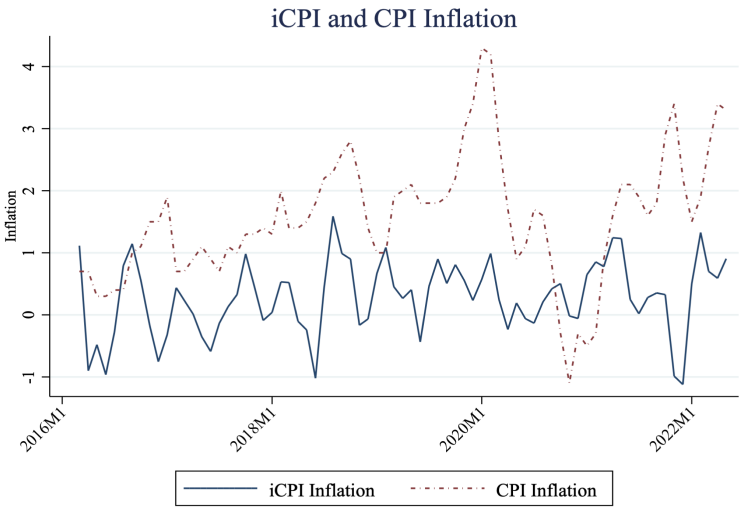

Figure A5. iCPI inflation in China from 2016 to 2022.

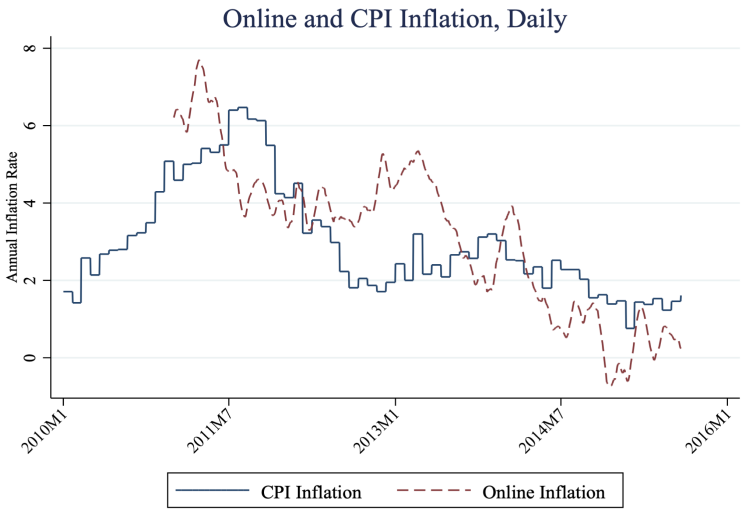

Figure A6. Online and CPI inflation in China from 2010 to 2015.

Table A1. Inflation and Regions.

Dep Var	CPI Inflation				
Period	2000M1–2022M10	2000M1–2005M10	2005M2–2010M1	2010M2–2015M1	2015M2–2022M10
Eastern Region	–0.114**	–0.092	–0.484***	–0.189**	0.240***
	(–2.332)	(–0.956)	(–3.433)	(–2.534)	(5.537)
Central Region	–0.003	0.195	–0.036	–0.266***	0.126**
	(–0.051)	(1.518)	(–0.191)	(–2.656)	(2.174)
Observations	9,828	2,592	2,160	2,160	3,312
R-squared	0.001	0.002	0.006	0.004	0.009

Table A2. Correlation of Inflaiton across China's Cities from 2000M1 to 2022M10.

	Beijing	Tianjin	Shijiazhuan	Taiyuan	Hohhot	Shenyang	Dalian	Changchu	Harbin	Shangha	Nanjing	Hangzhou	Ningbo
Beijing	1.00												
Tianjin	0.95	1.00											
Shijiazhuan	0.94	0.95	1.00										
Taiyuan	0.91	0.91	0.95	1.00									
Hohhot	0.93	0.91	0.94	0.95	1.00								
Shenyang	0.92	0.94	0.95	0.92	0.92	1.00							
Dalian	0.94	0.96	0.96	0.92	0.92	0.95	1.00						
Changchun	0.93	0.95	0.94	0.92	0.92	0.94	0.95	1.00					
Harbin	0.93	0.95	0.93	0.92	0.91	0.96	0.95	0.95	1.00				
Shanghai	0.93	0.91	0.93	0.94	0.95	0.90	0.92	0.92	0.91	1.00			
Nanjing	0.93	0.96	0.95	0.93	0.90	0.93	0.96	0.94	0.93	0.92	1.00		
Hangzhou	0.94	0.94	0.93	0.92	0.92	0.92	0.95	0.95	0.93	0.94	0.93	1.00	
Ningbo	0.94	0.95	0.94	0.93	0.93	0.92	0.96	0.95	0.93	0.95	0.95	0.96	1.00
Hefei	0.91	0.92	0.93	0.93	0.91	0.91	0.93	0.92	0.89	0.93	0.94	0.92	0.94
Fuzhou	0.91	0.92	0.93	0.94	0.94	0.93	0.92	0.93	0.93	0.94	0.93	0.92	0.94
Xiamen	0.85	0.85	0.89	0.91	0.89	0.87	0.87	0.86	0.86	0.89	0.87	0.87	0.89
Nanchang	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.93	0.95	0.95	0.94	0.94	0.94
Jinan	0.96	0.96	0.96	0.94	0.93	0.96	0.96	0.94	0.96	0.93	0.96	0.94	0.95
Qingdao	0.94	0.95	0.93	0.92	0.91	0.93	0.95	0.93	0.94	0.92	0.94	0.92	0.94
Zhengzhou	0.90	0.94	0.94	0.93	0.91	0.96	0.93	0.93	0.94	0.89	0.94	0.90	0.90
Wuhan	0.93	0.96	0.95	0.94	0.93	0.94	0.95	0.95	0.94	0.94	0.97	0.94	0.96
Changsha	0.91	0.93	0.95	0.94	0.94	0.93	0.93	0.93	0.94	0.94	0.93	0.93	0.94
Guangzhou	0.91	0.93	0.93	0.92	0.89	0.90	0.93	0.91	0.91	0.92	0.93	0.92	0.94
Shenzhen	0.90	0.93	0.93	0.91	0.91	0.92	0.92	0.90	0.93	0.91	0.92	0.92	0.92
Nanning	0.85	0.90	0.90	0.88	0.87	0.90	0.88	0.88	0.91	0.86	0.89	0.85	0.87
Haikou	0.84	0.90	0.91	0.89	0.87	0.90	0.91	0.88	0.88	0.88	0.92	0.87	0.89
Chongqing	0.90	0.95	0.93	0.91	0.91	0.94	0.94	0.95	0.95	0.91	0.93	0.92	0.92
Chengdu	0.92	0.94	0.94	0.93	0.94	0.95	0.94	0.95	0.95	0.92	0.94	0.93	0.93
Guiyang	0.91	0.91	0.88	0.87	0.85	0.88	0.89	0.91	0.93	0.87	0.90	0.90	0.89
Kunming	0.84	0.87	0.85	0.84	0.85	0.83	0.87	0.90	0.87	0.86	0.85	0.88	0.88
Lhasa	−0.11	−0.02	−0.01	−0.01	−0.05	0.00	−0.01	−0.01	0.02	−0.05	−0.01	−0.01	−0.04
Xi'an	0.94	0.96	0.95	0.94	0.93	0.95	0.95	0.94	0.95	0.91	0.95	0.94	0.94
Lanzhou	0.92	0.94	0.93	0.92	0.92	0.93	0.93	0.94	0.95	0.92	0.93	0.93	0.93
Xining	0.91	0.92	0.93	0.91	0.91	0.91	0.92	0.93	0.92	0.92	0.91	0.92	0.92
Yinchuan	0.91	0.93	0.93	0.92	0.92	0.93	0.92	0.92	0.94	0.91	0.92	0.91	0.91
Urumqi	0.93	0.93	0.94	0.91	0.90	0.90	0.93	0.93	0.92	0.91	0.93	0.91	0.92

	Hefei	Fuzhou	Xiamen	Nanchang	Jinan	Qingdao	Zhengzho	Wuhan	Changsh	Guangzhou	Shenzhen	Nanning	Haikou	Chongqing	Chengdu	Guiyan	Kunming	Lhasa	Xi'an	Lanzhou	Xining	Yinchuan	Urumqi
Hefei	1.00																						
Fuzhou	0.90	1.00																					
Xiamen	0.87	0.94	1.00																				
Nanchang	0.92	0.96	0.92	1.00																			
Jinan	0.92	0.94	0.87	0.95	1.00																		
Qingdao	0.90	0.94	0.88	0.94	0.95	1.00																	
Zhengzhou	0.90	0.92	0.84	0.93	0.95	0.92	1.00																
Wuhan	0.96	0.94	0.87	0.95	0.96	0.94	0.94	1.00															
Changsha	0.89	0.97	0.91	0.96	0.95	0.92	0.92	0.93	1.00														
Guangzhou	0.91	0.93	0.92	0.93	0.93	0.92	0.89	0.94	0.92	1.00													
Shenzhen	0.88	0.94	0.90	0.94	0.94	0.92	0.91	0.93	0.94	0.96	1.00												
Nanning	0.83	0.90	0.84	0.91	0.91	0.86	0.91	0.89	0.90	0.90	0.90	1.00											
Haikou	0.88	0.90	0.91	0.91	0.88	0.89	0.88	0.90	0.89	0.92	0.90	0.86	1.00										
Chongqing	0.87	0.93	0.83	0.93	0.94	0.91	0.95	0.94	0.94	0.91	0.92	0.94	0.88	1.00									
Chengdu	0.90	0.95	0.88	0.95	0.95	0.93	0.95	0.94	0.95	0.90	0.92	0.90	0.90	0.95	1.00								
Guiyang	0.84	0.88	0.79	0.89	0.92	0.89	0.90	0.90	0.89	0.88	0.89	0.90	0.79	0.94	0.90	1.00							
Kunming	0.83	0.86	0.77	0.84	0.88	0.82	0.86	0.87	0.87	0.83	0.83	0.83	0.75	0.89	0.86	0.89	1.00						
Lhasa	0.02	−0.05	0.02	−0.02	−0.03	−0.09	0.01	−0.01	−0.02	0.06	0.06	0.09	0.07	0.01	−0.03	0.03	0.07	1.00					
Xi'an	0.93	0.93	0.86	0.95	0.96	0.94	0.96	0.96	0.93	0.93	0.94	0.91	0.89	0.94	0.95	0.91	0.87	0.02	1.00				
Lanzhou	0.90	0.94	0.85	0.94	0.95	0.92	0.93	0.95	0.94	0.92	0.93	0.93	0.85	0.96	0.94	0.95	0.90	0.04	0.95	1.00			
Xining	0.91	0.90	0.81	0.92	0.93	0.89	0.92	0.93	0.91	0.88	0.89	0.89	0.83	0.94	0.93	0.92	0.89	0.02	0.94	0.96	1.00		
Yinchuan	0.86	0.94	0.85	0.93	0.94	0.91	0.94	0.91	0.94	0.90	0.92	0.94	0.86	0.96	0.95	0.93	0.88	0.03	0.94	0.96	0.93	1.00	
Urumqi	0.91	0.90	0.85	0.93	0.93	0.92	0.91	0.93	0.90	0.91	0.88	0.88	0.88	0.92	0.92	0.90	0.84	0.00	0.94	0.94	0.94	0.91	1.00

Table A3. Correlation Coefficient of Sectoral Inflation in China from 2000 to 2022.

Sectors	Food	Clothing	Household	Residence	Transport and Communication	Medicine	Recreational, Educational, Cultural Article
Food	1.00						
Clothing	0.07	1.00					
Household	0.40	0.62	1.00				
Residence	0.29	–0.03	0.11	1.00			
Transport and Communication	0.01	0.35	0.49	–0.03	1.00		
Medicine	0.25	0.47	0.59	0.11	0.20	1.00	
Recreational, Educational, Cultural Article & Service	–0.06	0.30	0.07	–0.11	0.48	0.13	1.00