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Indicating Fiscal Expenditure: Should the Government Notice Consumer Confidence?

Abstract. *Consumer confidence can predict and reflect consumer behaviour and economic operation, which has certain implications for the government in formulating fiscal policy. This paper investigates the relationship between fiscal expenditure and consumer confidence in China. Using the time-varying rolling window approach, we find that the interaction mechanism between fiscal expenditure and consumer confidence is complex. On the one hand, the positive impact of fiscal expenditure on consumer confidence can confirm that a rise in fiscal expenditure increases the total demand and stimulates consumer sentiment. However, as consumer confidence is a "barometer" of economic health, it reflects more than changes in fiscal spending. This could lead to a divergence between consumer confidence and fiscal expenditure. In addition, consumer confidence influences fiscal spending negatively, suggesting that consumer confidence is a leading indicator of policy on fiscal expenditure. Low consumer confidence could stimulate the government to expand fiscal spending in order to restore the total demand and promote economic activity. Therefore, the government should closely observe consumer sentiment in the process of policy formulation and implementation.*

Keywords: *public fiscal expenditure, consumer confidence, causality, rolling-window.*

JEL Classification: E12, H31, H50.

1. Introduction

This paper investigates the correlation between consumer confidence and public fiscal expenditure (PFE). The PFE is a vital policy tool the government uses to adjust a country's domestic product, which refers to the total value of goods produced and services provided in a country. Quantitative and structural PFE

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changes significantly influence real economic growth. In addition, the fluctuations in PFE affect national income, impacting consumer expectations (Huang et al., 2021). In the global finance crisis that began in 2008, systemic risks emerged in the global financial system, requiring a government bailout; for another, the uncertainty in the international economy has reduced consumer confidence, driving government intervention to revive demand. Therefore, countries adopted an active PFE policy in response to the global financial crisis, although the structure and strength of PFE differed strongly. As a result, the rise of PFE improves consumer expectations about the economic outlook and revives confidence during economic downturns (Dajčman, 2020). Consumer confidence is an essential element determining consumers' behavioural outcomes and economic decisions and has forecasting power to a certain degree (Daskalopoulou, 2023). Individual satisfaction with the financial situation, job prospects, and growth prospects can be measured by consumer confidence. Therefore, consumer confidence is an extremely important consideration for policymakers and market players (Dajčman, 2020). Indeed, one of the key drivers of future economic growth is consumer confidence. The COVID-19 pandemic causes a slowdown in economic activity and significantly impacts consumer beliefs, resulting in the PFE supporting the affected sector to reduce the negative impact. Given these, the relationship between consumer confidence and PFE must be discussed in depth.

With the accession to the World Trade Organization of China in 2001, China opened up to the world and experienced external shocks, also changing the affection and decision of fiscal policy. However, the PFE is still a vital pillar that the government uses to manage the country effectively. In 2020, for the first time, the meeting of the Central Political Bureau proposed the core "demand-side reform" with the main objective of increasing residents' income, enhancing consumer confidence. and expanding civil consumption. As the main tool for the government to regulate the economy, PFE policy plays an important role in improving consumer sentiment. The report on the draft budget for 2023 clearly points to the role of PFE policy in restoring consumer confidence and promoting consumption. The Chinese authorities prioritise expanding consumption in PFE policy and increasing spending on civil livelihood. A rise in PFE to favour the people's livelihood can improve the structure of fiscal expenditure, stimulate consumer sentiment. and form a vast demand market (Wang et al., 2022). In addition, to fully unleash consumption's potential and cultivate new consumption points, the Chinese government expects to enhance consumer income through multiple channels, such as a rise of social security and transfer payments, shoring up consumer confidence. With the increase in PFE, consumer expectations can be more active in the future household economic conditions, raising confidence. However, consumer confidence has the opposite effect on PFE. When consumer sentiment is low, the total demand falls, causing a slowdown in economic activity. Therefore, the government will expand PFE to boost consumption and investment, restoring market vitality. In 2013, for example, the United States was intent on withdrawing quantitative easing, negatively affecting market confidence in China. A sharp drop in aggregate demand is triggered by the

fall in consumer confidence, which reduces economic activity. Therefore, the government issues positive fiscal policies, such as expanding PFE and tax cuts, to stimulate demand and activate the market, impacting consumer confidence. Thus, the mutual relation between consumer sentiment and PFE policy can be made clear by a time-varying causal correlation between consumer confidence and PFE.

In contrast to the previous research, this article has some contributions. Firstly, based on the Keynesian cross model with consumer confidence, we find the transmission path between PFE and consumer confidence. The results show that national income is essential to the mutual effect between PFE and consumer confidence. Most of the previous literature studies the role of consumer sentiment in the impact of PFE on economic activity (such as Jia et al., 2021). Few studies explore the key factor in the interaction between PFE and consumer confidence. Secondly, the previous analyses stress exploring one-side influence (the impact of PFE shock on consumers in China) (Yang and Xin, 2020; Guo and Ma, 2021); the results are not systemic and comprehensive. In addition, few articles study the reasons that lead to PFE shock from the perspective of consumer confidence. Therefore, exploring the mutual causality between PFE and consumer sentiment is indispensable, as well as further studying whether consumer sentiment may influence PFE policy under the uncertainty of external economic policy. The results show that PFE has active and negative effects on consumer confidence. Positive effects indicate that increasing PFE can boost consumer confidence and two variables change in the same direction. The negative impacts suggest that consumer confidence may reduce when the government increases the PFE due to external economic uncertainty shocks. The results help the government scientifically formulate PFE, improve expenditure efficiency, and increase consumer confidence in the face of fluctuations in consumer expectations. Thirdly, in contrast to previous findings, we find that the causal relationship between PFE and consumer confidence could change over time. The traditional Granger causality test results are not credible due to neglecting time series and parameter instability. Therefore, we apply a parametric stability test for accurate results through bootstrap full-sample and sub-sample methods. The empirical findings suggest that the causality between PFE and consumer confidence is not always tenable and may change over time. By analysing the empirical results from the perspective of the Chinese government, we propose some policy recommendations (e.g., increasing household income may improve consumer confidence). Thus, in order to prove the time-varying mutual effect between consumer confidence and PFE, the bootstrap sub-samples and full-samples methods are adopted in this paper (Su et al., 2023).

We arrange the rest of the contents of this article as follows. The relevant literature on the PFE and consumer confidence is expressed in Section 2. Section 3 introduces the theoretical hypothesis of public fiscal expenditure and consumer confidence. Then, the bootstrap full-sample and sub-sample methods are detailed in Section 4. Data and descriptive statistics about key variables are in Section 5. The empirical results on mutual effects on PFE and consumer confidence and the

demonstration analyses are shown in Section 6. Section 7 presents the research and policy proposals in this paper.

2. Literature review

Despite gaining great attention, the mutual relationship between PFE and consumer confidence has not reached a consensus so far. Some views identify that PFE can boost consumer sentiment. Dajčman (2020) demonstrates that the rise of PFE improves agents' expectations about the economic outlook and revives confidence in the euro area after the Great Depression. Gagnon and Gimet (2020) verified that consumer confidence is a timely reflection of the changes in PFE and that the direction of change is consistent. The assessment (2020) shows that stronger PFE, such as stronger government investment spending, help provide a short-term stimulus and restore confidence. Malik et al. (2021) find that increasing PFE enhances consumer expectations by demonstrating policymakers' commitment to macroeconomic stability and shifting the demand curve to the right. Zuo (2022) documents that in the debt crisis, the government transfers payments to improve the quality of life for the poor, causing a rise in consumer confidence. Georgarakos and Kenny (2022) find that expansionary fiscal intervention in the time of epidemic, for instance, growing PFE to compensate consumers for the loss of employment and income, could improve the confidence of consumers and enterprises, which in turn could trigger private spending and investment. On the contrary, many studies provide strong evidence of the negative responses of consumer confidence to PFE. Jia and Kim (2015) find that unexpected and large increases in PFE may be deemed a symbol of a slumping economy and generate consumer pessimism, ultimately weakening the effectiveness of the expansionary fiscal policy. Varela (2017) documents that consumer confidence plays a negative role in transforming expenditure shocks into output, resulting from that consumers recognise such expenditure is short-lived and will have to be repaid in the future through higher taxes or a decrease in productive spending. Gagnon and Gimet (2020) find in periods of crisis, and under zero interest rates, changes in PFE are not immediately reflected in confidence and sentiment indicators due to the uncertainty concerning the economic consequences of a fiscal policy and the purely psychological reactions of consumers, especially in highly leveraged countries. Jia et al. (2021) conclude that PFE shocks may cause consumer pessimism in all business cycle phases. Kim and Zhang (2022) argue that an unexpected and significant increase in PFE may be seen as the confirmation of an impending recession in the short run, causing consumer pessimism, and then a decrease in private spending.

There are also some findings that PFE impacts consumer confidence in a significant way in China. In response to severe acute respiratory syndrome (SARS), the sufficient PFE provided by the Chinese government greatly alleviated the adverse impact on consumer expectations caused by the sudden illness (Fan, 2003). McKissack and Xu (2011) find that China announces an economic stimulus plan for 4 trillion RMB (586 billion USD), resulting in increasing total social demand and

restoring consumer sentiment. Qi (2016) shows that the PFE on social security would reduce residents' precautionary savings and enhance their consumption confidence. The Chinese government timely augments PFE to cushion the negative impact and boost consumer expectations (Yang and Xin, 2020). Guo and Ma (2021) reveal that the Chinese government assuages a reduction in consumer confidence by increasing government spending. However, the impact of fiscal expenditure on consumer confidence is not always positive. Romer (2012) finds that China undertakes relatively large PFE expansions during the financial crisis, reducing the fiscal space available in the event of a future crisis and increasing instability in fiscal policy, causing a reduction in confidence. Mansur (2016) argues that the government needs to provide incentives in the PFE aspect to cope with the turbulence in the economy, which does not improve market confidence in the short term. Wang (2020) reveals that active PFE adjustments made by the authorities to deal with external shocks have a negative influence on consumer sentiment. Zang and Gu (2023) argue that with the significant inflation in housing prices, the rise of PFE negatively impacts consumer confidence significantly. Su et al. (2024) find that with the slowdown of the economy in China, the authorities issue bonds and increase PFE, causing a rise of capital in the government bonds market, depressing corporate bonds markets and falling consumer expectations.

Clarifying the relationship between public fiscal expenditure and consumer confidence is necessary. According to the different economic conditions, the influences of consumer confidence on PFE still need more attention and further argument. This paper explores the possibility that consumer expectation can be considered a leading indicator to forecast fluctuations in PFE. We attempt to help consumers correctly grasp the policy intention, further maximising civil benefits and welfare in the changing policy intervention. In contrast to most previous studies on the unidirectional effect of PFE on consumer confidence, the relationship between the two variables has rarely been explored. Furthermore, there are drawbacks in that existing research does not count the time variability of the Granger causality between consumer confidence and PFE. As a result, the direction of influence between the two variables still needs further exploration. Therefore, we use the bootstrap sub-sample and full-sample methods to discuss consumer expectation's pivotal role in government intervention. Studying the mutual effects between consumer confidence and PFE can comprehensively give full play to the effectiveness of PFE policy in China and demonstrate the value of consumer confidence in the policy transmission process.

3. Model specification

Keynesian cross model with consumer confidence

A key issue is that consumer confidence and PFE interact with each other in economic theory. In the Keynesian cross model (Mankiw, 2020), the national income consists of consumption (C), investment (I), public fiscal expenditure (PFE), and net

exports (NX). The impact of government fiscal policy on economic total demand and net income (Mankiw, 2020):

$$Y = C + PFE + I + NX \quad (1)$$

$$NI = Y - T \quad (2)$$

where Y is total demand, NI is net income, C is consumption expenditure, PFE is public fiscal expenditure, I is investment expenditure, NX is net exports, and T is taxation. Fiscal policy affects total demand and net income by adjusting PFE and T, influencing consumer confidence and consumption behaviour. The influence of consumer confidence upon consumption behaviour (Acuña et al., 2020):

$$C = a + b(NI) + c(CCI) \quad (3)$$

where a is a constant term, b is the income consumption tendency coefficient, and CCI is the consumer confidence index, which measures consumer confidence (Daskalopoulou, 2023). Consumption expenditure is dependent on net income and consumer confidence.

By substituting Equations (2) and (3) into the total demand Equation (1):

$$Y = a + b(Y - T) + c(CCI) + PFE + I + NX \quad (4)$$

when I and NX are constant, after rearranging:

$$Y = 1/(1 - b)[a - bT + c(CCI) + PFE] \quad (5)$$

where *1/(1-b)* is the marginal propensity to consume, which represents the quantity consumption expenditure will increase with the increase in income by 1 unit.

Based on the analysis above, PFE and T affect the total demand and net income, which in turn influence CCI and consumption behaviour (Westerhoff and Hohnisch, 2007). CCI reflects the judgment of economic conditions and future expectations, while consumption behaviour depends on factors such as consumer income and confidence. When we include T as a control variable, the interaction between PFE and CCI will be transmitted through aggregate demand or income. In the model, a rise in PFE increases total demand or total income, while demand or income, in turn, affects CCI. Similarly, changes in CCI are transmitted to PFE through aggregate demand or income. Therefore, the theoretical model suggests that PFE and CCI are both cause and effect.

4. Methodology

4.1 Bootstrap full-sample causality test

The common method adopted to test the Granger causality is the vector autoregressive (VAR) model. However, the statistical results of VAR are not credible, considering that the model does not cohere with the standard asymptotic distribution. Therefore, to deal with this problem and improve the causal relationship, Shukur and Mantalos (2000) devised a solution that employs the threshold value of the bootstrap (*RB*) method based on residual. Moreover, they find that the likelihood ratio (*LR*) tests can be modified by the features of ability and size in the small sample, which can obtain superior statistical results. Thus, this paper

uses the *RB*-based revised *LR* statistics to clarify the relationship between the public fiscal expenditure (PFE) and the consumer confidence index (CCI).

We build up the bivariate VAR (*p*) course as follows:

$$X_t = \beta_0 + \beta_1 X_{t-1} + \ldots\ldots + \beta_p X_{t-p} + \varepsilon_t \quad t=1, 2, ..., T \quad (6)$$

where this paper applies the Schwarz Information Criterion (SIC) to decide definitely the optimal lag order *p*. In the binary VAR (*p*) course, the variable *X* consists of CCI and PFE, that is $X_t = (\mathrm{CCI}_t, \mathrm{PFE}_t)'$. In addition, this article selects national tax (Tax) as a control variable, which usually accompanies fiscal expenditure policies and affects consumer confidence, further acting on the interaction between the PFE and CCI (Westerhoff and Hohnisch, 2007). Then, Equation (6) can be expressed as follows:

$$\begin{bmatrix} CCI \\ PFE \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11}(L) & \beta_{12}(L) \\ \beta_{21}(L) & \beta_{22}(L) \end{bmatrix} \begin{bmatrix} \mathrm{CCI}_t \\ \mathrm{PFE}_t \\ \mathrm{Tax}_t \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (7)$$

where $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})'$ is a white-noise matrix satisfying the conditions of zero mean. Also, $\beta_{ij}(L) = \sum_{k=1}^{p} \beta_{ij,k} L^k$, i, j=1, 2 and *L* is defined as the lag operator which is computed by equation $L^k X_t = X_{t-k}$.

Then, the assumption that PFE has no impact on CCI is regarded as the null hypothesis. We can test this hypothesis by Equation (7), with considering the additional restrictions such as $\beta_{12,k}$=0 for *k*=1, 2, ..., *p*. If the result objects the null hypothesis, we can ascertain that PFE affects CCI in a significant way. Analogously, the assumption that CCI has no influence on PFE is considered as the null hypothesis. Based on Equation (7), we can test this null hypothesis by constraints such as $\beta_{21,k}$=0 for *k*=1, 2, ..., *p*.

4.2 Parameter stability test

There is irrationality in using the bootstrap full-sample method to test the causality between the variables. The assumption of this method that there is no structural change in the parameters is not always satisfied in practice (Balcilar et al., 2016). Thus, by fixing the parameter values, the result that the causal relationship between the variables is single over the sample period is not convincing. Due to the specificity of parameters in empirical studies, it is an important link that is to check the parameter's stability. Andrews and Ploberger (1994) deal with this problem by exploiting the *Sup-F*, *Ave-F,* and *Exp-F* tests. Therefore, we use *Sup-F* to test whether there is a structural mutation in the parameters or not. Meanwhile, the *Ave-F* and *Exp-F* are adopted to examine the gradual development of parameters over time. Furthermore, to test the stability of the parameters in the VAR model, we employ the L_c statistical test (Nyblom, 1989; Hansen, 1992). Therefore, we adopt the

sub-sample rolling-window method to overcome the problem of time-varying parameters and obtain reliable causality between PFE and CCI.

4.3 Bootstrap sub-sample rolling-window causality test

Given the structural changes of variables and the temporal diversity of different sub-samples, we adopt a bootstrap sub-sample rolling-window method to examine accurately the causal relationship between the variables. According to Balcilar et al. (2016), the entire time series length (*T*) is split into small sample intervals based on rolling-window width denoted by *w*, then resulting in *T*-*w* sub-samples progressively rolling over to the entire time series from stem to stern. Furthermore, we apply the *RB*-based modified-*LR* test in each sub-sample to causality results of *T*-*w* small samples. These test results are more credible than the view that the causal relationship between the variables is single over the sample period. We can obtain the causality between PFE and CCI by calculating and collecting the *p*-values and *LR* statistics for *T*-*w* small samples. Moreover, we can also observe the carry-over factor between the variables during the operation. The effect that comes from PFE to CCI can be observed by the average value of bootstrap estimation $N_b^{-1}\sum_{k=1}^{p}\hat{\beta}_{12,k}^{*}$ in which N_b is regarded as the number of bootstrap repetitions. Also, the average value of bootstrap estimation $N_b^{-1}\sum_{k=1}^{p}\hat{\beta}_{21,k}^{*}$ means the influence of PFE on CCI. The estimated values $\hat{\beta}_{12,k}^{*}$ and $\hat{\beta}_{21,k}^{*}$ are calculated from Equation (7). Furthermore, a 90% confidence interval is chosen in this paper, resulting in the corresponding lower limits (5$^{\text{th}}$ quantile) and higher limits (95$^{\text{th}}$ fractile) of $\hat{\beta}_{12,k}^{*}$ and $\hat{\beta}_{21,k}^{*}$ separately (Cao et al., 2024; Wang et al., 2024).

5. Data

In order to achieve the research objectives, the monthly data, 2001:M1 to 2023:M8, is adopted in this paper. In 2001, China joined the World Trade Organisation and integrated the country into the global economic order. Foreign capital flows into China, easing the financial pressure of domestic construction. At the same time, numerous multinational companies participate in the Chinese market. These events directly impact Chinese consumers, such as job growth, increased revenue, and consumer sentiment. CCI reflects consumer expectations in various aspects of economic development and is an indicator to measure consumer mentality from a macro perspective. According to Yost et al. (2020), the National Bureau of Statistics of China collects the national consumer confidence index, which is adopted in this paper. Positive consumer sentiment means that consumers have higher expectations for the macro economy. An improvement in consumer sentiment implies a rise in consumption power, which may further expand household expenditure. The growth of individual spending augments total demand, resulting in increased economic activity and fluctuation in PFE. Furthermore, the Chinese PFE,

collected by the National Bureau of Statistics of China, was adopted in this paper (Huang et al., 2021). A higher PFE means more robust government intervention in economic activity, directly influencing CCI.

In Figure 1, it can be observed that PFE shows a general upward trend. However, the CCI does not increase even though the PFE is higher. In 2001, foreign capital and advanced technology flowed into China, creating more jobs and high CCI. As a result of the inflow of foreign investment, there is adequate social liquidity and weak dependence on fiscal funds for the construction of the economy, so there is no remarkable increase in PFE. In 2003, it witnessed the deterioration of severe acute respiratory syndrome (SARS), which resulted in a sharp drop in CCI. As the spread of SARS is gradually under control, the downward trend of CCI has been restricted. The Chinese stock market was turbulent in 2004, negatively impacting the Shanghai and the Shenzhen component index and hitting consumer confidence hard. At the same time, there is no noticeable increase in PFE. The subprime crisis in the United States in 2007 triggered the financial crisis and deteriorated the global economy. In 2008, the financial crisis was transmitted to China, leading to sharp fluctuations in Chinese stock prices. The stock market turbulence means uncertain economic prospects, obviously reducing consumer confidence (Zorio-Grima and Merello, 2020). In 2011, the rise of international commodity prices and the proactive PFE policy worsened the inflation in China, with CCI falling. Chinese growth slowed in 2005, resulting from increased uncertainty in the global economy and declining CCI. Then, in 2021, consumer confidence decreased dramatically due to the spread of COVID-19 in China. At the same time, the Chinese government has enhanced PFE in response to the epidemic's impact. In addition, active PFE is frequently accompanied by tax reduction, affecting consumer confidence. After that, the national tax (Tax[1]) is chosen as the control variable in this article (Westerhoff and Hohnisch, 2007). In summary, there is a variable relationship with time, rather than a constant interrelation, between PFE and CCI.

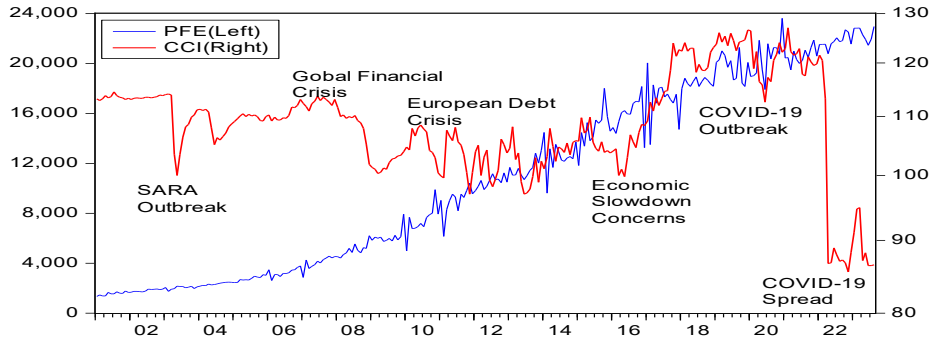

Figure 1. The trends of PFE and CCI

Source: data collected by the National Bureau of Statistics of China - own processing.

[1] Data from the CEIC website.

Table 1 presents the descriptive statistics report. The means of PFE, CCI and Tax illustrate that their sequences are centrally distributed at 10745.49, 109.0293 and 7827.009, respectively. The gap between the maximum and minimum of PFE is extremely large, meaning that this variable is considerably labile. After calculation, correspondingly, CCI and Tax are also volatile. The kurtosis parameter values of CCI are more than 3[2], satisfying the leptokurtic distribution, which means a greater probability of extreme events. Except for CCI, there is positive skewness in PFE and Tax, demonstrating that both are the right-skewed distributions. Synchronously, the hypothesis of normal distribution for the PFE and CCI is rejected at 1% and 10% levels, respectively, based on the Jarque-Bera test results. Because of these results, we find that the precise Granger causality test is not available through the traditional VAR model. Therefore, to obtain the time-varying Granger causality between two variables, we have adopted the bootstrap sub-sample rolling window test in this paper. Also, the PFE, CCI, and Tax all use the logarithm to eliminate the possibility of heteroscedasticity.

Table 1. Descriptive statistics

	PFE	**CCI**	**Tax**
Observation	272	272	272
Mean	10745.49	109.0293	7827.009
Median	9567.650	109.4000	7570.450
Maximum	37742.00	127.0000	24279.00
Minimum	827.2800	85.50000	933.0000
Standard Deviation	8189.640	8.873051	5252.566
Skewness	0.714043	-0.33104	0.661175
Kurtosis	2.772249	3.291365	2.908361
Jarque-Bera	23.70137***	5.929967*	19.91274***

Source: data from the National Bureau of Statistics of China and the CEIC website - own processing.

6. Empirical results

We use Equation (7) to construct the VAR model, which can help us estimate the full-sample causality between PFE and CCI. The optimal lag order, determined by SIC, is 3 in this paper. Table 2 presents the results of the full sample test, which shows that the mutual effect between PFE and CCI is insignificant. Therefore, PFE is not the Granger cause of CCI, and CCI is not the Granger cause of PFE.

[2] The leptokurtic distribution illustrates that the data distribution is concentrated and have a flatter tails causing more possibility for extreme events. The platykurtic distribution is completely different.

Table 2. Full-sample Granger causality tests

Tests	H_0: PFE does not Granger cause CCI		H_0: CCI does not Granger cause PFE	
	Statistics	***p*-value**	**Statistics**	***p*-value**
Bootstrap *LR* test	4.397	0.319	0.564	0.958

Notes: We calculate *p*-value using 2,000 bootstrap repetitions.
Source: data from the National Bureau of Statistics of China - own processing and calculations.

The full sample causality test supposes that the parameters are fixed because of neglecting the structural change in time series data. As a result, the full sample causality test acquires the implausible results. For this reason, we intend to probe the presence of structural changes by a parameter stability test. Then, the *Sup-F* test, *Ave-F* test, and *Exp-F* test are employed in order to detect the stability of both PFE and CCI. In addition, we examine the stability of the VAR model through the results of L_c statistics. Then, we perform a parameter stability test, which is reported in Table 3. According to Table 3, we find that the PFE has a non-constant argument at a 1% level based on the *Sup-F* test, *Ave-F* test, and *Exp-F* test. In addition, at a 10% significance level, the *Sup-F* test result suggests the time-dependent characteristics of parameters in the CCI. Also, the *Exp-F* test rejects the hypothesis of parameters stability of the CCI at a 5% significance level. Therefore, we can ascertain that non-constant parameters in the time series of CCI and PFE are non-constant in nature. Also, the L_c statistics test objects to the null hypothesis that parameters of the VAR models follow a random walk process at the 5% level, which evidences non-stable parameters in the VAR system. As a result, it is not reliable that there is no causal relationship between PFE and CCI according to the full-sample causality test. Therefore, to examine the causality between PFE and CCI over time, the *RB*-based modified-*LR* method of sub-sample test is applied in this paper. The estimated results of the bootstrap values and the *LR* statistics are obtained by the VAR model in Equation (7). The correct scrolling window width in causality testing is conducive to the accuracy and stability of the model estimation, and the width of 24-month[3] is selected in this paper.

Table 3. The results of parameter stability test

Tests	PFE		CCI		VAR system	
	Statistics	***p*-value**	**Statistics**	***p*-value**	**Statistics**	***p*-value**
Sup-F	67.742^{***}	0.000	21.127^{*}	0.064	40.324^{***}	0.006
Ave-F	46.881^{***}	0.000	10.324	0.100	20.246^{*}	0.053
Exp-F	30.325^{***}	0.000	8.317^{**}	0.032	15.763^{***}	0.009
L_c					3.416^{**}	0.042

Notes: We calculate *p*-value using 10,000 bootstrap repetitions. *** denote significance at the 1% levels, ** denote significance at the 5% levels, **denote significance at the 5% levels.
Source: data collected by the National Bureau of Statistics of China - own processing and calculations.

[3] For purpose of ensuring stability, the widths of 20-, 28- and 32- months are chosen by us in order to test causality, and these results are not different from 24 months.

From Figure 2, we can find that the PFE affects the CCI in a significant way during the periods of 2003:M1-2005:M3, 2011:M2-2011:M12, 2013:M6-2013:M12, 2014:M9-2015:M5, and 2023:M4-2023:M8, at a 10% significant level. Furthermore, Figure 3 indicates that the PFE positively impacts the CCI in periods other than 2011:M2-2011:M12.

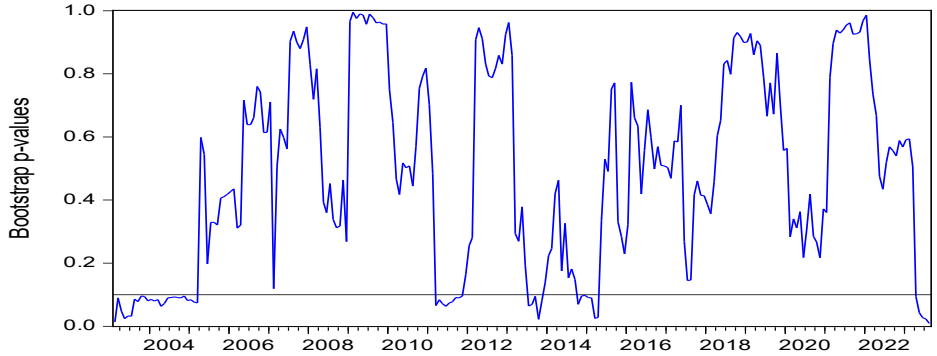

Figure 2. Bootstrap *p*-values of rolling test statistic testing the null hypothesis that PFE does not Granger cause CCI

Source: data from the National Bureau of Statistics of China - own processing and calculations.

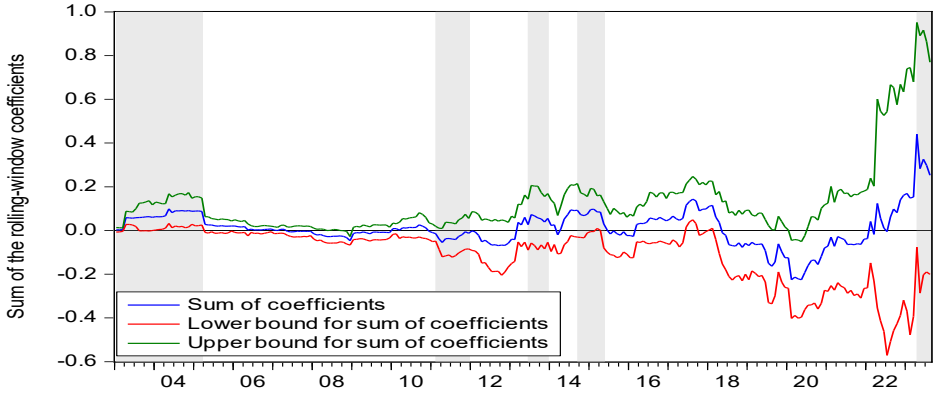

Figure 3. Bootstrap estimates of the sum of the rolling-window coefficients for the impact of PFE on CCI

Source: data from the National Bureau of Statistics of China - own processing and calculations.

The positive influence of PFE on CCI is evidence that expenditure on the Chinese government's budget can be seen as a driver of consumer confidence. With the deteriorating SARS in 2003, positive fiscal policies in China were applied through a rise of PFE and tax reduction to resist the impact of disease (Fan, 2003). As a result, active fiscal intervention helps to restore the Chinese economy and CCI. In 2004, agriculture was considered a priority by the Chinese government. China provides more than 10 billion yuan in direct subsidies to peasantry and agricultural

agents (National Bureau of Statistics of China, 2008), which increases observably consumer income and raises CCI. The financial support policies for agriculture continued to strengthen in 2005, with extra-budgetary PFE reaching about 35 billion yuan (National Bureau of Statistics of China, 2005). The off-budget PFE substantially affects economic growth and total demand, shoring up the total income and CCI. Therefore, the result we can be certain is that the CCI improves along with PFE during this period of 2003:M1-2005:M3.

President Xi Jinping pointed out that China is confronting shifts in the pattern of economic growth and upgrading of industry structure at the Central Political Bureau Commission conference in 2013. Therefore, the government should optimise the structure of PFE to sustain steady economic growth while PFE increases. The aggressive PFE stimulates aggregate demand, raising consumer expectations for household income, and improving CCI. In addition, the Chinese government has mounted PFE on education, health, and social security, reducing household spending uncertainty and boosting CCI. Both the PFE and CCI increased during the period of 2013:M6-2013:M12; Thus, the active relationship between PFE and CCI could then be proved.

With the new round of health system reforms in China, the positive PFE policies on healthcare and medicine were implemented in 2014. The Chinese PFE in health care increased by 22.9 percent in 2014 from the previous year (National Bureau of Statistics of China, 2014). A rise in PFE on health care alleviates the burden on consumers spending on medical care, indirectly improving the disposable income of residents and boosting CCI (Vus et al., 2021). Moreover, with the implementation of the innovation-driven strategy in China, more PFE has been invested in scientific and technological innovation, which raised 12.3 percent in 2015 (National Bureau of Statistics of China, 2015). Technology innovation is actively influenced by government support, resulting in more employment opportunities, a rise of consumer incomes, and reviving CCI. Thus, the positive influence of PFE on CCI during the period pertaining to 2014:M9-2015:M5 can be evidenced.

In order to recover and expand consumption in 2023, the PFE on social security and employment is increased by the Chinese government, which climbs by 8.2[4] percent in the first three quarters. A rise in social security benefits reduces uncertainty about household healthcare expenditures and increases consumer confidence (Perez-Arce et al., 2021). In addition, due to the role of government investment in guiding society's capital, the PFE on government investment will increase by 40 billion[5] yuan in 2023. The increase in government investment spending is associated with future productivity increases, changing consumer perceptions about these future fundamentals, and thus generating important systematic movements in confidence. Besides, the Chinese government has increased PFE toward achieving scientific and technological self-reliance and mastering the core key technologies in 2023. The PFE on science and technology

[4] Data is taken from the Chinese government website.
[5] Data is taken from the Chinese government website.

rises 3.3[6] percent in the first three quarters. Technological innovation promotes high-quality employment in the labour market, producing productive employment positions (Su et al., 2023) and increasing consumers' income and CCI. Therefore, the result can be affirmed that the higher PFE leads to an increase in the CCI during the time period of 2023:M4-2023:M8. Based on the consequences of the rolling-window bootstrap causality test, we can conclude that the PFE positively impacts CCI in certain sub-samples.

According to Figure 3, the negative effect of the PFE on CCI can be confirmed in the period 2011:M2-2011:M12. The aftershocks of the global financial crisis of 2008 still impede the Chinese economy. Faced with a slowdown in economic activity in 2011, the Chinese government introduced a series of initiatives, such as positive PFE policies, to expand domestic demand. Therefore, the PFE in China is increasing in 2011. However, economic activities are still influenced by complex external circumstances. The European debt crisis negatively affects consumer expectations about the economic prospects in China, causing the decline in CCI. Additionally, rising prices put more significant pressure on implementing proactive PFE policies. Consumer sentiments are more sensitive to rising prices when consumers expect their income to grow at a lower rate than the price of commodities (Li and Sinha, 2023) with a reduction of CCI. Hence, it can be certain that the PFE impacts CCI negatively for the period of 2011:M2-2011:M12.

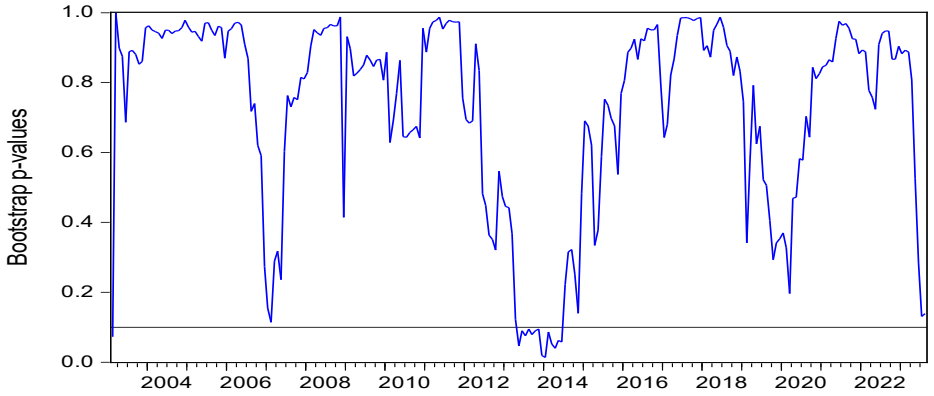

Figure 4. Bootstrap *p*-values of rolling test statistic testing the null hypothesis that CCI does not Granger cause PFE

Source: data from the National Bureau of Statistics of China - own processing and calculations.

[6] Data is taken from the Chinese government website.

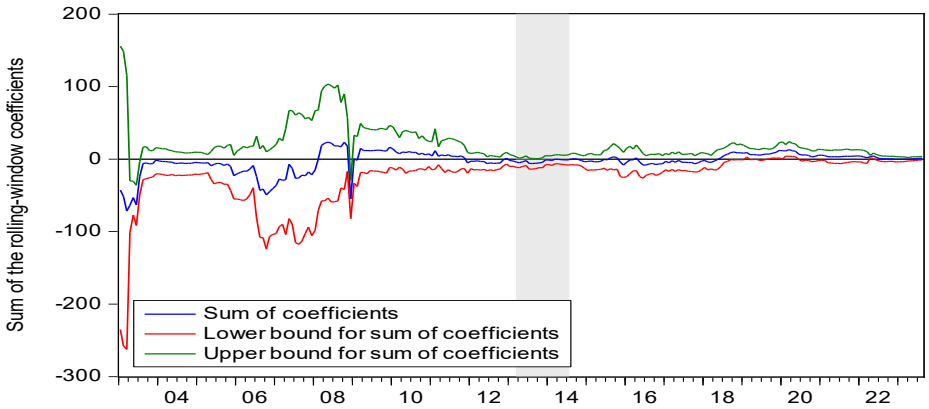

Figure 5. Bootstrap estimates of the sum of the rolling-window coefficients for the impact of CCI on PFE

Source: data from the National Bureau of Statistics of China - own processing and calculations.

From Figures 4 and 5, we can obtain the time period in which the CCI influences PFE and the direction. According to Figures 4 and 5, in the period of 2013:M3-2014:M7, when the null hypothesis is rejected, there is a negative relationship between CCI and PEF. The result illustrates the indicative influence of consumer confidence on public fiscal expenditure in certain periods.

In 2013, with the rise of policy uncertainty in major economies and quantitative easing monetary policy in the United States, there was greater potential for capital outflows and exchange rate depreciation in China. The depreciation of the RMB exchange rate can cause the rise of imported goods prices in the domestic market and promote the increase of prices. Because of wage stabilisation in the short term, rising prices result in lower real wages, shrinking consumer incomes, and falling in CCI. The lower CCI leads to a significant decline in aggregate demand, leading to a slowdown in economic activity. Therefore, the Chinese government issues positive fiscal policies, such as expanding PFE and tax cuts, to stimulate consumption and activate the market. In addition, the rises of PFE on education, health, and social security reduce household spending uncertainty, increasing consumer expectations about the future. Hence, it can be proved that the reduction in CCI stimulated the rise of PFE in the time period 2013:M3-2014:M6.

Above, we find that the rolling-window Granger causality test can deal with parameter instability and prove that the causal relationship between PFE and CCI is time-varying. When consumer confidence suffers from shocks, such as policy uncertainty in major economies and the pressure of rising prices, the CCI falls below 100 in the second and third quarters of 2013. Consumer sentiment is gloomy about the economic prospects, resulting in a reduction in total demand and a slowdown in commercial activities. The government increases the PFE to revive economic vitality, stimulating aggregate demand. Therefore, the PFE is at a high level when CCI keep to decrease. The result is consistent with the assumption of public fiscal expenditure and consumer confidence interaction mechanism, which argues that a

reduction in CCI cuts down on the total demand, spurring government intervention, and shoring up PFE. Conversely, PFE positively affects CCI, stressing that a rise in PFE stimulates the total income, resulting in active consumer expectations. With the premise of controlling Tax, the mutual relation between both PFE and CCI resembles the two-way Granger causality test. In summary, this paper can indicate the significance of CCI to PFE in China through the above analysis.

7. Conclusion and policy implications

This paper uses the rolling-window bootstrap test to examine the causality between PFE and CCI in China. In the first place, it can be affirmed through the causality test for the full sample that the PFE and CCI cannot cause and affect each other. However, the result is not entirely credible due to the existence of parameter instability. Besides, the sub-sample bootstrap test results show that the rise in PFE positively affects the CCI in most situations. At the same time, the negative impact appears during conditions such as inflation pressure in the domestic market. The positive effect shows that proactive PFE policies can improve CCI. The result is consistent with the assumption of public fiscal expenditure and consumer confidence interaction mechanism, which argues that a rise in PFE drives the total demand or income, in turn spurring positive psychological expectations. However, the above view makes it hard to explain the negative impact of PFE on CCI, mainly due to the influence of uncertainty of the domestic economic environment, for example, persistent rising prices. In turn, CCI negatively influences PFE in the short term, indicating that the PFE policies are affected by the fluctuation in the CCI, but only to a certain extent. The lower CCI decreases the total demand or income, stimulating government intervention and shoring up PFE.

Understanding the causality over time between CCI and PFE can provide insights for the government and consumers. Firstly, the government can provide PFE support to vulnerable groups, directly increasing their income and consumption sentiment. The government can issue consumer vouchers for daily necessities to low-income and vulnerable groups, and a rise in unemployment benefits also boosts consumer expectations. Besides, the government authorities also enhance transfer payments to underdeveloped areas and remote areas. Secondly, improving consumer confidence in the medium and long term depends on institutional reform to reduce the income gap. There are significant approaches to the rise of the minimum wage standard, the improvement of the income distribution system, and the structure of PFE. In particular, the government must raise the level of disposable income of consumers, which helps to increase civil consumption capacity. Stable income expectations can boost the CCI, promote the deepening of consumption, and further play the driving effect of consumption on the economy. Finally, promoting consumption can be a priority of proactive fiscal policies. The PFE policies have a relatively short transmission chain and are better targeted. A rise of PFE on consumption, especially support for health care, social security, science and technology, can boost CCI and improve supply and demand.

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