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Natural resource development, economic policy uncertainty and urban residents' consumption in China: a nonlinear ARDL and time-varying parameter vector autoregressive with stochastic volatility approach

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Abstract

Increased risks of economic policy uncertainty and overexploitation of natural resources exist in China. At the same time, the growth rate of urban residents' consumption has generally declined. The paper analyses the role of economic policy uncertainty (EPU) and natural resource exploitation on the urban residents' consumption in China. Based on the data from the first quarter of 2002 to the third quarter of 2021, the paper uses a nonlinear autoregressive distributed lag model to verify the asymmetric effects. Then the paper constructs a time-varying parameter vector autoregressive model with stochastic volatility term to analyze the nonlinear responses. Impulse response analysis was used to further explain the relationship between the three. The negative impact of rising EPU on urban residents' consumption is larger than its reduction. Negative shocks to natural resource development increase the urban residents' consumption. Positive shocks reduce the urban residents' consumption. There is a time-varying non-linear effect of EPU and natural resource development on urban residents' consumption in China. The negative impact of EPU on urban consumption has been further exacerbated by major crises such as the financial crisis, COVID-19 and the post-crisis period. The negative impact of natural resource development diminished after the government introduced industrial upgrading policies and environmental regulations. This study provides constructive suggestions for the optimization of economic policies and the improvement of urban consumption. This study also enriches consumer theory and provides new evidence for the resource curse hypothesis.

Keywords Economic policy uncertainty · Urban residents' consumption · Natural resource development · Asymmetry · Non-linearity

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1 Introduction

In recent years, the economic situation facing China has undergone significant changes. On the one hand, the U.S.-China trade conflict, the global geopolitical crisis, and COVID-19 had serious impacts on economic demand (Bashir et al. 2022; Cui et al. 2023; Hu et al. 2023). On the other hand, the pulling effect of China's domestic investment on the economy has been declining (Xiao et al. 2018; Yan and Su 2020). However, the contribution of consumption to economic growth reached 63%, which has become the first driving force of economic growth (Yang et al. 2020; Xue et al. 2022a, b). In recent years, China's consumption as a share of GDP has been significantly lower than that of major developed countries. Moreover, the proportion of urban residents' consumption expenditure in China's consumption demand is as high as 54.81% (Lai and Zhu 2022; Yang et al. 2022a, b). In today's deteriorating economic situation, it is essential to further stimulate the release of residents' consumption potential.

Different economic policies will have different impacts on consumption (Mayer 2009; Işık and Radulescu 2017; Işık et al. 2017; Evans et al. 2018; Ahmad et al. 2021; Işık and Pata 2021; Işık et al. 2021; Alvarado et al. 2022a; Alvarado et al. 2022b; Alvarado et al. 2022c; Deng et al. 2022; Ongan et al. 2022; Ahmad 2023; Altunöz 2023; Amin et al. 2023; Islam et al. 2023; Kirikkaleli et al. 2023; Ongan et al. 2023; Sarıgul et al. 2023; Solarin et al. 2023; Umar Faroog et al. 2023; Adebayo and Ozkan 2024; Adebayo et al. 2024; Alola et al. 2024; Amin et al. 2024; Appiah et al. 2024; Bekun et al. 2024; Jabeen et al. 2024; Pasigai and Jusriadi 2024, Masud et al. 2024). Since the post-financial crisis and the COVID-19 era, China has introduced various economic policies to promote economic recovery. However, the economic situation is still uncertain, China's GDP growth rate has been kept low. At the same time, the risk of policy uncertainty in China's economy has increased as policies continue to be adjusted (Mirza and Ahsan 2020; Huang and Luk 2020). Some scholars have already expressed concern about the impact of the uncertainty created by changing economic policies on the economy and businesses (Baker et al. 2012; Jiang et al. 2018; Liu et al. 2021; Xue et al. 2022a, b; Dogru et al. 2023a, 2023b, 2019;

Işık 2023, 2020; Cui et al. 2024). But few studies have focused on the impact of EPU on consumption levels. According to the precautionary savings and liquidity constraint theories, EPU may lead to lower levels of consumption in the future. Rational consumer individuals will reduce current consumption and increase savings (Fafchamps and Pender 1997). Real options theory also suggests that if a consumer makes a mistake by purchasing a higher-cost good, the mistake will be difficult to reverse. This results in higher economic losses for consumers (Ceseña et al. 2013; Trigeorgis et al. 2017). The above results have also been further confirmed in selected empirical studies (Yin et al. 2021; Han et al. 2023a, b; Peng et al. 2023). In addition, consumers may perceive EPU differently in different periods due to sticky information, differences in the magnitude of the risk of EPU and differences in the macro situation (Jin and Wu 2021; Ghirelli et al. 2021). This leads to a non-linear impact of EPU on consumption in different periods. Overall, economic policy uncertainty can have an important impact on consumption and can directly affect China's economic development. Therefore, it is necessary to examine economic policy uncertainty and consumption.

Besides economic policies, natural resources also play an important role in the national economy and consumption. Socio-economic development cannot be achieved without the material support provided by natural resources. The development of natural resources will also raise people's incomes and further increase the level of consumption. However, rapid economic growth will inevitably lead to excessive consumption of natural resources and environmental pollution (Işık 2010). The depletion of natural resources will limit the speed and quality of economic development (Gylfason and Zoega 2006; Khan et al. 2021; He et al. 2022). Unlike EPU, many scholars around the world have now explored the relationship between natural resources, environmental quality and economic growth from an asymmetric and non-linear perspective (Zeb et al. 2014; Ali et al. 2022; Hossain et al. 2022; Usman et al. 2023). Although many scholars have confirmed the existence of the environmental Kuznets curve and the resource curse through their research, they have ignored the level of urban residents' consumption. Therefore, it is necessary to re-examine the impact on urban consumption. The paper sets out again to examine the relationship between natural resource development and urban residents' consumption from a non-linear and asymmetric perspective.

This paper examines the relationship between EPU, natural resource development and urban residents' consumption levels based on data from the first quarter of 2002 to the third quarter of 2021. Specifically, the paper uses the NARDL model to test for asymmetric effects. The TVP-VAR-SV model was then used to test for non-linear effects. The innovations and contributions of this paper are as follows. First, previous studies have only considered the impact of EPU on macroeconomic variables such as economic growth, while this paper examines the impact of EPU on urban residents' consumption. This paper enriches the research related to EPU and consumption level. Secondly, most of the previous studies have examined the linear and symmetric effects of EPU using econometric models, and this paper empirically examines the asymmetric and non-linear effects of EPU using the NARDL model and the TVP-VAR-SV model. Third, previous studies have examined the impact of natural resource exploitation through environmental quality and economic growth. This paper refines the research object. Examining the relationship between natural resource exploitation and urban residents' consumption can provide brand new evidence for the environmental Kuznets curve and the resource curse hypothesis. This paper enriches the traditional theory that EPU and natural resource development affect the urban residents' consumption. By analyzing and testing the asymmetric and non-linear effects, it is possible for the government to formulate more precise policies for different periods and levels of EPU and natural resource development. At the same time, this paper is conducive to reducing the volatility of urban residents' consumption and promoting the release of consumption potential.

2 Literature review

2.1 Economic policy uncertainty and consumption

EPU is the uncertainty about the impact that newly introduced and implemented policies will have on economic agents (Pástor and Veronesi 2013). Based on the meaning of EPU, scholars have conducted a lot of discussions on the relationship between EPU on green finance (Ahsan et al. 2022; Zhang et al. 2023), energy consumption (Pirgaip and Dinçergök 2020; Qamruzzaman et al. 2022a2022) and environmental pollution (Anser et al. 2021; Syed et al. 2022; Zhang et al. 2017; Xie et al., b; Long et al. 2022). Precautionary savings theory earlier discussed the relationship between EPU and consumption (Dreze and Modigliani 1972; Zeldes 1989). Romer (1990) noted from real options theory that uncertainty may delay investment and consumption plans. Based on theoretical analyses, scholars have mainly used various linear models to develop empirical analyses of the impact of EPU. Alexopoulos and Cohen (2009) find that economic policy uncertainty shocks can bring about sharp short-term recessions. This leads to declines in consumption, output, employment, productivity and investment. Fernández-Villaverde et al. (2015) found that fiscal volatility shocks reduce aggregate output, investment, consumption. Mumtaz and Surico (2018) use an SVAR model to find that uncertainty caused by policy changes related to government debt has the greatest impact on macroeconomic variables such as consumption. Baiardi et al. (2020) summarized articles related to the precautionary savings theory reconfirms that when the risk of uncertainty increases, people in both rich and not-so-wealthy countries reduce investment and consumption. Other studies have examined the impact of EPU on consumption from a micro perspective. Chen et al. (2022) used the ARDL model to find that Chinese households respond to shocks from EPU by reducing non-permanent consumption expenditure. However, the effect of EPU on variables such as consumption may be asymmetric or non-linear due to factors such as policy time lag, different economic states, consumption habits and consumer awareness concepts (Aye et al. 2019; Al-Thaqeb et al. 2022). In an examination of G7 countries, Bahmani-Oskooee and Nayeri (2020) use the NARDL model to find that consumption paths are significantly different before and after a period of high uncertainty. Positive and negative shocks to EPU do not offset each other's effects on consumption. In summary, scholars have already explored a great deal about the impact of EPU on consumption. However, there are still the following shortcomings. First, fewer existing studies have examined the impact of EPU on residential consumption. Most of them only examine the macroeconomic effect of EPU and its impact on total consumption. Second, most of the studies are based on symmetrical and linear assumptions to carry out research on the impact of EPU on consumption. This paper enriches the impact of EPU and consumer theory from a non-linear and asymmetric perspective.

2.2 Natural resource development and consumption

Natural resources have been an important driver of China's economic development. Changes in economic growth and consumption are closely related to natural resources. Many scholars in the last century have argued that the abundance of natural resources is conducive to achieving economic prosperity (Wright 1990; Davis 1995). Davis (1995) examined mineral-based economies from 1970–1991 and found that 57 non-mineral economies were in most cases slightly weaker in terms of wealth and development than 22 mineral economies. He argues that the resource curse is very much the exception rather than the rule. Brunnschweiler (2008) used the panel data to find that the positive relationship is more pronounced in the case of land resources, which are strengthened by sound institutions. Alexeev and Conrad (2009) find that the level of abundance of oil and other mineral resources is positive in terms of its impact on countries' long-term economic growth. However, more studies agree that natural resources can be an impediment to economic growth. Auty (1994) proposed the resource curse in the study of mineral resource economies. Numerous studies have since been conducted based on the resource curse. Ploeg (2011) noted the fact that resource abundance in some countries has led to real exchange rate appreciation, weak institutions and poor financial systems. He proved that these countries are unable to convert their exhaustible resources into other assets, thus manifesting the resource curse phenomenon. Other scholars have argued that there is not simply a curse or a facilitating effect. Mehlum and Moene (2002) found that the resource curse only applies to countries that have developed friendly regimes to resource predators, while there is no negative impact on producer-friendly countries. Mehrara (2009) found that oil-rich countries' resources have a positive effect on the economy only when the growth rate of oil revenues is less than 18%. And when oil revenues exceed that threshold, this positive effect turns to curse. Zhang at al. (2021) found that economic growth in Pakistan is positively correlated with natural resources in the short run and opposite in the long run. Muhammad et al. (2021) used the NARDL model to find that natural resource development can accelerate environmental degradation in BRICS countries.

At the same time, some scholars have considered the relationship between natural resource development and energy consumption (Opuala et al. 2023; Usman et al. 2022), financial development (Awosusi et al. 2022; Dagar et al. 2022) and environmental sustainability (Astier et al. 2012; Majeed et al. 2021; Arslan et al. 2022). Through the above discussion, current studies have only focused on the natural resource development and the economy, energy and the environment (Işık et al. 2018; Pata and Işık, 2021; Rehman et al. 2022; Farooq et al. 2023; Han et al. 2023). However, there is a lack of academic research on the relationship between natural resource development and consumption. To fill this gap, this paper examines how the degree of natural resource exploitation will affect the urban residents' consumption. Among other things, the level of urban residents' consumption will have a direct impact on China's economic development. The paper will use it to test whether the resource curse hypothesis is valid again.

3 Methodology and data

3.1 Economic policy uncertainty

Baker et al. (2016) constructs a composite index of economic uncertainty in the U.S. by using the number of articles in the U.S. press with keywords related to EPU. Meanwhile, Baker et al. (2016) constructs an economic uncertainty index for China based on articles related to China's economic uncertainty in the South China Morning Post. They first look for articles that contain the keywords China or Chinese, economy or economic, and uncertainty. These articles should contain at least one of the following textual information on policies or spending or budgets or politics, governments or Beijing or authorities, taxes, regulations, supervision, central banks, the People's Bank of China, deficits, or the WTO. Finally, they use the ratio of the number of articles obtained to the total number of articles in the month as a monthly measure of China's economic policy uncertainty. To ensure the accuracy of the above procedure, Baker et al. (2016) also verified a random sample of 500 articles by human reading. They conducted an extensive audit study of randomly selected articles from major U.S. newspapers and auditors evaluated whether an article discussed economic policy uncertainty. And their indices are proven by market use. Business data providers including Bloomberg, FRED, Haver and Reuters use these indices to meet the needs of banks, hedge funds, corporations and policymakers. The results show that the above index of China's EPU has a high degree of accuracy and reliability. For this index, we obtain the quarterly data by arithmetic averaging the monthly data. Finally, based on data availability, we select data from the first quarter of 2001 to the third quarter of 2021.

3.2 Other variables

This paper uses natural resource rents as a share of GDP to measure the intensity of natural resource development (NRD). Besides EPU and natural resource development, there are other factors that affect urban residents' consumption (URC). At the same time, we also consider that the data used in this paper are macro-quarterly data, and too many variables may bring about the loss of degrees of freedom and covariance problems. We finally selected disposable income of urban residents (DI), price level (PL) and fiscal expenditure (FE) as control variables. Disposable income determines the purchasing power of urban residents, and an increase in disposable income will lead to an increase in the level of consumption. Natural resource development may provide people with more income. Increased economic policy uncertainty can reduce disposable income. We seasonally adjust and log disposable income per urban resident. We take the logarithm of the consumer price index for residents to measure the price level. We convert general public budget expenditure to per capita general public budget expenditure and take the logarithm. The value obtained is the fiscal expenditure. Fiscal expenditure can stimulate economic growth and boost consumption demand through infrastructure investment. And an increase in fiscal expenditure means an increase in tax revenue, and an increase in tax revenue will reduce the urban residents' consumption level. All the above data are sourced from the China Economy Network Industry Database.

3.3 NARDL model

Based on the role of various economic and social factors on urban residents' consumption in previous studies, we set the initial model as follows.

$$URC = f(EPU, NRD, DI, PL, FE) \quad (1)$$

To further analyze the asymmetric impact of EPU and natural resource development on urban consumption, this paper uses the NARDL model proposed by Shin et al. (2014). NARDL models allow for the simultaneous modelling of asymmetric and cointegration dynamics between underlying variables. It is useful for analyzing long-run and short-run asymmetric relationships between financial or economic time series (Katrakilidis and Trachanas 2012). The NARDL model is suitable for small-sample analyses as it requires a low data sample length. Since the NARDL model estimates both long- and short-term components, serial correlation and endogeneity problems can be eliminated. In conclusion, the NARDL model is used to identify asymmetric effects. We transformed the variables into logarithmic form with improving the normality of the distribution. This way we obtain more robust results. The positive and negative shocks for each variable can be decomposed as follows:

$$LnEPU = lnEPU_0 + lnEPU_t^+ + lnEPU_t^- \quad (2)$$

$$LnNRD = lnNRD_0 + lnNRD_t^+ + lnNRD_t^- \quad (3)$$

$$LnEPU_t^+ = \sum_{i=1}^{t} \Delta lnEPU_t^+ = \sum_{i=1}^{t} max\left(\Delta lnEPU_i, 0\right) \quad (4)$$

$$LnEPU_t^- = \sum_{i=1}^{t} \left(\Delta lnEPU_i, 0\right) + \varepsilon_t \quad (5)$$

$$LnNRD_t^+ = \sum_{i=1}^{t} \Delta lnNRD_t^+ = \sum_{i=1}^{t} \max\left(\Delta lnNRD_i, 0\right) \quad (6)$$

$$LnNRD_t^- = \sum_{i=1}^{t} \left(\Delta lnNRD_i, 0\right) + \varepsilon_t \quad (7)$$

In Eqs. (2) and (4), $lnEPU_t^+$, $lnEPU_t^-$ represent the rising and falling components of economic policy uncertainty, respectively. The other equations have the same meaning as above. Then we combine the ARDL model. The specific form of the NARDL (p, q) model is obtained as Eq. (8).

$$\begin{aligned}\Delta URC_t =& \alpha_0 + \alpha_1 URC_{t-1} + \alpha_2^+ EPU_{t-1}^+ + \alpha_2^- EPU_{t-1}^- \\ &+ \alpha_3^+ NRD_{t-1}^+ + \alpha_3^- NRD_{t-1}^- + \alpha_4 DI_t \\ &+ \alpha_5 PL_t + \alpha_6 FE_t + \sum_{t=1}^{p} \gamma_i \Delta URC_{t-i} \\ &+ \sum_{i=1}^{q} \lambda_{1i}^+ \Delta EPU_{t-i}^+ + \sum_{i=1}^{q} \lambda_{1i}^- \Delta EPU_{t-i}^- \\ &+ \sum_{i=1}^{q} \lambda_{2i}^+ \Delta NRD_{t-i}^+ + \sum_{i=1}^{q} \lambda_{2i}^- \Delta NRD_{t-i}^- + \varepsilon_t\end{aligned} \quad (8)$$

The coefficients of the long-run impact of rising and falling EPU on total urban consumption can be expressed as α_{EPU}^+ and α_{EPU}^-. The coefficients of the long-run impact of rising and falling EPU on total urban consumption can be expressed as α_{NCD}^+ and α_{NCD}^-. λ_{1i}^+ is the coefficient of the short-term impact of EPU on total urban consumption. λ_{2i}^+ is the short-term impact coefficient of natural resources development on total urban residents' consumption. p and q represent the lag order of the explained and explanatory variables. ε_t represents the random error term. Also, we can use F and t statistics to test for the existence of long run cointegration. The Wald test can be used to test for both long-run and short-run asymmetry.

We continue to use positive and negative cumulative dynamic multipliers to capture the asymmetric dynamic adjustment trajectory of urban consumption when economic policy uncertainty and natural resource development rise and fall.

$$M_{EPU,h}^+ = \sum_{j=0}^{h} \frac{\vartheta URC_{t+j}}{\vartheta EPU_t^+} \quad M_{EPU,h}^- = \sum_{j=0}^{h} \frac{\vartheta URC_{t+j}}{\vartheta EPU_t^-} \quad h = 0, 1, 2, \cdots \quad (9)$$

$$M_{NCD,h}^+ = \sum_{j=0}^{h} \frac{\vartheta URC_{t+j}}{\vartheta NRD_t^+} \quad M_{NCD,h}^- = \sum_{j=0}^{h} \frac{\vartheta URC_{t+j}}{\vartheta NRD_t^-} \quad h = 0, 1, 2, \cdots \quad (10)$$

4 TVP-VAR-SV model

In order to capture the nonlinear response of urban residents' consumption to EPU and natural resource development over time, this paper draws on Nakajima (2011) to construct a TVP-VAR-SV model. Compared with other models, it can capture the dynamic relationship between variables and the gradual and sudden changes in the economic structure. For this article, it can better capture the asymmetric impact of economic policy uncertainty and natural resource development on residents' consumption. We first construct the SVAR model. Among them, $B_i = A^{-1}F_i, X_t = I_k \otimes \left(y_{t-1}, y_{t-2}, \cdots, y_{t-s}\right)$. $\otimes$ stands for the Kronecker product. β is obtained by reorganizing the elements of the matrix by changing them.

$$y_t = B_1 y_{t-1} + \cdots + B_s y_{t-s} + A^{-1} \sum \varepsilon_t = X_t \beta + A^{-1} \sum \varepsilon_t, \varepsilon_t \sim N(0, I_k) \quad (11)$$

Introducing time-varying parameters such as β_t, A_t and $\sum t$ in Eq. (11), we can obtain the time-varying parameter vector autoregressive (TVP-VAR-SV) model with stochastic fluctuation terms. The specific form is as follows.

$$y_t = X_t \beta_t + A_t^{-1} \sum_t \varepsilon_t, \varepsilon_t \sim N(0, I_k) \quad (12)$$

$$\beta_{t+1} = \beta_t + \mu_{\beta t} \alpha_{t+1} = \alpha_t + \mu_{\alpha t} h_{t+1} = h_t + \mu_{ht} \quad (13)$$

In Eq. (12), A_t is the lower triangular matrix. We further assume that the time-varying parameters in the above equation follow a first-order stochastic process. h_t is a vector of random fluctuations. h_t is uncorrelated with the perturbation terms $\mu_{\beta t}$, $\mu_{\alpha t}$, μ_{ht}. The introduction of a stochastic volatility term into the model may lead to an over-parameterization problem. This over-parameterization problem is dealt with by means of a reduction method. The a priori information of the Bayesian approach provides a logically and formally consistent approach to the reduction technique. In this paper, we use the Bayesian estimation method of Markov chain Monte Carlo (MCMC) algorithm to estimate the above TVP-VAR-SV model. For the MCMC algorithm, the sampling number set in this paper is 20,000 times. At the same time, in order to avoid the estimation bias caused by the instability, the first 2000 values are discarded in this paper.

5 Results and analysis

5.1 Stability test

In this paper, we use ADF unit root and PP tests to examine whether each endogenous variable is stable. The results in Table 1 show that all the series are stable after the first-order differencing. And the significant level is at 1%. This can satisfy the requirement of smoothness of variables in NARDL model and TVP-VAR-SV model. To further examine the stability of the established model, we used the autoregressive characteristic root test. The results show that all the characteristic roots are less than 1, indicating that the model is stable. Figure 1 provides the results of the AR unit root test. All points are clearly located within the unit circle, indicating the existence of a long-term stable equilibrium relationship between the variables.

Table 1 Results of stationarity test

Variable	Level		1st difference	
	ADF test	PP test	ADF test	PP test
LnURC	−2.542	−2.518	−2.843***	−3.214***
LnEPU	−1.405**	−1.531	−2.412***	−2.758**
LnNRD	−1.563**	−1.609**	−2.511***	*2.701***
LnDI	−1.490**	−1.916**	−2.613***	−3.141***
LnPL	−1.890**	−2.151**	−2.542***	−2.048***
LnFE	−1.950**	−2.213**	−2.563***	−2.212***

*, ** and *** indicate that the corresponding variable is a smooth series at the 1, 5 and 10% significance levels, respectively

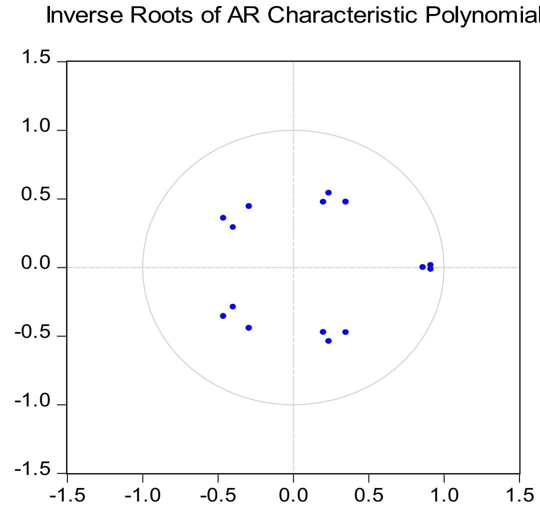

Fig. 1 Results of AR unit root test

Table 2 Regression test of NARDL model

Var	Coefficient	Std. error	t− statistic	Prob
R^2	0.9096			
Adjusted R^2	0.8859			
Bounds test	5.7845	K = 7	2.59	3.81
LM tests	4.7340			
	(0.1082)			
BPG tests	6.4922			
	(0.8702)			
Ramsey reset	0.2894			
	(0.3980)			
Wald LR test (EPU)	4.8032 (0.0139)			
Wald LR test (NRD)	0.0874 (0.9391)			
CUSUM	YES			
CUSUM− Sq	YES			

*, ** and *** indicate that the corresponding variable is a smooth series at the 1, 5 and 10% significance levels, respectively

5.2 Results of asymmetric impacts

We used the AIC information criterion for the selection of lagged orders of the regression variables. The results of the NARDL model are shown in Table 2. As can be seen in Table 2, the model fit is 0.9096, and the adjusted fit is 0. 8771. This means that economic policy uncertainty, natural resource development, urban residents' disposable income, the price level, and fiscal expenditures can be explained changes in urban residents' consumption at the level of 87.71%. The F-value in the borderline cointegration test is 5.7845, which is significant at the 1% level. This proves that although the order of smoothness of the variables is not uniform, there is a long-term correlation between the variables in the sample time interval. The number of cointegrating variables is 7. Meanwhile, the results of LM test, Breusch-Pagan-Godfrey test and RESET test indicate that there is no serial correlation, heteroskedasticity and setting bias in the regression. Figure 2 shows that the model is stable at the 5% level of significance.

After identifying the long-run steady-state linkages between URC, EPU and NRD, we use the NARDL model to test the magnitude and direction of the relationship between EPU, natural resource exploitation and urban residents' consumption. Table 3 presents the estimation results of the NARDL model. The table shows that the coefficient of ECM (1) is negative and significant at 5% level of significance. This means that the imbalance caused by variable shocks in the short run will adjust at a rate of 78.60% at the 5% level of significance and transition to the long run equilibrium through fluctuations. In the short run, a 1% increase in economic policy uncertainty reduces urban residents' consumption by 0.0116%. A 1% decrease in economic policy uncertainty will increase urban residents' consumption by 0.0012%. This provides substantial evidence for the numerous studies on the existence of a causal relationship between economic policy uncertainty and economic growth. In terms of the strength of the effect, the positive impact of EPU is much larger than the negative one. This confirms the existence of asymmetric effects of EPU on urban residents' consumption. In the long run, both positive and negative shocks to EPU reduce urban residents' consumption. The coefficient of EPU reduction on URC is −0.0020, which is not only much smaller in absolute value than the coefficient of the long-term effect of EPU increase on urban residents' total consumption expenditure, but also insignificant at the 1%, 5% and 10% levels. The reason may be that during times of economic uncertainty, urban residents may choose between different types of consumption for their own survival and development needs. This in turn leads to asymmetric effects. When the EPU falls, rising incomes and favorable expectations lead to an increase in urban consumption expenditures. When EPU rises, urban residents may reduce current consumption and build up corresponding savings to face future uncertainty shocks. In addition, because urban residents anticipate liquidity constraints that will occur in the future,

Table 3 Results of NARDL model estimation

Var	Coefficient	Std. error	t− statistic	Prob
Short run coefficients				
ΔURC_{t-1}	−0.7066***	0.0704	−6.7888	0.0000
ΔEPU^{+}_{t-1}	−0.0116**	0.0776	−0.8872	0.3930
ΔEPU^{-}_{t-1}	0.0012	0.0580	0.5593	0.4903
ΔNRD^{+}_{t-1}	−0.0199**	0.3811	−4.8800	0.0001
ΔNRD^{-}_{t-1}	0.0178**	0.0541	3.1602	0.0039
ΔDI	0.7502***	0.0840	0.8932	0.0007
ΔPL	−0.3203***	0.1932	2.4307	0.0001
ΔFE	0.0051	0.5902	6.4392	0.0001
ECM (−1)	−0.7860**	0.0724	−10.1920	0.0000
Long run coefficients				
EPU^{+}_{t}	−0.0151***	0.3922	−1.9207	0.0740
EPU^{-}_{t}	−0.0020	0.0936	−2.1283	0.0514
NRD^{+}_{t}	−0.0304***	0.0724	−0.2000	0.8332
NRD^{-}_{t}	0.0231***	0.1328	0.1342	0.8979
DI	0.6627**	0.1505	1.0809	0.3029
PL	−0.1376**	0.0817	−1.6843	0.1210
FE	0.0099	0.4610	0.3976	0.6990
C	19.0839***	5.3919	3.7833	0.0057

*, ** and *** indicate that the corresponding variable is a smooth series at the 1, 5 and 10% significance levels, respectively

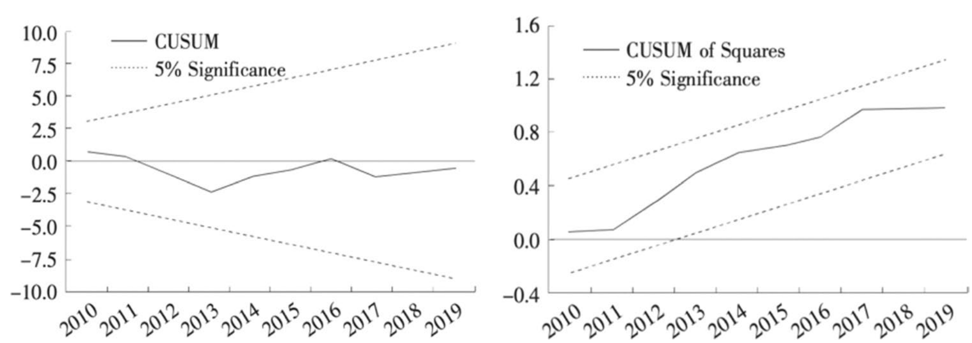

Fig. 2 Parameter stability test

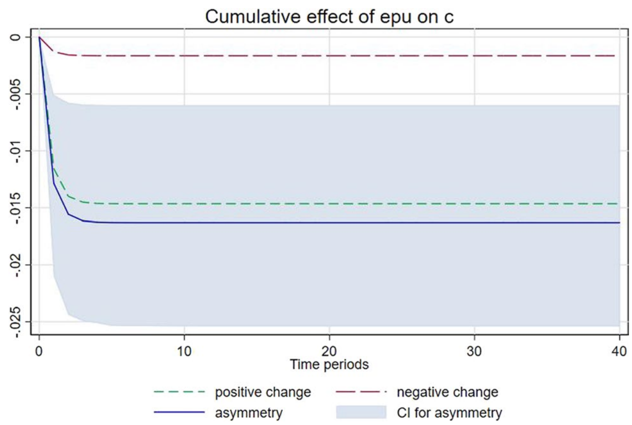

Fig. 3 Asymmetric cumulative effect of EPU on urban residents' consumption in China

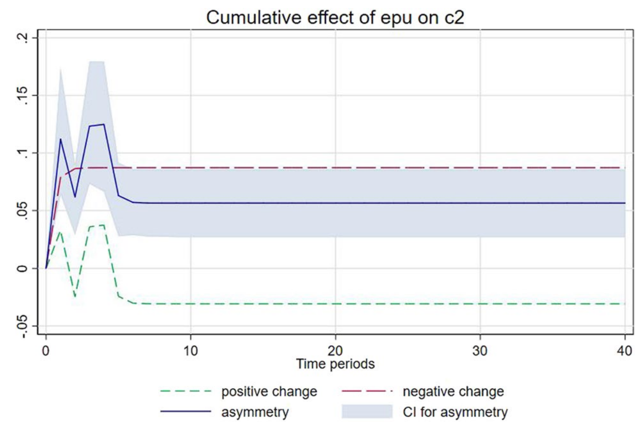

Fig. 4 Asymmetric cumulative effect of NRD on urban residents' consumption in China

they consciously reduce consumption in the present. The conclusions reached in this paper differ from the traditional theory of the consumption ratchet effect. According to the ratchet effect, consumption habits formed during periods of high income also influence consumer behavior. It may be difficult for urban residents to cut down their expenditures significantly when the EPU increases. The positive shock from the EPU will be smaller than the negative shock. The reason for the bias may be China's unique economic situation and consumption characteristics.

We further examine this asymmetric relationship by plotting the dynamic cumulative multiplier effect of EPU on URC. In Fig. 3, the green dashed line represents the response of URC to a rise in EPU, while the red dashed line represents the response of Chinese URC to a fall in EPU. The blue solid line represents the asymmetric dynamic cumulative effect of EPU on URC. URC is more sensitive to a rise in EPU than a fall in EPU of the same magnitude. This further proves that the rise in EPU has a greater impact on the URC in China.

Furthermore, there is an important link between natural resource development and URC in China. In the short run, positive shocks to natural resources reduce urban consumption. For every 1% increase in natural resource development, urban consumption decreases by 1.99%. Negative shocks to natural resource development have the opposite effect. The long-term impacts of natural resource development are similar to the short-term. It is worth noting that a 1% increase in the development of natural resources in the long run is associated with a 3.04% decrease in the urban residents 'consumption. This suggests that the long-term impact of natural resource development is more pronounced. While the exploitation of natural resources can bring huge economic gains in the short term, the environmental problems associated with it can offset the economic benefits in the long term. Previous studies have examined the impact of natural resource development from a macro perspective, and this paper retests the above theory from the level of consumption. The reason why the development of natural resources will reduce urban consumption in the short term may be that the dividend period brought by resources to China has passed. If natural resources were to be exploited now, the economic gains they would bring would not be enough to offset the negative impacts of exploitation. According to existing studies, serious environmental quality problems have a direct impact on the level of business investment. At the same time, countries and governments must raise environmental protection taxes to reduce pollutant emissions. This can place an economic burden on businesses. These will ultimately lead to a decline in the level of economic development and the reluctance of urban residents to spend any more money. This study revalidates the environmental Kuznets curve and the resource curse hypothesis through the relationship between natural resource development and URC in China.

Figure 4 illustrates the asymmetric dynamic cumulative multiplier effects of natural resource development on urban consumption in China. Specifically, when natural resource development declines, the increase in URC is significantly larger than the increase in URC due to the rise in natural resource development. This again demonstrates the asymmetric impact of natural resource development on URC in China.

From the results of the control variables, the coefficient of disposable income on URC is significantly positive. This indicates that the increase of disposable income level will promote the increase of urban residents' consumption. This is in line with the traditional economic theory. The impact of price level on URC is significantly negative, which means that an increase in price level will lead to a decrease in the purchasing power of urban residents per unit of money. This further leads to a decline in their consumption. The

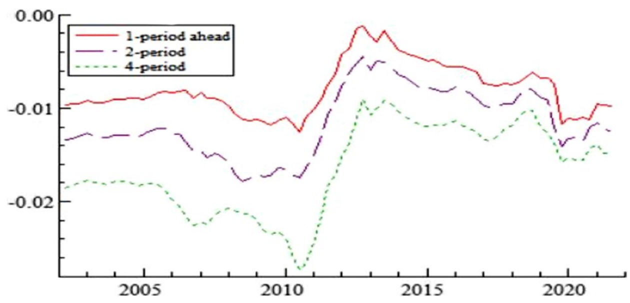

Fig. 5 Time-varying impulse response of urban consumption to positive EPU shocks

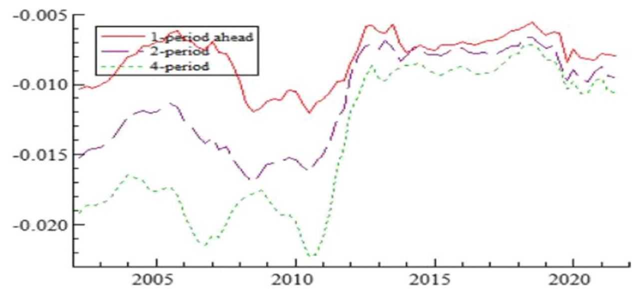

Fig. 6 Time-varying impulse response of urban consumption to NRD positive shocks

effect of fiscal expenditure on urban residents' consumption expenditure is not significant. The reason for this may be that the crowding-out and crowding-in effects of changes in fiscal expenditures cancel each other out, resulting in an insignificant impact on urban residents' consumption. In fact, China has implemented many kinds of fiscal policies for a long time, but the stimulus effect on consumption is limited.

5.3 Analysis of the effects of time-varying nonlinearities

Based on the above analyses, the impact of EPU on urban residents' consumption may be time-varying and non-linear. Therefore, this paper uses the TVP-VAR-SV model to examine whether there is a time-varying nonlinear response of Chinese urban residents' consumption to the positive shocks of EPU in different periods. Figure 5 shows the time-varying impact of positive EPU shocks on urban residents' consumption over time. The response of urban residents' consumption to a positive EPU shock is negative, which is also in line with the results of the NARDL model above. In particular, urban residents' consumption shows a clear time-varying response to positive EPU shocks in different periods. Before the financial crisis, China's EPU was at a relatively low level, and the response of urban residents' consumption to its shocks was relatively small at this stage. However, during the financial crisis of 2008–2009, the negative response of urban consumption to EPU shocks rose sharply. Overall, it shows a clear "U" shape and continues until 2010. The reason for this may be that, in response to the financial crisis of the early twentieth century, the Chinese government frequently launched a variety of fiscal and monetary rescue policies. The "four trillion yuan" stimulus programme, structural tax cuts for export commodities, increased money supply and successive reductions in reserve requirement ratios are representative of these policies. The large-scaled, high-frequency stimulus policies have led to an increase in the risk of EPU. This has further led to an increased incentive for urban residents to save precautionarily and a tightening of liquidity constraints, resulting in a sharp decline in total urban consumption over the period. In 2019–2020, COVID-19 explodes and brings about a series of chain reactions. China's economic policy uncertainty climbs to a record high level of 791.87, and the negative response of urban consumption reaches a stage extreme again. In conclusion, EPU does have a time-varying nonlinear effect on urban consumption in China. Moreover, in a sudden major crisis and its aftermath, a positive EPU shock can further exacerbate the decline in urban consumption.

We again apply the TVP-VAR-SV model to examine the time-varying nonlinear response of urban residents' consumption to natural resource development in China. Figure 6 shows that in the face of positive shocks to natural resource development one quarter, half a year and one year in advance, the response of urban consumption in China is negative. This suggests that an increase in natural resource exploitation leads to a decline in urban consumption in China. This is also consistent with the results of the NARDL model described above. The response of urban consumption to natural resource development shocks in China is also time-varying and non-linear over time. In general, the intensity of the response shows a downward-enhancing-declining-flat-enhancing trend. It is worth noting that natural resources developed a current peak during the financial crisis of 2008–2009. During the same period, the response of the urban population in terms of consumption also experienced a phase of extreme values. It is also worth noting that the negative impact of natural resource development on urban consumption was smallest around 2014. This may be due to China's "Made in China 2025" programme, which was launched in 2014 to promote the structural transformation and upgrading of the economy. The Chinese government also started to introduce numerous laws to reduce pollution emissions. There is now many research that finds that strict environmental regulations reduce the negative impacts of overexploitation of natural resources (Ulucak et al. 2023; Naqvi et al.2023). At the same time, increased levels of green production technology will also reduce the negative impacts of natural resource development (Yang et al.2022a,

Table 4 Results of robustness test

Var	Coefficient	Std. error	t− statistic	Prob
Short run coefficients				
ΔURC_{t-1}	−0.7199***	0.0712	−6.8403	0.0000
ΔEPU^{+}_{t-1}	−0.0120**	0.0769	−0.8766	0.3921
ΔEPU^{-}_{t-1}	0.0010	0.0572	0.5505	0.4812
ΔNRD^{+}_{t-1}	−0.0190**	0.3760	−4.8603	0.0001
ΔNRD^{-}_{t-1}	0.0171**	0.0527	3.1802	0.0038
ΔDI	0.7453***	0.0839	0.8903	0.0006
ΔPL	−0.3232***	0.1912	2.4322	0.0001
ΔFE	0.0052	0.5869	6.4430	0.0001
ECM (−1)	−0.7821**	0.0720	−11.2825	0.0000
Long run coefficients				
EPU^{+}_{t}	−0.0146***	0.3900	−1.9147	0.0732
EPU^{-}_{t}	−0.0013	0.0901	−2.2533	0.0520
NRD^{+}_{t}	−0.0303***	0.0714	−0.2002	0.8211
NRD^{-}_{t}	0.0221***	0.1308	0.1321	0.8673
DI	0.6707**	0.1505	1.0209	0.3029
PL	−0.1296**	0.0797	−1.6543	0.1220
FE	0.0100	0.4610	0.4076	0.6944
C	19.0219***	5.3319	3.7833	0.0050

*, ** and *** indicate that the corresponding variable is a smooth series at the 1, 5 and 10% significance levels, respectively

b; Shang et al.2023; Xu et al.2023). The results show that the negative impacts of natural resource development have the same Matthew effect as EPU. They will further exacerbate this effect when the external environment deteriorates. This will further lead to a decline in urban consumption (see results of robustness test in Table 4).

5.4 Robustness test

In general, periods of higher EPU may also be associated with relatively higher economic uncertainty (Baker et al. 2012). However, economic uncertainty (EU) may also affect the volatility of economic variables such as urban consumption (Bloom 2009). In this paper, we control for the possible disturbing effects of EU by adding this variable to the above model. For the construction of the EU indicator, this paper refers to Brogaard and Detzel (2015) and takes the standard deviation of the calculated closing price of the Shanghai Composite Index as a proxy for economic uncertainty. After the model incorporates the indicator EU and regresses it again, the estimation results of the obtained NARDL model and TVP-VAR-SV model are shown in Table 5 and Fig. 7.

With the inclusion of EU variables, the results of the NARDL model show that EPU and NRD have asymmetric impacts on urban consumption in China. Specifically, a rise in EPU has a significant negative effect on URC, but a fall in EPU has a non-significant effect on URC.A rise in NRD reduces URC, and a fall in NRD significantly raises URC. In the long run, every 1% increase in EPU reduces URC by 1.16%. A fall in EPU brings the same result. In addition, after the inclusion of EU, the results of the TVP-VAR-SV model show that the time-varying nonlinearities of EPU and NRD on urban residents' consumption are obvious. Positive shocks to EPU have an overall negative impact on URC, and the intensity of this negative impact varies over time. We then estimated the effects of lag 6, lag 8 and lag 10, and the results remain consistent with those above.

Fig. 7 Robustness test results of TVP-VAR-SV model

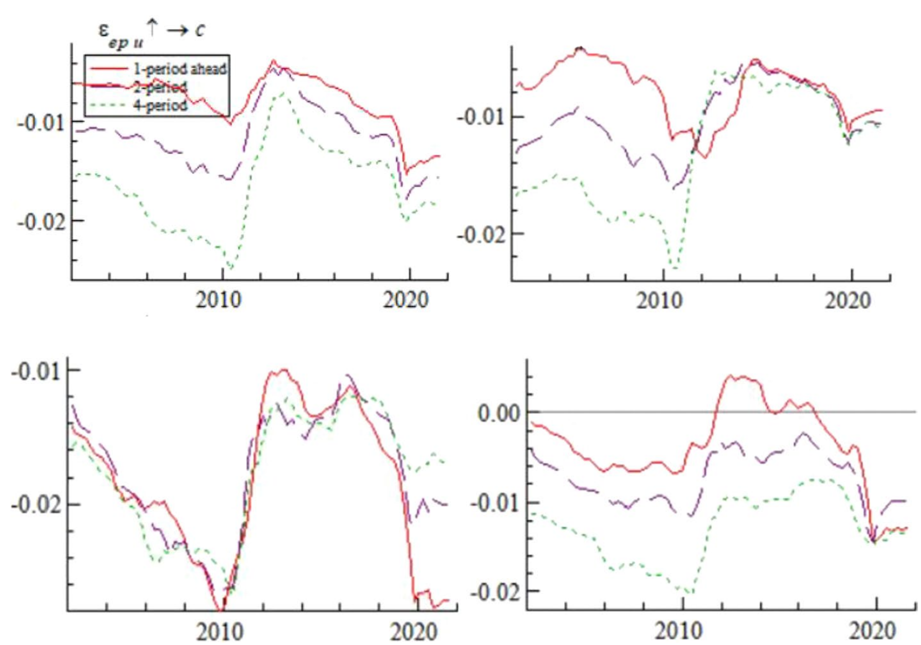

Table 5 Quantile regression method

Quantile	EPU_POS	EPU_NEG	NRD_POS	NRD_NEG	DI	PL	FE
0.05	−0.0254***	−0.102***	0.2303	0.1303**	0.0483	−0.1304	0.1997
	(−0.2214)	(−1.2234)	(1.3761)	(0.4328)	(0.2532)	(−0.6674)	(1.0003)
0.10	−0.0598***	0.0323***	0.0422	0.2077**	0.0130	−0.0473*	0.2138
	(−0.5233)	(0.2636)	(0.8902)	(0.5212)	(0.0927)	(−0.3247)	(1.4382)
0.20	−0.0879***	−0.0343**	−0.4327**	0.2708**	0.1149	−0.0638*	0.1098
	(−0.4750)	(−0.2703)	(−1.4539)	(0.5600)	(1.1689)	(−0.6404)	(1.0885)
0.30	−0.0901**	−0.2321**	−0.4668**	0.3401**	0.1115	−0.0779**	0.1380
	(−0.6493)	(−1.2193)	(−1.6493)	(0.6076)	(1.3609)	(−0.9230)	(1.6125)
0.40	−0.0834**	−0.2881**	−0.4922**	0.4552**	0.1016	−0.1458**	0.1382
	(−0.5802)	(−2.3201)	(−1.7004)	(0.7811)	(1.3879)	(−2.3482)	(1.6177)
0.50	0.1002***	0.3122**	−0.5122***	0.4901**	0.3208*	−0.3528***	0.2356
	(−1.2201)	(−2.5087)	(−1.2201)	(−1.2201)	(5.4368)	(−3.6379)	(3.7349)
0.60	−0.1206***	−0.4211**	−0.6434***	0.5330**	0.6614**	−0.3402***	0.1376
	(−1.2328)	(−2.5565)	(−1.4656)	(1.3628)	(7.4324)	(−3.4372)	(1.3928)
0.70	−0.1651***	−0.8369**	−0.8999***	0.7408**	0.7191**	−0.3882***	0.1551
	(−1.3412)	(−2.6932)	(−1.8027)	(1.5505)	(7.4972)	(−2.7712)	(1.5409)
0.80	−0.1960***	−1.2630**	−1.034***	1.0170**	0.8730**	−0.7241***	0.1030
	(−1.4096)	(−2.7196)	(−2.0112)	(1.8893)	(6.4596)	(−3.7493)	(0.7247)
0.90	−0.1827***	−1.7757**	−1.2095***	1.2009**	1.3224**	−1.9267***	0.1258
	(−0.1389)	(−2.9202)	(−2.3008)	(2.0181)	(6.6086)	(−5.1321)	(0.6489)
0.95	−0.1496***	−2.0320**	−0.9818***	1.4022**	0.5302**	−0.5187***	0.1587
	(−0.1300)	(−3.2488)	(−1.9010)	(2.2709)	(3.3106)	(−1.5348)	(0.4169)

*, ** and *** indicate that the corresponding variable is a smooth series at the 1, 5 and 10% significance levels, respectively

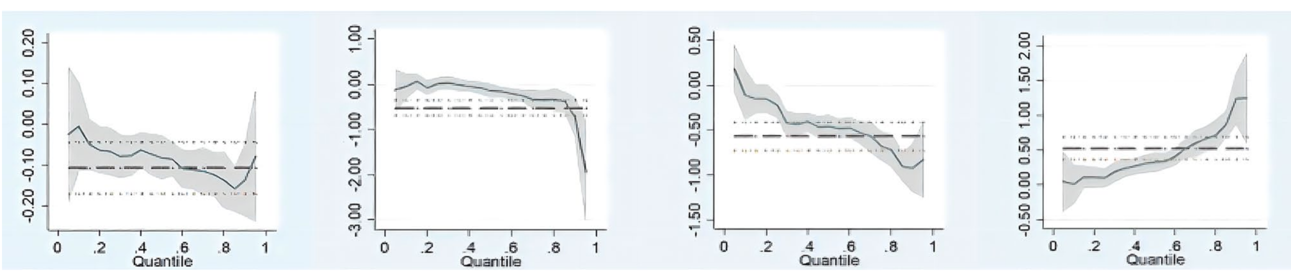

Fig. 8 Quartile regression estimation plot

5.5 Additional quantile regression estimation

In order to better examine the relationship between EPU, NRD and other control variables and URC, we use Quantile Regression Method (QRM) proposed by Buchinsky (1998) and Koenker and Hallock (2001). Compared with mean regression, it can fully consider the asymmetric relationship of the data. It is also able to attenuate the effect of excessive peaks in the data. Unlike other regression methods, QRM is more flexible. Based on these characteristics, QRM has been widely used in research on resources, energy and economic growth (Dogan et al. 2020; Lin et al. 2021; Sun et al. 2023). The quantile regression results for EPU, NRD and URC are shown in Fig. 8. From left to right are positive and negative shocks to EPU and positive and negative shocks to NRD. Due to space constraints, we do not present plots for the other control variables. We selected 11 different quantiles, and the x-axis represents this quantile. The results show that either a rise or fall in EPU reduces urban consumption. But the effect of rising EPU is more significant. The result of rising EPU is significant at 1% level at q = 95%. A rise in NRD will have a negative impact on urban consumption and its fall will have a positive impact on URC. The results produced by QRM remain largely consistent with the above

6 Discussion

This paper examines the asymmetric and nonlinear relationship between economic policy uncertainty, natural resource exploitation and residential consumption using a variety of models. It is found that a reduction in economic policy uncertainty reduces residential consumption. The possible reason for this is that changes in economic policies directly affect the state of economic development. The result is consistent with Chang et al.'s (2023) assessment for the COVID-19 period in China. It leads to situations such as rising unemployment and reduced welfare subsidies that directly reduce the enthusiasm of residents to consume (Jie et al. 2023; Cui et al. 2024). Meanwhile, the consumption habits of the residents will directly bring long-term effects. The hazards associated with increased uncertainty can be detrimental to economic growth and increased consumption in the long run. This is confirmed by Alola et al. (2021) in their study on the United States and Xie et al. (2022a) in their study on OECD countries. For natural resources, short-term exploitation will directly contribute to the consumption of the population. But prolonged exploitation can dampen consumption. Numerous previous studies have verified the existence of the resource curse by examining the relationship between economic growth, financial development, environmental quality and natural resources (Guan et al. 2020; Rahim et al. 2021; Adabor et al. 2023; Huang et al. 2024; Gao et al. 2024). Unlike previous articles, this paper provides brand new evidence for the existence of the resource curse by examining the relationship between natural resources and residential consumption.

7 Conclusions and recommendations

The paper analyses the impact of economic policy uncertainty and natural resource development on urban consumption in China from an asymmetric and nonlinear perspective. We select quarterly data for the period 2002–2021, and empirically examine these asymmetric and nonlinear effects using a nonlinear autoregressive distributed lag model and a time-varying parameter vector autoregressive (TVP-VAR-SV) model with a stochastic volatility term. We add economic uncertainty to test robustness. At the same time, we use quantile regression model (QRM) to retest the effects of EPU and NRD. The conclusions drawn in this paper are as follows. Firstly, a rise in EPU has a significant negative impact on urban consumption in China, but a fall in EPU has an insignificant impact. A rise in NRD reduces urban consumption, while a fall in NRD has a positive impact on urban consumption. Secondly, there is a time-varying nonlinear impact of EPU and NRD on URC in China, and the positive impact of EPU and NRD on URC is generally negative, and this impact shows obvious time-varying nonlinear characteristics. The negative impacts of EPU and NRD are further intensified during major crises such as the financial crisis, COVID-19, and the period following them. Unlike previous studies, this study enriches consumer theory from a new perspective.

Based on the above conclusions and findings, the paper makes the following recommendations. First, policies should focus on long-term policies, supplemented by short-term regulation. This will keep the EPU at a relatively low level to avoid frequent changes that would lead to a rise in uncertainty. At the same time, the government should further strengthen the transparency and credibility of its economic policies (Deng et al. 2024; Işık et al. 2024a, b, c). It should actively explain the trend and intention of future policy adjustments to urban residents in advance through the internet and other media. The government must promote the implementation of economic policies, thereby enhancing its credibility. This will lead urban residents to form reasonable expectations in line with the policy objectives and reduce the negative impact of EPU on urban consumption.

Second, natural resources development belongs to the labor-intensive and low-technology production sector (Işık et al. 2020; Çetin et al. 2023). Governments need to focus on industrial restructuring and resource utilization (Bulut et al. 2023; Işık et al. 2024d). In areas of western China where natural resources are more abundant, enterprises need to optimize the structure of resource utilization and improve production efficiency, thereby reducing the cost of pollution. The government should pay more attention to the development of light industry, which has more room for technological knowledge improvement, is more geographically specific and has a stronger absorptive capacity. This can mitigate the negative impact of NRD enhancement.

Thirdly, the government should smooth the channels of consumer credit for residents and further reform the social security system (Anas et el. 2023; Han et al. 2023a, b). On the one hand, the government should speed up the development and improvement of consumer credit financial products by banks and other financial institutions that offer lower risk and reasonable interest rates. When economic policy uncertainty rises, they should provide reasonable consumer credit support. The government should speed up the reform and improvement of the social security system for the elderly, medical care and unemployment. This includes increasing the investment in social security funds, lowering the threshold for social security applications and simplifying the procedures for social security operations. This will reduce the incentive for precautionary savings and weaken the impact of EPU on urban residents' consumption.

Author contributions Author Contributions statement: Conceptualization: J.Y. and C.I.; methodology: J.Y. and C.I. Software:

J.Y. investigation, writing—original draft/revised preparation: T.L., J.Y., X.C., C.I., S.P. and M.I. writing—review and editing, T.L., J.Y., X.C., C.I., S.P. and M.I. supervision, C.I. all authors have read and agreed to the published version of the manuscript.

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Data availability The datasets generated and analyzed during the current study are available in the World Bank Indicator, Materialflows.net, World Intellectual Property Organization repository, http://data.worldbank.org and World energy Agency.

Declarations

Conflict of interest The authors declare no conflict of interest.

References

Adebayo TS, Özkan O (2024) Investigating the influence of socioeconomic conditions, renewable energy and eco-innovation on environmental degradation in the United States: a wavelet quantile-based analysis. J Clean Prod 434:140321

Adebayo TS, Özkan O, Eweade BS (2024) Do energy efficiency R&D investments and information and communication technologies promote environmental sustainability in Sweden? A quantile-on-quantile KRLS investigation. J Clean Prod 40:140832

Adabor O, Mishra A (2023) The resource curse paradox: the role of financial inclusion in mitigating the adverse effect of natural resource rent on economic growth in Ghana. Resour Policy 85:103810

Ahsan T, Al-Gamrh B, Mirza SS (2022) Economic policy uncertainty and sustainable financial growth: Does business strategy matter? Financ Res Lett 46:102381

Ahmad M et al (2021) Heterogeneous links among urban concentration, non-renewable energy use intensity, economic development, and environmental emissions across regional development levels. Sci Total Environ 765:144527

Ahmad M et al (2023) Is environmental sustainability transmissible? transportation-based environmental taxation spillovers for sustainable development. Environ Sci Pollut Res 30:1–16

Alexeev M, Conrad R (2009) The elusive curse of oil. Rev Econ Stat 91(3):586–598

Alexopoulos M, Cohen J (2009) Uncertain times, uncertain measures. University of Toronto Department of Economics Working Paper, 352(7): 8

Ali M, Kirikkaleli D, Sharma R et al (2022) The nexus between remittances, natural resources, technological innovation, economic growth, and environmental sustainability in Pakistan. Environ Sci Pollut Res 29(50):75822–75840

Al-Thaqeb SA, Algharabali BG, Alabdulghafour KT (2022) The pandemic and economic policy uncertainty. Int J Financ Econ 27(3):2784–2794

Alola AA, Akadiri S (2021) Clean energy development in the United States amidst augmented socioeconomic aspects and country-specific policies. Renew Energy 169:221–230

Alola AA, Bekun FV, Obekpa HO, Adebayo TS (2024) Explaining the environmental efficiency capability of energy mix innovation among the Nordic countries. Energy Rep 11:233–239

Alvarado R et al (2022a) Impact of the informal economy on the ecological footprint: the role of urban concentration and globalization. Econ Anal Policy 75:750–767

Alvarado R et al (2022b) Impact of natural resources on economic progress: evidence for trading blocs in Latin America using non-linear econometric methods. Resour Policy 79:102908

Alvarado R et al (2022c) Biocapacity convergence clubs in Latin America: an analysis of their determining factors using quantile regressions. Environ Sci Pollut Res 29(44):66605–66621

Altunöz U (2023) Analysis of Turkey's classic and financial kuznets curves in regards to the level of development and increased distribution. J Ekon *5*(2):60–69. https://doi.org/10.58251/ekonomi.1352268

Amin A et al (2023) The influence of renewable and non-renewable energy on carbon emissions in Pakistan: evidence from stochastic impacts by regression on population, affluence, and technology model. Front Environ Sci 11:1182055. https://doi.org/10.3389/fenvs.2023.1182055

Amin A et al (2024) The influence of energy transition, and natural resources on carbon emissions in China: an augmented ARDL application. Environ Develop Sustain 1–19. https://doi.org/10.1007/s10668-023-04398-0

Anas M et al (2023) Moving towards sustainable environment development in emerging economies: the role of green finance, green tech-innovation, natural resource depletion, and forested area in assessing the load capacity factor. Sustain Develop 1–17. https://doi.org/10.1002/sd.2833

Anser MK, Apergis N, Syed QR (2021) Impact of economic policy uncertainty on CO_2 emissions: evidence from top ten carbon emitter countries. Environ Sci Pollut Res 28:29369–29378

Appiah M, Gyamfi BA, Usman O, Bekun FV (2024) Modeling the asymmetric effects of exchange rate, financial development, and oil prices on economic growth. Singap Econ Rev 1–30. https://doi.org/10.1142/S0217590823500595

Arslan HM, Khan I, Latif MI et al (2022) Understanding the dynamics of natural resources rents, environmental sustainability, and sustainable economic growth: new insights from China. Environ Sci Pollut Res 29(39):58746–58761

Astier M, García-Barrios L, Galván-Miyoshi Y, et al. (2012) Assessing the sustainability of small farmer natural resource management systems. A critical analysis of the MESMIS program (1995–2010). Ecol soc 17(3). https://doi.org/10.5751/es-04910-170325

Auty RM (1994) Industrial policy reform in six large newly industrializing countries: the resource curse thesis. World Dev 22(1):11–26

Awosusi AA, Xulu NG, Ahmadi M et al (2022) The sustainable environment in Uruguay: the roles of financial development, natural resources, and trade globalization. Front Environ Sci 10:430

Aye GC, Clance MW, Gupta R (2019) The effectiveness of monetary and fiscal policy shocks on US inequality: the role of uncertainty. Qual Quant 53:283–295

Bahmani-Oskooee M, Nayeri MM (2020) Policy uncertainty and consumption in G7 countries: an asymmetry analysis. Int Econ 163:101–113

Baiardi D, Magnani M, Menegatti M (2020) The theory of precautionary saving: an overview of recent developments. Rev Econ Household 18:513–542

Baker SR, Bloom N, Davis S J (2012) Has economic policy uncertainty hampered the recovery? Becker Friedman Institute for Research in Economics Working Paper, (2012–003). Becker Friedman Institute for Research in Economics Working Paper No. 2012-003. https://ssrn.com/abstract=2009451. https://doi.org/10.2139/ssrn.2009451

Baker SR, Bloom N, Davis SJ (2016) Measuring economic policy uncertainty. Q J Econ 131(4):1593–1636

Bashir MF, Sadiq M, Talbi B et al (2022) An outlook on the development of renewable energy, policy measures to reshape the current energy mix, and how to achieve sustainable economic growth in the post COVID-19 era. Environ Sci Pollut Res 29(29):43636–43647

Bekun FV (2024) Race to carbon neutrality in South Africa: what role does environmental technological innovation play? Appl Energy 354:122212

Bloom N (2009) The impact of uncertainty shocks. Econometrica 77(3):623–685

Brogaard J, Detzel A (2015) The asset-pricing implications of government economic policy uncertainty. Manage Sci 61(1):3–18

Brunnschweiler CN (2008) Cursing the blessings? natural resource abundance, institutions, and economic growth. World Dev 36(3):399–419

Buchinsky M (1998) Recent advances in quantile regression models: a practical guideline for empirical research. J Human Resour 33(1):88–126

Bulut U et al (2023) The nexus between government spending, economic growth, and tourism under climate change: testing the CEM model for the USA. Environ Sci Pollut Res 30(36):86138–86154

Ceseña EAM, Mutale J, Rivas-Dávalos F (2013) Real options theory applied to electricity generation projects: A review. Renew Sustain Energy Rev 19:573–581

Çetin M et al (2023) The impact of natural resources, economic growth, savings, and current account balance on financial sector development: theory and empirical evidence. Resour Policy 81:103300

Chang L, Mohsin M, Iqbal W (2023) Assessing the nexus between COVID-19 pandemic–driven economic crisis and economic policy: lesson learned and challenges. Environ Sci Pollut Res 30(9):22145–22158

Chen Y, Fu D, Zhang Y (2022) How do households respond to economic policy uncertainty? Evidence from China. Appl Econ Lett 29(1):80–83

Cui X et al (2024) Do geopolitical risk and economic policy uncertainty cause CO2 emissions in BRICS? The role of institutional quality and energy productivity. Stoch Environ Res Risk Assess 1–15. https://doi.org/10.1007/s00477-023-02646-3

Cui L, Yue S, Nghiem XH et al (2023) Exploring the risk and economic vulnerability of global energy supply chain interruption in the context of Russo-Ukrainian war. Resour Policy 81:103373

Dagar V, Khan MK, Alvarado R et al (2022) Impact of renewable energy consumption, financial development and natural resources on environmental degradation in OECD countries with dynamic panel data. Environ Sci Pollut Res 29(12):18202–18212

Davis GA (1995) Learning to love the Dutch disease: evidence from the mineral economies. World Dev 23(10):1765–1779

Deng QS et al (2022) Asymmetric impacts of foreign direct investment inflows, financial development, and social globalization on environmental pollution. Econ Anal Policy 76:236–251

Deng QS et al (2024) Nexus between government stability and environmental pollution. J Clean Prod 434:140061

Dogan E, Altinoz B, Tzeremes P (2020) The analysis of 'financial resource curse' hypothesis for developed countries: evidence from asymmetric effects with quantile regression. Resour Policy 68:101773

Dogru T et al (2023) Employee turnover dynamics in the hospitality industry vs. the overall economy. Tour Manag 99:104783. https://doi.org/10.1016/j.tourman.2023.104783

Dogru T et al. (2023b). The impact of business models and state regulations on the accommodation sector: theory and empirical evidence from the recent pandemic. Int J Contemp Hosp Manag

Dogru T et al (2019) The balance of trade and exchange rates: theory and contemporary evidence from tourism. Tour Manage 74:12–23

Dreze JH, Modigliani F (1972) Consumption decisions under uncertainty. J Econ Theory 5(3):308–335

Evans O, Adeniji S, Nwaogwugwu I et al (2018) The relative effect of monetary and fiscal policy on economic development in Africa: a GMM approach to the St. Louis equation Bus Econ Q 2:3–23

Fafchamps M, Pender J (1997) Precautionary saving, credit constraints, and irreversible investment: theory and evidence from Serniarid India. J Bus Econ Stat 15(2):180–194

Farooq U et al (2023) The Nexus between tourism-energy-environmental degradation: Does financial development matter in GCC countries? Tour Econ 30(3):680–701. https://doi.org/10.1177/13548166231174812

Fernández-Villaverde J, Guerrón-Quintana P, Kuester K et al (2015) Fiscal volatility shocks and economic activity. Am Econ Rev 105(11):3352–3384

Gao Z, Li L, Hao Y (2024) Resource industry dependence and high-quality economic development of Chinese style: reexamining the effect of the "Resource Curse." Struct Chang Econ Dyn 68:1–16

Ghirelli C, Gil M, Pérez JJ et al (2021) Measuring economic and economic policy uncertainty and their macroeconomic effects: the case of Spain. Empir Econ 60:869–892

Gylfason T, Zoega G (2006) Natural resources and economic growth: the role of investment. World Econ 29(8):1091–1115

Guan J, Kirikkaleli D, Bibi A et al (2020) Natural resources rents nexus with financial development in the presence of globalization: Is the "resource curse" exist or myth? Resour Policy 66:101641

Han L, Liu X, Ma S (2023a) The influence of uncertain expectations on Chinese rural residents' consumer behavior decisions: theoretical analysis and empirical test. Front Psychol 13:1052962

Han J et al (2023a) General equilibrium model-based green finance, decarbonization and high-quality economic development: a new perspective from knowledge networks. Environ Develop Sustain 1–36. https://doi.org/10.1007/s10668-023-04072-5

Han J et al (2023b) The construction of green finance and high-quality economic development under China's SDGs target. Environ Sci Pollut Res 30(52):111891–111902

He Y, Li X, Huang P et al (2022) Exploring the road toward environmental sustainability: natural resources, renewable energy consumption, economic growth, and greenhouse gas emissions. Sustainability 14(3):1579

Hossain ME, Islam MS, Bandyopadhyay A et al (2022) Mexico at the crossroads of natural resource dependence and COP26 pledge: Does technological innovation help? Resour Policy 77:102710

Hu G, Liu S, Wu G et al (2023) Economic policy uncertainty, geopolitical risks, and the heterogeneity of commodity price fluctuations in China——an empirical study based on TVP-SV-VAR model. Resour Policy 85:104009

Huang H, Cheng X, Wei L et al (2024) Are natural resources a driving force for financial development or a curse for the economy? Policy insight from Next-11 countries. Resour Policy 88:104466

Huang Y, Luk P (2020) Measuring economic policy uncertainty in China. China Econ Rev 59:101367

Işık C, Ongan S, Islam H, Jabeen G, Pinzon S (2024a) Is economic growth in East Asia pacificand South Asia ESG factors based and aligned growth? Sustain Develop 1–14. https://doi.org/10.1002/sd.2910

Işık C et al (2024d) Renewable energy, climate policy uncertainty, industrial production, domestic exports/re-exports, and CO_2 emissions in the USA: a SVAR approach. Gondwana Res 127:156–164

Işık C et al (2023) Renewable energy, economic freedom and economic policy uncertainty: new evidence from a dynamic panel threshold analysis for the G-7 and BRIC countries. Stoch Environ Res Risk Assess 37:1–16

Işık C et al (2021) Convergence analysis of the ecological footprint: theory and empirical evidence from the USMCA countries. Environ Sci Pollut Res 28:32648–32659

Işık C et al (2020) Testing the efficacy of the economic policy uncertainty index on tourism demand in USMCA: theory and evidence. Tour Econ 26(8):1344–1357

Işık C et al (2018) A nexus of linear and non-linear relationships between tourism demand, renewable energy consumption, and economic growth: theory and evidence. Int J Tour Res 20(1):38–49

Işik C, Radulescu M (2017) Investigation of the relationship between renewable energy, tourism receipts and economic growth in Europe. Stat: Stat Econ J 97(2):85–94

Işik C et al (2017) Analyzing the causalities between economic growth, financial development, international trade, tourism expenditure and/on the CO_2 emissions in Greece. Energy Sour Part B 12(7):665–673

Işik C (2010) Natural gas consumption and economic growth in Turkey: a bound test approach. Energy Syst 1:441–456

Işık C, Ongan S Islam H, Pinzon S, Jabeen G (2024b) Navigating Sustainability: Unveiling the Interconnected Dynamics of ESG factors and SDGs in BRICS-11. Sustain Dev 1–14. https://doi.org/10.1002/sd.2977

Işık C, Ongan S, Islam H (2024c) A new pathway to sustainability: Integrating economic dimension (ECON) into ESG factors as (ECON-ESG) and aligned with sustainable development goals (SDGs). J Ekon 34–39. https://doi.org/10.58251/ekonomi.1450860

Islam H, Rahman J, Tanchangya T, Islam MA (2023) Impact of firms' size, leverage, and net profit margin on firms' profitability in the manufacturing sector of Bangladesh: an empirical analysis using GMM estimation. J Ekon 5(1):1–9

Jabeen G et al (2024) Role of energy utilization intensity, technical development, economic openness, and foreign tourism in environmental sustainability. Gondwana Res 127:100–115

Jiang Y, Meng J, Nie H (2018) Visiting the economic policy uncertainty shocks-economic growth relationship: wavelet-based granger-causality in quantiles approach. Rom J Econ Forecast 21(2):80–94

Jie H, Khan I, Alharthi M et al (2023) Sustainable energy policy, socio-economic development, and ecological footprint: the economic significance of natural resources, population growth, and industrial development. Util Policy 81:101490

Jin X, Wu H (2021) Economic policy uncertainty and cost stickiness. Manag Account Res 52:100750

Khan I, Hou F, Le HP et al (2021) Do natural resources, urbanization, and value-adding manufacturing affect environmental quality? Evidence from the top ten manufacturing countries. Resour Policy 72:102109

Katrakilidis C, Trachanas E (2012) (2023) What drives housing price dynamics in Greece: new evidence from asymmetric ARDL cointegration. Econ Model 29(4):1064–1069

Kirikkaleli D, Boz FC, Torun M (2023) Do Economic and Financial Stabilities Matter for Political Stability in Estonia? J Knowl Econ 1–16. https://doi.org/10.1007/s13132-023-01662-6

Koenker R, Hallock KF (2001) Quantile regression. J Econ Perspect 15(4):143–156

Lai P, Zhu T (2022) Deflating China's nominal GDP: 2004–2018. China Econ Rev 71:101709

Lin WL, Lee C, Law H (2021) Asymmetric effects of corporate sustainability strategy on value creation among global automotive firms: a dynamic panel quantile regression approach. Bus Strateg Environ 30(2):931–954

Liu H, Liu Y, Wang Y (2021) Exploring the influence of economic policy uncertainty on the relationship between tourism and economic growth with an MF-VAR model. Tour Econ 27(5):1081–1100

Long S, Zhang R (2022) The asymmetric effects of international oil prices, oil price uncertainty and income on urban residents' consumption in China. Econ Anal Policy 74:789–805

Majeed A, Wang L, Zhang X et al (2021) Modeling the dynamic links among natural resources, economic globalization, disaggregated energy consumption, and environmental quality: fresh evidence from GCC economies. Resour Policy 73:102204

Masud R, Al Mamun A, Hossain MK, Islam H (2024) Exploring the dynamics of Bangladesh bank's monetary policy: a factor analysis approach. J Ekon 6(1):1–17

Mayer J (2009) Policy space: what, for what, and where? Develop Policy Rev 27(4):373–395

Mehlum H, Moene KO, Torvik R (2002) Plunder & Protection Inc. J Peace Res 39(4):447–459

Mehrara M (2009) Reconsidering the resource curse in oil-exporting countries. Energy Policy 37(3):1165–1169

Mirza SS, Ahsan T (2020) Corporates' strategic responses to economic policy uncertainty in China. Bus Strateg Environ 29(2):375–389

Muhammad B, Khan MK, Khan MI et al (2021) Impact of foreign direct investment, natural resources, renewable energy consumption, and economic growth on environmental degradation: evidence from BRICS, developing, developed and global countries. Environ Sci Pollut Res 28:21789–21798

Mumtaz H, Surico P (2018) Policy uncertainty and aggregate fluctuations. J Appl Economet 33(3):319–331

Nakajima J (2011) Time-Varying Parameter VAR Model with Stochastic Volatility: an overview of methodology and empirical applications. Monetary Econ Stud, Bank of Japan, IMES Discussion Paper Series 11-E-09, 29

Naqvi SAA, Hussain B, Ali S (2023) Evaluating the influence of biofuel and waste energy production on environmental degradation in APEC: role of natural resources and financial development. J Clean Prod 386:135790

Opuala CS, Omoke PC, Uche E (2023) Sustainable environment in West Africa: the roles of financial development, energy consumption, trade openness, urbanization and natural resource depletion. Int J Environ Sci Technol 20(1):423–436

Ongan S et al (2022) Retesting the EKC hypothesis through transmission of the ARMEY curve model: an alternative composite model approach with theory and policy implications for NAFTA countries. Environ Sci Pollut Res 29(31):46587–46599

Ongan S et al (2023) Are economic growth and environmental pollution a dilemma? Environ Sci Pollut Res 30(17):49591–49604

Pasigai A, Jusriadi E (2024) The influence of service strategies and business relations on the growth of starup businesses in medium digital marketing. J Ekon 6(1):18–24

Pástor Ľ, Veronesi P (2013) Political uncertainty and risk premia. J Financ Econ 110(3):520–545

Pata UK, Isik C (2021) Determinants of the load capacity factor in China: a novel dynamic ARDL approach for ecological footprint accounting. Resour Policy 74:102313

Peng XY, Zou XY, Zhao XX et al (2023) How does economic policy uncertainty affect green innovation? Technol Econ DevelopEcon 29(1):114–140

Pirgaip B, Dinçergök B (2020) Economic policy uncertainty, energy consumption and carbon emissions in G7 countries: evidence from a panel Granger causality analysis. Environ Sci Pollut Res 27:30050–30066

Ploeg F (2011) Natural resources: curse or blessing? J Econ Lit 49(2):366–420

Qamruzzaman M, Karim S, Jahan I (2022) Nexus between economic policy uncertainty, foreign direct investment, government debt and renewable energy consumption in 13 top oil importing nations: evidence from the symmetric and asymmetric investigation. Renew Energy 195:121–136

Rahim S, Murshed M, Umarbeyli S et al (2021) Do natural resources abundance and human capital development promote economic growth? A study on the resource curse hypothesis in Next Eleven countries. Resour Environ Sustain 4:100018

Rehman A et al (2022) Carbonization and agricultural productivity in Bhutan: investigating the impact of crops production, fertilizer usage, and employment on CO_2 emissions. J Clean Prod 375:134178

Romer PM (1990) Endogenous technological change. J Political Econ 98:S71–S102

Sarıgül SS, Ünlü M, Avcı P, Yaşar E (2023) The empirical analysis of cereal production under the climate exchange and examining the effects of banks' domestic credit on cereal production: evidence from Turkey. J Ekon 5(2):1–1

Shang M, Ma Z, Su Y et al (2023) Understanding the importance of sustainable ecological innovation in reducing carbon emissions: investigating the green energy demand, financial development, natural resource management, industrialisation and urbanisation channels. Economic research-Ekonomska istraživanja 36(2):1–40. https://doi.org/10.1080/1331677X.2022.2137823

Shin Y, Yu B, Greenwood-Nimmo M (2014) Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. Festschrift in honor of Peter Schmidt: econometric methods and applications, 281–314. https://ssrn.com/abstract=1807745. https://doi.org/10.2139/ssrn.1807745

Solarin SA, Lasisi TT, Hossain ME, Bekun FV (2023) Diversification in the tourism sector and economic growth in Australia: a disaggregated analysis. Int J Tour Res 25(6):543–564

Sun Y, Gao P, Raza SA et al (2023) The asymmetric effects of oil price shocks on the world food prices: fresh evidence from quantile-on-quantile regression approach. Energy 270:126812

Syed QR, Bouri E (2022) Impact of economic policy uncertainty on CO_2 emissions in the US: evidence from bootstrap ARDL approach. J Public Aff 22(3):e2595

Trigeorgis L, Reuer JJ (2017) Real options theory in strategic management. Strateg Manag J 38(1):42–63

Ulucak R, Baloch MA (2023) An empirical approach to the nexus between natural resources and environmental pollution: Do economic policy and environmental-related technologies make any difference? Resour Policy 81:103361

Umar Farooq M et al (2023) Role of innovations to mitigate CO_2e: theory and evidence for European economies. Sustainability 15(9):7618

Usman M, Balsalobre-Lorente D, Jahanger A et al (2023) Are Mercosur economies going green or going away? An empirical investigation of the association between technological innovations, energy use, natural resources and GHG emissions. Gondwana Res 113:53–70

Usman M, Balsalobre-Lorente D, Jahanger A et al (2022) Pollution concern during globalization mode in financially resource-rich countries: Do financial development, natural resources, and renewable energy consumption matter? Renew Energy 183:90–102

Wright G (1990) The origins of American industrial success, 1879–1940. Am Econ Rev 651–668. https://www.jstor.org/stable/2006701

Xiao WEN, Pan JD, Liu LY (2018) China's industrial structure upgrade in the "New Normal": empirical test and determinants. Singap Econ Rev 63(04):1037–1058

Xie Z, Qu L, Lin R et al (2022a) Relationships between fluctuations of environmental regulation, technological innovation, and economic growth: a multinational perspective. J Enterp Inf Manag 35(4/5):1267–1287

Xie X, Tong Z, Xu S (2022b) Risk attitudes and household consumption behavior: evidence from China. Front Pub Health 10:922690

Xu X, Yan J, Zhang Y (2023) Design of ecological compensation criteria for livestock farming based on Heckman-ISM Model—evidence from 1069 farm household surveys in 106 counties. Pol J Environ Stud 32(5):4891–4905

Xue C, Shahbaz M, Ahmed Z et al (2022a) Clean energy consumption, economic growth, and environmental sustainability: what is the role of economic policy uncertainty? Renew Energy 184:899–907

Xue Y, Tang C, Wu H et al (2022b) The emerging driving force of energy consumption in China: Does digital economy development matter? Energy Policy 165:112997

Yan J, Su B (2020) What drive the changes in China's energy consumption and intensity during 12th Five-Year Plan period? Energy Policy 140:111383

Yang J, Cai W, Ma M et al (2020) Driving forces of China's CO_2 emissions from energy consumption based on Kaya-LMDI methods. Sci Total Environ 711:134569

Yang X, Li N, Ahmad M et al (2022a) Natural resources, population aging, and environmental quality: analyzing the role of green technologies. Environ Sci Pollut Res 29(31):46665–46679

Yang X, Nielsen CP, Song S et al (2022b) Breaking the hard-to-abate bottleneck in China's path to carbon neutrality with clean hydrogen. Nat Energy 7(10):955–965

Yin Y, Qamruzzaman M, Xiao H et al (2021) Nexus between uncertainty, remittances, and households' consumption: evidence from dynamic SUR application. Front Environ Sci 10:950067

Zeb R, Salar L, Awan U et al (2014) (2014) Causal links between renewable energy, environmental degradation and economic growth in selected SAARC countries: progress towards green economy. Renew Energy 71:123–132

Zeldes SP (1989) Consumption and liquidity constraints: an empirical investigation. J Polit Econ 97(2):305–346

Zhang L, Godil DI, Bibi M et al (2021) Caring for the environment: How human capital, natural resources, and economic growth interact with environmental degradation in Pakistan? A dynamic ARDL approach. Sci Total Environ 774:145553

Zhang YJ, Bian XJ, Tan W et al (2017) The indirect energy consumption and CO_2 emission caused by household consumption in China: an analysis based on the input–output method. J Clean Prod 163:69–83

Zhang Z, Hao L, Linghu Y et al (2023) Research on the energy poverty reduction effects of green finance in the context of economic policy uncertainty. J Clean Prod 410:137287