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Does line loss broaden the deviation between the added value of industry and the industrial electricity consumption in China?

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Abstract Studies have shown that industrial structure (IS) adjustment, climate factors, energy intensity, etc. factors are the reasons causing the deviation between the growth rate of industrial value added (IVA) and electricity consumption of industry (Ele) in China. However, no one researches whether line loss (LL), calculated in industrial electricity consumption in China, is one of the reasons contributing to the deviation. In order to thoroughly figure out what is the cause of the deviation, theoretical method, correlation analysis, autoregressive distributed lag (ARDL) model and an error correction model (ECM) have been undertaken in the paper. Experimental results are as follows: (1) LL fluctuates violently in accordance with temperature, while IVA is not; (2) the correlation between IVA and Ele becomes stronger, if LL is eliminated from Ele; (3) both in the long-run and short-run equation of ARDL model, IS is the first driver of Ele, followed by LL and IVA; (4) compared with International Energy Agency and based on the experimental results, the practice statistics of LL in Ele is not reasonable in China; (6) policies for promoting the upgrading of the internal industrial structure and for improving the statistical method of electricity consumption in China are proposed, finally.

Keywords Electricity · Consumption of industry · Industrial value added · Line loss · Internal industrial structure · ZA test · ARDL model

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1 Introduction

Historically, with the fast economic development characterized with the rapid industrialization and globalization, electricity consumption has maintained a steady growth in China (Shiu and Lam 2004; Yoo 2006; Yuan, et al 2007; Lin and Liu 2016). The International Energy Agency (IEA) (2016) also reports that energy is the fundamental factor in production and the economic growth of developing countries. Indeed, electricity consumption has been acted as an important driver of economic growth in China (Muhammad, and Hooi 2012; Niu et al. 2013; Zhang et al. 2016; Pata and Kahveci 2017; Pata and Terzi 2017). Nevertheless, as we face an increasingly uncertain future where fossil energy supply is limited, taxes on fossil fuel, encouraging new energy generation, progressive energy prices, carbon trading, etc. have been implemented (Choi et al. 2016; Lan et al. 2016). In this aspect, energy-saving and environment protecting have made a certain achievements in China. Meanwhile, the economic growth has entered a new normal.

Accordingly, a deviation of the growth rate of the electricity consumption and GDP appeared in the first quarter in 2009 (Fig. 1). The International Energy Agency (IEA) doubted even the accuracy of China's GDP, considering that the growth rate of GDP for the first quarter was 6.4%, which did not consist with the decreasing demand for electricity consumption. After that, an expanding body of scholars started to seek the determinants of the deviation. Some empirical literature qualitatively demonstrated that industrial energy intensity, technical progress, deepening work of energy-saving and the destocking of energy-intensive products are reasons that result in the deviation (Liu et al. 2009; Lin 2010; Lin et al. 2010; Xiao and Li 2015). A structural vector autoregression model (SVAR model) is employed to illustrate inventory investment, and electricity consumption structure and electricity efficiency were factors contributed to the deviation by Lin and Liu (2016). Climate factors, such as cold and hot events, wind speed, precipitation and sunshine duration, are elements influencing the electricity consumption (Wu 2015; Fan et al. 2015; Tan and Sun 2016; Ge et al. 2017).

We argue that the application of different elements ultimately impacts the research conclusions that what are reasons resulting in the deviation between the added value of industry and the industrial electricity consumption. Moreover, as the industry has been acted as the foundation of the economy in China, the deviation between industrial value added (IVA) and electricity consumption (Ele) of industry is becoming a growing focus of

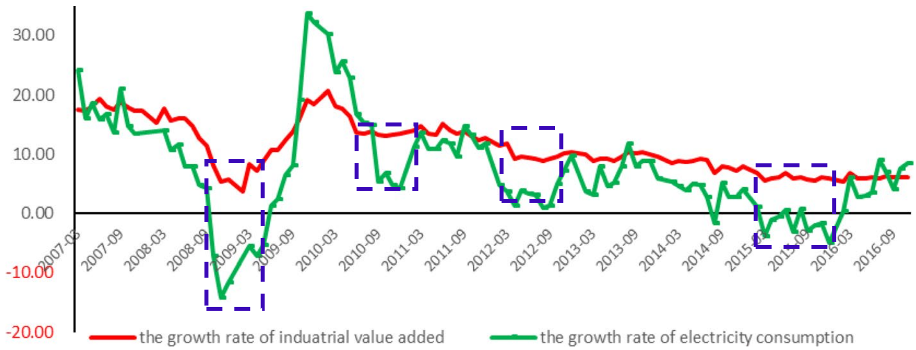

Fig. 1 The growth rate of industrial electricity consumption and industrial value added in China

research. As far as we are aware, there is only Chen and Chi (2014) researching the impact of statistical line loss on the industrial power consumption. Nevertheless, the impact of line loss on the deviation Chen and Chi (2014) didn't study. Moreover, almost all of the previous studies focusing on the deviation are mainly seeking the reasons from energy intensity, industrial structure, energy-saving strategies, climate factors, etc. aspects. No one researches whether the line loss counted in industry is a factor to widen the deviation. These research gaps form the basis for our paper. In the novel analysis, academic analysis, correlation analysis, an autoregressive distributed lag (ARDL) model and an error correction model (ECM) have been implemented. Considering the availability of the electricity consumption data and IVA data, Anhui Province is chosen to be the research object. The deviation also appeared in August 2013 in Anhui Province, where the growth rate of electricity consumption is high up to 32.86%, while the industrial value added is just 10% (Fig. 2).

The remainder of the paper is organized as follows: Sect. 2 details the various definitions of line loss both in International and in China and describes the unreasonable components of electricity consumption statistical method in China. Furthermore, details methodology utilized in this paper. Section 3 describes the data collection. Section 4 presents and discusses the findings of the regression. Section 5 presents conclusions as usual.

2 Methodology

2.1 Academic analysis

The statistical methods of the electricity consumption in China and IEA are enormously different (Song 2016). According to Energy Information Administration (EIA) of America, line loss is defined as transmission and distribution losses and unaccounted for annual or monthly data, i.e., line loss including three parts: transmission and distribution losses, data collection time-frame differences and estimation error. Transmission and distribution

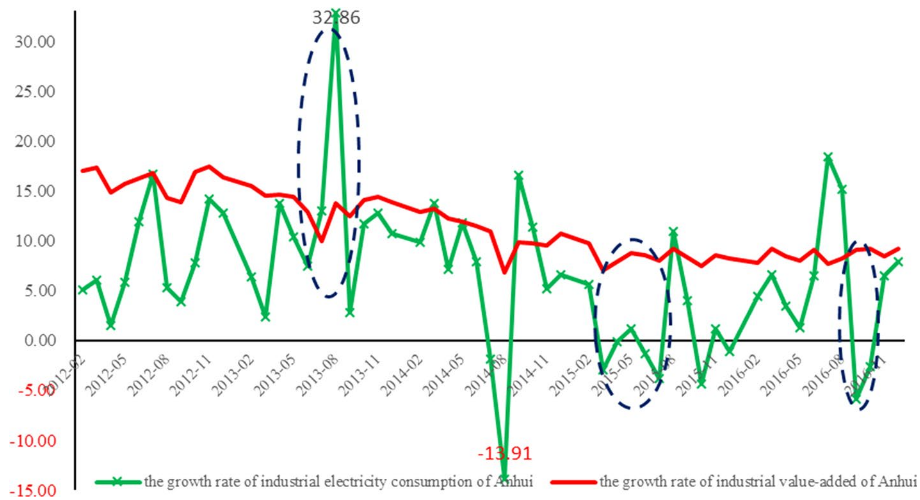

Fig. 2 The growth rate of industrial electricity consumption and industrial value added in Anhui Province

losses are indicated the theoretical line losses, which were generated by the electric transmission and transformation equipment. Data collection time-frame differences are caused by the different periods of electricity supply and electricity consumption. Moreover, the formula of computation of line loss is total supply minus the aggregate consumption. Line loss is recorded excluding the whole society electricity consumption in America.

However, according to Chinese Handbook of Electric Power Statistics (CHEPS), line loss is explained as losses during transmission and distribution of grid cooperation and the unknown losses. The formula of line loss is as the same as that in America. Considering the definition of line loss in China, it is generated by the normal production activity of Production and Supply of Electric Power and Heat Power Industry. Furthermore, Production and Supply of Electric Power and Heat Power Industry belonged to industry. Briefly speaking, line loss is recognized in the electricity consumption of industry.

2.2 Econometric model

2.2.1 Model Equation

In order to figure out whether the line loss broadens the deviation between industrial value added and the electricity consumption, a multiple regression model was established as follows:

$$\mathrm{Ele}_{\mathrm{mt}} = \beta_0 \mathrm{IVA}_{\mathrm{mt}} + \beta_1 \mathrm{LL}_{\mathrm{mt}} + \beta_2 \mathrm{IS}_{\mathrm{mt}} + \varepsilon_{\mathrm{t}} \tag{1}$$

where the dependent variable $\mathrm{Ele}_{\mathrm{mt}}$ represents industrial electricity consumption in month m year t; $\mathrm{IVA}_{\mathrm{mt}}$ is industrial value added in month m year t; $\mathrm{LL}_{\mathrm{mt}}$ represents the line loss; IS indicates internal industrial structure, which is indicated by primary energy-intensive industries added value accounts for industrial value added. Primary energy-intensive industries refer to manufacture of basic chemical raw materials, manufacture of cement, lime and gypsum, smelting of iron, smelting of commonly used nonferrous metals, mining and washing of bituminous coal and anthracite and mining and processing of iron ore in this paper.

2.2.2 Co-integration Analysis

In order to examine the long-term equilibrium relationship among electricity consumption, industrial value added, internal industrial structure and line loss, an autoregressive distributed lag (ARDL) bound test given by Pesaran et al. (2001) is employed in this paper. ARDL model has multiple advantages than Engle and Granger technique (1987) and Johansen and Juselius (1990) test. Engle and Granger technique test merely suits for two variables. JJ co-integration requires the study period long enough and all variables should be integrated of the same order, i.e., I(1) or I(2). However, ARDL model, which cannot only tackle with variables in short time, but can handle with data integrated by purely I(0), purely I(1) or the mixture of both I(0) and I(1). Moreover, Zivot–Andrews (ZA) test (Zivot and Andrews 1992) is utilized to check the stationarity of variables.

The main idea of ARDL co-integration test is the bound test, which is based on *F*-statistic. If the calculated *F*-statistic is higher than the upper bounds, it means there exists long-run co-integration; if calculated *F*-statistic is below the lower bounds, ARDL model is invalid; if calculated *F*-statistic is between lower and upper bounds, then ARDL model is considered to be inconclusive. Besides, if *F*-statistic is between lower and upper bounds, error correction term (ECM) model is a useful way to make the variables be co-integration. The ARDL model of Eq. (1) is as follows:

$$\Delta \mathrm{Ele}_t = \alpha_0 + \sum_{k=1}^{n} \alpha_{1k} \Delta \mathrm{Ele}_{t-k} + \sum_{k=0}^{n} \alpha_{2k} \Delta \mathrm{IVA}_{t-k} + \sum_{k=0}^{n} \alpha_{3k} \Delta \mathrm{LL}_{t-k} + \sum_{k=0}^{n} \alpha_{4k} \Delta \mathrm{IS}_{t-k} + \gamma_0 \mathrm{Ele}_{t-1} + \gamma_1 \mathrm{IVA}_{t-1} + \gamma_2 \mathrm{LL}_{t-1} + \gamma_3 \mathrm{IS}_{t-1} + \varepsilon_t \tag{2}$$

where Δ represents the first difference of the variable; α_0 represents constant; ε_t is white noise error term, $\alpha_1 - \alpha_5$ are error correction dynamics; $\gamma_0 - \gamma_4$ represents the long-run relationship among the variables in the model.

Meanwhile, the ARDL-ECM model is established as follows:

$$\Delta \mathrm{Ele}_t = \varphi_0 + \sum_{k=1}^{n} \varphi_{1k} \Delta \mathrm{Ele}_{t-k} + \sum_{k=0}^{n} \varphi_{2k} \Delta \mathrm{IVA}_{t-k} + \sum_{k=0}^{n} \varphi_{3k} \Delta \mathrm{LL}_{t-k} + \sum_{k=0}^{n} \varphi_{4k} \Delta \mathrm{IS}_{t-k} + \lambda \mathrm{EC}_{t-1} + \varepsilon_t \tag{3}$$

where λ indicates the rate of deviation from equilibrium and EC_{t-1} is the error term of Eq. (1).

2.2.3 Correlation analysis

Based on the academic research on the definition of line loss, we can conclude that the statistical method of line loss in China is quite different from that in America. In order to further demonstrate whether line loss is a reason that broadens the deviation, a correlation analysis between industrial value added (IVA), industrial electricity consumption (Ele), industrial electricity consumption without line loss (Ele1) and line loss (LL) was carried out by Eviews 9.0.

Besides, in order to clarify line loss record in which industry, a correlation analysis needs to be created.

3 Data

This section discusses the variables used throughout the analysis, their measurements and data sources. This study is extended from 2011.1 to 2016.12, for which data are integrity and comparability. The data of value added of large industrial enterprises and high energy consumption industrial value added are obtained from Anhui Provincial Bureau of Statistics. The consumption of electricity in month of industry and line loss data in month is directly obtained from the State Grid Anhui Electric Power Company. Data on gross domestic product (GDP) in quarter are obtained from Statistics Bureau of Anhui Province. Where, the tertiary industrial value added (TVA) is indicated by value added from Hotels and Catering Services and Wholesale and Retail Trades industries, which are relatively high electricity consumption industries in the tertiary industry. GDP of primary industry (PVA) is indicated by value added of agriculture, forestry, animal husbandry and fishery industries. In this paper, electricity consumption in month is expressed in terms of 10^8 kilowatt hours (kWh). Moreover, in order to avoid the price influence, value added of industry has been transformed to standard prices for the base period of 2011. As there is no data on industrial value added in January and February from 2014, it is approximated by the accumulated data of February

Table 1 Results of augmented dickey-fuller test statistics (automatic—based on AIC, maxlag = 9)

Variables	ADF test			
	Level	Difference	1% critical value	MacKinnon *P*
Ele	− 4.421094	I	− 3.542097	0.0000
IVA	− 8.531483	I	− 3.542097	0.0000
LL	− 7.443122	0	− 3.528515	0.0000
IS	− 11.00409	I	− 3.528515	0.0001

Authors carry out the results using Eviews 9.0

Table 2 Results of Zivot–Andrews (ZA) tests

Sequence	Level		(BIC lag method)	
	Intercept	Intercept and trend	Intercept	Intercept and trend
IE	− 8.947*	− 8.945*	− 8.947*	− 8.945*
IVA	− 10.114*	− 10.025*	− 10.114*	− 10.025*
IS	− 6.464*	− 6.436*	− 6.464*	− 6.436*
LL	− 8.601*	− 8.597*	− 8.601*	− 8.597*

*,** and *** declare statistical significance level of 1, 5 and 10%, respectively

and the historical data of industrial value added in 2011–2013. Meanwhile, when estimated the industrial value, the impacts of Spring Festival have been considered.

4 Results and discussion

4.1 ARDL model analysis

4.1.1 Stationarity tests

To check the stationarity of variables chosen in the ARDL model, the ADF test is used. Moreover, the ADF test is computed by Eviews 9.0 (Ma et al. 2016). Table 1 reports the results of the ADF test on the integration properties of Ele, IVA, LL and IS in Anhui Province. Results of the ADF tests indicate that LL factor is found to be stationary; however, Ele, IVA and IS variables are stationary at their first differences, i.e., I (1). In terms of this fact, ordinary least square (OLS) estimation method turned to be invalidation. Therefore, ARDL mode is set up to estimate the coefficients.

ARDL model requires none of the variables should be I (2) in a structural break. Thus, the Zivot–Andrews test (ZA) is also operated in our paper. ZA test results are calculated by Eviews 9.0. As indicated in Table 2, none of the variables has a unit root with structural break in the intercept. Hence, ARDL model can be implemented.

Table 3 Lag length selection criteria for co-integration VAR lag-order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	− 883.5239	NA	51015815	29.09914	29.23756	29.15339
1	− 781.7203	186.9179	3065983.	26.28591	26.97800	26.55715
2	− 754.0299	47.21000	2104920.	25.90262	27.14838	26.39084
3	− 719.7909	53.88433	1178377.	25.30462	27.10405	26.00983
4	− 675.2901	64.19775	478891.3	24.37017	26.72327*	25.29237
5	− 650.6179	32.35697	381393.5	24.08583	26.99261	25.22503
6	− 615.8040	41.09187	224605.4	23.46898	26.92943	24.82517
7	− 581.7421	35.73709*	141251.6	22.87679	26.89091	24.44996
8	− 560.5976	19.41132	143358.3	22.70812	27.27591	24.49828
9	− 532.7280	21.93023	125823.6*	22.31895	27.44041	24.32610*
10	− 510.4298	14.62177	147392.7	22.11245*	27.78759	24.33659
11	− 494.9627	8.113882	252755.3	22.12992	28.35873	24.57105

Authors carry out the results using Eviews 9.0

* indicates lag order selected by the criterion

Table 4 Results of normality, Lagrange multiplier test, heteroscedasticity and Ramsey's regression specification error test (RESET)

Test statistic	LM version
Lagrange multiplier test	CHSQ(12) = 17.8503 [.120]
Ramsey's RESET	CHSQ(1) = .20558 [.650]
Normality	CHSQ(2) = .071667 [.965]
Heteroscedasticity	CHSQ(1) = .094286 [.759]

Authors carry out the results using Eviews 9.0

4.1.2 Optimal lag length selection and Co-integration

ARDL approach is based on the number of regressions $(P + 1)^k$, where P is the number of the maximum lags; K is the number of variables in each equation. According to Bahmani and Brooks (2003), F-statistic is quite sensitive to the number of lags in the ARDL model (Ahmad and Du 2017), choosing an optimal lag length becomes very important. LR, FPE, AIC, SC and HQ criterions are comprehensively considered, i.e., the majority will be selected in this paper. According to the criterions, the optimal lag length is selected as 9 in this paper (Table 3). Moreover, this result is carried out by Eviews 9.0 (Arshed 2015).

In case of running ARDL, there are some additional preconditions, such as autocorrelation, normality, specification and heteroskedasticity diagnostic tests, being checked (Table 4). Table 4 shows that serial correlation of the model is significant at 5% in the Lagrange multiplier test. So we could conclude that there is no autocorrelation among the variables at 5%. Similarly, both normality and heteroskedasticity are also insignificant. Hence, there are no apparent issues with running ARDL model.

Having checked the requirements of the ARDL, we move to estimate the F-statistics (Table 5). As Table 5 illustrated, when Ele is taken as a dependent variable, IVA, LL and IS are taken as independent variables, the F-statistic is 5.518127, which is greater than the upper bounds at 1% level of significance. So, we conclude that there exists a long-run

Table 5 ARDL bounds test for the existence of co-integration

Test statistic	Value	k
F-statistic	5.518127	3
Significance	I0 Bound	I1 Bound
Critical value bounds		
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Authors carry out the results using Eviews 9.0

association among the variables. Then, the long-run and short-run coefficients of Eqs. (1) and (2) are derived.

4.1.3 Long-run and short-run estimation results analysis

Long-run and short-run coefficients of the ARDL model are reported in Table 6. Table 6 reveals that all variables are positive and are all significant at 5% level. Both the long-run and short-run estimated results all demonstrate that except IVA factor, IS and LL factors generate positive impacts on the electricity consumption too. Therefore, when IS and LL changes unexpectedly, the deviation between the growth rate of IVA and Ele appearing is rational. However, why the deviation didn't show historically? Reasons might be assigned to the IS and LL factors. For IS factor, it belongs to the industrial structure adjustment in recent years. Traditionally, the increase in economic growth is depended on heavy industries, which are typically high energy-consuming industries. However, under the process of destocking and the internal industry reforming, production of high value-added products of energy-intensive increased, while, low value-added products of energy-intensive decreased. For example, the proportion of panel products is 40.9% in 2013, which increased to 51.8% in 2016 in Masteel, a representative iron and steel production company in Anhui Province. For LL factor, the reason is perhaps that LL includes the consumption of electricity of tertiary industry and residents. With the development of economy, the disposable income increased. Air conditioning capacity

Table 6 The estimates results of ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-run coefficients estimated results				
LL	2.655544	0.964477	2.753352	0.0099
IVA	0.132884	0.017122	7.761202	0.0000
IS	3.806204	0.868038	4.384834	0.0001
C	− 95.935180	29.203351	− 3.285074	0.0026
Short-run coefficients estimated results				
D(LL)	1.462821	0.100658	14.532554	0.0000
D(IVA)	0.066201	0.009681	6.838177	0.0000
D(IS)	1.684223	0.513463	3.280121	0.0026
ECM(− 1)	− 0.755498	0.135106	− 5.591903	0.0000

per 100 households of rural resident, which become one big consumer of electricity, is 30.74 in 2011, while in 2015, the capacity per 100 households of rural resident is 55.38, increasing 1.8 times.

Noticeably, among the three positive factors, the increasing influence generated by LL factor is higher than that exerted by IVA factor, in both long-run and short-run equations.

4.1.3.1 Long-run estimated results analysis IS, which is illustrated by primary energy-intensive industrial value-added account for the whole industrial value added, has been considered to be a decisive factor in the increase in the electricity consumption of industry (Lin et al. 2010; Xiao and Li 2015). The similar conclusion is obtained in this research too. After reducing excess capacity policy put forward in 2012.10, the proportion of primary energy-intensive industrial value-added accounts for the whole industrial value added declined obviously (Fig. 3), which dropped from 17.4 to 10.9%, during 2012–2016. Therefore, the consumption of electricity caused by the IS factor decreases, leading to the deviation expands (Fig. 3). Conversely, this also demonstrates that the adjustment of the internal industrial structure will bring about the consumption of electricity decreasing. Assuming that the speed of industrial structure adjustment remains unchanged, i.e., the average growth rate of which is − 1.5%, the consumption of industrial electricity will save 19.03×10^8 kWh in Anhui Province during 2017–2020.

However, as Fig. 3 depicted, in January, February, July and November, during 2012–2016, the inconsistency between the growth rate of economic growth and electricity consumption still cannot be rectified. Fortunately, the impact of line losses, i.e., transmission and distribution losses, data collection time-frame differences and the estimation error, is calculated in this paper by ARDL model (Table 6). Table 6 shows that when line losses increase 1×10^8 kWh, the electricity consumption (including line losses) will increase 2.66×10^8 kWh. The increase in line loss produced an expanded effect on the industrial electricity consumption. The relationship between electricity consumption and line losses is pictured in Fig. 4, which shows the trend of electricity consumption is almost in accordance with that of line loss. Moreover, line loss, which has been qualitatively analyzed in Sect. 2, should not be included in industrial electricity consumption too.

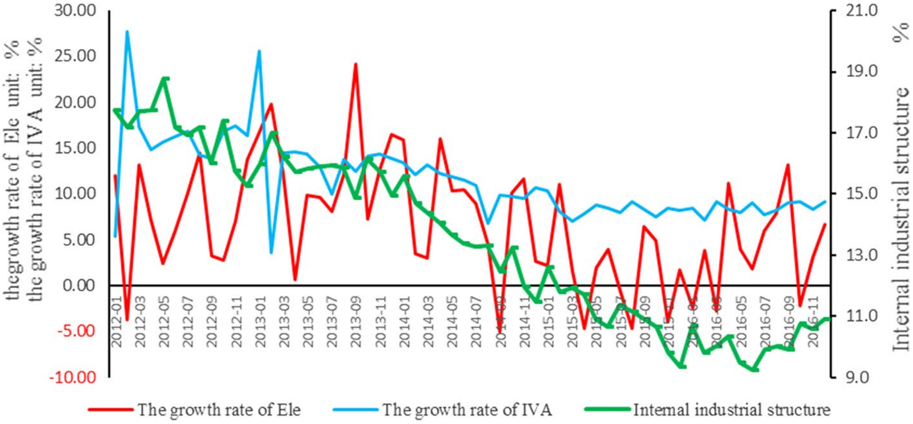

Fig. 3 The change of internal industrial structure, growth rate of Ele and IVA during 2012.01–2016.12

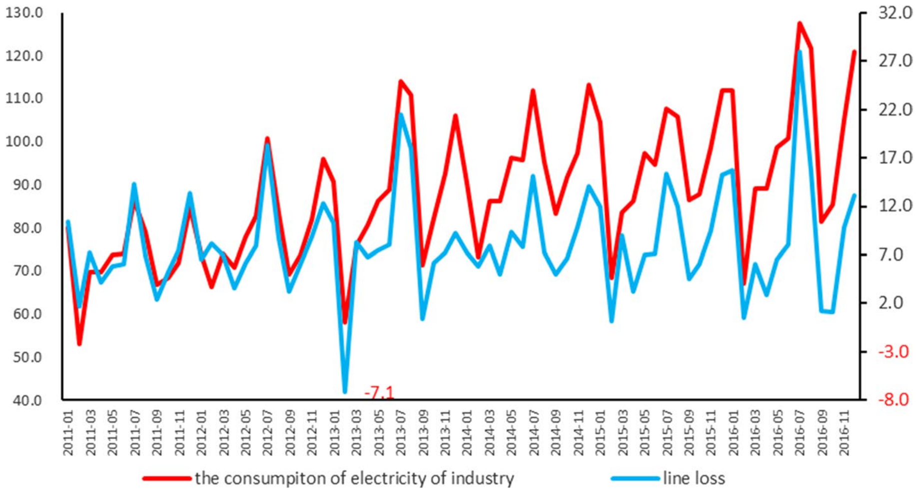

Fig. 4 The relationship between electricity consumption of industrial without line loss and economic growth and internal industrial structure

4.1.3.2 Short-run estimated analysis Next, according to the short-run equation, we fixed the deviation between Ele and IVA. Modified electricity consumption of industry is calculated as follows:

1. Computing the average level of line loss and internal industrial structure in history. For example, the average level of line loss in year t month m is (Average($\mathrm{LL}_{t-1} + \mathrm{LL}_t$);
2. Measure variations of LL and IS in each month firstly, i.e., ($\Delta\mathrm{LL}_{m,t} = \mathrm{LL}_{m,t} - \mathrm{average}(\mathrm{LL}_{m,t-1} + \mathrm{LL}_{m,t})$); then calculating the short-run estimated coefficients of LL and IS (Table 8) multiply by the variations of LL and IS, respectively;
3. Counting the modified electricity consumption, i.e., make the original electricity consumption of industry in month m year t minus the results of step 2.
4. Calculating the modified Ele growth rate.

As Fig. 5 pictured, if industrial power consumption does not include the influence of line loss and internal industrial structure fluctuation, the deviation between Ele growth rate and IVA growth rate will almost shrink.

4.2 Correlation analysis

In order to investigate the relationship among line loss, IVA, Ele and Ele1, the correlation coefficients are calculated by Eviews 9.0. As Table 7 illustrated, there is not any correlation between line loss and industrial value added. Further, if line loss was eliminated from the industrial power consumption, the correlation coefficient between Ele and IVA will become stronger.

In order to investigate the line loss has correlation with which industry, another correlation analysis is established. The estimated results are pictured in Table 8. As shown in Table 8, line loss has more correlation with TVA. Data collection time-frame differences

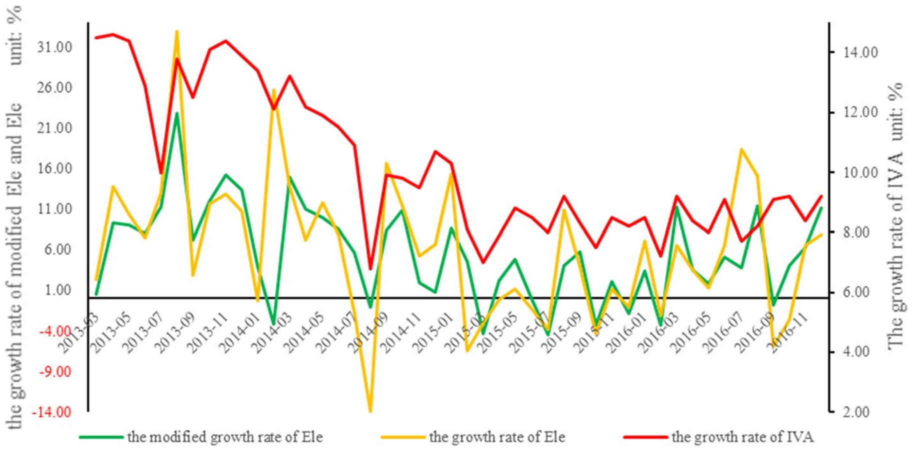

Fig. 5 The relationship between Ele, IVA and modified Ele during 2013–2016

Table 7 The correlation analysis between line loss and Ele, Ele1, IVA

Correlation *t*-Statistic Probability	Ele	Ele1	LL	IVA
Ele	1.000000			
	–			
	–			
Ele1	0.962493	1.000000		
	29.68166	–		
	0.0000	–		
LL	0.785625	0.588312	1.000000	
	10.62384	6.087027	–	
	0.0000	0.0000	–	
IVA	0.678066	0.795686	0.205373	1.000000
	7.718501	10.99073	1.755699	–
	0.0000	0.0000	0.0835	–

can be the reason. As Fig. 6 depicted, the consumption of power use of tertiary industry varied violently with line loss. However, line loss also included the transmission and distribution losses, which are generated by power transmission and distribution department. Therefore, based on the research results, we suggest that line losses should be excluded from the social electricity consumption in China.

5 Conclusions

This paper undertakes three methods, i.e., theoretical approach, ARDL model and correlation analysis, to investigate whether line loss broadens the deviation between IVA and Ele. Owing the data availability's advantage, Anhui Province is selected to be our research

Table 8 The correlation coefficients between LL and GDP, GY, NLMY and SC

Correlation *t*-Statistic Probability	GDP	IVA	TVA	PVA	LL
GDP	1.000000				
	–				
	–				
IVA	0.814730	1.000000			
	6.590466	–			
	0.0000	–			
TVA	0.972417	0.807227	1.000000		
	19.55443	6.414721	–		
	0.0000	0.0000	–		
PVA	0.531015	− 0.040798	0.462822	1.000000	
	2.939332	− 0.191517	2.448895	–	
	0.0076	0.8499	0.0228	–	
LL	0.480839	0.390017	0.572617	0.272079	1.000000
	2.572210	1.986668	3.276086	1.326194	–
	0.0174	0.0596	0.0035	0.1984	–

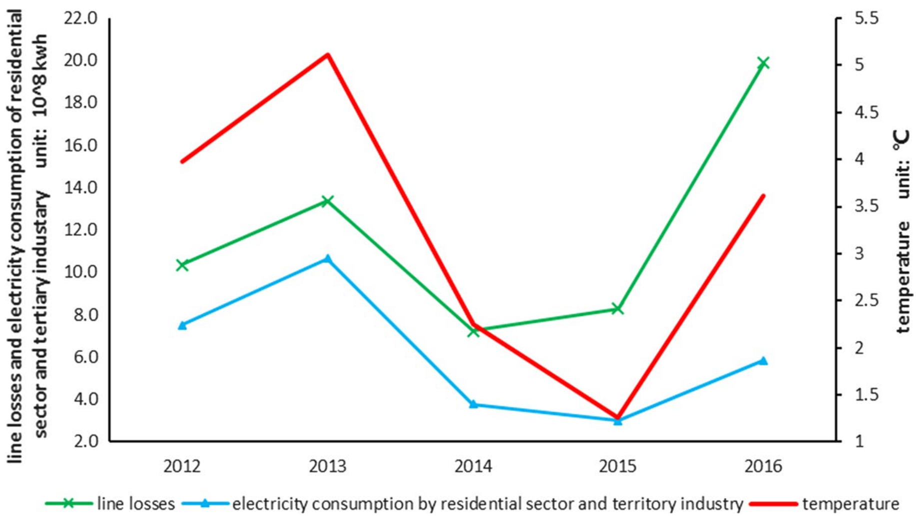

Fig. 6 The increase in line loss, electricity consumption of residential sector and tertiary industry and temperature in July compared to June during 2012–1016 in Anhui Province in China

object. The study period is extended from 2011.1 to 2016.12. According to the theoretical and empirical results, several conclusions are generated as follows:

1. Based on the theoretical approach, we conclude that the definition of line loss of China just includes a part of the line loss of America, while, the calculating equation of line

loss is fixed as the same as America. So, line loss included in industrial electricity consumption seems to be not reasonable in China.

2. Built on the ARDL model, we proved that there exists a co-integration relationship among line loss, industrial structure, industrial value added and electricity consumption of industry. Besides, line loss is a positive factor of industrial electricity demand, whose impact ranked second. When line loss increased 1×10^8 kWh, the electricity demand of industry will increase 2.66×10^8 kWh in the long-run relationship.
3. On the strength of ARDL model, one conclusion is that if the growth rate of IS remains − 1.5% per year, the electricity consumption of industry would save 19.01×10^8 kWh during 2017–2020 in Anhui Province. Therefore, we suggest that National Development and Reform Commission continue to vigorously promote the internal industrial structure upgrading policies.
4. According to the ECM model, if the increased power consumption of industry caused by the varieties of IS and LL are subtracted, the deviation between the growth rate of IVA and Ele will almost be shrunk.
5. In view of the correlation analysis, line loss has been demonstrated and has no linkages with IVA. Moreover, it has close relation with TVA.
6. Based on both the qualitative analysis and the quantitative analysis, we suggest the statistical department amend the original statistical method of line loss, i.e., separating line loss from the total electricity consumption of the whole society.

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