Thanks very much for reviewer’s opinion, we have re-fitted China's lime production and extended its age to 1930.

The USGS records China's lime production from 1990 to 2020, but they are all estimates. In China, the only record of China's lime production is the "China Building Materials Industry Yearbook", whose values are provided by the China Lime Association. Its dataset is shown in Figure 1 for actual production, covering the years 1996-2014 and 2019-2020. Considering that the downstream sectors of lime in China mainly include construction, steel, calcium carbide, and alumina, we collected China's cement production (1930-2020), total housing area completed (1963-2020), steel production (1949-2020), calcium carbide production (1949-2020), and alumina production (1954-2020) as variables to fit the lime data. We have adopted the multivariate linear regression method you suggested. In order to avoid multicollinearity, a stepwise method is used to establish a model. The dependent variable in the model is lime yield, and the independent variable is calcium carbide yield, the completed area of houses in the whole society, cement yield and alumina yield. The determination coefficient of the model is 0.9954, and the adjusted determination coefficient is 0.9942. Given that data on the completed area of housing in the whole society is limited to after 1963, the model only predicts lime production data from 1963-1995 and 2015-2018 (that is, the red line in Figure 1, the shaded part is the 95% confidence interval of the estimation result).

For China's lime production data before 1963, we use the ARIMA model to make predictions. The method is divided into two parts. For 1949-1962, taking China's lime production from 1962 to 2020 as the verification sequence, using the ARIMA (0,1,0) model, taking steel production, calcium carbide production, and cement production as external control variables, the model has a coefficient of determination of 0.9828 (as shown in Figure 2). For the period from 1930 to 1948, using China's lime production data from 1949 to 2020 as the validation sequence, the ARIMA (2,2,0) model without external control variables was used for fitting, and the determination coefficient of the model was 0.9786 (as shown in Figure 3).

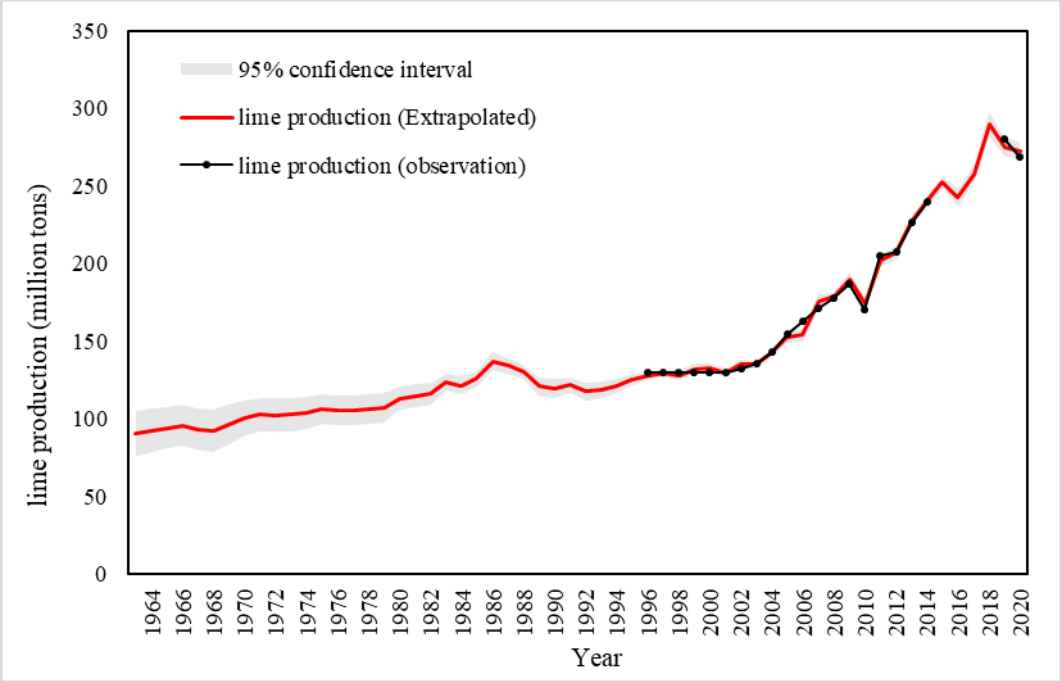

Fig 1. China's lime production estimation in1963-2020

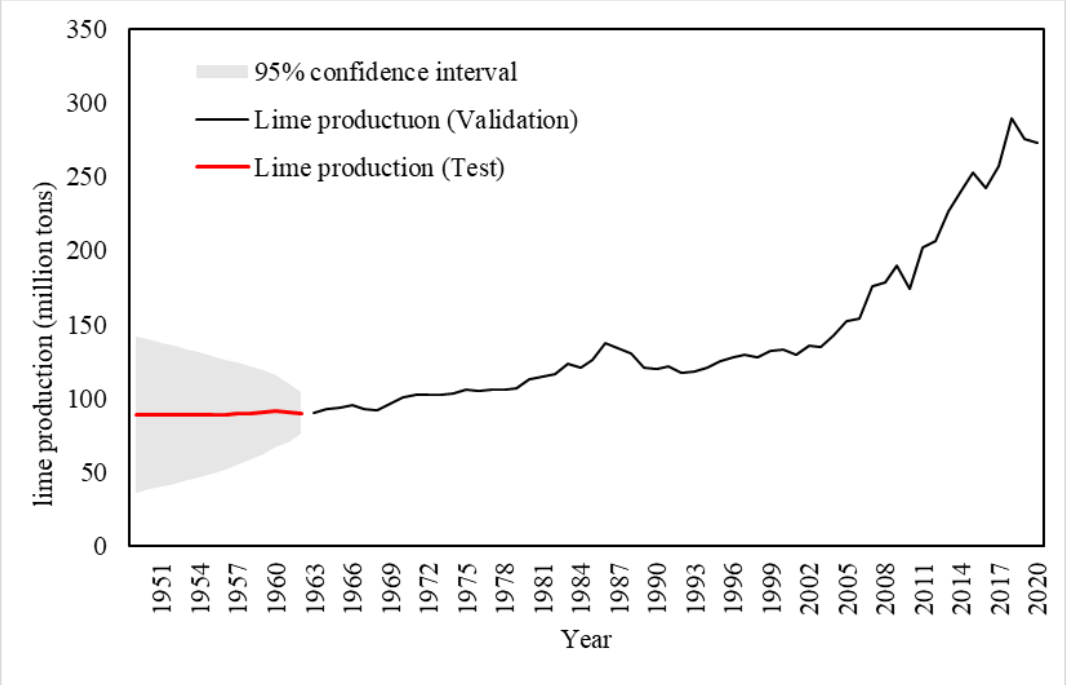

Fig 2. China's lime production estimation in 1949-1962

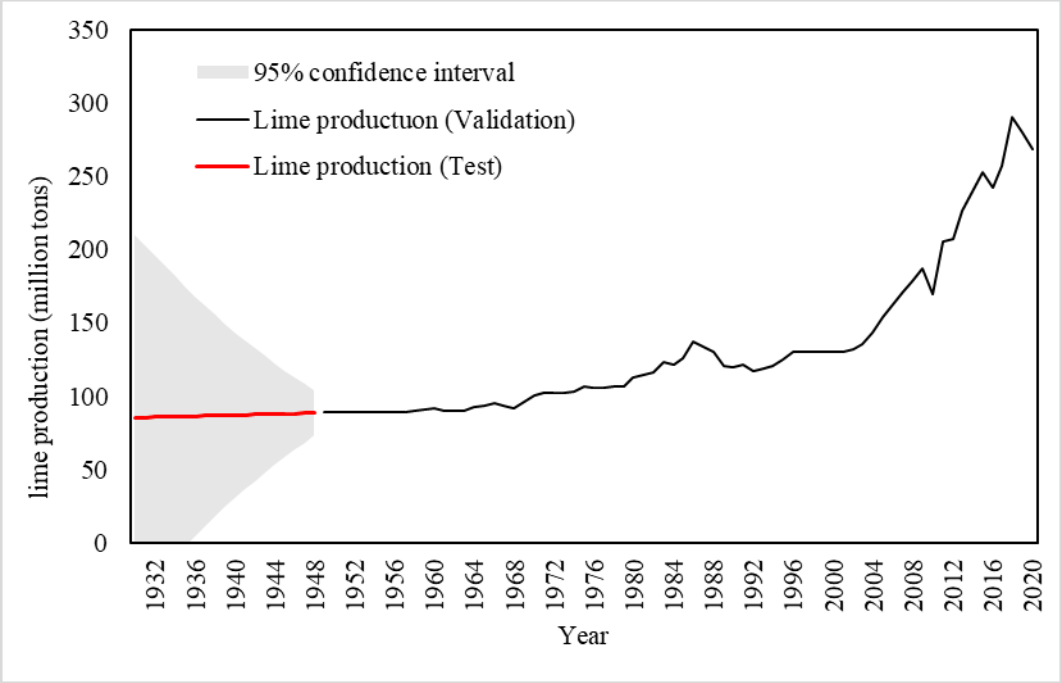

Fig 3. China's lime production estimation in1930-1948

Regarding the different growth rates of lime production and other variables mentioned by reviewer, first of all, the independent variable we selected is the downstream sector of lime, and there is a significant correlation between these variables and lime production (as shown in Table 1).

Table 1 Correlation coefficient matrix

	Calcium carbide production	Crude steel production	Floor Space Completed	Cement production	Alumina production	Lime production
Calcium carbide production	1					
Crude steel production	0.980**	1				
Floor Space Completed	0.951**	0.974**	1			
Cement production	0.972**	0.990**	0.979**	1		
Alumina production	0.980**	1.000**	0.974**	0.990**	1	
Lime production	0.982**	0.979**	0.970**	0.969**	0.979**	1

**. Correlation is significant at the 0.01 level (2-tailed).

However, although the correlation between the various variables is strong, their growth rates are quite different. Considering the comparability between the various variables, we normalized the time series data of each variable from 1963 to 2020. The normalized growth rate of each variable is shown in Table 2. It can be seen that our fitted lime production growth rate was 341% from 1963 to 2020 and 84% from 1963 to 2002, which was similar to the growth rate of each explanatory variable.

Table 2. Growth rate of each variable after standardization

	Lime	Calcium	Crude steel	Floor Space	Cement	Alumina

	production	carbide production	production	Completed	production	production
Growth rate from 1963 to 2020	341%	416%	446%	221%	338%	557%
Growth rate from 1963 to 2002	84%	60%	74%	127%	101%	40%

In the process of fitting, we drew on data provided in the Global Carbon Project's fossil CO2 data. The source of lime yield data in our study is the same as that of Shan et al. (2002-2012) and Cui (2003-2016), namely Almanac of the Chinese Building Materials Industry. In Liu and Wang's study, the lime yield data from 1980 to 1990 was mentioned, but as mentioned in your discussion, this part of the data is being underestimated, and we also used our method to fit according to this data as a verification sequence, but the result was not what we hoped, and the yield of the fitted value even appeared negative. Regarding Olivier's research, I'm sorry we didn't find the reference, but through your report, we learned that the research interpolates the lime production in China. The first key reference point is China's first national communication in 1994. Since the national communication has only two years of data, and Shan et al. pointed out in their study that the data on lime production in these two reports were unreasonable and regarded as abnormal values, they were not used in our study. It was used as a reference.

It is worth mentioning that, in our estimation, China's lime production peaked in 1986, and showed a downward trend from 1986 to 1990. During this period, China's "Seventh Five-Year Plan" period, the government carried out timely rectification of the overheated economic development in the previous period. It can also be seen from the data of various variables that during this period, the area of completed housing in the whole society has dropped significantly, the output of calcium carbide has fluctuated, and the output of cement and alumina has changed. The trend is similar with study by Liu and Wang et al.