Research on the Development of Inclusive Finance in Rural Areas of Shaanxi Province and Its Poverty Reduction Effect

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Abstract: *Based on the data of rural areas in Shaanxi Province in 2005-2016, this paper measures the development level of inclusive finance in rural areas of Shaanxi from six dimensions by means of factor analysis, and constructs the regression model on the basis of this, and studies the relationship between inclusive financial development and poverty alleviation. The results show that the development level of inclusive finance in rural areas of Shaanxi province is increasing, and the increase is increasing. Linear regression model shows that inclusive finance has the effect of poverty reduction. Curve estimation results show that three curves can better fit the relationship between inclusive finance and poverty, and the development of inclusive finance can promote the alleviation of poverty, but in the low level of inclusive financial development, its contribution to poverty alleviation shows a decreasing phenomenon, when inclusive finance has developed to a certain level, Its mitigation effect on poverty has shown an increasing phenomenon.*

Keywords: Inclusive finance；Poverty reduction；Rural areas

1. Introduction

From 1978 to 2018, after 40 years of reform and opening up, China's economic development has made great achievements. At the same time, with the rapid economic development, the gap between the rich and the poor has gradually widened. In order to solve this problem, China has taken many measures in terms of concepts, model policies and so on. In the context of a market economy, Promote rural poverty alleviation by vigorously developing inclusive financehas become a sustainable financial development model and an important measure for precise poverty reduction.

Inclusive finance was first proposed by the United Nations in the "International Year of Microcredit" in 2005. Since then, countries have responded and actively established an inclusive financial system. In 2013, China wrote the concept of inclusive finance into the party's resolution and proposed to "develop inclusive finance." With the rapid development of Internet technology, the voice of developing diversified inclusive finance is getting higher and higher. In 2016, the "Promoting Inclusive Financial Development Plan (2016-2020)" was issued, indicating that China's attention to the development of inclusive finance has been continuously enhanced.

The development of inclusive finance is to provide fair financial services to all sectors and groups of society, to benefit all sectors of society, and to focus on poor and low-income groups that cannot be covered by traditional financial services. China defines inclusive finance as: providing appropriate and effective financial services to all sectors and groups of society with financial services needs at an affordable cost by increasing policy guidance and support, strengthening financial system construction, and improving financial infrastructure.

Most of the poor people in China gather in rural areas. To promote economic development in rural areas, it is necessary to establish an efficient financial service system in rural areas and actively promote the development of inclusive finance in rural areas. It has important theoretical and practical significance for financial reform and poverty alleviation in rural areas.

2. Literature Review

2.1 Status of domestic research

Domestic research on inclusive finance is mainly based on the calculation of the inclusive financial index and the relationship between inclusive finance and poverty alleviation. The former is also the research basis of the latter. The research on the measurement of the inclusive financial development index is mainly different in two aspects, one is the determination of the weight of each index, and the other is the synthesis method of the index. Existing research has two main methods in determining weights, namely subjective weighting and objective weighting, subjective empowerment such as analytic hierarchy process (Jiao Jinpu et al., 2015) and equal weight method (CaiYangping, 2015), objective empowerment such as Coefficient of variation (Han Xiaoyu, 2017) and entropy weight method (Zhang Xiaolin et al., 2016). There are three main methods of index synthesis, one is the weighted geometric mean method (LuoSidan et al., 2016), the other is the method of compiling HDI (Jiao Jinpu; Han Xiaoyu)and the third is the principal component analysis method (Ma Yingfei, Du Chaoyun, 2017) or factor analysis method (Yang Jun et al., 2016).

Domestic research on the relationship between inclusive finance and poverty alleviation has produced two main conclusions: The first is that inclusive finance contributes to the reduction of poverty (Han Xiaoyu; Ma Yufei, Du

Chaoyun). Han Xiaoyu's test by vector autoregressive model found that inclusive finance has obvious poverty reduction effects and is a one-way Granger cause of the gap between rich and poor. Ma Yufei and Du Chaoyun analyzed the mechanism of inclusive financial poverty alleviation. Empirical research proves that inclusive finance is conducive to poverty alleviation. The second conclusion is that inclusive finance can promote poverty reduction and reduce poverty reduction (Li Tao et al., 2015; GuoQianqian, 2017). Li Tao studied the relationship between inclusive finance and economic growth. The results show that inclusive financial development is in line with the law of diminishing marginal returns, which can promote economic growth and may also damage economic growth. GuoQianqian uses time fixed effect model to analyze the impact of inclusive financial development on farmers' income.The results show that there is a clear linear relationship between the two in the short term.The higher the economic development, the more obvious the effect of poverty reduction.On the contrary, inclusive financial development inhibits the growth of farmers' income. The threshold effect is obvious.In addition, the results of LuoSidan et al. also show that there is a "U-shaped" relationship between inclusive financial development and poverty alleviation, showing interval effects and significant threshold characteristics.

2.2 Status of foreign research

The study of inclusive finance abroad mainly focuses on the evaluation of the development level of inclusive finance. Gupte et al. (2012) used the geometric mean method to measure the level of inclusive financial development in India in 2008 and 2009. NoeliaCáamara et al. (2014) used a two-stage principal component analysis to measure the inclusive financial comprehensive index of 82 countries. The results show that accessibility is the most important dimension, and the development level of inclusive finance is highly correlated with macroeconomic conditions. DilipAmbarkhane et al. (2014) selected indicators from three dimensions: supply, demand and infrastructure, and used the Euclidean distance method to synthesize the inclusive financial development index of 21 Indian states in 2011, and then applied the influence of the resistance factor to the inclusive financial index, get the comprehensive inclusive financial index, and give the ranking of each state.

There are few scholar who directly study the poverty alleviation effect of inclusive finance abroad, but there are similar studies, and the research results show that inclusive finance has the effect of reducing poverty. Burgess and Pande (2005) empirically examined the impact of rural residents directly participating in financial activities on poverty，the results show that the more financial institutions are established, the more poverty will be reduced.Corrado (2017) analyzes the impact of inclusive finance on inclusive growth and development, and demonstrates that access to financial products has a direct impact on innovation and productivity, which can promote economic growth.HosseinJalilian et al. (2005) established the link

between financial development and economic growth, economic growth and poverty reduction.The results show that: above the threshold of economic development, the growth of the financial sector can promote poverty reduction, but income inequality caused by financial development will affect the effect of poverty reduction.The results of Cyn-Young Park et al. (2015) show that inclusive finance can significantly reduce poverty and reduce the income gap.In addition, the study in [14] also reached a consistent conclusion.

In summary, most scholars' research results show that inclusive finance can promote poverty alleviation, but there are still some shortcomings in the research process:First, on the scope of research, existing research is mostly based on national data, or research on a certain province, and there are differences in qualitative conclusions about whether inclusive finance has a poverty reduction effect. This may be due to the fact that the actual development of different provinces is different. At present, there is little research on rural areas in Shaanxi. The research results of other provinces may not be applicable to the province, which makes Shaanxi rural inclusive financial poverty alleviation practice lacks appropriate theoretical support.Second, in the method of determining the development level of inclusive finance, subjective empowerment will inevitably have errors, while the coefficient of variation method is objectively empowered, but it also has certain subjectivity.For example, when LuoSidan adopts the coefficient of variation method, it is assumed that the four dimensions are equally important, and the weights are all 1.However, in the dimension of constraints, only one indicator of the natural growth rate of the population is included. The other dimensions are relatively large, which makes the weight of the natural growth rate of the population too high compared to other indicators.In the exponential synthesis method,the weighted geometric mean method and the reference to HDI need to determine the weight first, and the factor analysis method can directly determine the weight according to the variance contribution rate, and directly perform the index synthesis. Therefore, this paper uses factor analysis to measure the development level of inclusive finance in rural areas of Shaanxi. The development level is measured to empirically analyze whether the development of inclusive finance can play a role in poverty reduction in rural areas in Shaanxi, in order to provide theoretical support for the practice of inclusive finance to promote poverty alleviation, and to enrich the research results of inclusive financial theory.

2.3 Measuring the development level of inclusive finance

2.3.1 Building indicator systems and data sources
This paper intends to select 13 corresponding indicators from the six aspects of financial service distribution density, accessibility, tolerance, use, insurance, post and telecommunications and Internet development, and build a comprehensive evaluation index system for inclusive finance in rural areas of Shaanxi Province.The distribution density shows how easy it is for farmers to obtain financial

services. This dimension directly reflects the degree of financial inclusiveness from the supply side.With the corresponding financial service foundation, whether farmers can really enjoy financial services is another problem.Therefore, from the two dimensions of accessibility and use, the situation of farmers' access to and utilization of financial services is expressed. These two dimensions directly reflect the degree of financial inclusiveness from the demand side.The tolerance of financial institutions includes two aspects, one is the asset bearing of traditional financial institutions, and the other is the development of post and telecommunications and the Internet. In the future, inclusive finance must rely on the Internet to develop efficiently. Therefore, the development of post and telecommunications and the Internet is a substitute indicator for the development of inclusive financial infrastructure. Finally, insurance, as one of the financial services that farmers have access to, can also be used to measure the development of inclusive finance. The data involved in this paper are derived from the regional data of the National Bureau of Statistics and the China Macroeconomic Database. In addition to the number of rural broadband access users, other data use relative indicators to reduce the problem caused by the inconsistent cardinality.A small amount of missing data is calculated by the average growth rate. The specific indicators are shown in the following table:

Inclusive financial comprehensive evaluation index system

Dimension	index
Distribution density	Number of financial institutions per square kilometer
	Number of employees in financial institutions per square kilometer
	Number of financial institutions per 10,000 people
	Number of employees in financial institutions per 10,000 people
Accessibility	Farmers' per capita deposit balance(Ten thousand yuan)
	Rural per capita loan balance(Ten thousand yuan)
Tolerance	The proportion of total assets of rural financial institutions to GDP(%)
Use	Household deposits as a share of GDP(%)
	The proportion of farmer loans to GDP(%)
Insurance situation	Rural pension insurance fund income as a share of GDP(%)
	Per capita share of rural endowment insurance fund income(Ten thousand yuan / 10,000)
Postal, internet	Rural broadband access users(Ten thousand households)
	Rural delivery route for every 10,000 people(Km/10,000)

2.3.2 Descriptive statistics
Using SPSS software for analysis, the following table is a descriptive statistic of the original data, which can easily see the minimum, maximum, average and standard deviation of each indicator.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
x1	12	11.92	13.70	12.6987	.46062
x2	12	82.82	110.90	95.3179	10.85630
x3	12	1.29	1.68	1.4728	.14434
x4	12	8.40	15.02	11.1883	2.42506
x5	12	.26	2.63	1.1411	.79780
x6	12	.52	2.99	1.3742	.82982
x7	12	2.06	4.72	3.1980	.84098
x8	12	1.38	2.64	1.8387	.41424
x9	12	1.51	3.00	2.4152	.48884
x10	12	.02	.06	.0329	.01474
x11	12	30.89	524.44	224.2809	188.81601
x12	12	17.01	188.00	70.6708	50.43503
x13	12	53.59	72.99	63.6975	7.28866
Valid N (listwise)	12				

2.3.3 Measurement results of the development level of inclusive finance
In the results of factor analysis, the correlation coefficient matrix of the original variables shows that except for the indicators x_1 and x_9, the other correlation coefficients are relatively high, indicating that there is a strong linear relationship, and the common factor can be extracted from it, which is suitable for factor analysis. The commonality of the variables shows that if all the eigenvalues are extracted by using the principal component analysis of the original 13 variables, then all the variances of the original variables can be interpreted, and the commonality of the variables is 1; when the eigenvalues are extracted according to the condition that the eigenvalue is greater than 1, the commonality of all the variables is high, and the information loss of each variable is less, and the overall effect of factor extraction is ideal.The cumulative contribution of the first factor is 79.986%; the cumulative contribution of the second factor is 92.046%. Finally, SPSS extracted two factors, which explained 92.046% of the total variance of the original variables. The information loss of the original variables is less, and the factor analysis effect is ideal. The gravel diagram also proves that the eigenvalues after the third factor are small and can be ignored, so it is appropriate to extract two factors. After the factor rotation, the variance contribution rates of the two factors are 79.541% and 12.505%, respectively, and the variance contribution rate will be used as a weight when calculating the factor composite score.The figure below shows the final output of the factor analysis given by SPSS:

Component Score Coefficient Matrix

	Component 1	Component 2
x1	-.001	.509
x2	.086	-.026
x3	.101	.115
x4	.092	-.026
x5	.097	.010
x6	.102	.088
x7	.084	-.122
x8	.089	-.023
x9	.060	.576
x10	.096	.029
x11	.099	.045
x12	.095	.017
x13	.086	-.049

According to the above component score coefficient matrix, the factor score function can be written F_1 and F_2. Then calculate the factor comprehensive score, that is, the contribution rate of each factor is rotated, and the comprehensive score is the sum of the scores of the factors multiplied by the corresponding weights. That is, the variance contribution rate of each rotated factor is the weight, and the comprehensive score is the sum of the scores of the factors multiplied by the corresponding weights.Then the final factor comprehensive score function is：$F = 0.79541F_1 + 0.12505 F_2$, By substituting all relevant values, you get:

$F = 0.0629X_1 + 0.0652X_2 + 0.0947X_3 + 0.0699X_4 + 0.0784X_5 + 0.0921X_6 + 0.0516X_7 + 0.0679X_8 + 0.1198X_9 + 0.08X_{10} + 0.0844X_{11} + 0.0777X_{12} + 0.0623X_{13}$

At this point, we can use the above formula to comprehensively take into account the indicators to measure the level of inclusive financial development in rural areas of Shaanxi from 2005 to 2016. The greater the value, the higher the level of inclusive financial development. The results are shown in the following table:

The development level of inclusive finance in rural areas of Shaanxi Province(2005——2016)			
years	IFI value	years	IFI value
2005	15.04	2011	33.46
2006	16.09	2012	46.36
2007	17.66	2013	51.93
2008	19.41	2014	56.75
2009	22.08	2015	67.46
2010	26.09	2016	73.12

According to the above table, it is easy to see that the development level of inclusive finance continues to increase, and the growth rate is increasing. This is due to the government's active investment in inclusive financial construction and the joint efforts of all walks of life, as well as the continuous development of the economy in rural areas.

3. Empirical Study on the Poverty Alleviation Effect of Inclusive Finance

3.1 Preliminary construction of the model

In order to study whether the development of inclusive finance contributes to poverty alleviation, this paper constructs the following linear regression model:

$$\text{pov}_t = \alpha_0 + \alpha_1 ifi_t + \alpha X + \varepsilon_t$$

Among them, pov_t is the poverty situation, ifi_t is the development level of inclusive finance, X is the control variable, ε_t is the random disturbance item, and parameter α_0 is the part that does not change with the variable. If $\alpha_1 > 0$, it indicates that inclusive finance has the effect of reducing poverty.

3.2 Select model metrics

This paper selects the per capita net income of rural areas in Shaanxi Province to measure poverty. The lower the per capita net income, the more impoverished,thecore explanatory variables (inclusive financial development level) use the above measurement data. At the same time, in order to avoid the influence of other possible factors on the research results, the model introduces relevant control variables, including employment (emp), economic development level (eco), agricultural mechanization level (fmp), education (edu) and government support for agriculture (gov). The employment situation is expressed by the rural employment rate. The level of agricultural mechanization is measured by the total power of per capita agricultural machinery. The education situation is replaced by the per capita cultural and educational entertainment consumption expenditure.The government's support for agriculture is expressed by the proportion of local finance's agricultural and forestry and water affairs expenditure to the GDP of the primary industry. The following figure shows the descriptive statistics of each variable. The three variables with relatively large changes are per capita net income, inclusive financial development index and education.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
pov	12	2052.63	10149.88	5114.3573	2666.10338
ifi	12	15.04	73.12	37.1208	21.08413
emp	12	.62	.84	.7283	.07730
eco	12	.19	.99	.5667	.29137
fmp	12	.60	1.53	1.0422	.32214
edu	12	296.07	2659.89	661.6533	672.90061
gov	12	.15	.33	.2503	.06119
Valid N (listwise)	12				

3.3 Empirical analysis

Using stepwise regression, SPSS constructed three models. The first introduced the level of inclusive financial development (ifi), the second introduced education (edu), and finally introduced the level of agricultural

mechanization (fmp).The three insignificant variables of employment, economic development and government support for agriculture are automatically excluded. The figure below gives a summary of the model:

Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.992[a]	.983	.982	360.10722	
2	.995[b]	.990	.988	292.91067	
3	.999[c]	.999	.998	113.26911	3.063

a. Predictors: (Constant), ifi
b. Predictors: (Constant), ifi, edu
c. Predictors: (Constant), ifi, edu, fmp
d. Dependent Variable: pov

The summary of the model shows that when only ifi is added, the goodness of fit of the model is 0.983, and the model fits well. The second model has a goodness of fit of 0.990. After adding all three variables to the model, the goodness of fit was 0.999, the model fits well, and the D-W test is also passed. Analysis of variance showed that all three models were significant. The residual analysis results show that the histogram of the residual is approximately symmetrical, with fluctuations between and at a relatively ideal level. The p-p graph of the normalized residual also shows that the residual is close to the normal distribution. A scatter plot of residuals and predicted values indicates that the model fit has no major problems and the results are also usable. The figure below shows the parameter estimates for the model:

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	459.489	217.597		2.112	.061		
	ifi	125.398	5.150	.992	24.351	.000	1.000	1.000
2	(Constant)	582.422	183.843		3.168	.011		
	ifi	113.111	6.499	.895	17.405	.000	.415	2.407
	edu	.504	.204	.127	2.473	.035	.415	2.407
3	(Constant)	-1313.308	271.883		-4.830	.001		
	ifi	29.910	11.788	.237	2.537	.035	.019	52.966
	edu	1.506	.160	.380	9.439	.000	.101	9.877
	fmp	4146.355	573.975	.501	7.224	.000	.034	29.312

It is easy to see from the above figure that after adding the variable "fmp", there is a serious multi-collinearity between the variables. In order to solve the problem of multi-collinearity, the simplest treatment method is adopted here, and the variable of agricultural mechanization level is eliminated. Using Model 2, based on the parameter estimation results of Model 2, the expression of the model can be written:

$$\text{pov}_t = 582.422 + 113.111 ifi_t + 0.504 edu_t$$

The coefficient of ifi is positive, indicating that the development level of inclusive finance is positively correlated with per capita net income. That is to say, when the development level of inclusive finance is raised, the per capita net income will also increase, which means that inclusive finance has the effect of reducing poverty. The coefficient 113.111 indicates that if the other variables are unchanged, every change of the development level of the inclusive financial development will cause an average change of 113.111 units per capita net income. Comparing the coefficients in the model, we can see that the coefficient of ifi is much larger than the coefficient of edu, indicating that the impact of the development of inclusive finance on poverty alleviation is far greater than the impact of

education, indicating that inclusive finance is the main influencing factor.

Noting the level of significance in the above table, the level of significance of education is greater than that of inclusive finance. According to the research of Zhu Yiming and Wang Wei, Inclusive Finance is heterogeneous in reducing poverty in areas with different stages of economic development. The previous measurement results also show that the growth rate of inclusive financial development in rural areas of Shaanxi Province is increasing, which depends on the rapid development of rural economy in Shaanxi Province in recent years. Therefore, the rapid development of rural economy in Shaanxi Province may cause non-linear impact of inclusive finance on poverty alleviation, so the performance of inclusive finance in the linear model is not very significant. In order to further study whether there is a nonlinear relationship between inclusive finance and poverty alleviation, SPSS is used for curve estimation. After preliminary analysis, the quadratic curve is not significant, and the cubic curve can be well fitted. In order to facilitate the comparison, two models of linear and cubic curves are generated at the same time. The following figure shows the model summary and parameter estimation:

Model Summary and Parameter Estimates

Dependent Variable: pov

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.983	592.952	1	10	.000	459.489	125.398		
Cubic	.996	651.528	3	8	.000	-2733.370	427.494	-8.034	.063

The independent variable is ifi.

It is easy to see that the goodness of fit of the linear model is 0.983, and the goodness of fit of the cubic curve model is 0.996. It is obvious that the curve model is better than the linear model. Although both models are significant, we take the optimal model, the cubic curve. The figure below also makes it easier to see that the cubic curve fits well.
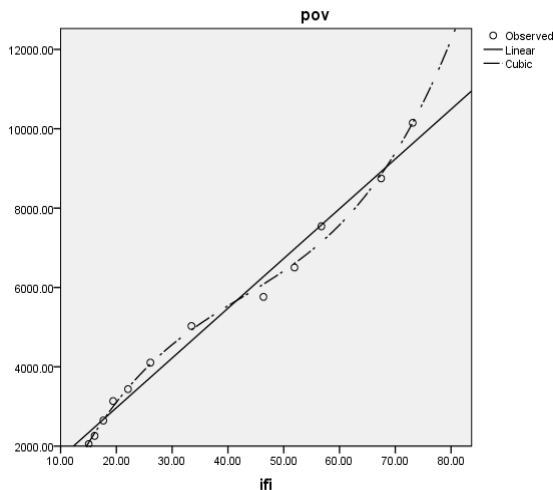
According to the parameter estimation results, the p values of each coefficient are less than 0.05, which is very significant, so the model expression can be written:

$$\text{pov}_t = -2733.370 + 427.494 ifi_t - 8.034 ifi_t^2 + 0.063 ifi_t^3$$

According to the above figure, the slope of the cubic curve first becomes smaller and then larger, indicating that the promotion effect of inclusive finance on poverty alleviation first decreases and then increases. That is to say, in the stage of low development level of inclusive finance, the development of inclusive finance can indeed promote poverty alleviation, but this effect is gradually weakened within a certain range, and when the level of inclusive financial development is at a higher stage, itstill has the effect of reducing poverty. The difference is that this effect will gradually increase and the effect of poverty reduction will be more obvious. This inspires us to actively promote inclusive finance in rural areas of Shaanxi Province and promote the development of inclusive finance to a higher level, which will effectively alleviate poverty. When the poverty alleviation effect of inclusive finance is gradually weakened, we cannot stop developing inclusive finance. It should continue to support its development. When crossing the inflection point, inclusive finance will greatly reduce poverty. At the same time, the development of inclusive finance depends on a certain foundation of economic development. Therefore, while promoting the continuous development of inclusive finance, we must also actively promote the development of the economy itself, and then promote the rapid development of inclusive finance.In this way, we can better play the poverty alleviation effect of inclusive finance and realize poverty alleviation in rural areas in Shaanxi Province as soon as possible.

4. Main Conclusions and Related Countermeasures

Through the above research, the following conclusions can be drawn: (1) The development level of inclusive finance in rural areas in Shaanxi Provinceshows an increasing trend, and the growth rate is increasing. (2) The results of the linear regression model show that inclusive finance has the effect of reducing poverty, and the improvement of education will also promote poverty alleviation to some extent. (3) The curve estimation results show that the cubic curve is better than the linear model, and when the development level of inclusive finance is low, the promotion effect of inclusive finance on poverty alleviation shows a diminishing phenomenon；when inclusive finance develops to a certain level, its slowing effect on poverty has shown an increasing phenomenon. Based on these findings, in order to improve the poverty situation in rural areas of Shaanxi Province, in addition to some financial means such as precision poverty alleviation, actively developing inclusive finance will be a good sustainable strategy.Specifically do the following four points:

First, the development of inclusive finance should be based on a certain level of economic development, and cooperate with other means to actively promote regional economic growth, so that the poverty alleviation effect of inclusive finance can play a greater role.

Second, we must actively respond to the call of the state, build an organizational leadership system for local inclusive financial development, strengthen top-level design, actively improve relevant laws and regulations, and create a suitable environment for the development of inclusive finance.

Third, from the perspective of the supply side of inclusive financial services, encourage the development of financial institutions at all levels that provide inclusive financial services. At the same time, under the background of "Internet +", we will actively innovate financial products and explore diversified inclusive financial services.

Fourth, from the demand side of inclusive financial services, strengthen the level of education. Especially for farmers, strengthen financial education, improve farmers' financial literacy, and pay attention to cultivating the ability of rural residents to use the Internet and mobile terminals.

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