

Utilising Capital and Labour Force to Increase Economic Growth

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Abstract: This research, based on the data of Chinese capital, labor force and economic output from 1978 to 2008, studied the relationship between the allocation of capital and labor force and the relationship between economic growth and them. Economic growth is generally measured by the level of total output, and the production process is inseparable from the input of various production factors. The result presented in the passage is the estimated production function for China during 1978-2008 using the Cobb-Douglas production function model. The Cobb-Douglas production function was used, which is a binary power function linearized by the logarithm and added with random error terms.

Keywords: Capital; Labour Force; Economic Growth; Regression Model; Cost-Benefit Analysis

Introduction

In today's world, economic growth is a critical factor that determines a country's overall well-being. Governments and businesses worldwide strive to increase their economies' growth rates to create more jobs, increase income, and improve the standard of living for their citizens. Two crucial factors that play a vital role in economic growth are capital and labor.

Capital refers to the machinery, tools, buildings, and other physical assets used in production. Labor, on the other hand, refers to the physical and mental effort people put into producing goods and services. The efficient utilization of capital and labor is crucial to achieving and maintaining economic growth.

In conclusion, the efficient utilization of capital and labor is critical to achieving and maintaining economic growth. Governments and businesses worldwide must invest in capital and education/training programs to increase productivity and stimulate economic growth. Additionally, policies that encourage job creation can have a positive impact on the economy, leading to higher standards of living for citizens.

1. Literature Review

1.1 Literature Review outside China

The key to utilizing capital and labor effectively is to invest in education and training programs that will improve the skills of the workforce. This will enable them to be more productive, efficient, and innovative, leading to increased economic growth. (Tyson, 2018)

Capital and labor are the two key ingredients for economic growth. However, it is not just about having more of each. The quality of capital and the skills of the labor force are equally important. Investing in human capital through education and training can have a significant impact on economic growth. (Krugman, 2009)

1.2 Literature Review of Chinese people

In the 21st century, labor supply and demand have undergone significant changes, that is, the transition from the total supply and demand of labor to the structural imbalance, and the shortage of labor supply is particularly significant in some regions and some industries. (Zhu, 2006)

Several researchers made quantitative analysis of the labor supply and demand in China in the next few years and concluded that in

the next few years, China's labor market is still oversupply, and the task of solving the problem of labor unemployment is still urgent.(Wang, Tao, 2014)

1.3 Summary

All of these points emphasize the importance of investing in human capital through education and training programs to improve the skills of the labor force, promoting innovation, and investing in physical infrastructure. They all agree that capital and labor are the two key ingredients for economic growth, and a supportive environment that encourages entrepreneurship and innovation is essential for sustained economic growth.

2. Research Questions

5.1 What is the relationship between output value, capital and labour force ?

5.2 What is the most efficient way to allocate funds to increase productive output?

3. Research Methodology

The researcher will collect the data and study how to solve the relationship between the allocation of capital and labor force and the relationship between economic growth and them with the Douglas function according to the thesis below.

The quantitative relationship between input and output is studied by Douglas production function in economics. $Q(t), K(t), T(t)$ is used to express the output value, capital and labor force of a certain region or department at the time t respectively, and their relationship can be recorded.

$$Q(t)=F(K(t),T(t))$$

At a fixed time and environment, there is an optimal allocation of funds and labor force, allowing every labor force to make full use of the support given by funds. The researcher thinks this distribution can create the maximum benefit when there is a certain amount of capital.

Combined with the actual data of China's development, The researcher will verify the rationality of the theory, and try to find out the theoretical and practical errors, and summarize the reasons for the deviation.

Frame of methodology	
Data sample	Chinese capital, labor force and economic output from 1981 to 2012
Data Collection Sources	Internet, iFinD, questionnaires
Data Analysis Approach	Quantitative: Descriptive data analysis For Q1: The regression model of the relationship between (1) total output and input labor; (2) total output and the amount of capital. For Q2: evaluation and analysis of capital output elasticity and labor output elasticity: Qualitative: A brief analysis of the general trend of economic growth when capital and labor force change separately and together.
Data Analysis	Excel, Matlab
Present Form	Line graph & Regression model

4. Result

4.1 About Question 1:

The quantitative relationship between input quantity and output in economics is studied by the production function, namely:

$$Y=AF(L, K)$$

Y represents the total output, A represents the total factor productivity, L represents input labor, K represents the amount of capital, F production of the production and production of the production and the dependence between the factors of production combination.

In the 1930s, the Cobb Douglas production function was created:

$$Y = AL^\alpha K^\beta$$

It can be clearly seen from the Cobb Douglas production function that the driving force of the total economic output lies in the input of manpower and capital.

The GDP data and employment personnel data from 1978 to 2008 were taken from China Statistical Yearbook, which is professional:

Table 1: The Relationship Between Capital, Labor And Economic Output During 1978-2008 in China

Year	1978	1979	1980	1981	1982	1983	1984	1985
Y(multiple 100 million)	3645.2	4062.6	4545.6	4891.6	5323.4	5962.7	7208.1	9016.0
L(multiple 10 thousand)	40152	40124	42361	43725	45925	46436	48197	49873
K(multiple 100 million)	6139	6636	7217	7724	8312	9014	9943	11065
Year	1986	1987	1988	1989	1990	1991	1992	1993
Y(multiple 100 million)	10275.2	12058.6	15042.8	16992.3	18667.8	21781.5	26923.5	35333.9
L(multiple 10 thousand)	51282	52783	54334	55239	64749	65491	66152	66808
K(multiple 100 million)	12283	13719	15241	16214	17185	18742	20348	22953
Year	1994	1995	1996	1997	1998	1999	2000	2001
Y(multiple 100 million)	48197.9	60793.7	71176.6	78973.0	84402.3	89677.1	99214.6	109655.2
L(multiple 10 thousand)	67455	68065	68950	69820	70637	71394	72085	72797
K(multiple 100 million)	26111	29685	33570	37484	41697	46044	50754	55997
Year	2002	2003	2004	2005	2006	2007	2008	
Y(multiple 100 million)	120332.7	135822.8	159878.3	184937.4	216314.4	265810.3	314045.4	
L(multiple 10 thousand)	73280	73736	74264	74647	74978	75321	75564	
K(multiple 100 million)	62269	70267	79487	90467	103069	116990	131872	

The Cobb-Douglas production function formula (2) is a binary power function, linearized by the logarithm and added with random error terms:

$$\ln Y = \ln A + \alpha \ln L + \beta \ln K + \mu$$

The scatter plot of Y logarithm and L of logarithm, and the relationship between them is approximately linear, which is suitable for the establishment of binary linear regression equation.

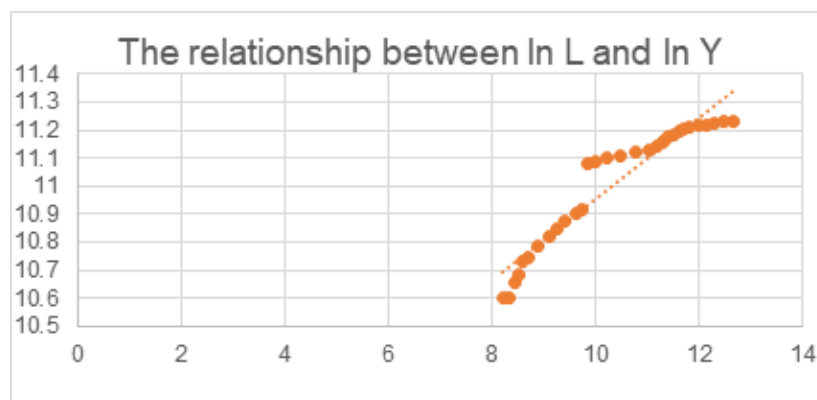


Figure 1: The relationship between ln L and ln Y

Slope: 1.68

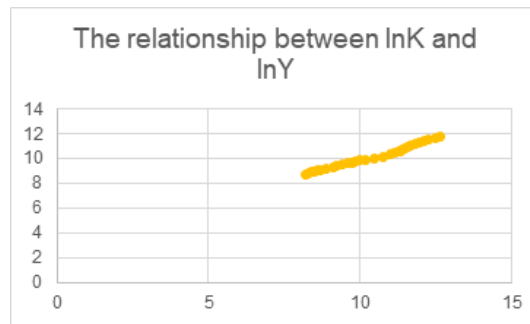


Figure 2: The relationship between lnK and lnY

Slope: 1.14

Result: $\ln Y = -19.71 + 1.68 \ln L + 1.14 \ln K$.

When studying the relationship between K and Y, the deviation between the regression equation and the point in the figure is large. The possible reasons are as follows:

Insufficient sample data or uneven distribution: The regression analysis requires sufficient sample data to ensure the accuracy of the fit. If the sample data is too little or unevenly distributed, then the credibility of the regression line will be reduced, resulting in a large variance between the regression line and the point.

Polycollinearity: It refers to the high correlation between independent variables, which leads to increased uncertainty of the regression coefficient, leading to a large variance between the regression line and the point.

4.2 About Question 2:

According to the regression model:

When the capital stock increases by 1%, the GDP will increase by 1.14%;

When the labor input increases by 1%, the output will increase by 1.68%.

The output elasticity of labor input is much greater than the output elasticity of capital stock, indicating that the main driving force of our economic growth comes from the input of labor force. And China's labor force is still in a simple primary labor force, but also need to pass the training and education of human resources, technical level and labor proficiency, so as to improve the efficiency of China's productivity. At the same time, the use of capital in our country still has great deficiencies.

To address the current resource-dependent economic growth pattern, which incurs high costs and excessive reliance on the international market, there are concerns about the lagging people's livelihood in relation to economic and social development sustainability. Thus, government regulations should prioritize adjusting the investment structure incrementally through various policies. This includes increasing investments in primary and tertiary industries, public services, and domestically-oriented consumption. Such measures can enhance worker quality, foster independent innovation and research, promote consumption, reduce surplus, improve livelihoods, and facilitate a shift towards multiple growth goals.

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