# Policy suggestions for optimizing the New Nationwide System From the perspective of "156 Projects"

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**Abstract:** "156 Projects", a massive funded effort that harnesses the nation's resources, is the foundation of the industrialization of the New China. Quantitative research on the long- and short-term impacts on regional and national industrialization is required in order to appropriately analyze China's early industrialization strategies and validate the theory of economic development with Chinese characteristics.

**Keywords:** "156 Projects", the transfer of technology, industrial upgrading, regional development

## 1. Introduction

The only way for late-developing nations to urbanize and modernize is through industrialization, which is also the prerequisite and cornerstone of modernization [1]. The more backward a country's economy is, the more likely it is to maintain relatively high growth rates after industrialization starts, and catch up with developed countries, that is, the "blowout" phenomenon [2]. Gerschenkron summarizes the reasons as follows: First, the existence of "substitutability". The less developed countries can borrow or imitate technologies and systems from the advanced countries, or they can choose a different path according to their own conditions.

Second, social tension increases with relative backwardness. When a late-developing nation's citizens experience economic stagnation, there is a strong desire to industrialize, and when the nation experiences international disadvantages, there is a strong desire to advance national interests. Abramovitz [3] argued for the existence of a latecomer advantage for latecomer countries to accomplish catch-up using the "catch-up hypothesis." The "156 projects" established the first autonomous industrial system prototype on Chinese soil [4] and served as the foundation for the development of the new Chinese industry [5]. It encouraged the establishment and growth of China's industrial production base as a whole [7], enhanced the quality and productivity of industry [6], and established the framework for long-term industrial growth [8]. The "156 projects" in industrialization, technology introduction, urban building, and industrial heritage have been the subject of numerous descriptive studies by academics, but the study of their effect mechanisms on Chinese industry is still lacking. The comprehensive revitalization plan for northeast China and the Development and Reform Commission's transformation plan on the restructuring of old industrial bases both show the importance of revisiting and utilizing the "156 projects" and their outcomes for the current industrial development of China. This study aims to clarify the theoretical model of the "156 projects" effects on Chinese industry, investigate potential impact mechanisms, and experimentally evaluate the theoretical model's assumptions. According to the study's findings, funding the "156 projects" will greatly enhance each province's industrial production, which will quickly raise the investment areas' total industrialization level. The "156 projects" long-term effects on industrialization are decreasing from a vertical perspective, while from a horizontal one, their emphasis on the central and western areas produces the greatest "post-industrialization advantages."

## 2. Data sources, model settings and variable descriptions

### 2.1 Data sources

The China Industrial Economic Statistics, Compilation of Statistics of New China in the Past 60 Years, China Statistical Yearbook, and China Industrial Statistical Yearbook are where the data came from. The data were adjusted by "linear interpolation" before the empirical evidence to guarantee the sample capacity.

### 2.2 Model setting and variable description

The following econometric model is built up in this study to assess the influence of "156 projects" investment on China's industrialization and its influence mechanism.

$$Y_{i,t} = \alpha_0 IM_i + \beta_0 W_{i,t} + \gamma \Phi_t^i + \delta \psi_t^r + \varepsilon_{i,t} \quad (1)$$

Among them, the subscript i denotes the provinces, t the years, and the r denotes the four main economic regions

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of China. The four "channel variables" described in the theoretical model, including the natural logarithm of total factor productivity ($\ln TFP$); the natural logarithm of labor input by province ($\ln Labor$), as measured by the natural logarithm of employment by province; the natural logarithm of capital input by province ($\ln Capital$), as measured by the natural logarithm of fixed capital stock by province ; and the natural logarithm of investment by province ($\ln Investment$), as measured by the natural logarithm of fixed asset investment by province. And the natural logarithm of the ratio of industrial value added to total GDP ($\ln Output$), as measured by the natural logarithm of the provincial share of industrial value added in total GDP, are included as explained variables.

The absolute amount of investment in "156 projects" is represented by the explanatory variable $IM_t$. Among the control variables $W_{i,t}$ are (i) the actual level of foreign direct investment (FDI): Fernandes and Paunov [15] used particular data on businesses from 1992 to 2004 and discovered a substantial positive link between the rise in FDI and the rise in productivity of connected industries; (ii) the distance traveled by road: Wang Dianhai [16] measured the impact of road transportation development to national economic growth using the Solow Growth Model; and (iii) the communications industry: the impact of the communications industry on regional economic development was significant in all cases, according to Lei Ding [17], who used a panel data model to examine the different regions of China from 1986 to 2002. This study examined the contribution of postal transportation to national economic growth.

In addition, the model categorizes other factors into error terms, including the following three factors: (i) impacts that are province- and time-fixed ($\Phi_t^i$), such geographic location, technological advancement, and sudden policy changes; (ii) economic region- and time-fixed ($\Psi_t^r$), such as region-specific environmental changes and policy shocks; and (iii) other unobservable disturbance terms ($\varepsilon_{i,t}$).

Since the FDI result has a zero value, we add 1 to it before taking the logarithm ($\Phi_t^i$) of the indicator. This is done for two reasons: one, to perform exponential smoothing to reduce or eliminate heteroskedasticity, and two, to make the coefficient after the regression be able to represent the rate of change.

## 3. Analysis of empirical results

This section examines empirical data from three angles: To analyze the long-term effects of engineering investment on total industrial production and "channel factors", the baseline regression contains data from 17 provinces from 1951 to 2020; Second, from 1951 to 2020, the influence of engineering investment is analyzed every 10 years to see how it changes total industrial production and "channel variables"; Third, in order to analyze the disparities between the four areas impacted by investment on a horizontal level, the regression of the influence of engineering investment on regional industrial production from 1951 to 2020 is separated into four economic regions: East, Central, West, and Northeast.

### 3.1 The effect of funding "156 initiatives" on industrial output

The regression findings for 1951-2020 are provided in Table.1 following the Co-integration test.

Table.1. The area's investment's long-term effects on the region's overall industrial output

| | I | II | III | IV |
|---|---|---|---|---|
| | $\ln Output$ | | | |
| $\ln IM$ | 0.0279*** (4.82) | 0.0300*** (5.16) | 0.0119* (1.78) | 0.0252*** (3.71) |
| $\ln FDI$ | | -0.0199*** (-7.20) | -0.0202*** (-6.37) | -0.0256*** (-7.63) |
| $\ln HT$ | | | 0.2772*** (24.37) | 0.1874*** (15.00) |
| $\ln PT$ | | | | 0.2338*** (25.28) |
| Province x year fixed effects | Y | Y | Y | Y |
| Economic region x year fixed effects | Y | Y | Y | Y |
| Wald chi2 | 1028114 | 1056475 | 1111234 | 566986.41 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

The observation of coefficients shows that the investment amount of "156 projects" has a substantial positive influence on the overall industrial production of the investment region with a parameter estimate of 0.0252, according to Models I through IV, which each include control variables in turn. This shows that, after adjusting for other explanatory factors, each 1% increase in the investment amount for the "156 projects" added to the investment area results in a 0.0252% rise in the total industrial value.

Road mileage and total post and telecommunications services have significant positive effects on industrial output, as shown by their coefficients, which indicate that each 1% increase in road mileage and each 1% increase in total post and telecommunications services increases industrial output by 0.1874% and 0.2338%, respectively, while holding other explanatory variables constant. The "pollution sanctuary theory" may be true given the strong negative impact of FDI on industrial production.

### 3.2 Vertical variations in the effects of "156 projects'" investment on industrial output

For each decade of the period 1951-2020, the coefficients of the influence of the absolute amount of initial investment in "156 projects" on the entire industrial production of the investment region were evaluated. The findings are presented in Tables.2.

Table.2. The Effect of Time-Divided Investment Amount on Investment Location's Industrial Output

| ln *Outp* | (I) 1970 | (II) 1980 | (III) 1990 | (IV) 2000 | (V) 2010 | (VI) 2020 |
|---|---|---|---|---|---|---|
| *lnIM* | 0.0825*** (4.88) | 0.0483*** (3.71) | 0.0395*** (4.00) | 0.0359*** (4.44) | 0.0338*** (4.76) | 0.0252*** (3.71) |
| Control variables | Y | Y | Y | Y | Y | Y |
| Province x year fixed effects | Y | Y | Y | Y | Y | Y |
| Economic region x year fixed effects | Y | Y | Y | Y | Y | Y |
| Wald chi2(17) | 5.52e+08 | 2643539 | 1059626 | 660476.56 | 603097.68 | 566986.41 |
| *P* | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

According to Table.2, the "156 projects" investment has a considerable long-term influence on the industrial production of the investment region, although the impact's strength gradually diminishes. 1951-1970: A 1% increase in investment will result in a 0.0825% rise in industrial production; 1951-2020: A 1% increase in investment will only result in a 0.0252% increase in industrial output.

### 3.3 The way that investments in "156 projects" have an impact on industrial output

The four "channel variables" are regressed as explanatory factors in combination with the theoretical analysis in Section 2 to examine the channels via which the investment in "156 projects" influences industrial production. The results are displayed in Table.3.

Table.3. The Impact of Investment on Industrial Output: A Channel Analysis

| | ln *TFP* | d. ln *Labor* | d. ln *Capita* | ln *Investm* |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ln *IM* | 0.0098 (1.20) | -0.0015 (-1.51) | 0.0022*** (4.52) | 0.0662*** (6.47) |
| Control variables | Y | Y | Y | Y |
| Province x year fixed effects | Y | Y | Y | Y |
| Economic region x year fixed effects | Y | Y | Y | Y |
| Observations | 1190 | 1173 | 1173 | 1190 |
| Wald chi2(17) | 3699164.64 | 58247.04 | 466538.12 | 3.12e+07 |
| P | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

The results of regressing the aforementioned four "channel variables" as explained variables are reported in columns (1) through (4), where first-order differences are used to guarantee cointegration between the variables. The findings indicate that, with the exception of employment, investment in "156 projects" has a non-significantly beneficial impact on total factor productivity but a significantly favorable impact on total fixed assets and investment. When the investment in projects grows by 1%, the increment of total fixed capital increases by 0.0022%, and the increment of fixed assets increases by 0.0662%, with a negative influence on the increase in employment under the control of other explanatory factors. It is clear that "156 projects" will have an indirect impact on industrial production by increasing total factor productivity (TFP), gross fixed assets, and investment.

### 3.4 Robustness tests

We do robustness tests from two angles to check the accuracy of the aforementioned findings.

The baseline regression is first supplemented with a control variable, the size of industrial firms, which is calculated as the ratio of all employed individuals (10000) to the quantity of industrial enterprises (units) in province i. The establishment of scale economies and the advancement of regional industrialization are more favorable when industrial companies are greater in size. Regression with the industrial firm size's natural logarithm ln *SCALE* in the model, with the outcomes shown in column (1) of Table.4. Second, we divided the country into economic areas in the prior study. The geographic regions of China are divided into the Northeast, East, North, Central, Southwest, Northwest, and South China; the test only includes the first six regions because South China does not have any "156

projects" investments. We control for geographic region year fixed effects in the robustness test in column (2). The two outcomes show that the main conclusions of this research are sound.

Table.4. The result of robustness tests

| | (1) $\ln Output$ | (2) $\ln Output$ |
|---|---|---|
| $lnIM$ | 0.0195*** (2.92) | 0.0355*** (10.86) |
| $\ln FDI$ | -0.0244*** (-8.45) | -0.0308*** (-9.18) |
| $\ln HT$ | 0.1822*** (13.97) | 0.0423*** (4.18) |
| $\ln PT$ | 0.2310*** (26.13) | 0.2476*** (29.24) |
| $\ln SACLE$ | 0.1048 (14.30) | 0.0896*** (16.88) |
| Province x year fixed effects | Y | N |
| Economic region x year fixed effects | Y | N |
| geographic region × year fixed effects | N | Y |
| Wald chi2(87) | 351934.45 | 622907.33 |
| $P$ | 0.0000 | 0.0000 |

## 4. Conclusion

The introduction of technology has a long-term impact on industrialization. The empirical findings reveal that although the influence of the "156 projects" investment on the total industrialization of the investment zone decreases from 1951 to 2020, the impact is still significantly favorable until that year. The reason is that some of the projects presented by the projects are eliminated with screening and the passage of time, while others of the technologies introduced and the development of skills play a more substantial role via demonstration, imitation, digestion, and absorption. The major investments in the coal sector, the Fuxin Haizhou Open Pit Mine and Fushun West Open Pit Mine, making the eastern region of the 1960s and 1970s a vital coal supplier for the new China. Around the start of the twenty-first century, these two projects—which at the time were referred to as "the largest open-pit coal mines in Asia" and "one of the thickest open-pit coal mines in the world," respectively—were all but forced to close owing to resource depletion. When the Sanmenxia Water Conservancy Hub was first constructed, its flow rate was only 1,000 cubic meters per second, but through the "156 Projects," learning from newly introduced technology, continuous exploration, and improvement, it was able to increase its flood flow capacity to 9,701 cubic meters per second at a height of 315 meters, and by the end of 2006, it had produced 33.3 billion kilowatt hours of electricity, making a significant contribution to China's industrial growth. When it was initially finished, Anshan Iron and Steel, one of the major iron and steel projects in the "156 Projects," had an annual production of 3.361 million tons of pig iron, 2.910 million tons of steel, and 1.923 million tons of steels. By the end of 2009, it had reached the highest-ever levels of 20,509,500 tons of iron, 20,126,600 tons of steel, and 18,997,900 tons of steel. These records helped to advance China's iron and steel industry's growth and economic construction while also advancing the country's overall industrialization. The Political Bureau of the CPC Central Committee meeting held in July 2022 also highlighted the necessity of actively promoting exports, increasing imports, and doing a good job of introducing technology and foreign investment. This is an objective requirement for us to make good use of the two international and domestic markets and two kinds of resources to form a virtuous pattern of synergistic interaction between high-quality development and high-level opening up, and is also necessary for us to achieve our long-term goals of economic growth and social progress.

## References

1. Lin Yifu, Zhang Pengfei. Advantage of latecomer, technology introduction and economic growth of backward countries [J]. Economics (quarterly), 2005, Vol.4 (4): 53-74.
2. Alexander Gerschenkron; Translated by Zhang Fenglin. Historical Perspective of Economic Backward [M]. Beijing: Commercial Press, 2011.
3. Abramovitz M.Thinking about Growth[M]. Cambridge University Press，1989.
4. Chen Xi. Foundation laying: the beginning and end of 156 projects aided by the Soviet Union to China 1 (summary of memoirs and memorabilia of special research) [M]. Chengdu: Tiandi Publishing House, 2020.
5. Dong Zhikai, Wu Jiang. Research on 156 construction projects of the foundation stone of new China industry from 1950 to 2000 [M]. Guangzhou: Guangdong Economic Publishing House, 2004.
6. William W H.Capital Formation in Communist China[J].China Quarterly，1964，Vol.17(17): 39-55.
7. Dwyer D J . The Coal Industry in Mainland China Since 1949[J].Geographical Journal，1963，Vol.129(3): 329-338.
8. Singh A.Political Economy of Socialist Development in China since 1949[J].Economic and Political Weekly，1973，Vol.8: 2097-2099，2101-2111.
9. Lu Xiaodong, Lian Yujun. Estimation of total factor productivity of industrial enterprises in China: 1999-2007 [J]. Economics (quarterly), 2012,(2): 541-558.
10. Zhang Jiuchun. Research on "156 Projects" of Industrial Construction in 1950s [J]. Engineering Research-Engineering in Interdisciplinary Vision, 2009, (3):213-222.
11. Li Debin. The Problem of Introducing Technology and Equipment in China in 1950s [J]. Journal of

Peking University (Philosophy and Social Sciences Edition), 1984,(4): 78-81.

12. Hu Xiaojuan, Hu Anping. Empirical study on the impact of foreign technology introduction on the upgrading of China's industrial structure [J]. Soft Science, 2016, (2): 9-12,18.
13. Li Zhanguo, Jiang Xinying. An Empirical Analysis of Foreign Investment and Employment Effect in China Based on Bounded Test Method [J]. International Business (Journal of university of international business and economics), 2008,(5): 61-66.
14. Tang Yanyan. From the construction of "156 projects" to see the exertion of the advantages of latecomers [J]. Theoretical Monthly, 2009,(12): 67-70.
15. ANA M.F,CAROLINE,P.Foreign Direct Investment in Services an Manufacturing Productivity Growth:Evidence for Chile[R].The World Bank Policy Reasearch Working Paper,2008:4730.
16. Wang Dianhai, Li Hongqiang, Wang Jianzhi, Ji Jingyi. Calculation Method and Application Research of the Contribution Rate of Highway Transportation Development to National Economic Growth [J]. Journal of Civil Engineering, 2003, Vol. 36 (7): 100-104.
17. Ding, Lei;Haynes, Kingsley.The Role of Telecommunications Infrastructure in Regional Economic Growth in China[J].Australasian Journal of Regional Studies, The,2006,Vol.12(3): 281-302.