

An Empirical Study on the Impact of Financial innovation on High Quality Economic Development

-- Based on the Mesomeric Effect of Scientific and Technological Innovation

Yi Wu

School of Nanjing Normal University, Nanjing 210000, China

Abstract: High quality development has become the primary task of building China into a socialist modern country in an all-round way, and the key to high-quality economic development lies in Financial innovation and scientific and technological innovation. Therefore, this paper is committed to studying the relationship between Financial innovation, scientific and technological innovation, and high-quality economic development, and building a variable evaluation system through the entropy method. It uses empirical analysis to study whether Financial innovation can directly promote high-quality economic development, and whether it can promote high-quality economic development by promoting scientific and technological innovation; Finally, corresponding suggestions are proposed based on the results.

Keywords: Financial innovation, High quality economic development, Technological innovation, Empirical research.

1. Introduction

The General Secretary Xi Jinping proposed that high-quality growth is an important task in building an advanced socialist country, and the key to high-quality development lies in technological innovation. Innovation not only requires the support of capital, but more importantly, it also requires the integration of new science and technology. After all, technology is the first productive force and the material driving force for changing the world.

Whether it is the current prevention and treatment of novel coronavirus or the four technological revolutions that have changed the process of human development, science and technology can not be replaced. However, technological innovation has the characteristics of high cost, long cycle time, and high risk. From R&D technology to the transformation and application of R&D achievements, to market exploration, generating profits and investment returns in the market, substantial financial support is required at each stage. Therefore, technological innovation and the innovative development and support of finance are inseparable. An active financial market, smooth financing channels, and a good financial environment are important guarantees for high-quality economic development.

Therefore, Financial innovation better serves scientific and technological innovation, and scientific and technological innovation promotes high-quality economic development, that is, Financial innovation promotes scientific and technological innovation to promote high-quality economic development, which is a new development concept that China urgently needs to carry out.

2. Theoretical Analysis and Research Hypotheses

(1) The direct mechanism of Financial innovation on high-quality economic development

Financial innovation is not only the expansion of financial scope, but also the reform of financial methods and the improvement of financial quality. The economic foundation

determines finance, so financial services should also be based on supporting the real economy.

First, Financial innovation is the fundamental driving force for achieving high-quality economic development. Improving total factor productivity requires more financial resources to enter the field of technological innovation, providing more and better financial products and services for technology-based enterprises, especially technology-based startups, and supporting relevant enterprises and institutions to carry out research and development innovation activities. Promote the smooth transformation of scientific and technological achievements into real wealth, and provide fundamental impetus for high-quality economic development.

Second, Financial innovation has improved efficiency. Improving efficiency is the main line of high-quality economic development. Improving total factor productivity requires financial markets to improve efficiency, reduce information asymmetry, guide the rational flow of social resources, and thereby improve resource allocation efficiency.

Finally, the improvement of total factor productivity requires the reasonable flow and agglomeration of financial factor resources, achieving economies of scale, and reducing transaction costs. Third, Financial innovation has improved the efficiency of resource allocation in the financial market. The core of achieving high-quality economic development is to improve total factor productivity, and resource allocation efficiency is an important factor affecting total factor productivity. Theoretical research and economic practice have shown that market allocation of resources is more efficient than planned allocation.

To sum up, this paper proposes research hypothesis 1: Financial innovation can directly promote high-quality economic development.

(2) The indirect mechanism of Financial innovation on high-quality economic development

Financial innovation compensates the cost and risk sharing of scientific and technological innovation. Technological innovation projects have the characteristics of high risk and high return. The ultimate goal of technological innovation is to bring benefits and convenience to humanity, which needs

to be achieved through the industrialization of technological achievements. The process is slow and may even be difficult to accept, which is a huge, even fatal challenge for enterprises engaged in technological innovation. When the demand for products is small, the enterprise's income will be less, which will make it difficult to maintain the normal operation of the enterprise and launch new projects. Therefore, financial support is needed. Financial innovation is a magic weapon to better serve scientific and technological innovation. With strong financial support, technology can be innovated, leading to high-quality development of China's economy.

Financial innovation provides corresponding support for each growth cycle of the technology industry. The vast majority of innovative enterprises have the highest demand for funds during their research and development, seed stage, and entrepreneurship stages. However, due to the high-risk characteristics of technological innovation enterprises, the situation is not clear enough and financing difficulties arise. At this point, without financial support, relying solely on the own funds of technological innovation enterprises is difficult to achieve these goals, and it is difficult to promote high-quality economic development through promoting technological innovation.

Financial innovation gives full play to the advantages of

information transmission function. In the process of Financial innovation, financial institutions have a much better grasp of social information than individuals. Under the condition of rapid integration of finance, science and technology, and innovation, they can reduce the information lag caused by information asymmetry of scientific and technological innovative enterprises, which has led to the well-known crisis that innovative products of enterprises have come out and have to be eliminated because of backwardness. At the same time, Financial innovation is easier to solve the problem of moral hazard. On the basis of mastering the information advantages, the financial industry can better use modern financial technologies such as big data and cloud computing to screen and eliminate the fittest from the fittest for enterprise investment in science and technology projects, improving the quality of economic development.

To sum up, this paper proposes research hypothesis II: Financial innovation can promote high-quality economic development by promoting scientific and technological innovation.

3. Empirical Research Design

Table 1. Evaluation System of Economic High Quality and Quality Development Indicators

Measurement Dimension	Basic Indicator	Indicator Measurement
Economic development	economic growth level	Regional per capita GDP
Innovation-driven development	Research funding investment level	R&D funding investment/regional GDP
	Research personnel engagement level	Researcher full-time equivalent/number of employees
	Per capita patent authorizations	Number of three types of patent authorizations/permanent population
	Proportion of transaction volume in the technology market	Technology market transaction volume/R&D funding investment
coordinated development	Regional income ratio	Per capita annual income of residents/per capita annual income of national residents
	Regional consumption ratio	Per capita annual consumption of residents in each province/per capita annual consumption of residents nationwide
	Urban-rural income ratio	Ratio of per capita annual disposable income between urban and rural residents
	Urban-rural consumption ratio	Ratio of per capita annual consumption between urban and rural residents
	rational structure of production	Theil index
	Advanced industrial structure	Value added of the tertiary industry/value added of the secondary industry
	Investment rate	Total fixed capital investment/regional GDP
	Consumption rate	Final consumption expenditure/regional GDP
Green development	Investment consumption ratio	Total fixed capital investment/final consumption expenditure
	Unit output energy consumption	Standard coal consumption/regional GDP
	Exhaust gas emissions per unit of industrial added value	Industrial exhaust emissions/total industrial output value
	Wastewater discharge per unit of industrial added value	Industrial wastewater discharge/total industrial output value
	Waste discharge per unit of industrial added value	Industrial waste emissions/total industrial output value
Open development	Domestic waste treatment	Harmless treatment rate of household waste
	Proportion of total import and export volume	Total import and export volume/regional GDP
	Proportion of foreign direct investment	Actual total utilized foreign investment/regional GDP
Development for the benefit of all	Per Capita Disposable Income	Weighted value of per capita consumption expenditure of urban and rural residents
	per capita consumption expenditure	Weighted value of per capita consumption expenditure of urban and rural residents
	Average education expenditure per student	Education expenditure/average number of students on campus per 100000 population
	Per capita financial expenditure on healthcare	Medical and health expenditure/number of permanent residents
	Per capita social security expenditure	Financial expenditure on social security and employment/number of permanent residents

(1) Model Settings

To sum up, this paper first discusses the impact of high-quality economic growth on high-quality economic development in 30 sample provinces in China, so as to verify

hypothesis one, that is, Financial innovation can directly promote high-quality economic development in China, and the final model expression is model one. On this basis, this paper further explores the impact of the intermediary variable

scientific and technological innovation on high-quality economic development to test hypothesis two, that is, Financial innovation promotes high-quality economic development by promoting scientific and technological innovation. The final model expression is model two, that is, equations (1), (2), and (3) constitute the mesomeric effect model of scientific and technological innovation.

Model 1:

$$(1) EcoQua_{it} = \beta_0 + \beta_1 FinInn_{it} + \beta_2 MatCap_{it} + \beta_3 HumCap_{it} + \beta_4 Urban_{it} + \beta_5 GovInt_{it} + \varepsilon_{it}$$

Model 2 :

$$(2) TecInn_{it} = \beta_0 + \beta_1 FinInn_{it} + \beta_2 MatCap_{it} + \beta_3 HumCap_{it} + \beta_4 Urban_{it} + \beta_5 GovInt_{it} + \varepsilon_{it}$$

$$(3) EcoQua_{it} = \beta_0 + \beta_1 FinInn_{it} + \beta_2 TecInn_{it} + \beta_3 MatCap_{it} + \beta_4 HumCap_{it} + \beta_5 Urban_{it} + \beta_6 GovInt_{it} + \varepsilon_{it}$$

EcoQua refers to high-quality economic development, FinInn refers to Financial innovation, TecInn refers to technological innovation, MatCap refers to physical capital, HumCap refers to human capital, Urban refers to urbanization rate, and GovInt refers to government intervention.

(2) Variable selection

a) The dependent variable

High quality economic growth (EcoQua): Drawing inspiration from Wei Min (2018), this article selects 26 basic indicators from six dimensions of economy, innovation, coordination, green, openness, and sharing to construct a high-quality economic development system.

b) Explanatory variables

Financial innovation (FinInn): For Financial innovation, this paper uses 18 basic indicators from seven dimensions of financial products, systems, markets, institutions, supervision, technology, and resource innovation.

Table 2. Financial innovation Index Evaluation System

Measurement dimension	Basic indicators	Indicator measurement
Financial product innovation	Scale of savings deposits	Savings deposits/total population of the region
Financial system innovation	fiscal policy	Local fiscal expenditure/regional GDP
	education policy	Average number of students on campus per 100000 people
	industrial policy	Output value of the tertiary industry/regional GDP
	foreign policy	Total import and export volume/regional GDP
Financial market innovation	Size of listed companies	Number of listed companies/total population in the region
	Insurance density	Regional premium income/total population of the region
	Insurance depth	Regional premium income/regional GDP
	Bank concentration ratio	Employment in financial institutions/total population in the region
Financial Institution Innovation	Scale of fintech companies	Number of fintech companies/total population in the region
	Scale of new rural financial institutions	Number of new rural financial institutions/total population of the region
	Scale of small loan companies	Number of small loan companies/total population in the region
	Scale of financing leasing enterprises	Number of financing leasing companies/total population in the region
Financial regulatory innovation	Stock market foam	Total stock market value/regional GDP
	Non performing loan ratio	Commercial bank non-performing loans/total loans
	Deposit to loan ratio	Total bank loans/total deposits
Financial technology innovation	Digital inclusive finance	Peking University Digital Inclusive Finance Index
Financial resource innovation	Regional financial added value	Ln (Regional Financial Value Added)

c) Mediating variables

scientific and technological innovation (TecInn): This

article constructs from three dimensions: innovation input, output, and environment.

Table 3. Evaluation System of Technological Innovation Indicators

Measurement dimension	Basic indicators
Innovation investment	The proportion of local financial science and technology expenditure to local financial expenditure
	Per capita R&D expenditure internal expenditure
	R&D personnel full-time equivalent
	R&D funding intensity
Innovation output	Number of three types of patent authorizations
	Turnover in the 10000 person technology market
Innovation environment	Number of higher education institutions
	Average number of students enrolled in higher education per 100000 people
	Mileage of highways with a capacity of 10000 people

d) Control variables

Physical capital: capital stock of the current period=capital stock of the previous period * (1-10.96%)+total fixed asset formation of the current period (10.96% of which is the depreciation rate, referring to the practice of Shan Haojie).

Human capital: measured using average years of education.

Urbanization rate: measured by the proportion of urban population.

Government intervention: measured by government fiscal

expenditure/regional GDP.

(3) Data source

The data in this paper are mainly from China Statistical Yearbook, China Science and Technology Statistical Yearbook, China Economic Network statistical database, National Bureau of Statistics and Wind database (missing data are filled by trend recurrence method).

4. Empirical Result Analysis

(1) Regression result analysis

In order to study the impact of Financial innovation on high-quality economic development, this paper conducts overall model regression and multi-dimensional regression

Table 4. Model 1 Regression Test Results

	(1) EcoQua	(2) EcoDev	(3) InnDev	(4) CoorDev	(5) GreenDev	(6) OpenDev	(7) ShareDev
FinInn	0.2400*** (6.6060)	3.1390 (1.4842)	0.4788*** (8.5354)	0.1492*** (4.4697)	0.0372*** (2.6576)	0.0994 (1.2161)	0.0681 (0.7348)
MatCap	0.0000*** (5.1459)	0.0000*** (6.6351)	0.0000*** (4.1866)	-0.0000*** (-3.6483)	0.0000*** (2.6700)	0.0000*** (4.5872)	0.0000** (2.0383)
HumCap	0.0005*** (4.0480)	-0.0162** (-2.1305)	0.0007*** (3.4549)	-0.0002 (-1.4901)	0.0001* (1.7486)	0.0011*** (3.7273)	0.0005 (1.4472)
Urban	0.0001*** (7.3037)	0.0125*** (18.5547)	0.0001*** (3.1819)	0.0001*** (7.8418)	-0.0000 (-0.8170)	0.0001*** (3.2776)	0.0000 (1.4425)
GovInt	0.0034*** (6.7102)	-0.1771*** (-6.0927)	0.0018** (2.3518)	0.0022*** (4.8425)	-0.0018*** (-9.3408)	0.0082*** (7.3062)	0.0006 (0.4653)
C	-0.0089*** (-8.5292)	4.1144*** (67.9903)	-0.0093*** (-5.7983)	-0.0007 (-0.6939)	0.0030*** (7.4780)	-0.0156*** (-6.6818)	-0.0046* (-1.7445)
N	300	300	300	300	300	300	300
adj. R2	0.7915	0.8984	0.7359	0.6005	0.5520	0.4299	0.1635
t	10	10	10	10	10	10	10
F-value	228.02	529.63	167.60	90.88	74.67	46.10	12.69

Note: The symbols "*", "**", and "***" indicate significance at the 10%, 5%, and 1% levels, respectively; The numbers in parentheses represent the corresponding t-value.

The results are shown in the table above. From the regression results of the model, we can find that Financial innovation is significantly positively correlated with high-quality economic development at the level of 1%. And every 1% increase in the Financial innovation index will increase its high-quality economic development level by 0.2400%. The first hypothesis is that Financial innovation is conducive to promoting high-quality economic development in China.

In order to further explore how Financial innovation specifically affects high-quality economic development, this paper continues to return from various dimensions. It can be seen that Financial innovation and innovative development are significantly positively correlated at the level of 1%. In addition, the innovation and development of Financial innovation will increase by 0.4788% for each unit of change

in the financial innovation index. Financial innovation is also significantly positively correlated with coordinated development and green development at the level of 1%. For every 1% increase in Financial innovation indicators, its coordinated development level will increase by 0.1492%, and the green development level will increase by 0.0372%.

In addition, Financial innovation is positively related to economic development, open development and shared development, but not significant. The reason may be that whether Financial innovation has a long-term impact on economic, open or shared development, there may be a lag.

(2) Robustness test

Considering the endogeneity problem of modeling, this paper will verify the robustness of model I through instrumental variable method.

Table 5. Regression Results of Model I robustness Test

	Mixed effect	Instrumental variable method
FinInn	0.2400*** (6.6060)	
MatCap	0.0000*** (5.1459)	0.0000*** (5.6024)
HumCap	0.0005*** (4.0480)	0.0005*** (3.7765)
Urban	0.0001*** (7.3037)	0.0001*** (6.7932)
GovInt	0.0034*** (6.7102)	0.0043*** (7.0879)
L.FinInn		0.2792*** (7.1521)
C	-0.0089*** (-8.5292)	-0.0088*** (-8.1643)
N	300	270
adj. R2	0.7915	0.7967
t	10	10
F-value/Wald	228.02	211.81

Note: The symbols "*", "**", and "***" indicate significance at the 10%, 5%, and 1% levels, respectively; The numbers in parentheses are the corresponding standard errors.

It can be seen from the above table that, after using the instrumental variable method to test, Financial innovation

FinInn and high-quality economic development EcoQua show a significant positive correlation at the level of 1%,

which is consistent with the regression results in Table 1, indicating that Financial innovation is conducive to promoting high-quality economic development. This conclusion is robustness and is not affected by endogenous

problems.

(3) Mechanism analysis

This article uses STATA15.0 for regression based on Model 2, and the regression results are shown in the following table.

Table 6. Regression test results of each variable in Model 2

	(1) ecoqua	(2) tecinn	(3) ecoqua
fininn	0.2400*** (6.6060)	0.7383*** (7.2826)	0.1119*** (3.2351)
matcap	0.0000*** (5.1459)	0.0000*** (3.7472)	0.0000*** (3.7137)
humcap	0.0005*** (4.0480)	0.0034*** (9.2746)	-0.0001 (-0.4430)
urban	0.0001*** (7.3037)	-0.0001* (-1.9625)	0.0001*** (9.3552)
govint	0.0034*** (6.7102)	0.0044*** (3.1325)	0.0026*** (5.8291)
tecinn			0.1735*** (9.4689)
C	-0.0089*** (-8.5292)	-0.0290*** (-10.0147)	-0.0038*** (-3.6268)
N	300	300	300
adj. R2	0.7915	0.6892	0.8398

Note: The symbols "**", "* *", and "* * * *" indicate significance at the 10%, 5%, and 1% levels, respectively; The numbers in parentheses represent the corresponding standard t values.

It can be seen from the above table that the coefficient of Financial innovation FinInn in column (1) is significant at the level of 1%, the coefficient of Financial innovation FinInn in column (2) is also significant at the level of 1%, and the coefficient of scientific and technological innovation TecInn in column (3) is also significant at the level of 1%. Therefore, the final test of the coefficient of Financial innovation FinInn in column (3) shows that it is significant at the level of 1%. Therefore, it can be concluded that this model has mesomeric effect, and there are some mesomeric effect. The total effect is 0.2400, the direct effect of Financial innovation on high-quality economic development is 0.1119, and the mesomeric effect through scientific and technological innovation is 0.1281 (0.7383 * 0.1735). In the impact of Financial innovation on high-quality economic development, the direct effect accounted for 46.6%, and the mesomeric effect accounted for 53.4%.

5. Conclusion and Suggestions

(1) Conclusion

Based on the mesomeric effect of scientific and technological innovation, this paper studies the impact of Financial innovation on high-quality economic development. Through empirical analysis, the following conclusions are drawn:

First, Financial innovation can directly promote high-quality economic development. In addition, in the research on the impact of Financial innovation on various dimensions of high-quality economic development, this paper finds that Financial innovation has a significant positive role in promoting innovative development, coordinated development, and green development, while for economic development, open development, and shared development, this paper speculates that the existence of hysteresis may not show a significant effect. Therefore, after lagging behind the core explanatory variable Financial innovation, the empirical results show that Financial innovation has a significant positive effect on economic development, open development, and shared development.

Second, Financial innovation has promoted high-quality economic growth by promoting scientific and technological innovation. After adding the intermediary variable scientific and technological innovation, it can be concluded that this model has a mesomeric effect, and there are some mesomeric effect. This also demonstrates Hypothesis II, that is, Financial innovation promotes high-quality economic development by promoting scientific and technological innovation.

(2) Suggestions

Accelerate institutional innovation. Establishing a mutually competitive and complementary financial institution organizational system that promotes the innovative development of the financial industry currently requires further relaxation of financial access. By establishing more non-state-owned commercial banks, the monopoly of national commercial banks is further weakened. We need to increase the functional design of financial institutions, promote the development of local small and medium-sized financial institutions, and make up for the gap in county and rural finance after the large-scale merger of state-owned commercial banks. We need to moderately develop financial holding companies.

Accelerate structural innovation in the financial market. To further expand direct financing channels and promote Financial innovation, it is important to promote institutional innovation. At present, the first step is to break the institutional bottleneck of capital flow and promote the rational and orderly flow of funds between different markets. Optimize the internal structure of the financial market, accelerate the development of direct financing, and reasonably adjust the proportion of direct and indirect financing. At the same time, encourage the development of venture capital (also known as venture capital) and accelerate the development of high-tech industries.

Improve the level of financial supervision and guard against risks brought by Financial innovation. The first is to update the regulatory concept, reduce the friction between regulation and innovation, and form a good atmosphere to encourage and support Financial innovation. The second is to

accelerate the innovation of the regulatory system and form a regulatory institutional arrangement that automatically coordinates and balances the supply and demand of Financial innovation. Thirdly, we need to strengthen the cultivation of high-quality talents in regulatory departments.

References

- [1] Miao Junwei. Research on the Impact of Technological Innovation on High Quality Economic Development [D]. Beijing Jiaotong University, 2021.
- [2] Tang Juelan. Promoting high-quality economic development through financial service innovation: an analysis based on the perspective of total factor productivity [J]. People's Forum · Academic Frontiers, 2020 (14): 31-37.
- [3] Wu Chuanqing, Deng Mingliang. Science and Technology Innovation, Opening up to the Outside World, and High Quality Development of the Yangtze River Economic Belt [J]. Science and Technology Progress and Countermeasures, 2019,36 (03): 33-41.
- [4] Po-Hsuan, Hsu., Xuan, T.&Yan,X. Financial development and innovation:Cross-country evidence [J]. Journal of Financial Economics, 2014, 112(1):116-135.
- [5] Solow R M. Technical Change and the Aggregate Production Function[J]. Review of Economics & Statistics, 1957, 39(3): 554-562.