

New Trends in the Chinese Hi-Tech Industry: the Evidence from Huawei

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Abstract—The development of innovations is the key trend in the sustainable economic development of the countries and corporations all over the world. Huawei has proved to be one of the most efficient innovators on the market and conquered a significant niche on the global high-tech market. The authors put forward a hypothesis that such impressive results and a relatively narrow market niche are supported by the government influence on the company and the new trends in the Chinese high-tech development program. In order to clarify the issue, the authors have conducted an analysis of the corporate and government innovations development strategies and come to a conclusion that the delegation of innovations development to the corporate sector is the new trend in the Chinese R&D development strategy.

Keywords—Innovations; research and development; China; Huawei; trends, strategy

I. INTRODUCTION

The Chinese development today is one of the most dynamic in the world, and the most dynamic among all the fast-developing economies in Asia. This fact allows to draw several conclusions on the effectiveness of the Chinese development strategy and its industries' effectiveness.

One of the key industries, which define the tracks of the Chinese economy development, is the industry of high technologies. The key indicators in it depend on the corporate development dynamic, as the majority of the successes in the sphere originate from the main corporations, such as Huawei, Xiaomi, ZTE, Mediatec and others. Their research and development strategies and investments are of an utter importance to the development of the innovations in China in general, as they contribute to the main return on investments in innovations and to the social development [1]. The majority of the named companies develop the applied, not fundamental science, still such technological giants as Huawei pursue a strategy of fundamental science development aspiring to achieve the market leadership.

The research of the Huawei strategy and successes in the high-tech industry allows to reveal the interconnections between the corporate and the national strategies of science development and of investment in innovations. The practical significance of the findings is that knowing the key interconnections between the named processes, the innovative corporations from the EU, Russia and other countries can adopt them and benefit from the government-corporate

development strategies, especially in the sphere of computer sciences. Hence, the article is dedicated to revealing the key factors forming the sustainable growth of Huawei and the model of cooperation of the Chinese government and companies in the sphere of innovations.

II. METHODOLOGY

In order to conduct this comparison, the authors have pinpointed the main specific characteristics of the sustainable development strategy of Huawei and the key features of the Chinese innovative development plans. The comparative analysis results are supported by the statistical data on R&D, the authors forecasted the dynamic of R&D spending in China and by Huawei and conducted a correlation test on the two rows.

The analysis provided on the comparison of the innovative development strategies allows to reveal the key features of Chinese government-corporate partnership in the development of innovations and give a conclusion on the dependence of Chinese high-tech corporations on the government decisions

III. HUAWEI DEVELOPMENT STRATEGIES' SPECIFICS

The corporate strategy of the innovative development of Huawei is the core of the sustainable development plan of the company including among the other points digital inclusiveness, cybersecurity, environment protection and social responsibility [2]. The complex approach followed by Huawei provides natural limits to the innovations' development and their implementation in the everyday products. These limits are of the following character:

- The innovative products must contribute to a safer living environment in all aspects (the strategy itself denies the availability of "backdoors" in the software, or the creation of the innovative products in military sphere).
- The process of innovations is to be evolutionary, as the testing of the security of the revolutionary technologies takes time and if such technologies enter the market before strict testing, they may provide dangers for the cybersecurity of the customers, or even to their health and life (Huawei did not experience critical safety

failures of its products, like Samsung or Apple whose devices were at risk of a battery explosion).

- The strategy forces the company to rely on its own components and to cut down the production cooperation with other corporations, as it contributes to the higher risks of critical failures of the product components. It is especially evident in the context of discussing the national Chinese manufacturers, the majority of which does not follow the high standards of the quality and social responsibility as the leading Chinese high-tech corporations.
- This strategy connects the innovative and social component of the company's activity – the innovations cannot be presented as the minor updates for the consumer sector because the pursuit of the super revenues in the named sector contributes to the lower disposable income of its customers through regular cost of innovative products purchases.

The named points are theoretical and are not fulfilled in real life, but the pursuit for profits in the company is at least partially balanced by the strategy. This contributes to the additional profits through customer loyalty and helps gain the high goodwill values.

The development of innovations in Huawei's view lies mostly in the following sectors: wireless networks, carrier and enterprise networks, software, cloud core networks, artificial intelligence, etc. [3]. These spheres require massive research in the fundamental mathematics, physics and chemistry, apart from developing fundamental aspects of computer sciences. The Chinese scientific community historically lacks basic technologies in the named spheres, that is why Huawei found a new strategy of innovative development cooperation, comprising the following main points:

- The technologies that Huawei has developed by itself are strictly protected and not distributed, shared or sold in the form of patents.
- The innovations that the Company lacks in its current activities are extensively financed (in 2018 nearly 10% of revenues of Huawei were invested in R&D), the company seeks partners for their development; quite often these partners are situated abroad [4].
- The fundamental research is mainly conducted abroad, while the applied science is promoted in the headquarters of the Corporation.
- The financial resources are not divided by the country of investment parameter, hence the research institutions in other countries feel the same way, as the R&D departments in China [5].
- The main research spheres correlate with the ones offered by the Chinese five and three-year plans for the development of high technologies (7 out of 14 plans correlate with the primary Huawei points of innovative development strategy (calculated by the authors) [6].

These five points allow to conclude that the strategy of innovative development adopted by Huawei is the result of cooperation in this sphere with the Chinese government. In order to prove it the authors have forecasted the development

of investments in the R&D by Huawei and the spending of the Chinese government of the support of the R&D sphere (Fig. 1).

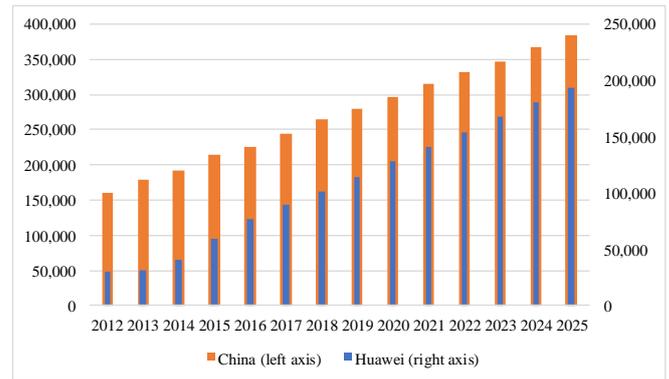


Fig. 1. The comparative statistics on R&D spending by China and Huawei (in millions CNY), created by the authors, based on [7, 8].

The correlation level between the two rows is equal to 0.9979 demonstrating the common trend and the common dynamics of the factor development since 2012. These findings lead to the necessity to estimate the main strategy of the Chinese innovations development and offer suggestions on the partnership model between the Chinese scientific authorities and the leading corporations of the country based on the evidence from Huawei.

IV. CHINA'S INNOVATIVE DEVELOPMENT

The development of the innovative research in China grew significantly in the last several years. This happened due to the growth of international tensions around the Chinese products and the necessity for the Chinese economy to prove its innovative potential in the age of information dominance on the market [9].

The previous course of the Chinese innovative progress was highly deviant from the regulations on intellectual property followed by the WTO countries – the Chinese authorities encouraged the companies to break the named rules and regulations and offered copied products. Today the situation has changed, as China needs extensive work on the development of the national economy and innovative products not fenced by the external influence. The trade war the country is conducting against the USA led to a sharp rise of China deterrence strategies in the US allies' countries [10, 11]. Another tendency is that China seeks to build an innovative economy with high value-added products as the main drivers for future development (it is dictated by the information society and the global scientific revolution [12]. In this regard, the development of the national innovative economy drivers is the key task for China.

The general strategy of China in this sphere is described by the following key points:

- The Chinese government encourages scientific activities in the universities and other research facilities, mainly in the sphere of AI, mathematics and computer sciences.

- The number of personnel involved in scientific research rises, while the number of institutions remains the same.
- The efficiency of the scientific personnel increases, especially in the named spheres (the number of scientific results grows faster than the number of scientists).
- The main financial resources are acquired from the state budget, not from private investments, allowing to develop the most demanded technologies in the economy.
- The fundamental/applied research funding ratio tends to rise to 0.61 in 2018 from 0.42 in 2013 demonstrating a significant restructuring of the research priorities (calculated by the authors, based on [8]).
- China proposes international cooperation in innovative development through its Belt and Road Initiative mechanisms, traditional student exchange and joint think tanks' creation; however, further implementation of their research results is highly regulated, as China insists that patents and copyright be reserved to Chinese owners or be in restricted joint use.

Taking these tendencies into account, it is possible to indicate several implications on the possibilities of the corporate R&D development. Out of 919 million CNY of the Chinese corporate investments in R&D, Huawei offered 101 million CNY, which allows to conclude it is one of the key investors in the sphere.

V. DISCUSSION

The correlation between the Chinese national development strategy and Huawei's development strategy allows to make several suggestions on the cooperation model proposed by China to its leading companies.

Firstly, the participants of the cooperation are the major and the most dynamically developing companies, no small enterprises are allowed, as the effectiveness of the R&D departments and the financial abilities of the big corporations suit more to the development model of the partly planned economy of China, as they are much more predictable.

Secondly, these companies should be leaders in some spheres, prior to the national innovative development of China, for instance, Huawei is the worldwide leader in 5G communications [13], while ZTE provides the majority of telecommunication equipment in the world. Xiaomi leads in the sphere of consumer electronics and has one of the best software development departments in China [14].

Thirdly, the cooperation is regulated by the long-term strategies, for instance, Huawei is opening education facilities [15, 16], in this way contributing to the development of the human potential in China (where the graduates of the named facilities have better job opportunities compared to their national economies).

Fourthly, the social effect of cooperation should be no less important than the economic effect. All the companies cooperating with the Chinese government produce high goodwill values.

Fifthly, in China, the share of the private sector in government-corporate partnership is small (public-private partnership in the democratic economies stands for the government-corporate partnership in China). Huawei, for instance, has a very complicated and not transparent ownership scheme, which highly likely points out the state involvement in Huawei ownership and development. Despite the fact that Xiaomi, for instance, is privately owned, its influence on the Chinese innovations is much smaller than the impact of Huawei or ZTE [18, 19].

All the mentioned points allow to conclude that China is delegating some of its major research programs in several high-tech spheres to the main corporations and uses their financial and human capital resources as the sources for the national innovative development boom, forming a variant of partnership where the government is a leading partner and directs the key spheres of research and the companies are inferior partners, fulfilling the plan of government innovation orders.

VI. CONCLUSION

The key trends revealed in this article allow to conclude that the Chinese technological giants arise from the state supported program of the Chinese innovations sector development. On the example of Huawei, the authors have revealed a key trend in the innovations development and proved that innovations and social sphere are tightly connected in the Chinese companies. These interconnections are formed by sustainable development programs, which are adopted by the Chinese companies and strictly adhered to (especially in relation to goals and metrics) under the influence of state policy.

The model of cooperation in the sphere of innovations revealed by authors has no analogs in the world, as it is based on the dominance of state investments in R&D and the control over corporate investments in the sphere, allowing to avoid the traditional non-elastic measures of state support in the planned economy. This strategy may be offered for the economies in transit in the sphere of innovative development; still, this strategy is useless for democratic economies.

Huawei as one of the leaders of the sphere of high technologies in the world pushes forward the economy of China by taxes payed, by positive social external effects, by international cooperation in R&D, attracting FDI in the most required research fields, and by sharing the innovations results with the Chinese government. This allows to conclude that the government-corporate cooperation with Huawei has a synergetic effect on the Chinese economy.

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