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Measurement of Superposition of New Energy Vehicle Industry Policy Based on Key Technology and Policy Optimization

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***Abstract*—Measuring the superposition of industrial policies on the key technology chains of new energy vehicles,using multiple regression models to explore the impact of the superposition of various policy measures on overall coordination .The result shows the multiple superposition of existing industrial policies has a limited effect on effectively promoting the development of new energy vehicle industry technology, and the adjustment of future policy should be based on dynamic monitoring of key technology chains.**

Keywords—New energy vehicles; key technology chain; superposition effect; policy optimization

I. INTRODUCTION

As an industrial system with multiple technologies, new energy vehicles are extracted from upstream raw materials to complete vehicle manufacturing, involving many emerging technologies, and intensive cultivation of key technologies is the prerequisite for realizing the controllability of the entire industrial chain. The initial development of the industry is not clear, the demand for technology is vague, and the limitations of the strength of the R&D of the car companies have led to the low enthusiasm of the new energy vehicle enterprises for their overall technological innovation. Under the support of industrial policies, the short-term production and scale of new energy vehicles The above-mentioned explosive growth, the human and financial resources invested in research and development have also risen sharply, but the manufacturing cost of the whole vehicle is too high, and the core component technology such as power battery needs further breakthrough.The new energy vehicle industry has experienced a development process from scratch to the present, and the promotion and influence of industrial policies have contributed. The problems behind the explosive growth of new energy vehicle production and sales are also endless. All kinds of signs have made the superposition of new energy auto industry policies questionable, and its implementation effect needs further evaluation.

In the long run, industrial policy is still a strong guarantee for promoting technological innovation and development of the new energy vehicle industry. However, there will also be mutual influences between the new energy vehicle industry policies. They may cooperate with each other to strengthen the role, and may also play the opposite role. Therefore, it is necessary to make scientific measurements on the superposition of policies on key technologies of new energy vehicles.

II. LITERATURE REVIEW

The current research perspective on the role of policy mainly involves the use of policy tools, market performance, and evaluation model construction. Yantai C [1] found the government attaches more importance to the entry of new energy vehicles and the development of the market but the investment. Suxiu L[2] found that with the increase in the number and intensity of industrial policies, technology patents, production and sales and business models showed a rapid development trend. Jiang C[3]examined the dynamic relationship between government subsidies and R&D intensity of new energy vehicle companies.Wei Z[4]constructed a multi-dimensional evaluation model for regional innovation policies to quantitatively evaluate innovation policies.Xiaozhen W[5]used negative binomial regression estimation model to study the impact of industrial policies on the innovation performance of wind power enterprises. From the perspective, there are few industrial policies that focus on the research of key energy technologies in new energy vehicles. The research on the key technologies to discuss the future direction of new energy vehicles is urgently needed.The superposition of multiple policies needs to be deepened within the policy system. Tae-hyeong Kwon [6]studied the effects of a portfolio of policies on renewable asset portfolio standards (RPS) and long-term contract auctions.Peng L[7] used the grey correlation degree coupled econometric model to empirically test the coupling and coordination degree of science and technology financial policy and innovation performance of SMEs.

In general, there are many researches on the policy of new energy vehicle industry at home and abroad, mainly focusing on the use of policy instruments, the importance and effectiveness of industrial policies,etc. From the perspective, there are few industrial policies that focus on the research of key energy technologies in new energy vehicles. The research on the key technologies to discuss the future direction of new energy vehicles is urgently needed.The superposition of multiple policies needs to be deepened within the policy system. The empirical method of coupling coordination degree is relatively mature for the measurement of the synergy of specific policy measures. This paper refers to this method based on key technology links for policy decomposition and recombination superposition. The superposition of scientific measurement policies promotes the effectiveness of technological innovation and provides a basis for further optimizing the new energy vehicle industry policy.

III. CARDING POLICY BASED ON KEY TECHNOLOGY LINKS

The new energy vehicle system is integrated by various technologies, from upstream raw materials to complete vehicles involving many key technologies(Fig. 1).

Through the policy developments announced by various websites such as China Automotive Industry Information Network and New Energy Vehicle Network, the industrial policies related to new energy vehicles issued by the state and various ministries and commissions since 2001 have been collected. After comparison and screening, 40 policies were selected. Based on the existing literature[8], experts from relevant fields were consulted and the policies were divided into four categories: planning and guiding , fiscal and taxation support , technical normative and administrative supervision measures. The policy is broken down and coded and matched to key technology links.

IV. MEASUREMENT OF INDUSTRIAL POLICY SUPERPOSITION EFFECT

Industrial policies play a role in various technological aspects and promote the innovation and development of technology. Through the superposition of policies and measures, mutual cooperation plays an obvious role in strengthening and greatly promotes technological innovation. On the contrary, it will inhibit each other from hindering innovation and development. The result of re-superimposition after the decomposition of the policy is shown in Fig. 2.

The combination of policy measures within the industrial policy system can promote the synergistic effect of synergy. It can be considered that there is a synergistic relationship between policy measures, usually with the degree of influence of the coupling degree reaction system or factors. However, in some cases, it is difficult to reflect the overall efficacy and synergy effect of the superposition of a number of policy measures.

To this end, it is necessary to construct a coupling coordination degree model to judge the degree of coordination of the interaction of policy measures.Based on the existing literature, we consulted relevant professionals engaged in research in the field of new energy vehicles. At the same time, we also invited three professors in the field of public policy and five leaders of new energy vehicle companies to conduct a careful discussion. Finally, a detailed set of scoring standards was developed to rigorously score the effectiveness of policy measures and obtain final data.Using the planning and guidance, fiscal and taxation support, technical norms and administrative supervision policy measures system coupling relationship model, the coupling degree and coupling coordination degree between the various policy measures of the key technologies in the upstream and downstream of the new energy vehicle industry chain are obtained (Fig. 3).

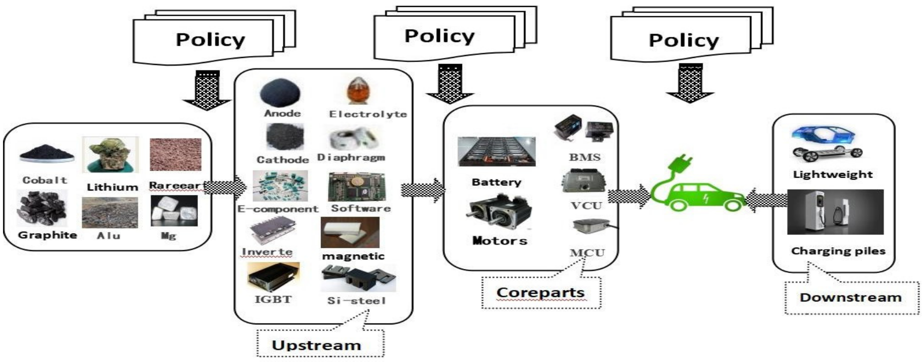

Fig. 1. Analysis of the structure of the new energy vehicle.

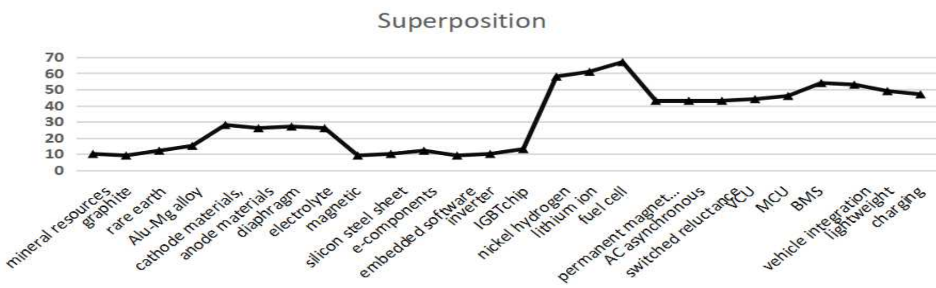

Fig. 2. 40 policy superimposition.

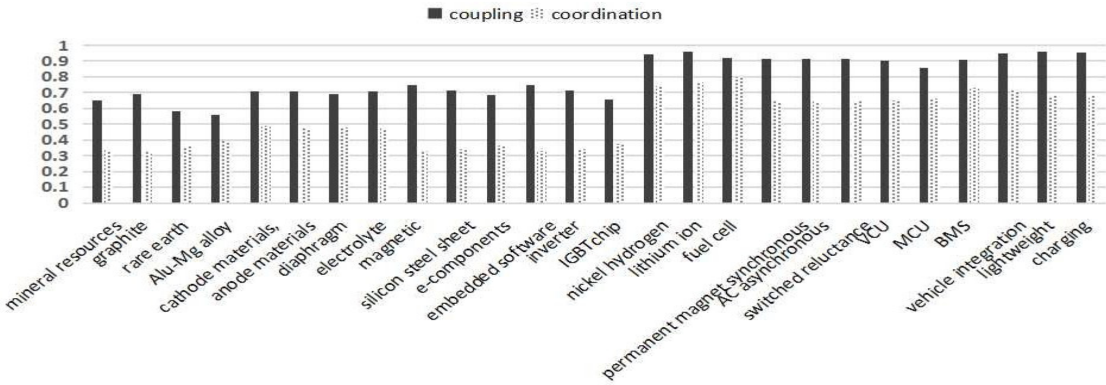

Fig. 3. [Coupling and coordination of policy measures based on various technologies

It can be seen from Fig. 3 that the coupling degree of the new energy vehicle industry policy system is significantly higher than that of the coordination degree, which indicates that the policy measures are highly dependent, and the mutual promotion and support between the systems is obvious. However, in the case of high coupling, the degree of coordination between policies is generally low, especially in the process of extraction and preparation of upstream raw materials.

From the superposition of various policies, the government has focused on supporting the middle and lower reaches of new energy vehicles, the “three powers” and the whole vehicle segment. We can also see from the subsidy preferential policies that the national focus is on the strong subsidies for vehicle manufacturers. There are few specific policy measures for the upstream raw materials. This also just explains the imbalance of upstream policy.

The regression model is a mathematical model for quantitatively describing statistical relationships. It is used to study the calculation method of a variable's specific dependence on another variable. The regression coefficient characterizes the degree of influence of the independent variable on the dependent variable.In order to further explore the factors affecting the overall coordination degree, The regression model is constructed as follows:

$$Y = \alpha + \lambda_1 ABC + \lambda_2 ABD + \lambda_3 ACD + \lambda_4 BCD + \varepsilon$$

Which Y indicates the overall coordination degree . A, B, C, and D represent planning guidance, fiscal and tax support, technical norms, and administrative supervision policies and measures, respectively. The combination of letters represents the degree of coordination between systems, λ_n (n=1, 2, 3, 4) are independent variable coefficients, α is model constants and ε indicates the influence of other random factors on the dependent variables (Table I).

From the results, it can be found that the coordination of the three types of policy measures: planning guidance, technical norms and administrative supervision is not high, which has a negative impact on the overall coordination degree. In the early stage of technical planning, the new energy vehicle industry policy set a lower threshold for promoting industrial development. Driven by the policy, it set off a new round of investment boom. However, there are many hidden dangers behind the prosperity. Domestic new energy auto companies have low grades, lack core competitiveness, and have no real core technology. However, the policy support standards for various technologies have not been updated. Instead, enterprises that do not have the conditions to produce new energy vehicles have taken advantage of the various subsidies, which has hindered the company from going to innovation and the high-end road, and constantly rebuilding the low level.

V. Conclusions

Firstly, pay attention to the balance of industrial policy formulation for upstream and downstream technology links of new energy vehicles. In response to technical links that are currently not supported by industrial policies, such as cobalt-nickel-lithium resources, IGBT chips,etc.The government departments actively guide and support enterprises to invest in relevant talents and research and development.Secondly, improve the coordination between planning guidance, technical norms and administrative supervision policies and measures, and strengthen the regulation and supervision of fiscal and taxation support measures. Formulate more detailed plans for core technology links, especially weak technologies, and stricter technical standards to effectively regulate enterprises and reduce the excessive influx of capital. Administrative supervision should also improve the matching with policy planning and technical norms, ensure the consistency of policy practice process and planning objectives; effectively supervise the implementation of fiscal taxation and optimize financial resources. Configuration; strictly regulate the behavior of the guided objects to ensure the quality and safety .Thirdly, the dynamic measurement and adjustment of the superposition of new energy vehicle industry policies. The new energy vehicle industry technology is both complex and highly uncertain. Therefore, the introduction of industrial policies needs to be dynamically adjusted according to the changes of the industrial environment.

TABLE I. EFFECT OF THE SUPERPOSITION OF THE THREE SYSTEMS ON THE OVERALL COORDINATION DEGREE

Dependent variable	**Y（Coupling coordination）**				
Independent variable	***A+B+C***	***A+B+D***	***A+C+D***	***B+C+D***	***Constant***
coefficient	2.265	0.217	-0.412	0.458	0.084

a. R-squared=0.990

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REFERENCES

[1] Y.T. Chen , L.J. Zhang , Q. Wang , et al., “Policy evaluation on the development of China's new energy vehicle industry based on Two-stage Model,”[J] Science Research Management, 2013, vol. s1, pp. 167-174.

[2] S.X. Li, Y.Q. Liu , J.Y. Wang, et al., “China's new energy vehicle industry development policy:based on the market performance,”[J] China Population,Resources and Environment, 2016, vol. 26(9), pp. 158-166.

[3] C.L..Jiang, Y.Zhang , M.L.Bu ,et al., “The Effectiveness of Government Subsidies on Manufacturing Innovation:Evidence from the New Energy Vehicle Industry in China,”[J] Sustainability,2018, vol. 10(6), pp. 1692-1702.

[4] X.Z. Wang , H.H. Zou , W. Gao , et al., “Research on the effectiveness of industrial policy: Consideration on the ownership nature of wind power enterprises and the heterogeneity of regional innovation environment,”[J] Studies in Science of Science, 2018, vol. 2, pp. 225-238.

[5] W. Zhang , X.Y. Fei , Y. Xiao , et al., “Regional innovation policy evaluation based on the multi- dimensional model in Jiangsu,Zhejiang and Shanghai,”[J] Science Research Management, 2016, vol. s1, pp. 614-622.

[6] Tae-hyeong Kwon, “Policy synergy or conflict for renewable energy support:case of RPS and auction in South Korea,” [J] Energy policy,2018, vol. 123(12), pp. 443-449.

[7] P. Lin, N.N. Meng, Y. Li., “Research on the Coupling Coordination of Science and Technology Financial Policy and Technology-based SMEs Innovation Performance: Taking Hebei Province as An Example,”[J] Science and Technology Management Research,2018, vol. 3, pp. 54-62.

[8] B.H. Guo , J.Q. Li , X.T. Zhang . “Influences of Policy Coordination on Policy Effectiveness: An Empirical Study Based on 227 Chinese Photovoltaic Industry Policies,”[J] Studies in Science of Science,2018, vol. 5, pp. 790-799.