Intelligent Transformation of Chinese Manufacturing Enterprises

Subjects: Agricultural Economics & Policy
Contributor: Jianhua Zhu

Manufacturing is a resource-consuming industry, and its green production plays a vital role in improving the environment.The dual guidance of the government and the market can help different types of production companies to carry out green production.This research mainly uses the principle of tax leverage to study how the government sets tax standards to achieve green production in the manufacturing industry.

Keywords: intelligent transformation ; Green production ; Principles of Tax Leverage ; Government intervention

1. Introduction

With the integration and development of the traditional manufacturing industry with 5G, artificial intelligence, and other next-generation information technologies, the intelligent transformation of the traditional manufacturing industry for the sustainable development of enterprises has become a field of great research interest [1][2][3]. For example, Sany Heavy Industry Co., Ltd. (Changsha, Hunan, China) established an intelligent monitoring and data analysis platform—the Enterprise Control Center—by continuously increasing investment in technology research and development and technological innovation. Through the interconnection of production equipment and intelligent monitoring, real-time remote monitoring enabled the enterprise to increase the operating rate by 10%, increase the utilization rate by more than 50%, reduce the defect rate by 14%, and reduce the consumption of heat, gasoline, diesel, and electricity. However, many small- and medium-sized enterprises refuse to carry out intelligent transformation, mainly because of the high cost and risk of intelligent transformation, which hinders many enterprises from transformation [4]. Although many studies have shown that government subsidies for technological innovation can facilitate intelligent transformation, a key question arises as to whether government financial subsidies can cover the cost of intelligent transformation [5][6][7][8]. In addition to financial subsidies, the government should take further measures, such as environmental regimes [9][10], to facilitate the intelligent transformation of enterprises.

Based on the above analysis, it is clear that the government is an integral part of the intelligent transformation of enterprises. Among the many government policies that promote the intelligent transformation of enterprises, environmental policies and financial subsidies play an important role [11][12][13]. Some governments have adopted financial subsidies to stimulate enterprises towards intelligent transformation. Currently, technology innovation subsidies (TIS) and technological innovation awards (TIW) are the two most important forms of government financial subsidies. TIS means that the government subsidizes a certain percentage of the actual investment of the enterprise for the implementation of technological innovation [14][15]. For example, Henan Province in China provides an ex post facto subsidy of 30% of the actual investment in equipment and R&D for technological innovation demonstration projects. TIW is a government incentive for companies to innovate based on the results of their technological innovation [16]. For example, Henan Province offers a matching bonus of up to RMB 0.3 million for first-time certified high-tech enterprises and up to RMB 3 million for newly approved national major innovation platform carriers. In addition to the aforementioned financial subsidies, the government also uses the environmental system to promote the intelligent transformation of enterprises, and green taxation has become the main tool of the government. The government uses the principle of tax leverage to increase the tax cost of high resource consumption and environmental pollution to compel enterprises to improve their intelligent technologies, reduce pollutant emissions, and help them transform their production. At present, the Tax of Pollutant Emissions (TPE), the Tax of Excess Pollutant Emissions (TEPE), and the Pollutant Emission Indicator Trading Mechanism (PEITM) are the main instruments of governmental green taxation. TPE is a tax on the exploitation, pollution, and damage of environmental resources by entities and individuals [17][18]. The government sets emission standards for pollutants and collects TPE within the standards and collects TEPE from outside the standards (Fullerton 2017) [19]. PEITM is an effective approach to introducing the market mechanism into environmental protection through the premise of

the paid use of the environment, by approving the total amount of emissions in the region and establishing a trading market between supply and demand [20][21]. The general practice of PEITM is that a government agency assesses the maximum amount of pollutants that can be emitted in a certain area to meet the environmental capacity and divides the maximum allowed emissions into a number of emission shares, with each share being one emission right. In the primary market of emission rights, the government offers the emission rights to the emitters for a fee by certain means, such as bidding, auctioning, etc. After purchasing the emission rights, the discharger can buy or sell the emission rights in the secondary market according to the usage.

2. Path Selection for Transformation of Chinese Manufacturing Enterprises

2.1. TIS for Transformation of Enterprises

In the intelligent transformation of manufacturing enterprises, the biggest shortcoming, in the Chinese context, is the lack of awareness and motivation of technological innovation in manufacturing enterprises. Achieving technological innovation is a long-cycle, high-investment project, and therefore, many manufacturing enterprises in China usually choose to import technology from other enterprises to achieve development. Although the above-mentioned development model of manufacturing enterprises can help achieve economic growth in the short term, this development model is unsustainable and will cause problems such as low overall product quality, shortage of core production technologies, and low-level simple repetition of manufacturing processes, making it difficult for Chinese manufacturers to enter the high-end manufacturing field with high technology content, high added value, and strong competitiveness. In today's large-scale and socialized technology R&D, high-tech and product R&D is characterized by large-scale high R&D costs, and many professional talents are required, which makes enterprises bear high risks. Therefore, according to the development needs of manufacturing enterprises and China's economic development strategy, the government needs to influence manufacturing enterprises to engage in technological innovation through technology subsidies and reduce the risk of technological innovation in order to promote technological progress and the transformation of manufacturing enterprises. Currently, the Chinese government has supported—via subsidies—some technological innovations. For example, from 2005 to 2008, the financial resources of the Autonomous Region amounted to RMB 100.39 million, supporting 115 projects.

2.2. Market-Oriented PEITM for Transformation of Enterprises

The core idea of PEITM is that the government establishes legal rights to pollutant emissions and gives such rights the property of a commodity that can be bought and sold to achieve the control of pollutant emissions. The manufacturing enterprises decide whether to buy or sell the pollutant emissions indicators on their own based on the needs of enterprise development. Because the government sets overall pollutant emissions targets to meet environmental requirements, no matter how said emissions indicators are traded among manufacturing enterprises, they will not lead to a decline in environmental quality. By establishing a market-based trading mechanism, improvements in the trading mechanism of energy use rights, pollutant emissions rights, innovating mechanisms of paid use, budget management, investment and financing, cultivating and developing the trading market, economically stimulating manufacturing enterprises to pursue product structure upgrades, and improving the technology initiative development of manufacturing enterprises can lead to the realization of the intelligent transformation of manufacturing industries.

2.3. Green Tax System for Sustainable Development in China

As an important system of environmental management in China, pollutant emissions charges have played a positive role in promoting the control of emission units, raising funds for pollution control, and strengthening environmental protection efforts. With the development of China's social economy, the existing pollutant emissions charges system can no longer meet the needs of reducing the total amount of pollutant emissions and improving environmental quality. According to the Law of the People's Republic of China on the Prevention and Control of Water Pollution, the Law of the People's Republic of China on the Prevention and Control of Air Pollution, and other relevant laws on environmental protection, the pollution emissions charge has been changed from a single pollutant emissions charge to pollutant emissions charges that can coexist with excess pollutant emissions charges.

Although China currently does not have an environmental tax in the legal sense, since the tax-sharing system in 1994, China's environmental-related tax revenue has continued to increase. In 2007, it was estimated at about RMB 529 billion, which has laid the foundation for the implementation of environmental taxes to prevent ecological destruction and environmental pollution. It is worth noting that since 2000, China's tax revenues, which are closely related to the environment, such as resource tax, consumption tax, and urban construction tax, have grown rapidly. The proportion of

total tax revenue has been around 11%, accounting for the total national income, and this proportion has continued to increase. In 2002, the proportion was 1.7%, and in 2007, the proportion rose to 2.14%. In the mid-1990s, environmental tax revenue in OECD countries accounted for 2–3% of each country's GDP. The environmental tax revenue of countries with higher proportions such as Denmark, Czech Republic, Finland, and others accounted for more than 3% of GDP; the U.S. is lower, at about 1%. It can be seen from the perspective of resources and the environment that China's current tax system is close to the level of OECD countries in the mid-1990s in terms of income. This shows that China's current tax system has a "light green" foundation.

References

1. Su, J.; Su, K.; Wang, S. Does the Digital Economy Promote Industrial Structural Upgrading?—A Test of Mediating Effects Based on Heterogeneous Technological Innovation. Sustainability 2021, 13, 10105.
2. Tim, S.; Michael, O.; Sascha, K.; Holger, K. Industry 4.0 as Enabler for a Sustainable Development: A Qualitative Assessment of its Ecological and Social Potential. Process. Saf. Environ. 2018, 118, S1879791293.
3. Niu, P.; Zhu, J.; Sun, Y. Dynamic Modeling and Chaos Control of Informatization Development in Manufacturing Enterprises. Entropy 2021, 23, 681.
4. Jz, A.; Ys, B. Dynamic modeling and chaos control of sustainable integration of informatization and industrialization—ScienceDirect. Chaos Solitons Fract. 2020, 135, 109745.
5. Li, F.; Andries, P.; Pellens, M.; Xu, J. The importance of large firms for generating economic value from subsidized technological innovation: A regional perspective. Technol. Forecast Soc. 2021, 171, 120973.
6. Lin, B.; Luan, R. Do government subsidies promote efficiency in technological innovation of China's photovoltaic enterprises? J. Clean Prod. 2020, 254, 120108.
7. Xu, J.; Wang, X.; Liu, F. Government subsidies, R&D investment and innovation performance: Analysis from pharmaceutical sector in China. Technol. Anal. Strateg. Manag. 2020, 33, 535–553.
8. Luo, G.; Liu, Y.; Zhang, L.; Xu, X.; Guo, Y. Do governmental subsidies improve the financial performance of China's new energy power generation enterprises? Energy 2021, 227, 120432.
9. Ouyang, X.; Li, Q.; Du, K. How does environmental regulation promote technological innovations in the industrial sector? Evidence from Chinese provincial panel data. Energ. Policy 2020, 139, 111310.
10. Ma, H.; Li, L. Could environmental regulation promote the technological innovation of China's emerging marine enterprises? Based on the moderating effect of government grants. Environ. Res. 2021, 202, 111682.
11. Hattori, M.; Tanaka, Y. Subsidy or tax policy for new technology adoption in duopoly with quadratic and linear cost functions. Mpra Pap. 2015, 35, 1423–1433.
12. Krass, D.; Nedorezov, T.; Ovchinnikov, A. Environmental taxes and the choice of green technology. Oper. Res. 2015, 22, 1035–1055.
13. Liu, L.; Kang, C.; Yin, Z.; Liu, Z. The effects of fiscal and taxation policies on the innovation efficiency of manufacturing enterprises: A comparative study from the perspective of economic regions. Transform. Bus. Econ. 2019, 18, 206–228.
14. Wu, H.; Hu, S. The impact of synergy effect between government subsidies and slack resources on green technology innovation. J. Clean Prod. 2020, 274, 122682.
15. Buravleva, Y.; Tang, D.; Bethel, B.J. Incentivizing Innovation: The Causal Role of Government Subsidies on Lithium-Ion Battery Research and Development. Sustainability 2021, 13, 8309.
16. Zhang, G.P.; Yu, J.; Xia, Y. The Payback of Effective Innovation Programs: Empirical Evidence from Firms that Have Won Innovation Awards. Prod. Oper. Manag. 2014, 23, 1401–1420.
17. He, P.; Ning, J.; Yu, Z.; Xiong, H.; Jin, H. Can Environmental Tax Policy Really Help to Reduce Pollutant Emissions? An Empirical Study of a Panel ARDL Model Based on OECD Countries and China. Sustainability 2019, 11, 4384.
18. Mardones, C.; Mena, C. Economic, environmental and distributive analysis of the taxes to global and local air pollutants in Chile. J. Clean Prod. 2020, 259, 120893.
19. Fullerton, D.; Karney, D.H. Multiple pollutants, co-benefits, and suboptimal environmental policies. J. Environ. Econ. Manag. 2017, 87, S516208804.
20. Bing, X.; Mitchell, B.; Yong, G.; Ren, W.; Mueller, K.; Ma, Z.; Oliveira, J.; Fujita, T.; Tobias, M. A review on China's pollutant emissions reduction assessment. Ecol. Indic. 2014, 38, 272–278.

21. Gao, G.; Zeng, X.; An, C.; Lei, Y. A Sustainable Industry-Environment Model for the Identification of Urban Environmental Risk to Confront Air Pollution in Beijing, China. Sustainability 2018, 10, 962.