

The Impact of Environmental Regulation on Employment: A Review of Studies

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Abstract: In the context of green and low-carbon transition, there is an increasing number of studies on the impact of environmental regulation on employment, and this paper mainly analyzes the connotation of environmental regulation, tools, employment impact perspectives, and research shortcomings and suggestions. First, this paper discusses the definition of environmental regulation, analyzes the common measurement methods of environmental regulation, secondly, summarizes the main tools of environmental regulation, and thirdly, summarizes the various views of the academic community on the impact of environmental regulation on employment, including different theoretical explanations such as cost effect, innovation effect and uncertainty effect. Finally, this paper reviews the shortcomings of current research, and suggests that policy design should take into account the dual goals of environmental protection and employment promotion to achieve sustainable development.

Keywords: Employment, environmental regulation, high-quality economic development, "Double carbon" goal.

1. Introduction

As the largest carbon emitter and the world's second largest economy, China has been consuming a large amount of fossil fuels due to its long-term dependence on the industrial economy to drive economic growth, resulting in rising carbon emissions. Huge carbon emissions have put China under increasing pressure to reduce emissions. The report of the 20th National Congress of the Communist Party of China also emphasized that China should focus on controlling fossil energy consumption, promote clean, low-carbon and efficient use of energy, promote the adjustment of energy structure from the supply side and the consumption side at the same time, and actively and steadily promote carbon peak and carbon neutrality. In order to achieve the "dual carbon" goal, China has introduced a series of carbon reduction measures, and environmental supervision has been continuously increased. Environmental regulation is a broad and profound social change, which will inevitably have an impact on all walks of life. In the process of environmental regulation, with the transformation of production methods and development concepts in all walks of life, some industries have been eliminated due to their inability to adapt to environmental changes, so employees in this industry have to face job adjustment and change. Employment, as a livelihood issue, is an important macroeconomic goal. The rise in unemployment will not only lead to a lag in economic construction and a decline in total social output, but will also widen the income gap and affect social and political stability (Chen Yuanyuan, 2011). At this stage, China is in a critical period of economic transformation and high-quality development, ecological environmental protection is related to the improvement of economic quality, and full employment is related to the stability of people's livelihood. It can be found that the environment is an ecological issue and a key way to achieve sustainable development in China, and employment is a livelihood issue and a livelihood issue. So, can the government introduce appropriate policy measures to achieve the dual benefits of the environment and employment? It is a hot spot of concern in today's society.

2. The Connotation and Classification of Environmental Regulation

2.1. The Connotation of Environmental Regulation

The evolution of environmental regulation reflects a shift from single-led government to the participation of multiple actors. In the early days, environmental regulation mainly relied on the government's "visible hand", through administrative orders, laws and regulations and market-oriented means, to impose strict control and restraints on heavily polluting industries. At this stage, the government played the role of the main regulator, taking mandatory measures to promote enterprises to reduce pollution emissions. However, with the progress of society and the increasing awareness of environmental protection among residents, the public has gradually attached more importance to environmental protection, and the government has begun to advocate the development concept of "green water and green mountains are golden silver mountains", emphasizing the harmonious symbiosis between economic development and environmental protection. In this process, non-government forces have gradually played an important role, including social organizations, environmental volunteers, residents and industry associations and other diversified subjects, so that environmental protection is no longer solely dependent on government supervision, but the formation of environmental protection synergy promoted by the government, enterprises and the public. Through the collaboration of such diversified subjects, the problem of negative environmental externalities has been solved more comprehensively and effectively. Whether it is the government or non-governmental organizations, the core purpose of environmental regulation is to promote green transformation through the constraints and guidance of polluting enterprises, realizing the double dividend of economic growth and environmental protection, thus laying the foundation for sustainable development and ultimately reducing or eliminating the negative impacts caused by pollution (Gao, 2023).

2.2. Classification of Environmental Regulations

Environmental regulation can be divided into formal regulation and informal regulation according to the different implementing entities (Zhou Haihua and Wang Shuanglong, 2016). Formal regulation is usually led by the government, including laws, regulations, standards and administrative orders, which are mandatory and legally enforceable. Informal regulation mainly relies on social groups, public opinion, and corporate voluntary norms of conduct, such as social responsibility, corporate ethics, and environmental information disclosure. As environmental issues become more complex, informal regulation has also played an important role in some cases, especially among an increasingly environmentally conscious public. In addition, environmental regulations can be classified according to their specific enforcement tools. Command-and-control environmental regulation restricts pollution sources through the government setting mandatory emission standards or codes of conduct, which has direct coercive force, but may lead to higher costs for enterprises. Market-based incentives encourage enterprises and individuals to participate in environmental protection by rewarding environmentally friendly behaviors, such as carbon trading, tax incentives, subsidies, etc. (Zhang Xiaomin et al., 2021) public participation regulation emphasizes the role of society and the public, promotes environmental information disclosure, public participation in decision-making and supervision, and promotes the socialization and transparency of environmental protection.

3. Measurement Methods for Environmental Regulation

In the literature, environmental regulation measurement methods are usually categorized into three main groups. The first category is the single-indicator method, which measures the intensity or effectiveness of environmental regulation by selecting a single indicator. For example, the proportion of government revenue from sewage charges to industrial value added, emissions per unit of GDP, environmental taxes and fees, and the number of environmental laws and regulations can all be used as measures (Yu Lianchao et al., 2019). The second category is the environmental regulation indicator system method, which evaluates the comprehensive efficiency of environmental regulation by constructing a comprehensive environmental regulation indicator system and combining multiple indicators. Common analytical methods include Data Envelopment Analysis (DEA), which can effectively assess the relationship between human, material and financial inputs and pollution control effects. The third category is the categorical examination method, in which environmental regulation is categorized into different types, such as command-and-control, market-incentive and voluntary-participation, and the strength and effectiveness of each type of environmental regulation is measured by comprehensive indicators constructed from these different perspectives (Qiao Bin, 2021).

3.1. The impact of Environmental Regulation on Employment

The current academic research on the impact of environmental regulation intensity on employment mainly presents three different views. The first view is that

environmental regulation inhibits employment through the “cost effect” and the “pollution refuge effect”. Specifically, stringent environmental regulations will increase the production costs of enterprises, especially the need to invest more money in pollution control or the construction of environmental protection facilities, which may lead to the downsizing of employees or layoffs, thus negatively affecting the job market. At the same time, some of the more polluting firms may choose to relocate to regions or countries with lower environmental requirements, further aggravating employment pressure. The second view is consistent with Porter's hypothesis, which argues that environmental regulations can promote technological innovation of firms. In this case, in order to cope with environmental regulations, firms may increase their R&D investment and promote the innovation of green technologies and production methods. Such innovation not only enhances the competitiveness of enterprises, but also creates new employment opportunities, especially in industries related to environmental protection and sustainable development, thus leading to overall employment growth. The third view is that the impact of environmental regulation on employment is uncertain and manifests itself in a “U-shaped” curve. Specifically, in the short term, the cost pressures faced by enterprises may inhibit employment, but over time, through technological innovation and transformation and upgrading, enterprises will be able to adapt to stricter environmental regulations, which will lead to the creation of new jobs, thus realizing the double dividend of employment and the environment. This view emphasizes the time lag and long-term nature of the impact of environmental regulations on employment.

3.2. The Cost Effect

The cost effect is that environmental regulations increase the production costs of firms, which in turn reduces employment opportunities. Research has shown that the implementation of strict environmental regulations can lead to more resources for companies to invest in compliance, which often means higher costs for companies, especially in highly polluting, resource-intensive industries. In order to cope with the additional environmental costs, companies may choose to lay off staff or scale back production, resulting in a loss of jobs. Through empirical research, Wu Qihe Tao Liang (2020) found that environmental regulations do inhibit employment growth in some cases, especially in the short term.

3.3. The Innovation Effect (Porter's Hypothesis)

Kuai et al. (2021) and Wang Feng and Ge Xing (2022) argue that in contrast to the cost effect, the innovation effect emphasizes that environmental regulation can stimulate technological innovation by firms, thereby driving employment growth. Porter's hypothesis suggests that while environmental regulation may lead to higher costs in the short term, it can improve the competitiveness of firms and create new jobs by incentivizing them to innovate in environmental technologies. For example, innovations in clean energy technology, energy-saving equipment, and environmental monitoring and treatment technologies have not only promoted industrial upgrading, but also provided more employment opportunities for high-skilled workers. Therefore, some studies believe that environmental regulation is a positive factor to promote technological progress and

industrial structure transformation, and can create more jobs in the long run.

3.4. The Uncertainty Effect (U-Curve)

Li Mengjie (2016) proposed that the uncertainty effect and the impact of environmental regulation on employment may show a U-shaped curve. Qin et al. (2018) argue that in the short term, due to the need for firms to adapt to new regulatory requirements, there may be rising costs and reduced production, which will lead to a decrease in employment. However, as firms adapt and improve productivity through technological innovation, environmental regulations may instead promote job growth. For example, some industries may see an increased demand for highly skilled workers due to the implementation of environmental regulations, especially in the environmental industry and green technology sectors. This effect suggests that the impact of environmental regulation is dynamic and needs to take into account the difference between the short and long term.

4. Conclusions and Recommendations

Based on the above analysis, the impact of environmental regulation on employment is not singular, but shows different effect mechanisms, and is affected by region, industry, enterprise and other factors. Overall, in the short term, strict environmental regulations may discourage employment through cost effects, especially in traditional and highly polluting industries. However, with the advancement of technological innovation and industrial structure transformation, environmental regulation is likely to promote employment in the long run, especially in emerging industries such as environmental technology and clean energy. The innovation effect and U-shaped curve effect of Porter's hypothesis provide a theoretical basis for this phenomenon.

Future research should further explore the impact of environmental regulation on employment, especially the heterogeneous impact across regions, industries, and firms. Policy design should consider how to give full play to the positive effects of environmental regulation by optimizing the supporting measures of environmental regulation and employment policies, avoid excessive restrictions on employment opportunities in traditional industries, and promote the growth of green employment. At the same time, the government and enterprises should work together to

strengthen the support of technological innovation and environmental protection industries to achieve the dual goals of environmental protection and employment promotion.

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