

Research Article

The Impact of Internet Use on Corporate Tax Avoidance: Evidence from Chinese Enterprises

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Based on the data of Chinese industrial enterprises from 2004 to 2009, a fixed-effect model is adopted in this paper to analyze the effect and the mechanism of the enterprises using the Internet on tax avoidance. The result shows that using the Internet will produce the peer effect, which enables enterprises to learn tax avoidance strategies on the Internet and makes the degree of tax avoidance between enterprises and other enterprises in the same industry converge. At the same time, using the Internet has a network effect, and the more the enterprises access the Internet, the higher the degree of tax avoidance for enterprises is. In addition, the effect of the Internet on tax avoidance is influenced by the intensity of tax collection and the nature of enterprises. With a further examination, it has been found that enterprises not only acquire the two tax avoidance strategies of underreporting profits and underpaying taxes through the Internet but also master the planning strategy.

1. Introduction

By January 2021, the global Internet population had reached 4.66 billion, and the global Internet penetration rate had reached 59.5 percent, according to the Digital 2021 Global Overview Report. The actual number of Internet users is likely to be bigger as COVID-19 has had some impact on the report. As to the market capitalization of companies, Internet companies are rising rapidly. By December 31, 2018, the world's top 30 listed Internet companies had created a total of 3.5 trillion US dollars, as reported by the China Academy of Information and Communication Technology (CAICT) in 2019 in the China Internet Industry Development Trend and Boom Index Report. In terms of economy, the digital economy among 47 countries measured in 2020 had reached \$32.6 trillion, according to the CAICT's White Paper on the Global Digital Economy (2021), which accounts for 43.7% of GDP and has become an important part of economic development and reconstructed a new map of the global economy. The Internet is showing its great influence and potential for individuals, enterprises, and

society. Also, people are witnessing the subversive economic development and social transformation in the network era.

With the development of the Internet, more and more scholars focus on the impact of the Internet on taxation. Gnanon [1] proved that the increase in Internet use in developing countries has a higher positive impact on tax reform, compared with other countries. Based on information such as tax returns and census data, Lediga [2] studied whether Internet access in South Africa could help intervene in the administration of electronic tax filing services. The result shows that when the percentage of households with Internet access increases by 10%, the percentage of enterprises filing tax returns increases by 1.86%. Although the Internet plays a decisive role in promoting the modernization of tax administration and improving the efficiency of tax collection, it will also cause adverse effects such as aggravating the degree of tax avoidance by enterprises. For example, at the macro-level, by analyzing 152 countries' data from 1999 to 2007, Elgin [3] found that Internet penetration increases online transaction behavior, which makes it easier for enterprises and

households to evade taxes, thereby expanding the size of the shadow economy. At the micro-level, Goolsbee and Bruce et al. found that the online transaction behavior of the Internet makes it easier for consumers to avoid paying consumption tax [4, 5]. Argilés-Bosch et al. found that e-commerce has an impact on companies' labor tax avoidance [6]. Specifically, the French e-commerce business can use more favorable employment agreements to circumvent social insurance premiums.

Although some valuable results have been achieved, there are still deficiencies. Existing studies mainly regard the Internet as a means or a tool for tax avoidance. They believe that the Internet can facilitate tax evasion for existing income sources, or that the taxes on the income gained through the Internet are easy to evade [7]. People ignore the role of the Internet in the dissemination of information. As an online platform for instant communication, the Internet has broken the geographical limitations of traditional communication platforms, which makes it easier for enterprises and individuals to share and master effective tax avoidance strategies, thus influencing the tax avoidance behaviors of enterprises and individuals. An essay closely related to this study is about the influence of Internet forums on the tax avoidance behaviors of Uber drivers [8]. It finds that the forums were flooded with tax-related contents such as tax returns, income definitions, and expense deductions by analyzing interactions in three Internet forums. These contents affect the willingness and behaviors of drivers to comply with tax payments. In this study, we try to explore the impact of the Internet as a communication tool on corporate tax avoidance.

Compared with previous studies, here is the marginal contribution of this article. Firstly, existing literature on the Internet and tax avoidance mainly regards the Internet as a means or tool for tax avoidance and pays less attention to its role in information dissemination. This study regards the use of the Internet by enterprises as a way for enterprises to build social networks. We examine the impact of enterprises' use of the Internet as an information exchange tool on corporate tax avoidance from the perspective of social network connection. It enriches the empirical literature on the intersection of the Internet and the economy as well as deepens the understanding of the economic effects of the Internet. Secondly, compared with Oei and Ring, the authors conduct a deep analysis of the mechanism of the Internet on corporate tax avoidance. Based on that, it is found that the Internet has an impact on corporate tax avoidance through peer effect and network effect, which deepens the understanding of the knowledge transfer mechanism of the Internet. Thirdly, the authors also find that the Internet has taught companies not only tax avoidance strategies of underpaying taxes and underreporting profits but also planning strategies. This finding is of great significance for the government to promote the implementation of tax and fee reduction policies. It requires dialectical treatment and correct guidance for helping enterprises to use the Internet.

The main work of this paper is as follows: using the data from China Industrial Enterprise Database between 2004 and 2009, we measure enterprise Internet use in terms of

whether enterprises report their web address (Web) and e-mail address (e-mail). The result shows that enterprises acquire tax avoidance strategies after using the Internet, which significantly intensifies their tax avoidance behaviors. Through the mechanism analysis, this article finds that the Internet will produce a peer effect, that is, the degree of tax avoidance of enterprises using the Internet is affected by the degree of tax avoidance of other enterprises in the network. In addition, the Internet also produces a network effect. That means the more the enterprises use the Internet, the greater the impact it has on the degree of tax avoidance. Further research shows that the effect of the Internet on the degree of tax avoidance is influenced by the intensity of tax administration and the nature of enterprises.

The rest of this paper is arranged as follows. Section 2 presents the literature review and theoretical analysis. Section 3 gives the theoretical model. Section 4 presents the research design, including the measurement model and the description of the data indicators. Section 5 gives the empirical results and discussion. Section 6 presents further discussion, including other evidence of corporate tax avoidance, heterogeneity analysis, and the evidence of corporate mastery of tax planning strategies. Section 7 gives the conclusions and policy implications.

2. Literature Review and Theoretical Analysis

2.1. The Impact of Social Networking on Tax Avoidance. The tax avoidance of enterprises is affected by many factors, such as executive characteristics, corporate reputation, official language, corporate debt, and so on [9–13]. Among them, the social network connection is a factor that cannot be ignored. As is known to all, the tax avoidance strategy and experience are private and hidden topics. Enterprises will only share the tax avoidance strategies and experience in their specific social networks. As a result, enterprises can tap into new tax avoidance strategies and experience with the help of their social networks. Once companies learn that other companies in shared networks succeed in avoiding taxes through some tax avoidance strategies and experience, they are likely to copy and refer to that tax avoidance strategy for tax avoidance purposes [14]. Social networking among enterprises has been shown to influence various enterprise strategies, including the use of tax avoidance [15–17]. Among them, the directors' network connection is a variable that is relatively easy to see in the corporate social network connection [18]. Brown and Drake suggest that board ties can promote the sharing of corporate tax avoidance knowledge among firms [14]. Their results indicate that firms have lower effective tax rate when directors on their boards also serve on the boards of other companies with low tax rates. On top of that, previous studies have also looked at employees and families, audit firms, affiliates, government-enterprise relationships, and other types of social network contact on corporate tax avoidance behavior [19–26]. The use of the Internet represents one of the ways in which companies build social networks. With the rapid development of information technology, a large amount of information and data is transmitted on the Internet [27].

Enterprises can obtain the knowledge and strategy of production and operation on the Internet. Most importantly, enterprises will build Internet-based social networks that break down geographic barriers and allow new knowledge, strategies, and ideas to spread faster and more widely. They help enterprises obtain strategies and experience from each other through the Internet. Here is a hypothesis.

Hypothesis 1. Companies using the Internet can obtain more strategies and experience from the Internet to raise their tax avoidance.

2.2. The Peer Effect of the Internet. The peer effect means that when an enterprise faces a market choice, rather than making an optimal decision in face of a single market, the enterprise will be influenced by the surrounding enterprises of the same status, thus changing its own behaviors and results. For example, Gao et al. [28] concluded that firms in the same region exhibit similar financial decisions. Matray [29] studied the peer effect of technological innovation of firms and found that technological innovation of a single firm promotes technological innovation of geographically adjacent firms. This is mainly because enterprises in the same area are geographically close. Also, there are more opportunities to build social networks and valuable connections. Therefore, there will be more opportunities for communication to form the imitation of communicative learning. Different from the social network composed of traditional social relations, the social network constructed by enterprises through the Internet breaks the geographical barriers so that the communication between enterprises is no longer limited to the adjacent areas. This new type of social network connection enables enterprises to observe and imitate the behaviors of other enterprises when making production and operation decisions and can also provide a reference for other enterprises' decision making so that the tax avoidance strategies of enterprises in Internet organizations tend to be consistent. Therefore, the authors propose Hypothesis 2 based on the above analysis.

Hypothesis 2. The Internet has a peer effect, and the tax avoidance of enterprises using the Internet is affected by the tax avoidance of other enterprises using the Internet.

2.3. The Network Effect of the Internet. The network effect is that the utility that each user gets from using a product is positively related to the total number of users. The more users there are, the higher the utility each user gets, and the value of each person in the network is proportional to the number of others in the network. This means that the increase in the number of network users will lead to a geometric increase in the total utility of users. In telecommunication systems, for example, there is no value in personally installing phones when people do not use them. The more widespread the telephone is, the more valuable it is to install the telephone [30]. The network effect is common in fields such as e-commerce, transportation, and finance [31–33]. As an interactive and shared

platform, the Internet can help to bring together cross-regional and cross-domain enterprises, resources, and demands and realize multilateral interaction in a low-cost and efficient way. In this process, enterprises can not only learn tax avoidance strategies from other subjects through the Internet but also share and disseminate their own experience to achieve the integration and penetration of information. Therefore, the Internet has a network effect. The more enterprises that access the Internet and the richer the information exchanged on the Internet, the more likely it is for enterprises to obtain effective tax avoidance strategies, thereby increasing the space for tax avoidance. The following hypothesis is therefore made based on the above analysis.

Hypothesis 3. The Internet has a network effect. The more the enterprises are on the Internet, the more the tax avoidance of enterprises is after accessing the Internet.

Figure 1 shows the impact path of Internet use by enterprises to increase tax avoidance. The enterprises have peer effect and network effect when using the Internet, which enable enterprises to learn tax avoidance strategies and enhance tax avoidance degree.

3. Theoretical Model

This paper adds the factor of enterprises' use of the Internet to the traditional A-S tax evasion model and analyzes the impact mechanism of enterprises' use of the Internet on enterprises' tax evasion behavior. According to the theoretical analysis, the impact of using the Internet on enterprise tax avoidance can be divided into the peer effect and network effect. The peer group effect of the Internet is that the tax avoidance behavior of enterprises will be influenced not only by the incentive of their own interests but also by other enterprises in the same industry in the social network. Enterprises can form social network connections through the Internet so that they can have a larger platform to exchange their tax avoidance experience. Enterprises are not only acquiring experience but also sharing experience, that is, enterprises can communicate and learn tax avoidance (tax planning) means through the Internet. The network effect is that as more enterprises in the same industry access the Internet, the more the tax avoidance experience they share and the larger the knowledge base they build, thus rendering it easier for enterprises to achieve the goal of tax avoidance.

3.1. Traditional A-S Model. In the traditional A-S model, w is all the actual income that taxpayers earn in a certain period and $w > 0$. x is the taxable income actually declared by the taxpayer to the tax department and $x \geq 0$. Due to the information asymmetry between taxpayers and tax departments, taxpayers will deliberately understate to evade tax, which will widen the gap between w and x . θ is the tax rate. In this model, it is assumed to be a fixed tax rate and $\theta > 0$. p is the probability that the taxpayer's tax evasion behavior is discovered by the tax authority. π refers to the proportion of

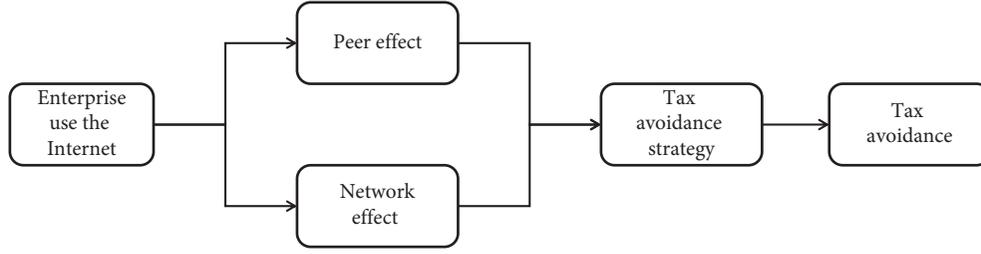


FIGURE 1: The impact path of Internet use by enterprises to increase tax avoidance.

the fines charged by the tax authorities to the undeclared income $(w - x)$ after the taxpayer's tax evasion is found, $\pi > 0$.

$$EU = (1 - p)U(w - \theta x) + pU[w - \theta x - \pi(w - x)]. \quad (1)$$

3.2. A-S Model of Enterprises Using the Internet. On the basis of the traditional A-S model, we can add two assumptions to the original model to reflect the impact of corporate Internet use on tax avoidance. There are two main factors affecting enterprises' use of the Internet. One is p . Enterprises can learn more tax avoidance strategies through the Internet and make it more difficult for tax authorities to find tax avoidance. The other is x . Enterprises have better tax avoidance strategies so they can declare lower taxable income.

The influence factor of the Internet network effect on p is defined as a ($0 < a < 1$). The influence factor on x is defined as b ($0 < b < 1$). A new formula consisting of p and x is built as follows:

$$\begin{aligned} p &= f(a) = e^{-a}p, \\ p &= f(b) = e^{-b}p. \end{aligned} \quad (2)$$

The A-S model of enterprises using the Internet is

$$\begin{aligned} EU &= (1 - e^{-\alpha}p)U(w - \theta e^{-b}x) \\ &+ e^{-\alpha}pU[w - \theta e^{-b}x - \pi(w - e^{-b}x)]. \end{aligned} \quad (3)$$

In order to analyze conveniently, suppose $Y = w - \theta e^{-b}x$, $Z = w - \theta e^{-b}x - \pi(w - e^{-b}x)$, and the simple expression of the model is

$$EU = (1 - e^{-\alpha}p)U(Y) + e^{-\alpha}pU(Z). \quad (4)$$

Taxpayer enterprises can achieve the purpose of tax evasion by limiting the amount of declared income so as to maximize their expected utility. Therefore, equation (5) needs to meet the conditions that the first derivative is equal to 0 and the second derivative is less than 0. This condition is proved below.

The first-order condition is

$$\begin{aligned} \frac{dE(U)}{dx} &= (e^{-\alpha}p - 1)\theta e^{-b}U'(Y) \\ &+ e^{-\alpha}p(\pi e^{-b} - \theta e^{-b})U'(Z) = 0. \end{aligned} \quad (5)$$

The second-order condition is

$$\begin{aligned} \frac{d^2E(U)}{dx^2} &= (1 - e^{-\alpha}p)\theta^2 e^{-2b}U''(Y) \\ &+ e^{-\alpha}p(\pi e^{-b} - \theta e^{-b})^2 U''(Z) < 0. \end{aligned} \quad (6)$$

When the second-order condition is permitted, there is a maximum value of the expected utility of the taxpayer enterprise. At this time, x can be obtained by means of the first-order condition, which corresponds to the maximum expected utility $E(U)$.

Taxpayers often prioritize lower risk tax avoidance strategies for risk aversion purpose. In information economics, the utility function of the risk averter is generally assumed to be concave. The utility increases with the increase of monetary return while the increase rate decreases. The second derivative of the utility function is smaller than zero.

The utility curve of the risk-averse subject meets $U(\cdot) > 0$, $U'(\cdot) > 0$, $U''(\cdot) < 0$. Given $\alpha \geq 0$, $b \geq 0$, $0 < p < 1$, $1 - e^{-\alpha}p > 0$, $\theta^2 e^{-2b} > 0$, $U''(Y) < 0$, $e^{-\alpha}p > 0$, $(\pi e^{-b} - \theta e^{-b})^2 > 0$, $U''(Z) < 0$, we can get $d^2E(U)/dx^2 < 0$, so the second-order condition is permitted. The maximum value can be obtained from equation (6). The taxpayer can maximize the utility by selecting the appropriate declaration amount x .

Then, we calculate the following equation:

$$\begin{aligned} \frac{\partial x}{\partial b} &= \frac{dE(U)/db}{dE(U)/dx} \\ &= \frac{(1 - e^{-\alpha}p)\theta x e^{-b}U'(Y) + e^{-\alpha}p(\theta - \pi)x e^{-b}U'(Z)}{(e^{-\alpha}p - 1)\theta e^{-b}U'(Y) + e^{-\alpha}p(\pi - \theta)e^{-b}U'(Z)}. \end{aligned} \quad (7)$$

By integrating $1 - e^{-\alpha}p$ and $\theta - \pi$ in the numerator and $e^{-\alpha}p - 1$ and $\pi - \theta$ in the denominator, $\partial x/\partial b < 0$ can be obtained.

$$\frac{\partial p}{\partial a} = \frac{dE(U)/da}{dE(U)/dp} = \frac{e^{-\alpha}pU(Y) - e^{-\alpha}pU(Z)}{-e^{-\alpha}U(Y) + e^{-\alpha}U(Z)}. \quad (8)$$

By integrating the numerator and denominator, $\partial p/\partial a = -p$ can be obtained. Since $p \geq 0$, $-p \leq 0$, it can be seen that $\partial p/\partial a < 0$.

From the above analysis, it can be seen that the use of the Internet by enterprises will lead to the decline of x and p . The more the enterprises use the Internet, the less taxable income they declare, and the lower the probability that enterprises' tax avoidance behavior will be found by the tax authorities.

3.3. *Analysis of Model Results.* Allingham and Sandmo [34] proved that

$$\frac{\partial x}{\partial p} > 0, \frac{\partial x}{\partial \pi} > 0. \quad (9)$$

According to the previous proof,

$$\frac{\partial x}{\partial b} < 0, \frac{\partial p}{\partial a} < 0. \quad (10)$$

Combined with the two conclusions above, $\partial x/\partial b < 0$, if an enterprise uses the Internet, its declared taxable income x will decrease, and so will the actual tax amount of the enterprise.

In other words, if $\partial p/\partial a < 0$, when enterprises use the Internet, the probability p of corporate tax avoidance detected by tax authorities will decrease. From $\partial x/\partial p > 0$, it can be seen that the decline of p will also cause the decline of the taxable income x , that is, the decrease of P will increase the tax evasion behavior of enterprises. Through recursion, it can be obtained that the use of the Internet by enterprises will promote the tax evasion behavior of enterprises and reflect the peer effect of the Internet. The more the enterprises use the Internet, the more p and x decline and the more radical the tax avoidance behavior of enterprises is. This reflects the network effect of the Internet.

4. Data Description, Measurement Model, and Typical Facts

4.1. *Data Description.* This paper is written based on the Chinese industrial enterprise database. We use these data for three reasons. Firstly, to ensure that the research sample matches the research question: the existing Internet research studies mainly use the data of Chinese industrial enterprises or the data of Chinese listed enterprises. In comparison, the former sample is larger, and the latter data are updated. The Ministry of Industry and Information Technology of the PRC revealed at the 2021 China Internet Conference that the number of 5G connections in China has exceeded 365 million, accounting for 80% of the world. The number of netizens has increased to 989 million, and the Internet penetration rate has reached 70.4%. This means that most enterprises are already using the Internet. The main purpose of this study is to compare the differences in tax avoidance between using the Internet and not using the Internet. Thus, if we use the latest enterprise data, all we can find is that only a very small percentage of the sample does not use the Internet. This will affect the estimation conclusion. In addition, the research conclusions obtained from this data have important policy reference significance for countries and regions where the current Internet penetration rate remains low. Secondly, to ensure the applicability of the research findings: the data samples are from state-owned industrial enterprises and non-state-owned industrial enterprises above the designated size. The statistical caliber of “industry” here includes “mining industry,” “manufacturing industry,” and “production and supply industry of electric power, gas, and water” in the “industrial classification of the national

economy,” mainly the manufacturing industry (accounting for more than 90%). Manufacturing enterprises are considered the core of economic development in many countries and regions. The study of Internet use in China has even more important implications for other developing countries and regions. Thirdly, the limitation of data: the data of Chinese industrial enterprises are from 1998 to 2014. The database began counting enterprises with official web pages in 2004 and stopped counting them in 2010 and beyond. Because of this limitation, we can only use data from 2004 to 2009.

The “above scale” here requires the annual mean business income (i.e., sales) of the enterprise to be 5 million yuan or more. In fact, the industrial enterprise database is the most comprehensive database. The database includes two types of enterprise information: one is the basic information of the enterprise and the other refers to the financial data of the enterprise. The basic information of the enterprise includes legal person code, enterprise name, legal representative, contact telephone number, postal code, specific address, year of operation, number of employees, and other variables. The financial data of the enterprise include current assets, accounts receivable, long-term investment, fixed assets, accumulated depreciation, intangible assets, current liabilities, long-term liabilities, main business income, main business costs, operating expenses, management expenses, financial expenses, total profit and tax of operating profits, advertising expenses, research and development expenses, total wages, value-added tax, and other variables.

We filter them and eliminate the unqualified abnormal observations in the database, including the missing values of key variables such as total assets, opening time, total profit, sales revenue, number of employees, and paid-in capital; illogical observed values such as the accumulated depreciation that is less than the depreciation of the current year and the total assets that are less than current assets; the data with wrong records or abnormal indicators, such as the establishment time earlier than 1949, the number of employees smaller than 8, and the sales revenue less than 5 million yuan; and the observed value of the effective tax rate that is greater than 1 or smaller than 0. Based on the availability of enterprise Internet indicators, the sample interval is 2004–2009.

4.2. *Econometric Model.* This paper aims to study the impact of enterprises’ use of the Internet on their tax avoidance degree. A least square regression measurement model is built as follows:

$$\text{Rate}_{it} = \alpha_0 + \alpha_1 \text{Web}_{it} + \sum_{j=2} \alpha_j X_{it} + V_i + V_t + \mu_{it}. \quad (11)$$

Among them, i and t represent the enterprise and the year, respectively, and Rate_{it} represents the difference between the nominal tax rate and the effective tax rate of the enterprise and measures the tax avoidance degree of the enterprise. Web_{it} is used to identify whether the enterprise uses the Internet. When the Internet is used, $\text{Web}_{it} = 1$; otherwise, $\text{Web}_{it} = 0$. Due to the certain cost of using the

Internet, the authors believe that once the enterprise reports the relevant information of the web page, it will continue to use it later, so it is set that there will be a long duration after using the Internet. X_{it} represents a series of control variables that affect the explained variables and core explanatory variables. Ignoring these control variables may lead to biased model estimation results. In addition, V_i is an enterprise's fixed effect, which is used to control factors that the enterprise does not change over time. V_t is a time-fixed effect, which is used to control the time trend. μ_{it} represents the random error term.

4.3. Variable Setting

4.3.1. Measurement of the Internet Use by Enterprises. Referring to the existing research, e-mails (e-mail) or official web pages (Web) are usually used as the proxy variable for enterprises to use the Internet [35, 36]. In reality, web pages have a stronger role in communication and diffusion, and e-mail is more used for daily communication. Therefore, in this paper, the official web page is selected as the main index to identify whether enterprises use the Internet with e-mail and both as the verification methods.

The selection of proxy variables may bring about some doubts. First of all, enterprises may fill them in statistics rather than using web pages or e-mail, which may falsely increase the degree of Internet use, but the authors believe that enterprises have no reasonable motives to make any false reports. Based on the assumption of economic man, if an enterprise fails to fill in the information truthfully, it is simply to obtain the inflow of economic benefits such as subsidies or reduce the outflow of economic benefits such as taxes. However, there are neither preferential policies for the use of the Internet nor regulations on whether to use the Internet as a direct basis for fund collection. At the same time, the use of the Internet will not be directly linked to variables affecting tax, such as reducing income or increasing expenditure. Therefore, it is nearly impossible to misreport in this form. Even if it exists, it is a relatively random small probability event, which has little impact on the results. Admittedly, there are some enterprises whose Internet is idle, unused, or rarely used. Even if it is similar to the above situation, it also underestimates the role of the Internet, so this is a minimum value. In other words, it will underestimate the extent to which enterprises use the Internet. If we can still get the significant relationship between the research objects when the using Internet is systematically underestimated, we can consider our estimate as a lower limit, that is, using the Internet will at least have an effect on corporate tax avoidance. Finally, the proxy variable in this paper can only judge whether enterprises "own" rather than "actually use" the Internet. It is undeniable that there are some enterprises whose Internet is idle or rarely used, similar to the previous situation, which also underestimates the role of the Internet, so this paper obtains a minimum value. In conclusion, setting web pages or e-mail as proxy variables cannot accurately measure the degree of Internet use by enterprises, but the grasp of the trend is more accurate and is a more reliable data source available at present.

Information about enterprises using e-mail addresses or official websites is available through the Chinese industrial enterprise database. Since the database has counted the situation of enterprises having official web pages since 2004 and will not be counted in 2010 and beyond, the final period selected in this paper is 2004–2009. In the case of setting the binary dummy variable, if the enterprise has a web page, it will be assigned the value of 1; otherwise, it will be 0 (the statistics on the web only include the information filled in, including "www," "www," "com," "com," "CN," "CN," "HTTP," and "HTTP." The statistical results show that the processed web accounts for about 12.59% of the cases without space, and the processed e-mail accounts for about 15.76% of the cases without space). In addition, because there are certain costs for enterprises to use the Internet, in this paper, it is believed that once they fill in the relevant information about the web page in the data survey of industrial enterprises, it will have a long duration after the Internet is started by default.

4.3.2. Measurement of Enterprise Tax Avoidance. The existing literature mainly uses the effective tax rate (effective tax rate = income tax payable/total profit) to measure the degree of tax avoidance [37, 38]. In order to eliminate the influence of the nominal tax rate, we adjust the effective tax rate appropriately and use the difference between the nominal tax rate and the effective tax rate as a measure of the degree of corporate tax avoidance. The greater the difference between the nominal tax rate and the effective tax rate is, the higher the degree of tax avoidance will rise. In the robustness test, we change the measurement method of tax avoidance degree, including the effective tax rate, the difference between the average effective tax rate of the industry in the province where the enterprise belongs, and the book-tax difference (BTD).

4.3.3. Setting of Control Variables. Considering that many factors affect tax avoidance, we draw on existing literature and add several controls into the model [39–41]: (1) enterprise scale: measured by the natural logarithm of total enterprise assets; (2) enterprise age: measured by the natural logarithm of the difference between the surveyed year and the year of operation; (3) net profit margin of total assets: measured by the ratio of the difference between total profit and income tax payable to total assets; (4) enterprise management cost: expressed as the proportion of management expenses in the sales revenue of main business products; (5) growth rate of total liabilities: calculated by the ratio of the increase of total liabilities to the base period; (6) proportion of current assets in total assets; and (7) annual average number of employees of the enterprise. In addition, this paper also introduces the industry trend item and provincial trend item and controls the time-fixed effect and individual-fixed effect. Besides, the number of letters per capita in each province in the early days of the founding of new China is set as a tool variable in order to control the endogenous problem. The main variables and descriptive statistics used in this paper are shown in Tables 1 and 2.

TABLE 1: Variable measurement.

Variable type	Variable	Variable description
Internet usage indicators	Web	The use of official web pages represents the use of the Internet by enterprises
	E-mail	The use of e-mail represents the use of the Internet by enterprises
	Both	The use of official web pages or e-mail indicates that enterprises use the Internet
Enterprise tax burden	Rate 1	Difference between nominal tax rate and effective tax rate
	Rate 2	Difference between the average tax burden of the province and the effective tax rate of the enterprise
	Etr	Effective tax rate (income tax payable/total profit)
	Btd	Book-tax difference (total profit – taxable income)/total assets
Control variables	Lasset	Natural logarithm of enterprise scale
	Lage	Natural logarithm of enterprise age
	Roa	Net profit/total assets
	Cost	Management cost/total assets
	Lev	Growth rate of total liabilities
	Ratio	Current assets/total assets
	Labor	Annual average number of employees

TABLE 2: Descriptive statistics.

Variable	Mean	Sd	Min	Max
Web	0.126	0.332	0.000	1.000
E-mail	0.156	0.364	0.000	1.000
Both	0.183	0.386	0.000	1.000
Rate 1	0.117	0.161	-0.542	0.330
Rate 2	0.097	0.164	-0.642	0.330
Etr	0.183	0.159	0.000	0.792
Btd	0.044	0.108	-1.440	4.984
Lasset	9.782	1.367	7.313	13.971
Lage	1.894	0.773	0.000	3.871
Roa	0.119	0.174	0.000	0.902
Cost	0.051	0.053	0.001	0.305
Lev	0.061	0.068	0.000	0.365
Ratio	0.574	0.242	0.052	0.983
Labor	4.613	1.059	2.485	7.748

4.4. Typical Facts

4.4.1. Changes in Tax Burden Difference of Various Industries in the First Year When Enterprises Use the Internet. In order to observe the change in tax burden before and after enterprises use the Internet, the authors distinguish different industries according to the classification standard of industry categories in the industrial enterprise database (GB/T 4754-2002) and calculate the average change of the difference between the nominal tax rate and the actual tax burden of enterprises in the industry in the early year of Internet compared with the previous year. The results are shown in Table 3. It can be seen that the tax burden difference of all industries in the year of using the Internet has increased compared with the previous year. Moreover, the tax burden difference of most industries exceeds 0.1, which indicates that there is likely to be a correlation between enterprises' use of the Internet and the actual tax burden.

4.4.2. Comparison of Financial Indicators of Whether Enterprises Use the Internet or Not. Table 4 shows the statistics of total asset net profit margin ((total profit-income tax payable)/total assets) and enterprise management cost (management expense/sales revenue of main products)

corresponding to whether the enterprise uses the Internet or not. From the analysis of the net profit margin of total assets, which reflects the profitability of enterprises, the ratio of enterprises using the Internet is lower than that of enterprises not using the Internet. The lower the index, the lower the asset utilization efficiency and the operation and management level of the enterprise, that is, the operation and management level of the enterprise using the Internet is relatively lower. From the analysis of enterprise management cost, Internet enterprises are significantly higher than enterprises that do not use the Internet. Based on the available literature, Abouzeedan et al. believe that the use of the Internet by enterprises is an innovation in organizational management, which can strengthen the ability to obtain resources required for operation, production, innovation, and other activities and enhance the ability to save relevant expenses [42, 43]. If the data reported by enterprises are accurate, the phenomenon of low management level and high management cost reflected in the statistical results is contrary to the positive effect described in the literature. Therefore, in this paper, a negative effect may exist in using the Internet and the reported data of enterprises may not be true, or it may be a result of tax avoidance. Thus, it is highly necessary to study the relationship and mechanism between Internet use and tax avoidance.

5. Results and Discussion

5.1. Benchmark Model Regression. The regression of the benchmark model is based on equation (1). OLS regression is based on the data from 2004 to 2009. The regression results are shown in Table 5. Both individual and time-fixed effects were added to the baseline regression. Column (1) in the table examines the relationship between the virtual variables characterizing the use of the Internet by enterprises and the degree of tax avoidance by enterprises without controlling other variables; in order to reduce the influence of missing factors varying with time at the enterprise level on the regression results, the time-varying control variables at the enterprise level are added in column (2) of the table; column (3) still adds industry and provincial trend items.

TABLE 3: Statistics of changes in the average tax burden of each industry in the first year of using the Internet.

Industry	Change in the industry average tax burden difference	Industry	Change in the industry average tax burden difference
Coal mining and washing industry	0.077	Cultural, educational, and sporting goods manufacturing industry	0.112
Oil and gas extraction industry	0.101	Petroleum processing, coking, and nuclear fuel processing industry	0.125
Ferrous metal mining and dressing industry	0.083	Chemical raw materials and chemical product manufacturing	0.122
Non-ferrous metal mining and dressing industry	0.122	Pharmaceutical manufacturing	0.146
Non-metallic ore mining and dressing industry	0.126	Chemical fiber manufacturing	0.150
Production and supply of electricity and heat	0.106	Rubber product industry	0.115
Gas production and supply industry	0.141	Plastic product industry	0.107
Water production and supply	0.092	Non-metallic mineral product industry	0.124
Agricultural and sideline food processing industry	0.161	Ferrous metal smelting and rolling processing industry	0.115
Food manufacturing	0.128	Non-ferrous metal smelting and rolling processing industry	0.131
Beverage manufacturing	0.136	Metal product industry	0.097
Tobacco product industry	0.048	General equipment manufacturing	0.094
Textile industry	0.110	Special equipment manufacturing	0.111
Textile and garment, shoe, and hat manufacturing	0.127	Transportation equipment manufacturing	0.112
Leather, Fur, feather, and its products industry	0.099	Electrical machinery and equipment manufacturing	0.106
Wood processing and wood, bamboo, rattan, palm, and grass products	0.137	Communication equipment, computers, and other electronic equipment manufacturing	0.164
Furniture manufacturing	0.116	Instrument, culture, and office machinery manufacturing	0.121
Papermaking and paper product industry	0.128	Arts and crafts and other manufacturing industries	0.110
Reproduction of printing and recording media	0.098	Waste resources and waste material recycling and processing industry	0.091

TABLE 4: Statistics of enterprise financial indicators from 2004 to 2009.

Year	Net profit margin of total assets		Enterprise management cost	
	Use the Internet (%)	Do not use the Internet (%)	Use the Internet (%)	Do not use the Internet (%)
2004	6.76	9.08	7.21	5.50
2005	6.97	10.49	6.83	5.02
2006	7.09	11.03	6.77	4.85
2007	7.69	12.56	6.71	4.75
2008	8.81	14.44	6.66	4.83
2009	8.83	14.89	6.80	4.68

The results show that in these three situations, the core explanatory variable of the study—enterprises using the Internet, i.e., having official web pages, has a significant positive impact on the degree of tax avoidance. Also, they can all pass the significance level test of 1%. Among them, the results of only controlling the individual and time-fixed effects show that the tax avoidance degree of enterprises using the Internet is about 0.06 higher than that of

TABLE 5: Benchmark regression.

Variable	(1) Rate 1	(2) Rate 1	(3) Rate 1
Web	0.006*** (0.001)	0.012*** (0.001)	0.012*** (0.001)
Constant	0.132*** (0.000)	-0.006 (0.005)	5.122*** (2.535)
Observations	1,417,428	1,065,563	1,065,563
R-squared	0.541	0.568	0.569
Control variable	NO	YES	YES
Industry trend	NO	NO	YES
Province trend	NO	NO	YES
Individual FE	YES	YES	YES
Time FE	YES	YES	YES

Note. *, **, and *** are significant at the levels of 10%, 5%, and 1%, respectively. The values in brackets are enterprise-level clustering standard errors.

enterprises not using the Internet. After controlling the variables at the enterprise level, the difference in tax avoidance does not change significantly and the coefficient

TABLE 6: Robustness test.

Variables	Replace the Internet identification method			Samples with effective tax rate greater than 1 will not be deleted	Change the measurement method of dependent variable			
	(1)	(2)	(3)		(4)	(5)	(6)	(7)
	Rate 1	Rate 1	Rate 1		Rate 1	Etr	Btd	Rate 2
E-mail	0.004*** (0.001)							
Both		0.007*** (0.001)						
P_web			0.003*** (0.001)					
Web				-0.012*** (0.001)	-0.012*** (0.001)	0.012*** (0.001)	0.008*** (0.001)	
Constant	5.045*** (2.535)	5.057*** (2.536)	5.060*** (2.534)	-5.953** (2.606)	-4.821* (2.535)	6.227 (1.066)	4.107* (2.159)	
Observations	1,065,563	1,065,563	1,065,563	1,066,722	1,065,563	1416,671	1,416,671	
R-squared	0.568	0.569	0.568	0.559	0.561	0.698	0.533	
Control variables	YES	YES	YES	YES	YES	YES	YES	
Industry trend	YES	YES	YES	YES	YES	YES	YES	
Province trend	YES	YES	YES	YES	YES	YES	YES	
Individual FE	YES	YES	YES	YES	YES	YES	YES	
Time FE	YES	YES	YES	YES	YES	YES	YES	

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the *t* statistic value is in parentheses. The results of other control variables are not displayed in the table.

increases. The trendy items of industries and provinces are further added, and the coefficient reached 0.012. From the descriptive statistics in Table 2, it can be seen that the average tax avoidance of the sample is 0.17. On average, when enterprises use the Internet, their tax avoidance will increase by 10 percent. This shows that the use of the Internet by enterprises will indeed significantly aggravate the degree of tax avoidance and exaggerate the gap between nominal tax rate and effective tax rate, and this positive correlation is very significant in both statistical and economic sense. In conclusion, the results of the benchmark regression in this paper preliminarily show that after using the Internet, enterprises will significantly improve the degree of tax avoidance represented by the difference between the nominal tax rate and effective tax rate.

5.2. Robustness Check. Based on the previous verification that using the Internet will increase the degree of tax avoidance, an empirical test is made again by changing the measurement method of core variables in this part. Firstly, set the dummy variables e-mail and both to indicate that only the mailbox and both the mailbox together with the web page are used by the enterprise, respectively. The estimation results in columns (1) and (2) in Table 6 are significantly positive, which verifies the above hypothesis again. Secondly, the definition standard of whether an enterprise uses the Internet is changed. It is assumed that only the characteristic fields contained in the information reported in the current year are regarded as using the Internet, and it needs to be reidentified in subsequent years, thus generating variable P_web. It can be seen from column (3) of Table 6 that the result is also significantly positive, which is consistent with the expectation. Column

(4) shows that the effective tax rate is not deleted when it is larger than 1. Thirdly, the measurement method of tax avoidance degree is changed in columns (5) to (7); the robust tests are performed with the actual tax burden of the enterprise, the profit difference of accounting tax, and the difference between the provincial average tax burden and the enterprise's effective tax rate, respectively. The results are still found stable. This supports the hypothesis that enterprises' use of the Internet will aggravate the degree of tax avoidance because enterprises can communicate with each other more easily and conveniently after using the Internet. There are more ways to learn, copy, disseminate, and improve tax avoidance methods and acquire new strategies and integrate new ideas in mutual communication.

5.3. Endogenous Test

5.3.1. Instrumental Variable. In this paper, instrumental variables are used to solve the endogenous problems caused by measurement errors and omitted variables. Based on the correlation and exogenous requirements of instrumental variables, the selected instrumental variables should be related only to whether the enterprise uses the Internet and have no direct correlation with other uncontrolled factors in the model, that is, the determined instrumental variables should affect the tax avoidance degree of the enterprise through whether the sample enterprise uses the Internet.

In this paper, the data of letters per capital in each province are selected as the instrumental variable in the early days of new China. Since this variable does not change with time and will be absorbed by the individual-

TABLE 7: Endogeneity test.

Variables	(1) First: Web	(2) Second: Rate 1	(3) Second: Rate 1
Letter_year	0.000** (0.000)		
Web		0.764* (0.433)	2.457*** (0.660)
Constant	-0.032 (0.066)		
Observations	964,238	964,238	585,073
Control variables	YES	YES	YES
Division of labor of enterprises	NO	NO	YES
Individual FE	YES	YES	YES
Time FE	YES	YES	YES

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the t statistic value is in parentheses.

fixed effect, an instrumental variable that changes with time based on the interaction between letters per capital and year is built up in this paper. This is because letters are a common way of communication between different subjects in the early days of the founding of the People's Republic of China. The number of letters per capital can reflect people's demand and use of traditional communication methods, and the communication demand is relatively stable or growing steadily, which will affect the acceptance of enterprises for the emerging communication method of the Internet in the sample period. Generally speaking, the higher the demand for communication is, the more likely the current enterprise is to use new tools such as the Internet. At the same time, as a tool for communication in people's daily life, letters will not have a direct impact on the tax avoidance of enterprises. Therefore, in the early days of new China, the average data of the letters per person in each province can meet the two criteria of instrumental variables better, so the endogenous problem can be solved.

The result of these two-stage regression instrumental variables is shown in Table 7. Columns (1) and (2) confirm that the selected variables meet the correlation conditions. There is no problem with weak instrumental variables, and they play a significant role in improving the degree of tax avoidance, which confirms the robustness and reliability of the conclusion further in this paper. Notably, letter can promote the division of labor of enterprises, which means that letter will not only affect enterprises' tax avoidance by affecting their use of the Internet but also affect enterprises' tax avoidance by affecting the degree of division of labor. In order to eliminate the interference of this problem with the results, the division of labor of enterprises is controlled in column (3) of this paper, and the results are still robust.

5.3.2. Placebo Test. As mentioned above, we control variables by adding forms at the enterprise level, individual-fixed effect, and time-fixed effect to alleviate the impact of missing

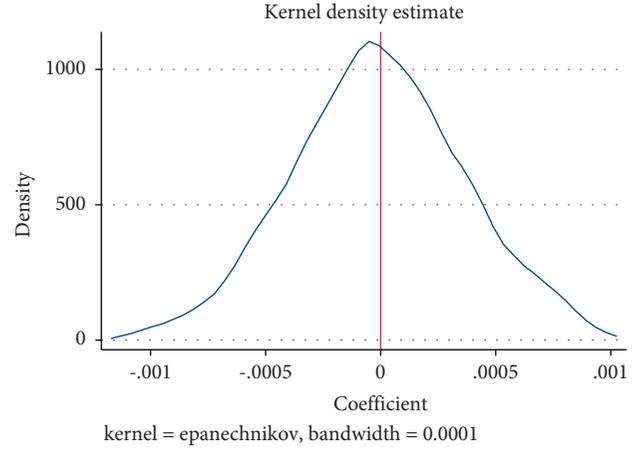


FIGURE 2: Distribution of $\hat{\alpha}_1^{\text{random}}$ after randomization (placebo test).

variables. However, due to the limitations of data and other factors, there may still be some unobtainable factors, which lead to the deviation of the estimated results. Therefore, referring to the method of Ferrara et al. [44], we indirectly test whether the unobtainable factors will affect the estimation results. According to the benchmark equation (1), the expression of the coefficient α_1 of Web_{it} is shown in the following equation:

$$\hat{\alpha}_1 = \alpha_1 + \tau \frac{\text{cov}(\text{web}_{it}, \mu_{it} | \omega)}{\text{var}(\text{web}_{it} | \omega)}, \quad (12)$$

where ω represents all control variables involved. If $\tau = 0$, the non-observational factors will not bias the estimation, that is, $\hat{\alpha}_1$ is unbiased. However, the difficulty is that we cannot directly test whether τ is zero.

On the premise of using a variable that will not actually affect the corresponding Rate1_{it} in theory (that is, $\alpha_1 = 0$) to replace Web_{it} , if $\hat{\alpha}_1 = 0$ is estimated, we can deduce $\tau = 0$.

Therefore, we make it completely random for each business to use the Internet and repeat the random process 500 times. This process ensures that Rate1_{it} will not be affected by whether a business uses the Internet or not. That is, $\alpha_1^{\text{random}} = 0$. In addition, we can estimate the mean value of $\hat{\alpha}_1^{\text{random}}$. Figure 2 shows the distribution of $\hat{\alpha}_1^{\text{random}}$ obtained by 500 random processes, which are concentrated near zero. Therefore, $\tau = 0$ can be deduced, which proves that the influence of the unobservable factors is well controlled in the study, and the estimation result is robust.

5.4. Test Peer Effect of the Internet. It has been proved that the Internet is an effective channel and carrier for communication between enterprises. It helps to improve the speed and breadth of information transmission, provides objective external conditions for enterprises to share tax avoidance strategies and experience to a certain extent, and affects enterprises' tax behavior.

In this paper, the peer effect of the Internet is tested in two methods. Firstly, examine whether the degree of tax

TABLE 8: Peer effect test.

Variables	Classified by medium category		Classified by small category	
	(1)	(2)	(3)	(4)
	Rate 1	Sdrate	Rate 1	Sdrate
Peer	0.720*** (0.021)		0.665*** (0.032)	
Indx		-0.025*** (0.009)		
Indz				-0.034*** (0.012)
Constant	-9.773 (6.967)	0.165*** (0.002)	-8.816 (6.996)	0.167*** (0.002)
Observations	163,224	2,825	163,224	1,078
R-squared	0.576	0.185	0.573	0.330
Control variables	YES	NO	YES	NO
Time trend	YES	NO	YES	NO
Province trend	YES	NO	YES	NO
Individual FE	YES	NO	YES	NO
Time FE	YES	YES	YES	YES

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the t statistic value is in parentheses.

avoidance of Internet enterprises is affected by the degree of tax avoidance of other Internet enterprises in the same industry by referring to the practice of corporate cohort effect literature [45]. Therefore, the sample is limited to enterprises using the Internet, and the explanatory variable peer is constructed to represent the average tax avoidance degree of other enterprises using the Internet in the industry except for this enterprise. Then, the degree of corporate tax avoidance Rate 1 is used as the explanatory variable for regression. From the results of columns (1) and (3) in Table 8, it can be seen that the peer constructed based on the industry category or industry sub-category in the industrial enterprise database (GB/T 4754-2002) is significantly positive, which indicates that the tax avoidance degree of Internet enterprises is affected by the tax avoidance degree of other Internet enterprises in the industry, which proves the existence of the peer effect.

The second method is to test whether the standard deviation of the tax avoidance degree of the industry is reduced with the increase of Internet enterprises in the industry. Before using the Internet, limited by space and time barriers, enterprises cannot master more tax avoidance strategies while they can break the above barriers, enrich the tax avoidance experience of members in the group, and make the tax avoidance strategies in the group converge with the help of the peer effect. Some enterprises with a low degree of tax avoidance in the industry have greatly improved their degree of tax avoidance after using the Internet. However, for some enterprises with a high degree of tax avoidance, because they have mastered a certain degree of tax avoidance strategies, the use of the Internet has less impact on their degree of tax avoidance. This means that with the increase

of Internet companies in the industry, there will be less volatility in the extent of tax avoidance within the industry. Therefore, the regression analysis is carried out in the full sample with the standard deviation of the tax avoidance degree of the industry as the explained variable and the proportion of enterprises using the Internet in the industry (the total number of enterprises using the Internet in the industry/the total number of enterprises in the industry) as the explanatory variable for regression. From the results in columns (2) and (4) in Table 8, it can be seen that with the increase in the number of Internet enterprises in the industry, the standard deviation of the tax burden in the industry is narrowing, which once again proves that the peer effect exists in using the Internet.

5.5. Test Network Effect of the Internet. As a resource allocation platform, the Internet provides space for enterprises to query, communicate, and disseminate tax avoidance and planning strategies. The more the enterprises access the platform, the more extensive the information can be integrated. Also, enterprises can get a greater probability to learn about tax avoidance strategies to achieve the network effect. However, unlike the general production and operation strategies, tax avoidance methods are targeted. Different industries have specific business contents and scope of business activities. Strategies other than those in this industry may not bring practical effects to enterprises. Therefore, this part is only about the impact of changes in the number of enterprises using the Internet in their industry. Based on the industry category and industry sub-category, we calculate the proportion of Internet using enterprises in each industry every year (the total number of the Internet using enterprises in the industry/total number of enterprises in the industry). We use this ratio to measure the number of enterprises using the Internet and add the interaction term between this ratio and the Web into the benchmark model for regression.

As is shown in Table 9, Indz and Indx represent the proportion of enterprises using the Internet in the industry category and industry sub-category. Web represents whether enterprises use official web pages. The interaction terms are significantly positive, indicating that the more the enterprises in the industry that use the Internet, the higher the degree of tax avoidance after enterprises use the Internet. This confirms the existence of the Internet network effect. The positive externality of the network can provide a convenient way for enterprises to exchange experience in tax avoidance. The network effect will greatly reduce the information search cost and exchange cost of enterprises as well as promote the tax avoidance behaviors of enterprises. The results in Table 9 verify research Hypothesis 3.

The findings on peer and network effects complement research on the economic effects of the Internet. This reflects that the Internet is not just a tool or means of tax avoidance [4, 5] but also a new type of social networking connection

TABLE 9: Network effect test.

Variables	(1) Rate 1	(2) Rate 1
Web	0.008*** (0.002)	0.009*** (0.002)
Indx	0.071*** (0.010)	
Indx * Web	0.022* (0.012)	
Indz		0.094*** (0.013)
Indz * Web		0.022* (0.014)
Constant	5.062*** (2.535)	4.997*** (2.535)
Observations	1,065,563	1,065,563
R-squared	0.569	0.569
Control variables	YES	YES
Time trend	YES	YES
Province trend	YES	YES
Individual FE	YES	YES
Time FE	YES	YES

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the t statistic value is in parentheses.

that allows enterprises to master and understand more advice on tax avoidance.

6. Further Discussion

6.1. Further Evidence of Tax Avoidance. In order to further verify that the use of the Internet will aggravate the tax avoidance degree of enterprises, the tax avoidance strategies of enterprises are discussed in this paper. In the current accounting tax system, the tax avoidance strategy of enterprises can be divided into two modes. The first is to underreport profits. According to document No. 101 issued by the State Administration of Taxation in 2008, the calculation of taxable profit needs to deduct operating costs and non-operating expenses from the enterprise's operating income so that the enterprise can achieve the purpose of underreporting profits by under recording operating income and overstating period expenses. The second is to pay fewer taxes. It is usually achieved by striving for non-taxable income and tax-free income and increasing various deduction items. The difference between the nominal tax rate and the effective tax rate has been used as the dependent variable, which proves that enterprises can learn the second tax avoidance mode by using the Internet, i.e., the strategy of paying fewer taxes. Can the use of the Internet provide the strategy of the first mode and make it possible for enterprises to avoid taxes?

Based on the treatment method of Cai and Liu [46], we use the income method of national income accounting to calculate the imputed profit of book income. Then, we use the approach degree of imputed profit and reported profit to reflect on whether the enterprise uses the first mode for tax avoidance.

$$\text{Impro}_{it} = Y_{it} - \text{MED}_{it} - \text{FC}_{it} - \text{WAGE}_{it} - \text{DEP}_{it} - \text{VAT}_{it}. \quad (13)$$

Among them, Impro_{it} is the imputed profit of the enterprise. Y_{it} is the total industrial output value. MED_{it} is the intermediate input, and FC_{it} is the financial expenses. WAGE_{it} represents the total wages. DEP_{it} is the depreciation of the current period, and VAT_{it} is the value-added tax. The imputed profit is not equal to the real profit, so it cannot be directly used as the proxy variable of the real profit, but in theory, the two are positively correlated.

$$\pi_{it} = \rho_{it} + \text{Impro}_{it} + \theta_{it}. \quad (14)$$

Among them, π_{it} is the tax profit of the enterprise. ρ_{it} is an unknown parameter, which reflects the inherent differences in profit calculation by using national income accounting and accounting standards for each enterprise, and θ_{it} is the random disturbance term with an expected value of 0. When the reported profit of an enterprise is Rpro_{it} , the relationship between the reported profit and the real profit is

$$\text{Rpro}_{it} = d_{it}\pi_{it} + \delta_{it} + \theta_{it}, \quad (15)$$

where $0 < d_{it} < 1$ represents the degree of tax avoidance of the enterprise. The smaller d_{it} is, the more the enterprise understates its profits and the more serious the enterprise's tax avoidance is; the closer d_{it} is to 1, the closer the reported profit is to the imputed profit and the smaller the degree of tax avoidance of the enterprise is. We substitute (12) and (13) into (14) to obtain the relationship between reported profit and imputed profit as follows:

$$\text{Rpro}_{it} = d_{it}\text{Impro}_{it} + d_{it}\rho_{it} + e_{it} + \theta_{it}, \quad (16)$$

where d_{it} reflects the degree of convergence between imputed profits and reported profits. Therefore, the more serious the tax avoidance, the lower the sensitivity between the imputed profit and the reported profit, and d_{it} is smaller. It is worth noting that all factors affecting tax avoidance are reflected in d_{it} , such as the time of establishment, the characteristics of the enterprise, the industry, and so on. Of course, the impact of enterprises' use of the Internet on enterprise tax avoidance is also included, so we expand based on equation (14) and use the following equation for regression:

$$\begin{aligned} \text{Rpro}_{it} = & \left(\beta_0 + \beta_1 \text{Web}_{it} + \sum_{j=2} \beta_j X_{it} \right) \text{Impro}_{it} \\ & + \sum_{j=2} \beta_j X_{it} + v_i + v_t + \mu_{it}. \end{aligned} \quad (17)$$

Among them, Rpro_{it} is the reported profit of the enterprise, which directly selects the total profit in the database, and it is also the taxable income that is declared by the enterprise to the tax authorities. Impro_{it} is the imputed profit of an enterprise. Web_{it} is the dummy variable of whether the enterprise uses the Internet, and β_1 measures the impact of the enterprise's use of the Internet on the reported

TABLE 10: Evidence of enterprises' acquisition of tax avoidance strategies.

Variables	(1) Rpro	(2) Rpro	(3) Rpro	(4) Rpro
Impro * Web	-0.008*** (0.001)	-0.004*** (0.001)	-0.006*** (0.001)	-0.007*** (0.001)
Constant	-5.463*** (0.824)	-4.945*** (0.835)	-3.619*** (0.601)	-7.292*** (1.156)
Observations	633,244	457,068	751,344	382,252
R-squared	0.986	0.988	0.988	0.987
Control variables	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES
Province trend	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the t statistic value is in parentheses.

profit. If the empirical results show that β_1 is significantly less than 0, it indicates that after using the Internet, the gap between reported profits and imputed profits is widened, and the degree of tax avoidance is more serious. X_{it} is a control variable, including enterprise size, enterprise age, net profit margin of total assets, enterprise management cost, and asset-liability ratio. V_i and V_t represent individual and time-fixed effects, respectively. Since the intermediate input in 2008 and 2009 is not counted in the database, the time is limited between 2004 and 2007. The asset standardization treatment is carried out for the reported profit and the imputed profit, respectively, referring to the practice of Desai and Dharmapala [47].

The regression result is shown in Table 10. Column (1) shows that the total profit in the excluded sample is less than or equal to 0. Column (2) shows that the reported profit in the excluded sample is greater than the imputed profit. Columns (3) and (4), respectively, show that neither item is excluded and both items are excluded. The regression coefficients are significantly negative, which indicates that the reported profits of enterprises using the Internet have decreased significantly, that is, the total profit reported by enterprises cannot truly reflect the operating income and the enterprises may underreport profits. It shows that enterprises have acquired the tax avoidance strategy of underreporting profits and paying fewer taxes through the use of the Internet.

6.2. Heterogeneity Analysis. It is worth noting that since enterprises can learn tax avoidance strategies from the Internet and the tax authorities can also learn about the tax avoidance policies of enterprises, the Internet may not have an impact on the degree of tax avoidance of enterprises. However, certain studies have found that the collection and management intensity of tax authorities is affected by the economic motivation, collection, and management discretion of local governments, which may enable tax authorities to improve the collection and management level with the help of the Internet but did not improve the collection and management intensity.

In order to test this hypothesis, we refer to the method of Xu et al. [48], which constructs the index of regional tax collection and management intensity by using the ratio of actual tax revenue to expected available income and divides the sample into high collection and management intensity group and low collection and management intensity group according to the mean value of collection and management intensity. According to columns (1) and (2) of Table 11, it can be seen that there are differences in the impact of enterprises' use of the Internet on the degree of tax avoidance in regions with different collection and management intensities. In areas with low collection and management intensity, the Internet has a greater impact on the degree of tax avoidance.

In addition, the identification method of collection and management intensity is changed in this paper. China's tax system was divided into the State Taxation Bureau and the Local Taxation Bureau before 2002. The State Taxation Bureau was mainly responsible for collecting the income tax of central enterprises and foreign-funded enterprises. The income tax of other enterprises was collected and managed by the local taxation bureau. In the case of imperfect accounting systems and asymmetric information, local governments inevitably manipulate tax preference or abuse tax flexibility in the process of law enforcement due to the motivation of tax competition in order to attract capital inflows. In addition, the collection and management level of the sample period is relatively low, which is difficult for the State Administration of Taxation to check. This provides a large space for enterprises to avoid tax. In 2002, the income tax sharing reform required that the tax collection and management organization should be changed from the Local Taxation Bureau to the State Taxation Bureau, but it was difficult to connect the two systems back then. In order to maintain the independence of the Local Taxation Bureau and the State Taxation Bureau, the enterprises established before 2002 were collected and managed by the Local Taxation Bureau while the later enterprises were collected and managed by the State Taxation Bureau. Due to the policy, the enterprises founded at different times face different tax enforcements. The results in columns (3) and (4) show that the Web coefficients are significantly positive at the level of 1%, indicating that the tax avoidance degree of enterprises collected and managed by the Local Taxation Bureau and the State Taxation Bureau is improved because enterprises use the Internet. The coefficient difference between groups is significant, suggesting that compared with the collection and management of the State Taxation Bureau, the tax avoidance degree of enterprises collected and managed by the Local Tax Bureau is higher, which further indicates that the tax authorities may improve the collection and management level with the help of the Internet but do not enhance the collection and management intensity.

Lastly, based on the ownership nature of enterprises, a heterogeneity analysis is made in this paper. First of all, the ownership of corporate tax profits determines that private enterprises have stronger tax avoidance motivation, more radical tax avoidance concepts, and more flexible tax avoidance methods than state-owned enterprises [49, 50].

TABLE 11: Heterogeneity analysis.

Variables	(1) High degree Rate 1	(2) Low degree Rate 1	(3) Local taxation Rate 1	(4) State taxation Rate 1	(5) State owned Rate 1	(6) Non-state owned Rate 1
Web	0.010*** (0.002)	0.012*** (0.002)	0.011*** (0.001)	0.010*** (0.003)	-0.002 (0.006)	0.013*** (0.001)
Constant	-3.777 (5.583)	9.968*** (3.829)	4.398 (2.957)	9.081*** (4.766)	-9.459 (8.040)	7.360*** (2.669)
Observations	374,599	444,347	747,377	318,186	56,617	1,004,487
R-squared	0.599	0.597	0.555	0.603	0.592	0.570
Control variables	YES	YES	YES	YES	YES	YES
Industry trend	YES	YES	YES	YES	YES	YES
Province trend	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES
Dif (P value)	-0.007***		0.004*		0.012***	

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the *t* statistic value is in parentheses.

Next, the amount of tax generated by the management of state-owned enterprises may play a positive role in promoting their promotion, which will encourage the management of state-owned enterprises to pay more taxes to the Chinese government. For example, Minh et al. [51] suggest that firms with high state ownership often have little or no tax avoidance but still have a negative impact on firm value. According to the results in columns (5) and (6), the use of the Internet significantly improves the tax avoidance degree of non-state-owned holding enterprises but has no significant impact on the tax avoidance degree of state-owned holding enterprises.

6.3. Can Enterprises Acquire Planning Strategies by Using the Internet? Generally speaking, on the premise of stable policy factors, the reduction of enterprise tax burden may be caused by tax avoidance or tax planning. Based on the verification that enterprises have tax avoidance strategies such as underreporting profits and underpaying taxes, whether enterprises can acquire planning strategies while acquiring tax avoidance strategies after using the Internet will be further explored in this part.

Compared with income tax, the value-added tax (VAT) voucher deduction mechanism makes its tax avoidance cost and illegal cost higher. In order to avoid risks, enterprises usually rely on tax planning rather than using radical tax avoidance means to reduce the value-added tax burden. Therefore, if the value-added tax burden of enterprises decreases significantly after using the Internet, it is likely to be due to the acquisition of planning strategies. Therefore, in this paper, the benchmark regression model is adopted to replace the explanatory variable with the value-added tax burden (value-added tax payable/sales revenue of main business products) to observe whether enterprises can learn planning strategies through the Internet.

The results in Table 12 show that the Web coefficients are significantly negative at the 1% level, indicating that the value-added tax burden has decreased significantly after enterprises use the Internet, which proves the above

TABLE 12: Evidence of acquisition planning strategies.

Variables	(1) VAT	(2) VAT	(3) VAT
Web	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Constant	0.034*** (0.000)	0.013*** (0.001)	0.133 (0.446)
Observations	1,417,428	1,065,563	1,065,563
R-squared	0.676	0.700	0.700
Control variables	NO	YES	YES
Industry trend	NO	NO	YES
Provincial trend	NO	NO	YES
Individual FE	YES	YES	YES
Time FE	YES	YES	YES

Note. ***, **, and * indicate the significance level of 1%, 5%, and 10%, respectively, and the *t* statistic value is in parentheses.

conjecture. That is, using the Internet can not only enable enterprises to learn tax avoidance strategies but also enable enterprises to contact the idea of planning and apply it so as to achieve the effect of tax reduction.

7. Conclusions and Suggestions

With the development of information technology, Internet has been used in an ever-expanding range and has gradually penetrated the operation and management of enterprises in various fields, reducing the cost of information exchange as well as improving the efficiency of resource dissemination. It has a far-reaching influence on the production and operation of enterprises. Based on the micro-data of Chinese industrial enterprises from 2004 to 2009, the authors explore the impact of enterprises' use of the Internet on tax avoidance from the perspective of social networks. In conclusion, the use of the Internet by enterprises significantly increases the degree of tax avoidance, and the core conclusion is still very robust when the key variables are changed and endogenous issues are taken into account.

The enterprises have a peer effect when using the Internet. The degree of tax avoidance of enterprises is affected by the degree of tax avoidance of other enterprises using the Internet in the industry. The Internet has a network effect. The more the enterprises in the industry use the Internet, the higher the degree of tax avoidance is after enterprises use the Internet. A further test shows that enterprises can learn the strategies of underreporting profits and underpaying taxes at the same time. In addition, it proves that the tax authorities have improved the level of tax collection and management through the Internet but not the intensity of tax collection and management. The heterogeneity analysis shows that the use of the Internet significantly improves the tax avoidance degree of private enterprises but has no significant impact on the tax avoidance degree of state-owned enterprises. Finally, it is found that the enterprises' VAT burden has been significantly reduced, which proves that enterprises have acquired both tax avoidance strategies and planning strategies after using the Internet. The discovery of this paper is a supplement to the research on the Internet's economic effect. It shows that the Internet is not only a tool or means of tax avoidance [4, 5] but also a new type of social network connection. Oei and Ring [8] conducted research from the social network perspective of the Internet based on personal data. They found that personal use of the Internet has an effect on personal tax avoidance. Our research is based on enterprise data. Both studies prove that as a new social tool, the social network connection built by the Internet will have an impact on the tax avoidance of micro-individuals. More importantly, with a deep analysis of the mechanism of the Internet on corporate tax avoidance, the authors find that the Internet has an impact on corporate tax avoidance through the peer effect and network effect. It deepens the understanding of the knowledge transfer mechanism of the Internet.

The findings of this study have certain policy references for countries and regions that have popularized the Internet, are popularizing the Internet, and will popularize the Internet. Firstly, to encourage and guide enterprises to make rational use of the Internet: for countries with high Internet penetration rates such as China, the "Internet plus" strategy has laid a huge user base and brought about profound changes in enterprise information interaction and operation management. The Internet has built a new type of social network connection for enterprises, enabling enterprises to have more channels to master more preferential tax information, obtain tax planning experience, and optimize tax burden according to their own conditions. Clearly, the Internet is an effective vehicle for the "last mile" of tax reduction and fee reduction. However, at the same time, enterprises should be guided to use the Internet reasonably to avoid tax risks and industrial chaos caused by radical tax avoidance. Secondly, to strengthen tax collection and administration: the use of the Internet has given a certain impetus to the information technology level of both the tax collector and the payer. Enterprises can learn from the Internet not only about tax subsidies but also about tax avoidance. In fact, tax avoidance is to make use of loopholes in the law to achieve the goal of tax evasion, which distorts

the intention of tax policy and damages the fairness and effectiveness of the market. On the one hand, the tax authorities should rely on big data to strengthen precise supervision and tax audit capabilities. On the other hand, the tax authorities should determine the optimal intensity of tax collection and management according to the policy objectives, the tax cost, and other factors to maintain tax fairness and efficiency. The third phase of the Golden Tax project completed by the Chinese government and the fourth phase of the Golden Tax project under construction are examples of the comprehensive use of the Internet and big data for tax collection and administration. Thirdly, to step up publicity and set up reward and punishment mechanisms to enhance enterprises' sense of social responsibility: in particular, it is necessary to strengthen the publicity and guidance of private enterprises to achieve positive interaction between taxation and enterprises. The government should create an excellent Internet cultural environment, guide enterprises to fully exploit and utilize the advantages of the Internet, and give full play to the positive role of the Internet.

Data Availability

The data used to support the findings of this study are available from the first and corresponding authors upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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