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Study on Policy Supply and Demand of Geothermal Resources Development in China

Yanfei ZHANG, Jianping GE

Mailing address, 29th Xueyuan Road, Haidian District, Beijing, China

E-mail address, gejianping@cugb.edu.cn

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ABSTRACT <HEADING 1 STYLE>

In recent years, issues such as climate change and energy shortage have become prominent. Geothermal energy has gradually attracted the attention of the government as a clean energy source and has received strong policy support. In order to put the exploitation and utilization of China's geothermal resources on the track of healthy and orderly development, in recent years, governments from central to local levels have successively promulgated and revised a series of policies, regulations and technical specifications related to the exploitation and utilization of geothermal energy, which have played a positive role in guiding the exploitation and utilization of geothermal energy in China. Based on a two-dimensional analysis framework built by M.Howlett's and M.Ramesh's policy instruments theory and the theory of industry chain, this article used the content analysis method to measure and analyze geothermal policies in China. Based on panel data from 31 provinces in China from 2010 to 2015, a multiple regression model was constructed to measure the impact of each policy instruments and policy combinations on geothermal exploitation and conflicts or coordination among different policy instruments. Private markets are the most effective policies to promote the exploitation of geothermal resources, followed by subsidies; other policies (regulation, tax and user charges, auction of property rights, information, and exhortation) have little effect on the exploitation of the geothermal resource. In addition, when different policy instruments are put together, there will be policy conflicts or policy coordination between some policies. Finally, based on the results of the model, corresponding policy recommendations are proposed for each policy instruments.

1. INTRODUCTION

Geothermal energy is the energy from the interior of the earth. It is the heat that transmits to the earth's crust through the high-temperature magma by the earth's core. It is generally distributed in the rupture of the earth's crust.

China's geothermal resources are extremely rich, with a geothermal resource potential of 11×106 EJ/a, accounting for 7.9% of the world (Zhao and Wan, 2014). The use of geothermal energy is usually divided into two categories: direct utilization and power generation. China has the largest installed capacity of direct utilization in the world, accounting for 25.2% of the total. And the shallow and hydrothermal geothermal heating (refrigeration) technology is basically mature in China (National Development and Reform Commission, 2017). However, China's geothermal power generation development is slow. According to the 2015 Geothermal Conference report (Lund and Boyd, 2016), China's geothermal power generation capacity rank the 18th among 26 geothermal power generation countries. The total installed capacity is 27.78MW, accounting for 0.2% of the total. China's geothermal resources account for about one-sixth of global resources (Hou and Liu, 2018), which indicates that geothermal energy has a great potential for development. After the enactment of "13th Five-Year Plan for the Development and Utilization of Geothermal Energy", geothermal resources will be fully promoted by the government to replace fossil fuels and provide solutions for China's energy consumption.

As a technology-intensive and capital-intensive industry, advanced technologies are needed to support the development of geothermal energy. Therefore, the government needs to invest a large amount of funds to promote geothermal energy industrialization. Other countries, such as the United States, Iceland, Japan, etc., have already issued relevant policies, including special funds, fiscal interest subsidies, tax incentives, loan guarantees, etc. (Hou and Liu, 2018). Zhao et.al (2016) found that R&D incentives, fiscal incentives, grid construction incentives and tariff incentives, and market incentives have played a major role in promoting geothermal development in China. Although China's geothermal potential is huge, direct use ranks first in the world, but its geothermal utilization efficiency is not high (Hou and Liu, 2018), and policy support is far from enough.

Some scholars have studied China's geothermal policy and believe that China's policies are imperfect. It is necessary to further develop corresponding policy mechanisms. They mainly focus on some of China's policies, such as certain laws or subsidies. Zhao and Wan (2014) studied China's geothermal industry and believed that China lacks comprehensive exploration and evaluation, strong policy support, and technical support. It is recommended that the government establish a platform for development and evaluation, establish an information supervision system, establish development plans and formulate preferential policies, such as funds, tax breaks and other measures to promote the development of geothermal in China. Hou and Liu (2018) studied the potential of geothermal resources in China, the status of development and utilization, and a series of related geothermal policies. They believe that geothermal energy has enormous economic, environmental and social benefits, but because there are no national, specific laws and regulations, geothermal development and utilization are lacking of a legal basis, resulting in chaotic and overlapping management, which are not conducive to the sustainable and healthy development of geothermal energy.

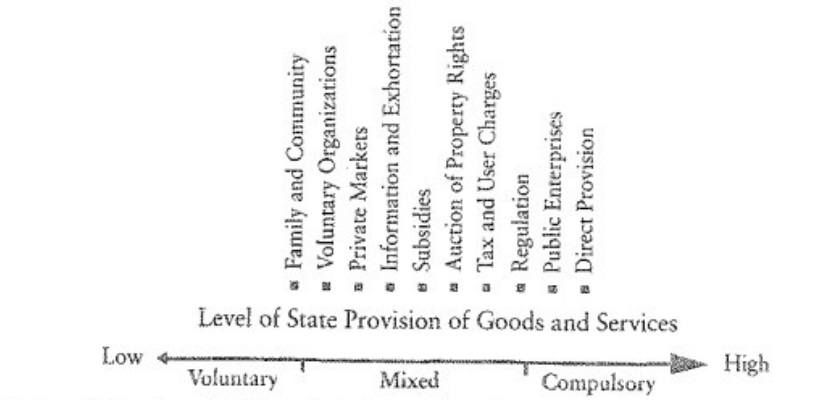
In the existing research, the research methods of geothermal policy are very limited. Zhang et.al (2019) used the options investment decision framework to compare the impact of different subsidies policies and propose policy recommendations accordingly. Chandarasekharam and Aref (2014) interviewed ground source heat pump operators by phone and mail, collected data and analyzed the development of ground source heat pumps. They also identified several key drivers and obstacles and gave provides policy advice on how to promote the development of geothermal district heating in United States. Fabbri et.al (2017) analyzed the relationship between geothermal water level and tourist flow through the R regression of the geothermal area in Euganean, northern Italy, and

combed the hydrogeological data and resource utilization status, and obtained the reasons of the decline of geothermal aquifer. And make corresponding suggestions for this.

2. STATUS OF CHINA'S GEOTHERMAL POLICY

In order to promote the development and utilization of geothermal energy in China, the central level policy promulgated by China is shown in Annex 1. The promulgation of the geothermal policy at the central level in China is divided into three stages. Before 2005, it was the first stage. During this period, various policies and regulations only mentioned encouraging the development of renewable energy such as solar energy and geothermal energy, but the intensity was small. The number of policies is also too small to effectively play its driving role. In the second phase from 2005 to 2013, the promulgation of the Renewable Energy Law of the People's Republic of China promoted the development of renewable energy including geothermal energy. At this stage, the government began to pay attention to the development of geothermal energy and passed legislations to encourage and support the development and utilization of geothermal energy. Since 2013, the government has entered the accelerated phase of geothermal development and utilization. In 2013, smog weather appeared in the central and eastern regions of China. Geothermal energy, as a clean energy source, has the advantages of saving coal resources, reducing carbon dioxide emissions, and spreading granules has attracted widespread attention from governments at all levels. The intensity of the government supports geothermal development and utilization has gradually increased, and China's geothermal development and utilization has entered to a stage of accelerated development. In January 2017, the 13th five-year plan for geothermal energy development and utilization was enacted. This is the first time that the development of geothermal energy has been planned at the central level, which has a major guiding role for the development of geothermal fields in various provinces in China. The development and utilization of geothermal energy in China will reach to a new stage.

This paper selects the classification framework of M. Howlett and M. Ramesh to conduct geothermal policy research. They divide policy instruments into three broad categories and ten subcategories based on the extent to which government power is directly involved. The details are shown in the table below. There are six main types of policy instruments used by the Chinese government to promote the development of the geothermal industry: regulation, tax and user charges, auction of property rights, subsidies, information and exhortation, private markets.



Source: M. Howlett and M. Ramesh, *Studying Public Policy: Policy Cycles and Policy Subsystems* (Toronto: Oxford University Press, 1995).

Figure 1:Policy instruments

By counting the geothermal policies of each province (municipality), each of the obtained policy instruments is as shown in the following figure:

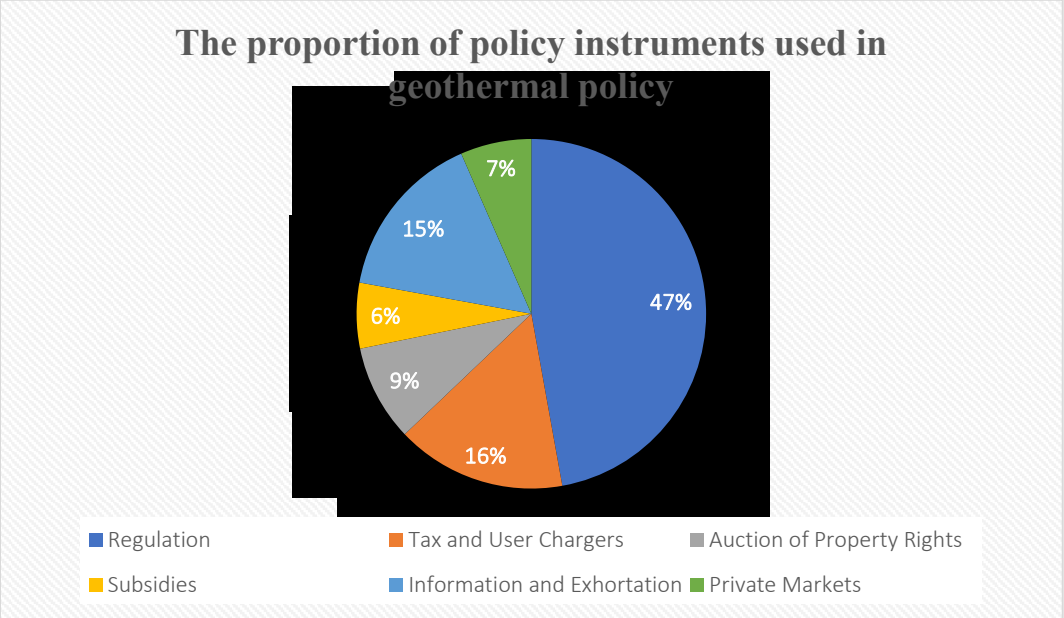


Figure 2: The proportion of policy instruments used in geothermal policy

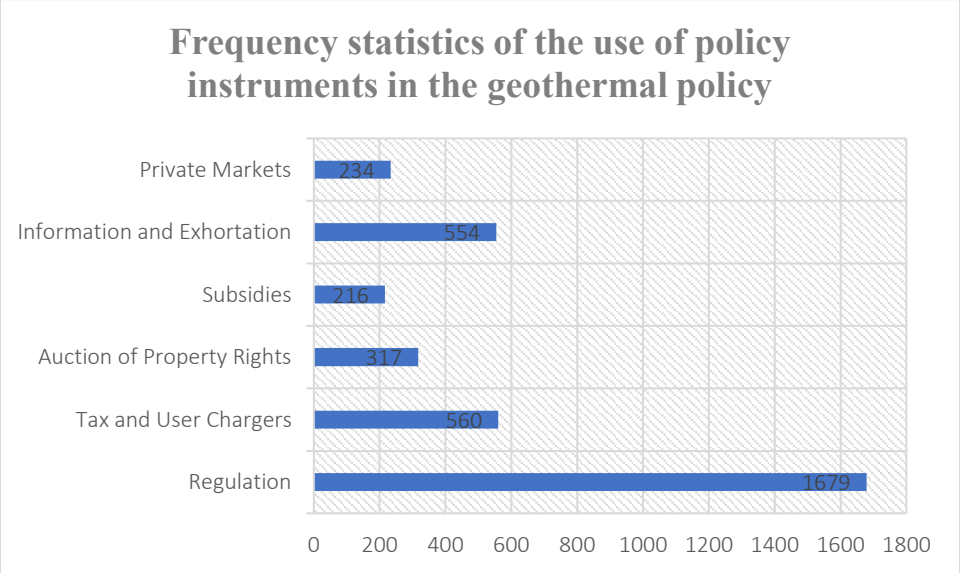


Figure 3 Frequency statistics of the use of policy instruments in the geothermal policy

According to the quantitative statistics, there are significant differences in the use of various political instruments in China's geothermal policy. Among them, the number of regulation policy is 1,679, accounting for 47.2% of the total; and the number of tax and user charges policy is 560, accounting for 15.7%; 317 for auction of property rights polidy, accounting for 8.9%; 216 for subsidies policy, accounting for 6.1%; 554 for information and exhortation policy, accounting for 15.6%; 234 for private markets policy, accounting for 6.6%.

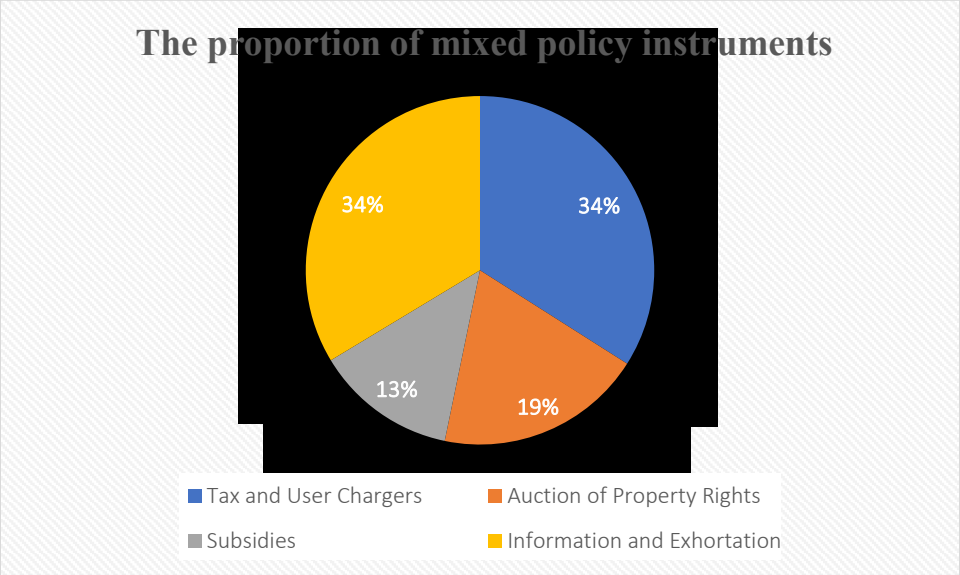


Figure 4 The proportion of mixed policy instruments

Through further analysis, we found that the regulation policy accounted for the largest proportion of all policy instruments; the subsidies policy accounted for the smallest proportion; in the mixed policy instrument, the government paid more attention to tax and user charges, information and exhortation. This shows that the government is more inclined to adopt less expensive policy instruments. Therefore, regulation, tax and user charges, information and exhortation are widely used, and the proportion of subsidies is the smallest, due to the high cost; private markets have not attracted the attention of the government.

3. METHODS AND DATA

In order to evaluate the effective implementation of China's geothermal policy, this study classified the geothermal policy according to policy instruments, and used the frequency of policy instruments of each province (municipality). Furthermore, a multiple linear regression model was established to evaluate the impact of each policy instrument on the exploitation of geothermal resource. Scholars have widely used this model to study the effectiveness of certain policies. (Menz and Vachon, 2006; Zhao et.al, 2013; Qiu and Sun, 2019)

3.1 Variables and data sources

Enter the keyword “geothermal”(in Chinese “地热”) in pkulaw and search for 4283 local-level effective policies including “geothermal”. Because there are too many policies involved, in the policy of “geothermal”, according to the classification framework of policy instruments by M. Howlett and M. Ramesh, the following keywords are used for screening and statistics. The number of policy instruments. The empirical part of this paper selects the data of China's various provinces (municipality) from 2010 to 2015, and the explanatory variables select the optimization of geothermal resources of China's 2010-2015 period. The data comes from China Land & Resources Almanac.

In Compulsory policy instruments, the following keywords are selected for regulation: “Licensing”(in Chinese “许可”), “Total” (in Chinese “总量”), “Limited Mining” (in Chinese “限量开采”), “Restricted Mining” (in Chinese “限制开采”), “Control Mining” (in Chinese “控制开采”), “Margin” (in Chinese “保证金”), “Risk Mortgage” (in Chinese “风险抵押金”), “Recovery Rate Coefficient” (in Chinese “回采率系数”) , "must"(in Chinese “必须”), "forbidden"(in Chinese “禁止”); direct provision select keywords "providing geothermal"(in Chinese “提供地热”), public enterprises select keywords "state-owned enterprises"(in Chinese “国有企业”). In mixed policy instruments, the keywords selected by tax and user charges are “payment” (in Chinese “缴纳”) and “levy” (in Chinese “征收”); the keywords selected by auction of property rights are “bidding” (in Chinese “招标”), “sell” (in Chinese “出让”) and “transfer” (in Chinese “转让”); the keywords selected by subsidies are “ reduction” (in Chinese “减收”), “deduction” (in Chinese “减缴”), “reduction” (in Chinese “减免”), “exemption” (in Chinese “免征”), “allowance” (in Chinese “补贴”), “subsidy” (in Chinese “补助”), “special funds”专用资金; the keywords selected for information and exhortation are “encourage” (in Chinese “鼓励”) and “should” (in Chinese “应当”). In voluntary policy instruments, the keywords selected by private markets are “markets” (in Chinese “市场”); the keywords selected for volunteer services are “volunteers” (in Chinese “志愿”); the keywords selected by families and communities are “communities” (in Chinese “社区”).

3.2 Model

This paper constructs multiple linear regression to describe the relationship between two or more models. The formula is as follows:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_j x_{ij} + \varepsilon_i \quad (1)$$

y is the dependent variable, x is the independent variable, a is the number of independent variables, b is the number of samples, j is the jth independent variable, β0 is a constant term, β1, β2, βj are the independent variable coefficient, and ε is the error term.

This paper has processed the above data to avoid multiple collinearity problems. The processing of variables and their definitions are shown in Table 1. The resulting model is as follows:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \beta_4 x_{i4} + \beta_5 x_{i5} + \beta_6 x_{i6} + \beta_7 x_{i7} + \beta_8 x_{i8} + \beta_9 x_{i9} + \beta_j x_{ij} + \varepsilon_i \quad (2)$$

The meaning of the symbol in the formula is the same as that of Equation 1.

Table1 Symbol and meaning

Symbol	Meaning	Variable interpretation and data processing	Data source
y	Exploitation of geothermal resource	Annual exploitation of the geothermal resource for each province Logarithmic processing	China Land & Resources Almanac
x1	Regulation	Annual number of the geothermal regulation p olicies in each province Centralized processing	Organized from the “pkulaw”
x2	Tax and user charges	Annual number of the geothermal tax and user charges policies in each province	Organized from the “pkulaw”
x3	Auction of property rights	Annual number of the geothermal auction of property rights policies in each province Centralized processing	Organized from the “pkulaw”
x4	Subsidies	Annual number of the geothermal subsidies policies in each province Centralized processing	Organized from the “pkulaw”
x5	Information and exhortation	Annual number of the geothermal information and exhortatio n policies in each province Centralized processing	Organized from the “pkulaw”
x6	Private markets	Annual number of the geothermal private marke ts policies in each province	Organized from the “pkulaw”

4. RESULTS AND DISCUSSION

First, we examine the six explanatory variables separately using the model. Then, multiple explanatory variables are combined and regression is performed respectively, and finally 62 multiple linear regression models are obtained.

4.1 Effect of individual explanatory variable

The six individual explanatory variables are respectively regressed with the control variables, and the regression results are shown in Table 2.

	(1)	(2)	(3)	(4)	(5)	(6)
	lny	lny	lny	lny	lny	lny
X1	-0.004					
	(-0.57)					
lnx7	4.043***	4.039***	4.009***	2.770***	3.757***	2.828***
	(57.45)	(11.85)	(23.69)	(5.92)	(8.12)	(16.44)
lnx8	0.243***	0.242***	0.245***	0.301***	0.258**	0.281***
	(3.16)	(3.51)	(3.61)	(3.85)	(2.65)	(4.13)
lnx9	-0.366	-0.392	-0.421	0.103	-0.309	-0.046
	(-0.74)	(-0.90)	(-0.87)	(0.18)	(-0.61)	(-0.09)
X2		-0.016				
		(-0.96)				
X3			-0.020			
			(-0.86)			
X4				0.134***		
				(2.84)		
X5					0.004	
					(0.13)	
X6						0.194***
						(4.52)
_cons	-30.846***	-30.569***	-30.054***	-23.734***	-28.829***	-22.775***
	(-6.21)	(-4.66)	(-4.90)	(-4.34)	(-6.76)	(-4.28)
N	186	186	186	186	186	186
r2						
r2_a						
F	6033.890	82.235	763.325	97.846	437.394	102.867
p	0.000	0.000	0.000	0.000	0.000	0.000

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Individual explanatory variable regression result

Table 2 shows the regression results of a single explanatory variable and control variables. The results show that private market policy instruments (x6) have the greatest impact on increasing the exploitation of geothermal resource, followed by subsidies (x4); other explanatory variables, regulation(x1), Tax and user charges (x2), auction of property rights (x3), information and exhortation (x5) have no effect on the increase of the exploitation of geothermal resource. For the control variables, the exploitation of geothermal resource (x6), GDP (x7), and exploitable geothermal resource (x8) have a significant positive correlation with the exploitation of geothermal resource, while coal consumption (x9) has no significant correlation.

4.1.1 Effectiveness of private markets policies

Private markets in voluntary policy instruments have a significant positive impact on the exploitation of geothermal resource. This is in line with the expected assumptions, indicating that the 2010-2015 period, the publication of the geothermal policy increased the exploitation of geothermal resource. The coefficient is 19.4%, indicating that when the number of geothermal policies in private markets increased by 1%, the exploitation of geothermal resource increased by 19.4%. Private markets attract social capital into the geothermal industry market and reduce government intervention. Its biggest feature is fairness and competitiveness. Through the market's automatic adjustment of supply and demand, the market can determine the distribution of factors and ultimately achieve the effective allocation of resources, so that the geothermal-related resources are distributed to the corresponding items according to the social value reflected by the private willingness to pay.

In the geothermal policy, most of the private market-related policies involve: introducing market competition mechanisms and introducing social capital into areas such as water pollution prevention, water resources allocation, geothermal exploration, electricity, and construction applications. There are also some policies that stipulate the market environment and propose to increase industrial support so that private capital can enter the market fairly. For example, the Mudanjiang Municipal People's Government has proposed to guide financial and corporate capital to participate in mineral exploration investment, and to attract social capital investment exploration; Neijiang Municipal Government encourages private capital to participate in the construction of new energy industry's power, and develops a market for power users and power generation enterprises to negotiate electricity prices; Lu'an Municipal People's Government proposes to support the market of renewable energy construction applications to stimulate the development of the industry. The policies related to private markets are designed to drive the development of the industry, promote the formation of the market, and stimulate the enthusiasm and innovation of geothermal-related enterprises. Therefore, the increase in private market policies has a positive effect on the exploitation of geothermal resource.

4.1.2 Effectiveness of subsidies policies

Subsidies in mixed policy instruments have a significant positive effect on the exploitation of geothermal resource. This is in line with the expected assumptions, which indicates that the release of the geothermal policy between 2010 and 2015 increased the exploitation of geothermal resource. The coefficient is 13.4%, indicating that the amount of geothermal policy in the subsidies increased by 1%, and the exploitation of geothermal resource increased by 13.4%. The possible reason is that the government uses different forms to transfer property to the relevant entities of the geothermal industry, which reduces the investment cost of enterprises or individuals to a certain extent, making them willing to invest in the exploitation of geothermal resources, thus generating a positive impact on the exploitation of geothermal resource. Role of promotion. Moreover, the will of the government is consistent with the will of the policy target group. For some reasons, the target group cannot implement its will. Subsidies can solve this problem, and the exploitation of geothermal resource is improved. Further, subsidies allow the policy target group to choose the way to respond the implementation of the policy. Unlike policy instruments such as regulation, which establishes rules and standards to enforce the behavior of target groups affecting the target group's innovation enthusiasm, subsidies can encourage them to innovate, so the exploitation of geothermal resource is improved.

Since the 1980s, China has adopted subsidies and incentives to support the research and development, construction and utilization of renewable energy. The main methods include: special funds, financial discounts, tax incentives, price subsidies and so on. Renewable energy such as geothermal is supported by special funds for renewable energy development. In order to support the development of renewable energy, the central government has specially allocated special funds for renewable energy development, and in the "Renewable Energy Law of the People's Republic of China", it supports the following projects: renewable energy exploration, evaluation and related information system construction. Renewable energy development and utilization science and technology research, standards development and demonstration projects; renewable energy development and utilization projects in rural and pastoral areas. For example, in order to promote the use of geothermal energy in building energy conservation and the development of ground source heat pumps, Beijing has provided 50% financial support for the implementation of heat pump system renovation projects. Changsha has subsidized 53 yuan/square meter for solar energy and ground source heat pump system projects.

However, the positive impact of subsidies on the exploitation of geothermal resource is lower than that of private markets. The possible reasons are as follows: 1. The development of China's policy system is not perfect, and there are the following problems: weak fiscal policy, unclear policies, lack of implementation rules and unified management. Institution (Lee and Shih, 2010). Some of the existing policies are suitable for macroeconomic regulation, but no specific policies have been clarified to develop geothermal energy. For example, "Guidance on the promotion of geothermal energy development and utilization" refers to the policy of providing electricity price subsidies for geothermal power commercial projects, but there are no specific details, such as "how to subsidies", "how much amount of subsidies", so the implementation of these policies is relatively difficult (Hou and Liu, 2018). 2. China currently lacks a unified geothermal resource information system, and has not yet established an information database. The existence of information asymmetry (Hou and Liu, 2018) makes it impossible for the government to grasp the real information in the market, and it is difficult to determine the amount of subsidies, resulting in the unreasonable subsidies quota. (Liu et.al, 2019). Liu et.al (2019) believes that government subsidies promote corporate innovation performance, but when there are too many subsidies, it will inhibit innovation. Murphy et.al (2006) also found that when the subsidies are very high, the company generates rent-seeking behavior in order to obtain more subsidies.

Due to the above factors, government subsidies may deviate from the ideal state of resource allocation and weaken policy effectiveness.

4.1.3 Effectiveness of regulation policies

The increase in the exploitation of geothermal resource has nothing to do with the promulgation of regulation policy instruments in mandatory policy instruments, and is not consistent with the expected trend. The reason may be that these policies are not implemented (Feng and Feng, 2018). On the one hand, it may be due to local governments paying more attention to superficial goals, such as GDP. On the other hand, it may be due to insufficient law enforcement capacity. For example, the Environmental Resources Law of the China University of Political Science and Law has conducted research on environmental law enforcement forces. It has found that law enforcement agencies have insufficient law enforcement capabilities, and systems and measures cannot be fully and fully complied with. Therefore, although some policies are issued, no real implementation is in place.

In addition, the higher the intensity of government regulation, the greater the possibility that the government will be captured by the industry (Li and Xi, 2012). In Figure 2, we can see that mandatory policy instruments account for 47.2%, and the intensity of regulation is higher; Li and Xi (2012) also mentioned that at the present stage of China's transitional economy, officials' rent-seeking behaviors are widespread, and governments at all levels also have strong development orientations, and there is a tendency to over-intervene in the micro-economic field. In this kind of institutional environment, it provides space and opportunities for enterprises to meet government needs and receive government protection and support, which makes enterprises have strong motivations that affect regulation policies. Therefore, the “regulation capture” situation exists in the geothermal industry, making regulation policy invalid.

4.1.4 Effectiveness of tax and user charges policies

The increase in exploitation of geothermal resource has nothing to do with the promulgation of regulation policy instruments in mandatory policy instruments. This may be due to the following reasons. The purpose of geothermal tax collection is to suppress destructive mining and waste. However, due to the lack of well-established sharing channels between information departments, there is a phenomenon of overlapping and overlapping. The main body of the collection involves multiple departments, making the purpose of collection unclear. , causing the tax and user charges policy to be invalid. Second, the structure of taxes and fees is unreasonable, and the pricing of tax rates is unreasonable, making it difficult to achieve policy objectives. Taxation has a crowding-out effect on corporate investment, which makes the company's disposable funds less, so it has a negative impact on investment. If the tax rate is too high, it will affect the production enthusiasm of the enterprise, and the tax rate is too low to achieve the policy goal. Therefore, appropriate taxation policies are important to promote the development of enterprises (Zhu and Wang, 2009).

4.1.5 Effectiveness of information and exhortation policies

The auction of property rights is a useful hybrid policy instrument that establishes a market where there is no market, enabling resources to be effectively configured. In China's geothermal policy, the auction of property rights mainly involves the transfer of geothermal mining rights in China to avoid the massive loss of state-owned assets and enable the transfer of the ownership of geothermal resources to be effectively allocated under the competition mechanism. As can be seen from the results, the increase of the exploitation of geothermal resource has nothing to do with the auction of property rights in the mixed policy instruments. That is to say, the promulgation of the policies related to the property of property rights does not work. The possible reasons are as follows: China's mineral resource management system still follows the characteristics of the planned economy. For example, the non-transparent licensing process, mining rights are not all allocated by the market, which provides a breeding ground for corruption (Dong et.al, 2019). Since the 18th National Congress, 13 local governments have been pointed out by the Central Inspection Team that there is a problem of mine-related corruption, accounting for 41.9% (Li, 2016), and they are all areas where mineral resources are concentrated. Corruption makes auction of property rights policies invalid

4.1.6 Effectiveness of information and exhortation policies

Although geothermal has made great achievements in development and utilization, the technology is still immature and has not yet formed a complete technical system. In terms of power generation, technology is still far behind advanced countries (Hou and Liu, 2018). In the past 30 years, China has paid less attention to geothermal energy, resulting in a shortage of talent. Therefore, investing in the geothermal industry requires a large amount of capital (Hou and Liu, 2018). It is difficult to promote the geothermal industry by the information and exhortation policy alone. Therefore, the effectiveness of using the information and exhortation policy is very low; it is best to use it with other police instruments to get good results (Howlett et.al, 2009).

4.2 Effect of multiple explanatory variable

In addition to the policy effectiveness of a single explanatory variable, this paper also tests the policy effectiveness of a combination of multiple explanatory variables. The result of effectiveness of two, three, four, and five explanatory variables for the exploitation of geothermal resource is shown in Annex 2-5.

The results in Annex 2-5 are basically consistent with the results of a single explanatory variable. Private markets policy instruments always have the greatest positive impact on the exploitation of geothermal resource (0.156-0.281); after the subsidies policy is combined with other policies, some of them become insignificant; the regulation policy is combined with the private markets policy, and most of its significance changes, showing negative correlation; tax and user charges, auction of property rights, information The and exhortation policy still shows no correlation with the exploitation of geothermal resource. This result shows that there is an interaction between different policies, and there exist policy conflicts or policy coordination.

For x6, combined x6 with other independent variables in turn, the confidence is unchanged, and the coefficients are increased, except x4 other two policies combinations (see Table 3). This indicates that there is a policy conflict between subsidies(x4) and private markets(x6), and there is policy coordination between other variables and x6.

As shown in the figure, the number of subsidies policies has declined year by year after reaching the highest value in 2013. Hou et.al (2018) believes that subsidies are one of the most important sources of funding for renewable energy companies, and government subsidies can promote corporate financing and investment. (Hou and Liu, 2018). Therefore, when the strength of the Chinese government's subsidies declines, the company loses its important source of funds, and the investment in renewable energy also decreases, leading to a decline in the exploitation of geothermal resource. In addition, the Chinese government pays insufficient attention to the geothermal market, and R&D funds are concentrated in other renewable energy sources (Zhao et.al, 2016), such as wind and solar energy, while geothermal development requires advanced technology to support and face huge investment risk (Hou and Liu, 2018). As a result, companies are reluctant to invest funds in the geothermal market, leading to the failure of geothermal subsidies and private markets policies.

One policy	Two policies	Three policies			
0.194***	16	126	136	146	156
	0.280***	0.281***	0.278***	0.244***	0.278***
	26	126	236	246	256
	0.232***	0.281***	0.235***	0.196**	0.241***
	36	136	236	346	356
	0.208***	0.278***	0.235***	0.170***	0.228***
	46	146	246	346	456
	0.156**8	0.244***	0.196**	0.170***	0.192***
	56	156	256	356	456
	0.221***	0.278***	0.241***	0.228***	0.192***

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3 Coefficients of x6

Add the other independent variables to the two policy combinations in turn, and get the three policy combinations, as shown in Table 3. We can see that the addition of x1 increases the coefficient of x6 in the two policy combinations, for example, x1x2x6 is 0.281*** and x2x6 is 0.232***. This shows that the promulgation of the regulation policy has enhanced the positive impact of market policies on the exploitation of geothermal resource.

The addition of x4 reduces the coefficient or confidence of x6 in the two policy combinations, for example, x2x4x6 is 0.196** and x2x6 is 0.232. This shows that the promulgation of the subsidies policy has weakened the impact of market policies on the exploitation of geothermal resource. The combination of four and five explanatory variables is the same as the three explanatory variable policy combinations, ie the regulation policy (x1) enhances the impact of the private markets policy (x6) on the exploitation of geothermal resource, and the subsidies policy (x4) weakens. The effect of the private markets policy (x6) on the exploitation of geothermal resource.

Three policies (no repetition)	Four policies		
126	1236	1246	1256
0.281***	0.280***	0.242***	0.279***
136	1236	1346	1356
0.278***	0.280***	0.243***	0.276***
146	1246	1346	1456
0.244**	0.242***	0.243***	0.244***
156	1256	1356	1456
0.278***	0.279***	0.276***	0.244***
236	1236	2346	2356
0.235***	0.280***	0.198***	0.243***
246	1246	2346	2456
0.196**	0.242***	0.198***	0.214***
256	1256	2356	2456
0.241***	0.279***	0.214***	0.214***
346	1346	2346	3456
0.170***	0.243***	0.198***	0.199***
356	1356	2356	3456
0.228***	0.276***	0.214***	0.199***
456	1456	2456	3456
0.192***	0.244***	0.214***	0.199***

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 4: Coefficients of x6

Four policies (no repetition)	Five policies	
1236	12346	12356
0.280***	0.242***	0.278***
1246	12346	12456
0.242***	0.242***	0.241***
1256	12356	12456
0.279***	0.242***	0.241***
1346	12346	13456
0.243***	0.242***	0.243***
1356	12356	13456
0.276***	0.278***	0.243***
1456	12456	13456
0.244***	0.241***	0.243***
2346	12346	23456
0.198***	0.242***	0.215***
2356	12356	23456
0.243***	0.278***	0.215***
2456	12456	23456
0.214***	0.241***	0.215***
3456	13456	23456
0.199***	0.243***	0.215***

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 5: Coefficients of x6

For x4, the policy combination with x4 is shown in the following table. In the policy combination of two explanatory variables, the coefficient of x4 containing the combination of x3 and x6 is significantly lower (0.135**, 0.099*) compared with the single policy; the x4 coefficient of the policy combination containing x1, x2, x5 is increased High (0.145***, 0.160***, 0.151***). This shows that there is policy coordination between x1, x2, x5 and x4, and there is a policy conflict between x3, x6 and x4.

One policy	Two policies	Three policies			
0.134***	x1x4	124	134	145	146
	0.145***	0.160***	0.144**	0.149***	0.109*
	x2x4	124	234	245	246
	0.160***	0.160***	0.159***	0.165***	0.127**
	x3x4	134	234	345	346
	0.135**	0.144**	0.159***	0.149***	0.097*
	x4x5	145	245	345	456
	0.151***	0.149***	0.165***	0.149***	0.126***
	x4x6	146	246	346	456
	0.099*	0.109*	0.127**	0.097*	0.126***

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 6: Coefficients of x4

There is a conflict between subsidies (x4) and the auction of property rights (x3) policy. In the geothermal policy, the auction of property rights mainly involves the transfer of geothermal mining rights in China. However, since China's mineral resource management system still follows the characteristics of the planned economy (Dong et.al, 2019), that is, the government plays a leading role, the problem that leads to opacity still exists. Due to information asymmetry, some companies will deliberately conceal real information to obtain financing (Zhang and Wu, 2014; Liu et.al, 2019), which leads to improper government subsidies and resource distortions. Therefore, when these two policy instruments are combined, the exploitation of geothermal resources is weakened.

There is policy coordination between subsidies (x4) and tax and user charges (x2). The tax and user charges in the geothermal policy mainly include the following: water resource fees, mineral resources compensation fees, mineral resource taxes, mining royalties, etc., and the subsidies mainly include special funds, financial interest subsidies, tax incentives, and price subsidies. Etc., the costs involved in the two policies are complementary. Therefore, policy coordination and mutual promotion are formed between the two.

There is policy coordination between subsidies (x4) and information and exhortation (x5). The Massachusetts Institute of Technology's Jefferson Tester team (Bloomquist and Lund, 2000) investigated public and local government perceptions and attitudes about geothermal energy and geothermal heating, and found that local governments lacked basic understanding of the strengths and weaknesses of geothermal resources. And the management has a negative attitude towards the promotion and application of geothermal heating, so the publicity and education work on geothermal is crucial. In Figure 2 we can see that the number of information and exhortation policies accounted for 15.6% of the total, ranking third in the total number of policy instruments, which promoted the awareness of local governments and the public on the development and utilization of geothermal energy. The geothermal industry is a technology-intensive industry and a capital-intensive industry (Hou and Liu, 2018). It is difficult to fully develop the geothermal industry based solely on market mechanisms and the company's own investment. Therefore, the government's corresponding subsidies policies are needed to support it. When the subsidies policy (x4) is combined with the information and exhortation policies (x5), policy coordination is formed.

In the combination of these two policies, other independent variables are added in turn. Comparing the obtained three policy combinations with the corresponding two policy combinations, it can be found that if there exist any one or two explanatory variables of x3 or x6, the coefficients will be significant decrease; the combination of the two policies including x3 and x6 (0.135**, 0.099*) decreased significantly after adding the x2 and x5 explanatory variables, such as x4x6 being 0.099* and x4x5x6 being 0.126*** This shows that the policy coordination between x2 and x5 and x4 is very strong. Add other independent variables in turn in the three policy combinations, and the resulting combinations are shown in the following table. If including one or two explanatory variables of x3 or x6, the coefficient or significance is reduced, and the four policy combinations with x2 or x5 have a significant increase in x4 compared with the corresponding three policy combinations.

Three policies (no repetition)	Four policies		
124	1234	1245	1246
0.160***	0.159***	0.165***	0.123**
134	1234	1345	1346
0.144**	0.159***	0.148***	0.108*
145	1245	1345	1456
0.149***	0.165***	0.148***	0.111**
146	1246	1346	1456
0.109*	0.123**	0.108*	0.111**
234	1234	2345	2346
0.159***	0.159***	0.163***	0.141***
245	1245	2345	2456
0.165***	0.165***	0.163***	0.141***
246	1246	2346	2456
0.127**	0.123**	0.141***	0.141***
345	1345	2345	3456
0.149***	0.148***	0.163***	0.1222***
346	1346	2346	3456
0.097*	0.108*	0.141***	0.1222***
456	1456	2456	3456
0.126***	0.111**	0.141***	0.1222***

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Coefficients of x4

In the combination of the five explanatory variables, the coefficient in combinations that include x3 and x6, are also reduced compared to the corresponding four policy combinations.

Four policies (no repetition)	Five policies	
1234 0.159***	12345 0.164***	12346 0.123**
1245 0.165***	12345 0.164***	12456 0.127***
1246 0.123**	12346 0.123**	12456 0.127***
1345 0.148***	12345 0.164***	13456 0.111***
1346 0.108*	12346 0.123**	13456 0.111***
1456 0.111**	12456 0.127***	13456 0.111***
2346 0.141***	12346 0.123**	23456 0.138***
2456 0.141***	12456 0.127***	23456 0.138***
3456 0.1222***	13456 0.111***	23456 0.138***

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 8: Coefficients of x4

For x1, the regulation policies (x1) are not significant as a single explanatory variable, but when combined with private markets (x6), the significance increases. As shown in the table, x6 promotes the negative impact of x1. At the same time, the combination of regulation (x1) and private markets (x6) also increases the coefficient of x6, so there is policy coordination between x1 and x6. In China's geothermal private markets policies, the government guides social capital into water pollution prevention and water resources allocation. The implementation of these policies requires certain preconditions, that is, the government prohibits enterprises or individuals from discharging pollutants and limiting the exploitation of geothermal resources. In fact, these preconditions are specified in the regulation polities. Therefore, when regulation (x1) is combined with private markets (x6), there is policy coordination.

One policies	Two policies	Three policies			
-0.004	x1x2	123	124	125	126
	-0.000	0.001	-0.002	-0.007	-0.019**
	x1x3	123	134	135	136
	-0.002	0.001	-0.008*	-0.008	-0.021***
	x1x4	124	134	145	146
	-0.010	-0.002	-0.008*	-0.008	-0.025***
	x1x5	125	135	145	156
	-0.011	-0.007	-0.008	-0.008	-0.028*
	x1x6	126	136	146	156
	-0.023***	-0.019**	-0.021***	-0.025***	-0.028*

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 9: Coefficients of x1

Add other independent variables in turn in the combination of these two explanatory variables. Comparing the resulting combination of policies for the three explanatory variables with the combination of two explanatory variable policies, the combination of policies with subsidies (x6) is significantly increased.

The other independent variables were added in turn in the policy combinations of the three explanatory variables. The results are shown in Table 10. When x6 is present, the significance of x1 is increased. In the policy combination of the four explanatory variables, when the variable x6 is added, the corresponding x1 has a significant increase or a decrease in the coefficient.

Three policies (no repetition)	Four policies		
123	1234	1235	1236
0.001	-0.001	-0.005	-0.018***
124	1234	1245	1246
-0.002	-0.001	0.001	-0.017**
125	1235	1245	1256
-0.007	-0.005	0.001	-0.024
126	1236	1246	1256
-0.019**	-0.018***	-0.017**	-0.024
134	1234	1345	1346
-0.008*	-0.001	-0.006	-0.024**
135	1235	1345	1356
-0.008	-0.005	-0.006	-0.026
136	1236	1346	1356
-0.021***	-0.018***	-0.024**	-0.026
145	1245	1345	1456
-0.008	0.001	-0.006	-0.024
146	1246	1346	1356
-0.025***	-0.017**	-0.024**	-0.026
156	1256	1356	1456
-0.028*	-0.024	-0.026	-0.024

t statistics in parentheses

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 10: Coefficients of x1

Four policies (no repetition)	Five policies	
1234	12345	12346
-0.001	0.001	-0.017***
1235	12345	12356
-0.005	0.001	-0.023
1236	12346	12356
-0.018***	-0.017***	-0.023
1245	12345	12456
0.001	0.001	-0.016
1246	12346	12456
-0.017**	-0.017***	-0.016
1256	12356	12456
-0.024	-0.023	-0.016
1345	12345	13456
-0.006	0.001	-0.022
1346	12346	13456
-0.024**	-0.017***	-0.022
1356	12356	13456
-0.026	-0.023	-0.022
1456	12456	13456
-0.024	-0.016	-0.022

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Coefficients of x1

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

In this paper, multiple linear regression models were used to examine the effects of six policy instruments on China's exploitation of geothermal resource using data from 2011-2015. This paper not only tests individual policies, but also tests the interactions between multiple policies. Based on the above results and analysis, the following conclusions and policy recommendations are drawn as follows.

5.1 Tax and user charges

Due to the lack of policy implementation, the regulations are not significant when regressing as a single explanatory variable, but the implementation of the private markets policy requires the assistance of the regulation policy, and the combination of the two produces policy coordination. The purpose of Regulation policies is to prevent overexploitation of geothermal resources and ensure the sustainable development of geothermal resources, so the increase in the number will reduce the exploitation of geothermal resource. Therefore, the future regulation policy should be formulated with caution and should be used in conjunction with other policies. Government transparency can reduce information asymmetry and increase the effectiveness and accuracy of market information (Kolstad and Wiig, 2009), reducing corruption, rent-seeking behavior and government irregularities (Li et.al, 2017; Ellis and Fender, 2006). Therefore, the government should disclose the decision-making process and relevant government information, and increase government transparency to ensure the effectiveness of the policy.

5.2 Regulation

Tax and user charges policies are not significant when regression is performed as a single explanatory variable, and policy coordination occurs when combined with the subsidies policy. The government should establish an appropriate tax rate and use it reasonably with the subsidies policy. Secondly, establish an effective collection and management mechanism, conduct a comprehensive tax census, grasp the situation of mining geothermal resources, find out the tax source structure, and strengthen the dynamic monitoring and tracking management of tax sources.

5.3 Auction of property rights

China's geothermal auction of property rights policies mostly involves the transfer of mineral property rights. Due to information asymmetry, the effectiveness of auction of property rights is not obvious, and when combined with subsidies policies, policy conflicts arise. Therefore, the transfer of geothermal property rights should be decided by the market, leaving no room for corruption (Dong et.al, 2019). Kwon (2018) found that auctions can reduce rent-seeking and information costs. Therefore, in the future policy formulation, more policies such as “bidding and auctioning” can be added to promote market development.

5.4 Subsidies

The subsidies policies show a positive correlation to China's exploitation of geothermal resource. Talents and technology are needed by China to support geothermal development, and geothermal development faces huge investment risks. Therefore, the Chinese government should increase capital investment (Hou and Liu, 2018) and increase the use of subsidies policies. Second, subsidies policies and private Markets policies create policy conflicts because of the reduction in the number of subsidies policies, so the use of more specific subsidies policies should be increased, and the macro policy should be reduced; in addition, the subsidies policies and the auction of property rights policies can be combined to create policy conflicts. The reason is that due to information asymmetry, the Chinese government should establish an information database as soon as possible to avoid resource mismatch and unsatisfactory amount of subsidies due to the inability to grasp the real market information (Liu et.al, 2019), and establish reasonable subsidies. Amount.

5.5 Information and exhortation

The information and exhortation policies alone are not effective, but when combined with other policy instruments, they produce good results, especially in combination with the subsidies policy, which significantly promotes the exploitation of geothermal resource. Therefore, in future policy development, the government should increase the number of policies and exhortation policies.

5.6 Private marketsRegulation

The private markets policy is positively correlated with China's exploitation of geothermal resource. As we can see in Figure 2, the number is 6.19% of the total, the least in all policies, but in fact its coefficient is higher than the coefficient of other explanatory variables, which shows that the role of private markets policy is more obvious than other explanatory variables. Therefore, the government should increase the number of private markets policies.

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Department	Releasing Time	Document	Main Contents
MLR	December 2002	*Notice on the further strengthening of geothermal, mineral water resources management*	Intensifying the efforts to evaluate geothermal resources; Promoting some demonstration projects on geothermal development; Developing relevant technologies to achieve sustainable utilization of geothermal resources.
Standing Committee of the National People's Congress	February 2005	*Renewable Energy Law of the People's Republic of China*	The development and utilization of geothermal energy is clearly included in the scope of new energy which is encouraged to develop.
NDRC	November 2005	*Guidance directory on the renewable energy industry development*	The related items and equipment of geothermal energy are included in the recommended directory.
NDRC	January 2006	*Renewable energy power generation*	The feed-in tariff of projects on solar power, marine

Annex 1

	(1) lny	(2) lny	(3) lny	(4) lny	(5) lny	(6) lny	(7) lny	(8) lny	(9) lny	(10) lny	(11) lny	(12) lny	(13) lny	(14) lny	(15) lny
X1	-0.000	-0.002	-0.010	-0.011	-0.023***										
	(-0.04)	(-0.31)	(-1.41)	(-0.84)	(-5.14)										
X2	-0.016					-0.012	-0.038*	-0.022	-0.041						
	(-0.59)					(-0.66)	(-2.00)	(-0.91)	(-1.53)						
lnx7	4.054***	4.068***	3.139***	3.939***	3.486***	4.106***	3.019***	3.859***	3.124***	2.943***	3.869***	3.036***	2.994***	2.234***	3.109***
	(50.55)	(49.60)	(8.89)	(13.00)	(34.98)	(15.82)	(6.78)	(8.77)	(22.03)	(7.64)	(8.16)	(36.75)	(4.83)	(5.91)	(8.66)
lnx8	0.241***	0.242***	0.282***	0.253**	0.238**	0.239***	0.285***	0.253**	0.259***	0.293***	0.254**	0.270***	0.285***	0.311***	0.259**
	(3.13)	(3.21)	(3.29)	(2.58)	(2.74)	(3.42)	(3.54)	(2.59)	(3.69)	(3.73)	(2.60)	(4.05)	(2.80)	(4.00)	(2.60)
lnx9	-0.394	-0.429	0.029	-0.397	-0.189	-0.447	0.013	-0.392	-0.178	-0.006	-0.416	-0.200	0.119	0.212	-0.053
	(-0.85)	(-0.85)	(0.05)	(-0.86)	(-0.35)	(-0.95)	(0.02)	(-0.90)	(-0.38)	(-0.01)	(-0.83)	(-0.38)	(0.22)	(0.36)	(-0.10)
X3		-0.018				-0.015				-0.022	-0.023	-0.034			
		(-0.96)				(-0.59)				(-0.98)	(-1.18)	(-1.65)			
X4			0.145***				0.160***			0.135**			0.151***	0.099*	
			(2.81)				(3.19)			(2.73)			(4.23)	(1.89)	
X5				0.020				0.012			0.007		-0.017		-0.020
				(0.42)				(0.32)			(0.25)		(-0.58)		(-0.68)

Annex 2

	(1) lny	(2) lny	(3) lny	(4) lny	(5) lny	(6) lny	(7) lny	(8) lny	(9) lny	(10) lny
X1	0.001	-0.002	-0.007	-0.019**	-0.008*	-0.008	-0.021***	-0.008	-0.025***	-0.028*
	(0.13)	(-0.17)	(-0.50)	(-2.45)	(-1.81)	(-0.53)	(-7.86)	(-0.58)	(-4.79)	(-1.82)
X2	-0.013	-0.035	-0.016	-0.018						
	(-0.48)	(-1.25)	(-0.58)	(-0.59)						
X3	-0.016				-0.012	-0.016	-0.011			
	(-0.77)				(-0.63)	(-0.68)	(-0.56)			
lnx7	4.074***	3.072***	3.950***	3.496***	3.165***	3.969***	3.505***	3.145***	2.880***	3.412***
	(45.80)	(8.91)	(12.68)	(31.75)	(8.86)	(12.08)	(34.67)	(7.90)	(7.42)	(10.59)
lnx8	0.241***	0.283***	0.251**	0.236**	0.281***	0.251**	0.237***	0.280***	0.268***	0.246**
	(3.18)	(3.24)	(2.55)	(2.71)	(3.30)	(2.56)	(2.77)	(2.81)	(2.79)	(2.26)
lnx9	-0.444	0.005	-0.425	-0.221	-0.016	-0.448	-0.228	0.045	0.085	-0.213
	(-0.92)	(0.01)	(-0.99)	(-0.43)	(-0.03)	(-0.93)	(-0.41)	(0.09)	(0.14)	(-0.41)
X4		0.160***			0.144**			0.149***	0.109*	
		(3.19)			(2.74)			(4.46)	(1.86)	
X5			0.020			0.018		-0.005		0.015
			(0.42)			(0.36)		(-0.10)		(0.31)

Annex 3-1

	(1) lny	(2) lny	(3) lny	(4) lny	(5) lny	(6) lny	(7) lny	(8) lny	(9) lny	(10) lny
X2	-0.036*	-0.018	-0.035	-0.035	-0.055*	-0.038				
	(-1.71)	(-0.64)	(-1.16)	(-1.48)	(-1.96)	(-1.14)				
X3	-0.006	-0.016	-0.020				-0.018	-0.033	-0.030	
	(-0.23)	(-0.70)	(-0.80)				(-0.94)	(-1.57)	(-1.39)	
X4	0.159***			0.165***	0.127**		0.149***	0.097*		0.126***
	(3.07)			(4.34)	(2.47)		(4.30)	(1.81)		(2.95)
lnx7	3.053***	3.919***	3.203***	3.089***	2.455***	3.223***	3.094***	2.444***	3.240***	2.558***
	(7.70)	(8.41)	(56.13)	(5.14)	(6.93)	(9.14)	(5.12)	(7.91)	(9.23)	(4.84)
lnx8	0.284***	0.251**	0.256***	0.280**	0.291***	0.251**	0.281***	0.300***	0.253**	0.281**
	(3.42)	(2.54)	(3.65)	(2.65)	(3.60)	(2.47)	(2.76)	(3.93)	(2.58)	(2.69)
lnx9	-0.012	-0.452	-0.249	0.026	0.111	-0.170	0.029	0.060	-0.189	0.270
	(-0.02)	(-0.97)	(-0.49)	(0.05)	(0.20)	(-0.38)	(0.05)	(0.10)	(-0.37)	(0.49)
X5		0.013		-0.007		-0.009	-0.014		-0.016	-0.034
		(0.35)		(-0.19)		(-0.25)	(-0.49)		(-0.53)	(-1.22)
X6			0.235***		0.196**	0.241***		0.170***	0.228***	0.192***
			(3.03)		(2.65)	(3.68)		(4.00)	(4.96)	(3.57)

Annex 3-2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
X1	-0.001	-0.005	-0.018***	0.001	-0.017**	-0.024	-0.006	-0.024***	-0.026	-0.024					
	(-0.14)	(-0.34)	(-3.12)	(0.04)	(-2.23)	(-1.56)	(-0.37)	(-7.82)	(-1.61)	(-1.56)					
X2	-0.034	-0.014	-0.017	-0.036	-0.033	-0.018					-0.034	-0.051	-0.032	-0.047	
	(-1.16)	(-0.49)	(-0.52)	(-1.29)	(-1.05)	(-0.58)					(-1.23)	(-1.61)	(-0.90)	(-1.50)	
X3	-0.005	-0.013	-0.008				-0.013	-0.007	-0.009		-0.005	-0.012	-0.019		-0.025
	(-0.24)	(-0.52)	(-0.37)				(-0.56)	(-0.38)	(-0.44)		(-0.22)	(-0.49)	(-0.80)		(-1.22)
X4	0.159***			0.165***	0.123**		0.148***	0.108*		0.111**	0.163***	0.125**		0.141***	0.122***
	(3.10)			(4.94)	(2.20)		(4.48)	(1.87)		(2.73)	(4.53)	(2.42)		(3.31)	(2.98)
lnx7	3.085***	3.974***	3.509***	3.079***	2.820***	3.422***	3.174***	2.896***	3.433***	2.883***	3.113***	2.517***	3.290***	2.636***	2.686***
	(8.56)	(11.76)	(29.61)	(8.01)	(7.19)	(10.32)	(7.62)	(7.74)	(10.15)	(6.62)	(5.04)	(8.04)	(8.95)	(5.00)	(5.42)
lnx8	0.282***	0.250**	0.236**	0.280***	0.269***	0.244**	0.279***	0.267***	0.245**	0.267**	0.279**	0.288***	0.249**	0.274**	0.275**
	(3.22)	(2.53)	(2.74)	(2.76)	(2.77)	(2.24)	(2.78)	(2.81)	(2.27)	(2.43)	(2.61)	(3.52)	(2.46)	(2.53)	(2.67)
lnx9	-0.014	-0.465	-0.247	0.030	0.062	-0.246	0.002	0.057	-0.244	0.094	0.004	0.061	-0.239	0.163	0.146
	(-0.02)	(-1.01)	(-0.47)	(0.06)	(0.11)	(-0.51)	(0.00)	(0.09)	(-0.46)	(0.18)	(0.01)	(0.10)	(-0.50)	(0.33)	(0.27)
X5		0.018		-0.007		0.015	-0.006		0.014	-0.003	-0.006		-0.008	-0.022	-0.030
		(0.37)		(-0.16)		(0.32)	(-0.12)		(0.28)	(-0.06)	(-0.18)		(-0.23)	(-0.67)	(-1.08)

Annex 4

	(1) lny	(2) lny	(3) lny	(4) lny	(5) lny	(6) lny
X1	0.001	-0.017***	-0.023	-0.016	-0.022	
	(0.09)	(-2.98)	(-1.46)	(-1.05)	(-1.35)	
X2	-0.035	-0.033	-0.017	-0.033		-0.044
	(-1.20)	(-0.99)	(-0.52)	(-1.08)		(-1.28)
X3	-0.006	-0.001	-0.006		-0.008	-0.010
	(-0.23)	(-0.04)	(-0.25)		(-0.37)	(-0.42)
X4	0.164***	0.123**		0.127***	0.111***	0.138***
	(5.07)	(2.23)		(3.30)	(2.76)	(3.51)
X5	-0.008		0.014	-0.005	-0.004	-0.021
	(-0.16)		(0.30)	(-0.11)	(-0.08)	(-0.66)
lnx7	3.095***	2.822***	3.435***	2.825***	2.902***	2.679***
	(7.45)	(7.23)	(9.73)	(6.52)	(6.66)	(5.11)
lnx8	0.279**	0.269***	0.243**	0.267**	0.266**	0.272**
	(2.72)	(2.76)	(2.24)	(2.41)	(2.43)	(2.51)
lnx9	0.009	0.059	-0.264	0.079	0.068	0.122
	(0.02)	(0.10)	(-0.52)	(0.16)	(0.13)	(0.24)

Annex 5