



Korean public's preference for supply security of oil and gas and the impact of protest bidders



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H I G H L I G H T S

- We investigate the Korean public's preferences for an oil and gas supply security.
- The respondents are willing to pay USD 0.017 per liter of gasoline or diesel.
- Governmental support for overseas E&P projects decreases the public utility.
- It is need to increase public understanding of overseas oil and gas E&P projects.

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The Korean governmental support for supply security of oil and gas via overseas exploration and production (E&P) projects are publicly criticized because of some poor projects lacking of economic feasibility, even though it should be expanded from a long-term perspective. Applying the contingent valuation, this study investigates the Korean public's preferences for governmental support for overseas oil and gas E&P projects. The result shows that the governmental support for overseas E&P projects rather decreases public utility. The primary reason behind this utility decrease is that some respondents protested to bid because of their resistance toward tax increase without guaranteeing the efficient government support. This result implies that simple tax increases for expansion of the governmental support may bring about public's strong opposition. In order to overcome this public opposition, this study suggests that it is necessary to arouse public understanding of the necessity of overseas oil and gas E&P projects.

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1. Introduction

1.1. Overview

In South Korea (hereafter, Korea), stable supply of oil and gas has been an important issue in energy policy making. Korea is the ninth on the list of primary energy-consuming countries in the world (BP, 2014). Korea imports 95.7% of total primary energy supply (TPES) from foreign countries in 2013 (KEEI, 2014) and within its territory, there are no oil reserve and very small gas field, which can provide 1.5% of annual consumption only. Korea imports most of the supply of fossil fuels which takes 85.2% of the

TPES in 2013 (KEEI, 2014). On the other hand, renewables, promoted as an alternative to fossil fuels, contribute only 3% of the TPES (KEEI, 2014). Seeing the National Accounts of Korea in 2013, the monetary value of energy imports accounts for almost one third of the monetary value of total imports of goods (KEEI, 2014). That is, the situation that Korea depends on foreign energy supply highly is one of primary reasons for deteriorating the Korean balance of trade. Moreover, Korean economy is highly dependent on the energy-intensive manufacturing, such as primary metal and petrochemical industries. Consequently, Korea is very vulnerable to disruption of stable energy supply or shocks of energy prices due to natural disasters, regional wars, and changes in global economy.

The unique circumstance Korea has been facing has made the concept of energy security in Korea somewhat different compared to other countries. Chester (2010) mentioned that the concept of energy security may be varied by different stakeholder's

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perception of what security means and how to reach a desirable level. The concept of energy security is influenced by the state whether a country is resource-rich or importer, focusing on a market solution or governmental involvement, developing or developed country (Bradshaw, 2010; Kuik et al., 2011). In general, the concept of energy security covers supply security, price volatility, geopolitical stability of oil nations, climate change, and other factors (Chevalier, 2006; IEA, 2007; Krut et al., 2009; Shin et al., 2013). When it comes to conceptualizing the energy security in Korea, the uninterrupted supply of oil and gas at the affordable prices is the most important factor as aforementioned (Kim and Kim, 2015; Shin et al., 2013). According to the demand forecast of the 2nd National Energy Master Plan's (MOTIE, 2014a), business-as-usual scenario, fossil fuels will account for 76% of the TPES in 2035 whereas renewables will contribute only 5%. Renewable energy sources such as wind, sunlight, and water are insufficient because of the country's small land area (MOTIE, 2014b). Nevertheless, the government has set an ambitious target of increasing the share of renewables to 11% of the TPES by 2035, mobilizing every possible policy measure. However, even if this target is accomplished, fossil fuels will still contribute the greatest portion of the energy mix in Korea. Thus, it may safely be said that supply security issues of oil and gas will continue to remain an important factor in the energy security environment of Korea. Therefore, the government has strategically supported overseas oil and gas exploration and production (E&P) projects since 1979 for the purpose of hedging risks of price jumps as well as bringing energy resources from these fields in case of emergency. Beyond this governmental support, there is recognition that supply security of oil and gas is a kind of public good (Abbott, 2001; Kim and Kim, 2015).

There are two conflicting issues about governmental supports for overseas oil and gas E&P projects in Korea. First of all, it is necessary to find additional financial sources for policy measures because overseas E&P projects are both capital-intensive and technology-intensive (Kim and Kim, 2015). Due to the lack of experiences and finances, Korean companies are much less competitive than major oil companies. In order to bridge this competence gap, the government has implemented several policy measures on supporting overseas E&P projects. The policy measures include financial support, such as loan and payment guarantee, and technical support, such as research and development (R&D) promotion and human resource development. The governmental support so far is considered to be effective in securing overseas oil and gas reserves to some extent, but not to be insufficient to enhance Korean companies' financial and technical competitiveness. In order to enhance Korean companies' competitiveness, it is required to revise the government policy measures and to provide an additional financial supports (MOTIE, 2014c).

Second, the Korean publics tend to be opposed to the governmental support for overseas E&P projects although they admit the necessity of supply security of oil and gas. There are financial stress and distrust of governmental policy beyond their opposite positions.

In Korea, governmental support for overseas E&P projects have been mainly financed by taxes on oil products, which are quite high compared to the rates for other energy sources. For example, the tax rate for retail gasoline is higher than 45%, whereas the tax rate for household electricity is lower than 6.5%. Tax rates for vehicle fuels are quite high compared to those in other OECD countries that do not collect a carbon tax (IEA, 2014). The high tax rates for oil products offer a possible explanation of the Korean publics' opposite positions for the governmental support for overseas E&P projects. In addition, the promotion of some reckless overseas E&P projects has been recently subjected to public criticism, which has had dramatic implications for the entire overseas

oil and gas E&P projects.

Under this circumstance, this study analyzes the Korean publics' preferences for the governmental support for overseas oil and gas E&P projects. It derives the willingness to pay (WTP) in terms of increased vehicle fuel tax for supply security of oil and gas via the governmental support for overseas E&P projects, in particular. As supply security of oil and gas is regarded as public good (Abbott, 2001; Kim and Kim, 2015), a contingent valuation (CV) survey is conducted to derive the WTP. This WTP helps to discuss whether it is possible to secure additional funding for the governmental policy for promoting overseas oil and gas E&P projects. In addition, this study examines the effect of protest bidders on the publics' preferences. The protest bidders are the respondents who refuse to bid associated with the valuation process, herein, antipathy toward payment vehicle, distrust of governmental policy, *et cetera*. This study deals with whether the Korean publics' preferences on the governmental support for overseas E&P projects are differed with the treatment of protest bidders. Further, the determinants of the protest bidders are empirically analyzed. The analysis concerning protest bidder are expected to fill the gap in the existing literature on protest bidders.

The remainder of this paper is organized as follows. Section 1.2 reviews previous literatures on energy security, especially focused on the public preference studies. Section 2 introduces the Korean policies for the promotion of overseas oil and gas E&P projects. Section 3 demonstrates the CV method and the survey design. Section 4 presents the survey results and the WTP estimation results. Based on those results, the policy implications for the governmental support for overseas E&P projects from the Korean publics' perspectives are discussed.

1.2. Literature review

This study reviews previous studies applying stated preference methods, such as CV and choice experiment (CE), to measure the economic value of supply security of energy. The stated preference methods are based on the respondent's statements from the hypothetical market where they do not actually make any behavioral changes (Adamowicz et al., 1994). In this case, the WTP is assumed to be equal to the economic value to avoid supply insecurity of energy (Månsson et al., 2014). Table 1 introduces the literature on energy security based on the stated preference methods, and they can be categorized into three groups by the object being assessed.

The first group of studies focused on the reliable supply of electricity. Willis and Garrod (1997) measured the monetary values of power interruptions avoided of industrial firms in the UK. Beenstock et al. (1998) investigated the cost of power outages in the Israeli household sector, focusing on the bias between WTP and WTA. Goett et al. (2000) examined US industrial customers' WTP for service attributes, such as reliability and power fluctuation, of retail electricity suppliers. Given the liberalization of the Swedish electricity market, Carlsson and Martinsson (2007) estimated the households' WTP for the reduction of power outages with various characteristics, such as the duration and whether the outage is known beforehand or not. Longo et al. (2008) investigated UK energy users' perceptions on a decrease in electricity supply reliability due to renewable energy promotion. Hatta et al. (2011) derived the WTP for electricity supply without a nuclear component by surveying the residents of Hokkaido, Japan, after the Fukushima disaster. Reichl et al. (2013) analyzed the macroeconomic outage cost and social impacts and economic losses of power outages of non-household consumers and household consumers in Austria. In their study, the social impacts and economic losses of power outages of household consumers were approximated by their WTP.

The second group analyzed the WTP for policy measures for

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