



Contingent feasibility for forest carbon credit: Evidence from South Korean firms



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ABSTRACT

Under the Kyoto Protocol, a global governmental response to climate change, protocol signatories make an effort to cut their greenhouse gas emissions. South Korea is not included in the list of Annex I countries; yet, South Korea is the seventh highest emitter of CO₂. The South Korean government has enacted various institutional policies to encourage greenhouse gas reductions. While previous studies have focused on the guidance that reflects the stance of suppliers in the carbon market, this study focuses on South Korean firms' actual demand for forest carbon credits. By applying the contingent valuation method, we estimated domestic firms' willingness to pay for forest carbon credits. We then applied a rank-ordered logistic regression to confirm whether the rank of forest carbon credits, as compared to any other carbon credit, is influenced by a firm's characteristics. The results showed that Korean firms are willing to pay 5.45USD/tCO₂ and 7.77 USD/tCO₂ for forest carbon credits in domestic and overseas forest carbon projects, respectively. Therefore, the introduction of forest carbon credits in the Korean carbon market seems reasonable. Analysis of the priority rankings of forest carbon credits, however, demonstrated that forestry projects were least likely to be ranked by firms as their first priority. Although relative preferences for forest carbon credits were influenced by individual firms' characteristics such as prior experience of environmental CSR related activities and whether the firm established an emissions reduction plan, the impact of perceived behavior control, whether the firm was included in the emissions target management scheme on forest carbon credits was negligible. Therefore, forest carbon credits are not a feasible solution without strong government support or institutional instruments. The results of this study are expected to provide policy makers with realistic approaches to formulate climatic change-related policies.

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1. Introduction

Since the validation of the Kyoto Protocol, developed countries have sought to combat climate change officially setting a solid target for the reduction of greenhouse gases (GHG). Because the life of the protocol has been extended to 2020, South Korea (hereafter Korea) can retain its status as a non-annex nation which is not necessarily required to reduce its emission level in accordance with the mandatory regime. Korea, however, is under significant pressure from both developed and developing countries as Korea is listed as the 7th greatest emitter of GHG (Olivier et al., 2011). Under these circumstances, the Korean government has set a mid-term target of a 30% reduction in GHG by 2020 (Yun et al., 2014). To accomplish the

goal effectively, the GHG & Energy Target Management System was set up in 2011 and a cap-and-trade emissions trading system (ETS) is due to commence on 1 January 2015 (Ernst and Young, 2013).

Meanwhile, starting in 1996, domestic firms began to take part in environmental management as the recognition of the potential threat of GHG emission spread rapidly after the introduction of the ISO 14000 standard for environmental regulation. As heavy CO₂ emitters, firms have been directly pressured by government regulations since the Korean government first initiated national greenhouse gas reduction plans on them. In fact, the government has already begun executing the GHG reduction plan, which targets those firms emitting high CO₂ levels. According to sustainability reports from a majority of Korean firms, firms exhibited behaviors that pointed to a strategic response to climatic change, reducing their quantity of CO₂ by cutting waste and energy inefficiency (Suk et al., 2007).

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Individual firms' efforts, however, are likely to face limitations in achieving the targeted amount of CO₂ reduction. In other words, it is likely that firms will be exposed to potential threats unless they efficiently purchase carbon credits, a proactive tool for preemptive defense, which aid in offsetting the obligated amount of GHG (Oh, 2010). The government's intention is to provide emitters who are seemingly incapable of achieving their required emission reductions with an opportunity to buy carbon credits, thereby achieving the country's overall national emission reduction goal. Therefore, heavy CO₂ emitters like firms are able to redeem their duties and preserve the environment.

Among the sources of carbon credits, forests, the only source of carbon-absorption, should play an important role as an external reduction method to achieve emitters' plans for reducing CO₂. According to Lee et al. (2009), the structure of Korean forest is mainly comprised of trees aged from 30 to 40 and such trees can be manufactured after 10–20 years. Therefore, the main reason for conducting this study was to understand how institutions can utilize such forests as a means of strategic offsetting tool appropriate for situation of carbon market in Korea (Koo et al., 2013). However, it has been difficult for Korean forestry government to utilize forest resource due to a specific situation where 97% of destitute forest owner accounts for 68% of the gross area of forest and, among those, non-residents consist of 54%. In order for private forest owners to proactively participate in forest management, we expect that the main demand of FCC should be a corporation. And the forest part of Korean carbon market remains immature because firms that should be the main source of demand for forest carbon credits (hereafter, FCC) do not voluntarily purchase them (Han and Youn, 2009). Such an asymmetric rationale shows that the incomplete information concerning the supply and demand of FCC leads to hesitation for firms in purchasing FCC, for both institutional and behavioral reasons (Koo et al., 2013). Moreover, FCC will not be effective in the domestic regulatory carbon market until 2020.

Nevertheless, the Korean government legislated that additionally gained carbon in forests can be used as a means of offsetting emissions in both the voluntary and regulatory carbon markets. According to the Act on Management and Improvement of Carbon Sink, the Korean Forest Service (KFS) is pushing forward on a policy whereby a firm can utilize FCC as an offsetting tool for its voluntary reduction plan. It seems natural that for a transaction involving a specific carbon credit to occur, a market where such credits can be exchanged should already exist (Han and Youn, 2009; Heugens, 2002; Scott, 1987; Scott and Meyer, 1983); otherwise, a firm is likely to wait until the market is formed because firms adopt a passive attitude to situations bearing high uncertainty (Scott, 1987; Scott and Davis, 2007).

To evaluate the feasibility of introducing FCC in the Korean carbon market, this study endeavors to suggest comparative evidence of FCC's potential role in the voluntary carbon market by understanding how firms react to environmental regulations the Korean government has actively issued. Specifically, this study estimates a firm's willingness to pay (WTP)¹ and analyzes how firms rank FCC compared with other competing sources of carbon credits. Our use of a multifaceted-methodology, which is under-explored in existing studies, will enhance the explanatory power for the feasibility of introducing FCC.

In Section 2, we introduce previous studies on carbon markets where FCC are exchanged. In Section 3, we explain the methods for

estimating WTP and identifying the relative preference for FCC over other carbon credits. The results of our analysis and information about firms in our sample are shown in Section 4, and conclusions and implications of this study are addressed in Section 5.

2. FCC in the carbon market

The carbon market is divided into two markets: an exchange market, where transactions occur within a particular exchange, and an Over the Counter (OTC) market, where carbon credits are negotiated between participants outside the exchange market. Built on the Marrakesh Accords,² FCC trading is most active in North America, where they are traded through OTC (Peters-Stanley et al., 2012). They reported that the total amount of FCC transacted in the carbon market was 105.9 million tCO₂, with 76.9% (81.4 million tCO₂) being transacted in the voluntary carbon market. Of that, 76.4 million tCO₂ was transacted through the OTC system. The amount of FCC transacted and the amount of FCC retired for offsetting their reduction targets have increased (Diaz et al., 2011). These figures from the carbon market show that there is an established and stable international carbon market for FCC. In Korea, however, only 4 enterprises participated in pilot forest carbon projects stimulated by KFS.

2.1. WTP for FCC

Projects that are relevant to issuing FCC are Afforestation/ Reforestation (A/R), Reducing Emissions from Deforestation and Forest Degradation (REDD), Improved Forest Management (IFM), and so on. In 2011, the average prices of FCC issued by such projects were \$6.3/tCO₂, \$8.5/tCO₂, \$12.7/tCO₂, respectively (Peters-Stanley et al., 2012).

It is necessary to approximate the range of demand WTP that can retire FCC from the carbon market; however it is almost impossible to know demanders' prices for FCC because the Korean ETS is not yet open. To date, there has been minimal research on WTP for FCC. Poudyal et al. (2011) estimated WTP of latent demanders for FCC. They stated that, by estimating WTP for FCC created by urban forests, demanders are likely to pay 7% more than the suggested price of FCC, \$5/tCO₂. Koellner et al. (2010) estimated the willingness of domestic and international firms to buy certificates for carbon sequestration. They revealed that most firms in Costa Rica are willing to invest approximately 65USD/tCO₂. Such findings have a limited application in the Korean carbon market, however, as the actual transaction cost of FCC in the voluntary carbon market varies by location or project type (Peters-Stanley et al., 2012).

2.2. FCC's rank in priorities

Fig. 1 shows the actual market share of carbon credits from OTC system in 2011. It demonstrates that carbon credits were issued by various projects and implies that various types of carbon credits may soon be traded in the Korean carbon market. Koellner et al. (2010) compared willingness to invest in four tropical forest

¹ WTP refers to the maximum amount price a person would be willing to pay in order to receive a good or service under that individual's normal utility function. This study asked firms whether they buy FCC by confirming their responses to gradually increasing prices and sought to discover the optimal price level of FCC.

² The Marrakesh Accords is a set of agreements reached at the 7th Conference of the Parties (COP7) to the United Nations Framework Convention on Climate Change (UNFCCC), held in 2001, on the rules of meeting the targets set out in the Kyoto Protocol. The UNFCCC is a legal agreement, the Kyoto Protocol is a plan of action, and the Marrakesh Accords specify the rules surrounding actions. The Marrakesh Accords define terms related to the activities of carbon sinks like forests, illustrate statistical investigations on greenhouse gas absorption/emission, and adopt acceptable boundaries for forest activities and clean development mechanisms (http://en.wikipedia.org/wiki/Marrakesh_Accords).

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