（続紙 1 ）

京都大学	博士（経済学）	氏名	昔 宣希 (Suk Sunhee)
論文題目	CARBON PRICING IN KOREA: EMPIRICAL STUDIES ON THE BUSINESS PERSPECTIVES		

（論文内容の要旨）

Employing empirical approach using data collected by questionnaire surveys targeting Korean companies, this study aimed to identify perspectives of Korean companies on carbon pricing using firm-level data and econometrics analysis methodologies. The introduction of each chapter of this study are described as below.

CHAPTER I (Introduction) provides an overview of the study, including research questions, research objectives and research framework.

CHAPTER II (Methodology and originality of this study) explains the research methodology and originality of this study.

CHAPTER III (Literature review and policy overview) has two subsections, a literature review on carbon pricing and policy overview on the status of carbon pricing policy implementation and operation in Korea.

CHAPTER IV (Empirical studies and results) provides a summary of the empirical studies, in five subsections, with each section comprising an introduction, methodology, results and discussion, conclusion and references. The study in the **CHAPTER IV-1** (Korean companies' understanding of carbon pricing and its influence on policy acceptance and practices) substantiates the correlation between the level of policy understanding of a company and its carbon and energy practices. Data were collected from 62 respondents from iron & steel, cement and petrochemical industries. This study found that the extent to which companies understand policy is the essential factor in their policy acceptance and related practices. This study in the **CHAPTER IV-2** (Affordability of energy cost increases for Korean companies due to market-based climate policies: a survey study by sector) estimates the affordability of energy cost increases for energy-intensive companies due to the introduction of market-based climate policies in Korea. The affordable energy cost increase was estimated using the multiple-bounded discrete choice (MBDC) format, results of which show that a mean energy cost increase of 2.6% is acceptable for all the entities sampled. Companies from the three sectors had similar affordability, with an average acceptable energy cost increase of 2.5-2.8%. The affordable policy-induced energy cost increases equate to carbon prices of 2500-4000 KRW/t-CO_2 (about 2.3-3.5 USD/t-CO_2) for the companies surveyed. The study in the **CHAPTER IV-3** (A survey analysis of company perspective to the GHG emissions trading scheme in Korea) identified company's viewpoints and the determinants due to their characteristics in organizational size, sector belongings and ownership. The companies do not appreciate the merits of the ETS, whereas, strongly concern about its negative aspects. Most of companies established the inventory for GHG emissions and would

make internal efforts in energy saving and GHG mitigation and invest in energy efficient technologies rather than simply transfer the policy burden to their clients. The study in the **CHAPTER IV-4** (An analysis of company's preferences to carbon tax policy and GHG emission trading schemes in Korea**)** provides the outcomes of a survey on the Korean energy intensive industry' preference to the attributions in designing the emission trading scheme by applying a choice experiment analysis. A total of 150 samples were collected from three sectors, petrochemical, cement and steel and ion. Various modeling exercises were conducted and confirmed that the companies' preference policy attributions for carbon tax and permit trading. For carbon tax policy, lower tax rate, relief measures, to use the tax revenues for energy saving and climate change and later introduction would increase the company's preference. For ETS, different categories of companies have different preference in cap setting methods. Lower ratio of auction for allowances allocation is more preferable for the companies. To set a penalty of 3 times of prices of carbon credits is strict enough for ensuring the samples not exceeding their allocated emissions limit. Regarding carbon leakage risks, carbon intensity is a more favorable option to be considered. The study in the **CHAPTER IV-5** (A survey on the impediments to low carbon technology investment of the petrochemical industry in Korea**)** analyzes investment barriers for low carbon technology investment and suggests supportive policies based on a survey to petrochemical companies in Korea. A total of 35 samples were collected. Among which, 32 companies are targeted by the Korean domestic emission trading scheme and represent 63% of the total CO_2 emissions of all petrochemical companies under this scheme. The analysis result indicates that low carbon technology introduction is not a priority for the sampled companies. Besides the lack of financial support, there exist other impediments to low carbon technology investment, e.g., lower investment priority, economic loss during new technology replacement, technology uncertainty and less pressure on energy prices. In addition, technology payback period acceptable for companies was estimated by the multi-bounded discrete choice method. The acceptable payback period on the part of half samples ranges from 2.4 to 3.6 years. The relatively high preference to short-term profitability of low-carbon technologies may hinder the companies to make the investment decision.

Lastly, **CHAPTER V** (Conclusion and synthesis summary) gives policy implications based on the findings of above studies that to be addressed by the government and companies for improving carbon pricing policy and operating the carbon market. While institutional improvements are needed by the government in order to improve the decision-making capacity of companies in trading, Korean companies need to shift their strategies and focus from voluntary or regulation-driven management approaches to innovative carbon management.

（続紙 ２ ）

（論文審査の結果の要旨）

本論文は、アジアとしては初めて導入された韓国における排出量取引制度が韓国企業にもたらした影響に関する実証研究である。排出量取引制度は、環境税と並ぶ環境政策における経済的手段の1つであり、環境経済学で直接規制に対する費用効率性上のメリットが強調されてきた。1990年代から現実に排出量取引制度が導入されるようになり、実証研究が進展し始めた。その中心的課題は、排出量取引制度が理論通り、環境政策上の効果と費用効率性を達成しえているのかについて、回帰分析その他の手法により、定量的に同定しようとするものであった。

これに対して本論文は、排出量取引制度による規制対象となった韓国企業を調査対象とし、彼らが排出量取引制度に対してどのような反応を示し、それを受容し、そして最終的にその導入後、適応していったのかを規制対象企業へのアンケート調査から得られたデータに基づいて、定量的に明らかにしようとする目的をもっている点に大きな特徴がある。つまり、本論文は韓国排出量取引制度に関する包括的な実証研究であると同時に、その企業行動に焦点を当てた点で独自の貢献を成し遂げた研究だと評価することができる。

韓国企業の反応は、日本企業の反応ときわめてよく似ており、結局、排出量取引制度導入による費用上昇はわずか2.5-2.8%であり、同等の日本企業や中国企業が温暖化対策で直面している費用上昇よりもむしろ軽微なのに、きわめて拒否感が強いことが明らかにされている。しかし、この制度に習熟した企業ほど上手に対処していること、そしていったん制度が導入されれば、企業は否応なく適応し、3.6年というきわめて短期の投資回収期間内だが、新たな温室効果ガス削減機会を見出すなど、政策手段に適応する企業行動が明らかにされた一方、排出量「取引」はきわめて不活発なことも明らかにされた点、多くの新しい知見を本論文は創出している。

他方、審査では次の課題も指摘された。第1に、本実証研究のデータがアンケートに基づいている点について、その客観性や信頼性は担保されるのかとの指摘、第2に、企業レベルの分析であれば、連続変数を用いた方がより適切な分析ができたのではないかとの指摘、さらに第3に内生性に関する問題の指摘、である。

以上の課題にもかかわらず本論文が、韓国排出量取引制度の実証研究を通じて新たな貢献を成し遂げた点を高く評価すべきだという点で意見の一致をみた。よって、本論文は博士（経済学）の学位論文として十分価値あるものと認定する。また平成29年11月13日、論文内容に関する口頭試問を行った結果、合格と認めた。