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# The Effect of Self-Efficacy of Small Business Start-ups in Korea and China on Startup Performance: Focusing on the Mediating Effect of Startup Intention and the Moderating Effect of Digital Transformation*

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**ABSTRACT**

**Purpose –** This study is aimed at small business start-ups in Korea and China, and examines the effect of "self-efficacy," an individual factor that affects the start-up performance of small business owners on "start-up intention" and "start-up performance". In addition, we will also consider the mediating effect of start-up intention and the moderating effect of digital transformation. At present, due to the proliferation of digital technologies and the prolongation of COVID-19, it is difficult for small business start-ups to operate with their existing business models. Therefore, we have focused on "digital transformation" as one of the capabilities they need. We also wanted to know whether digital transformation has a positive moderating effect between start-up intention and start-up performance in small businesses of Korea and China.
**Design/Methodology/Approach –** In existing research, various factors explaining the start-up performance in small business were reviewed. In this study, the self-efficacy of small business start-ups was set as the independent variable and the start-up performance as the dependent variable. In addition, the mediating effect of the start-up intention was examined. As mentioned above, we also tried to look at the moderating effect of digital transformation. After establishing a research model based on the existing research, a survey was conducted for small business start-ups in Korea and China for empirical test, and the results were analyzed.
**Findings –** In the case of small business start-ups in both Koreas and China, most of the relationships among self-efficacy, start-up intention, and start-up performance showed the same results. On the other hand, in the case of the moderating effect of digital transformation, positive moderating effect was found in Korea. However, there was no moderating effect in China.
**Research Implications –** In both samples from Korea and China, self-efficacy had a positive effect on start-up performance through start-up intention. It is inferred that the difference in the moderating effect is due to various factors such as culture, institutions, and policies between Korea and China. Finally, academic, economic, and policy implications were suggested.

***Keywords:*** digital transformation, Korea and China, self-efficacy, start-up intention, start-up performance
***JEL Classifications:*** L25, M13, O32

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## I. Introduction

Due to COVID-19, uncertainty in the global economy has increased; science and technology development and labor productivity have increased as well, making it difficult to increase employment and maintain the existing business model in the economic ecosystem. In this situation, small business start-ups contribute to the economic and social development of the country and region through job creation (Xu et al., 2020). Namely, small business start-ups, which account for a large proportion, are taking an irreplaceable and important position in the development of the national economy.

Small business start-up refers to the establishment of a small business by an entrepreneur who runs a relatively small business among SMEs (Park & Kim, 2018). Most of the small business start-ups (or owners) are based on the nature of their livelihood start-ups, and there are many individuals or corporations who start their business with small stores with a small amount of money and run their business under poor conditions (Park et al, 2015; Woo, 2015). In addition, in the case of small business start-ups, they have a characteristic that they occupy a high proportion in the national economy and have the advantage of high growth potential in the microscopic aspect (Agustina et al., 2017). In the case of Korea, according to a survey by the National Statistical Office, as of 2019, the number of domestic small business enterprises (or owners) was 2.77 million, accounting for 93.7% of SMEs. The number of businesses by industry of small business owners accounts for a large proportion of wholesale and retail businesses (890,000), lodging and restaurant businesses (660,000), and manufacturing (360,000) (Statistic Korea, 2020). Looking at the characteristics of small business owners, in the case of small business owners in Korea, there are no regular employees and a sole representative (CEO) company accounts for about 80% of all active companies (Shin & Kang, 2021).

Meanwhile, as of 2018, there were 97.76 million self-employed in China. Self-employment was most affected by COVID-19, with 30% of self-employment estimated to be a long-term shutdown or be closed due to COVID-19, resulting in about 45 million new unemployed. In the case of self-employment after entering from outside the city, the recovery speed is noticeably slow even after April 2020, when the spread of COVID-19 slowed (Park, 2020).

With the advent of the 4th Industrial Revolution, the application of digital and smart technologies has been underway for a long time, but as it spreads more rapidly due to COVID-19, the non-face-to-face economy is also rapidly spreading (Shin & Kang, 2021). Since then, research and application of "digital transformation" has been actively promoted in each industry, and the application of digital technology to small business start-ups and the creation of business opportunities have also become important topics. In other words, due to the advent of the 4th Industrial Revolution and the COVID-19 incident, "digital transformation," which has been treated as a future innovation strategy for large companies, is recognized as a strategic choice for new business opportunities and an essential choice for survival for small business start-ups, accounting for more than 80% of all operators (Lee et al., 2021; Yang & Han, 2020).

As the start-up environment and corporate innovation rapidly changed, many scholars have conducted research on related issues such as self-efficacy, start-up intention, and start-up performance. Start-up is the process of establishing a new company, and the 'Start-up Intention' must precede the decision and action to start a business (Park et al., 2017). Therefore, the 'Start-up Intention' can be said to be the starting point of start-up and is important not only for the national economy but also for the recovery of a stagnant organization (Shapero, 1975; Yoo, 2014). For a successful start-up, efforts must be made to develop not only environmental factors but also internal capabilities for founders to strategically lead the organization themselves. Therefore, it is also very important to consider the 'Start-up intention' of small business founders. Since

the role of the small business founder is more important than anything else for the survival and growth of the small business start-ups, more research is needed on the small business founder's will (or start-up intention) to start a business.

On the other hand, self-efficacy is a personal characteristic that affects the intention to start a business and is a variable receiving high attention in relation to personal competence, and many studies are being conducted on this issue (Kang & Ha, 2015). The most important factor in starting a business is the founder, and it is known that the self-efficacy of small business founders differs for each person to some extent.

The purpose of this study is as follows. Firstly, the purpose of this study is to examine what factors determine the intention of small business start-ups to start a business and how the preceding factors have a discriminatory effect on the intention to start a business and start-up performance. In particular, we would like to examine this relationship, focusing on self-efficacy. In addition, this study aims to demonstrate the role of 'digital transformation', the core of the 4th industrial revolution, in the start-up of small business owners, especially the moderating effect of digital transformation between start-up intention and start-up performance. Furthermore, we would like to compare the results of empirical analyses between Korea and China.

After that, the progress of this study is as follows. In the theoretical background of section II, the concept of small business start-ups' self-efficacy, start-up intention, start-up performance, digital transformation, etc. will be investigated. Section III, Research Design, presents the research hypothesis and overall research model, and introduces data collection and measurement methods. In section IV, we conduct an empirical analysis based on the research model and investigate the results. In section V, we examine some successful cases of digital transformation in small business start-ups. Finally, in the conclusion section, a summary of the research results, strategic implications, and limitations are suggested.

## II. Literature Review

### 1. Self-efficacy

In general, 'self-efficacy' is defined as 'a belief that one can effectively organize one's actions and execute them to achieve a given goal' (Bandura et al, 1993). Self-efficacy is related to a high level of concentration and to the more efficient use of cognitive resources in various task performance (Bandura, 1997). High self-efficacy can act as an advantage due to calmness and superiority in performing complex tasks, but low self-efficacy causes stress, depression, and anxiety (Pajares, 1997). In other words, when individuals with low self-efficacy experience difficulties or failures in the early stages of a task, they doubt their abilities and tend to give up easily or be easily satisfied with the results, which leads to low performance (Xu et al., 2020).

Krueger et al. (2000) argue that people with a strong sense of self-efficacy naturally cope with risks and challenges in various environments of entrepreneurship and have the belief that they can control themselves in the environments of risks and challenges. Self-efficacy is absolutely important in the start-up process (Moon & Jeon, 2017). In the end, a person with high self-efficacy exhibits a much better response ability than a person with low self-efficacy in high-risk start-up situations or uncertain and ambiguous decision-making situations (Park & Choi, 2016).

### 2. Start-up Intention

'Intention' represents commitment to future target behavior, and is the variable that most accurately predicts and explains whether the behavior will be executed or not (Park, 2014). 'Start-up intention' is a judgment about the possibility of starting a business, including the general plan of an individual to become a founder, and is defined as the desire to own one's own business (Crant, 1996). In addition, the intention to start a business can be said to be one's thoughts on whether to start a business in the future (Seo,

2019). According to Ajzen (1991)'s 'Planned Behavior Theory', an individual behavior is determined by behavioral intention, and individual attitudes and subjective norms were viewed as variables on behavioral intention.

Start-up intention is the state of mind to engage in entrepreneurial action, and it can be said to be the first step in the start-up process (Bird, 1988). In addition, it can be said that the intention (or will) to start a business is not a start-up, but a state in which an individual's interest is aroused for the execution of a start-up (Krueger et al., 2000). Start-up intention, which indicates a positive attitude toward start-up, is a key variable that can explain a series of behaviors related to start-up and is an essential concept to predict and explain the overall phenomenon of the start-up process (Bird, 1988). In summary, start-up intention is the entrepreneur's behavior to start a business, and it can be said that a "feasibility" of feeling how well the entrepreneur can fulfill the perceived desire and a "personal behavioral tendency" that the founder decides arbitrarily (Shapero, 1975).

## 3. Start-up Performance

Start-up performance is a multi-dimensional concept, and various scholars have defined it differently. In general, start-up performance is divided into 'financial performance', a quantitative part that can be objectively quantified, and 'non-financial performance', a qualitative part that is not subjectively visible. In order to secure quantitative sales, it is important to allocate personnel so that members of the organization can maximize their capabilities, and to maximize organization's capabilities so that they can successfully settle in the market (Cooper, 1971; Kim, 2019). Tsai et al. (1991) also argued that in order to measure a start-up performance, it is necessary to classify and use the objective index 'financial performance' and the subjective index 'non-financial performance'.

Small business start-ups face poorer resources and environments rather than companies with abundant scale and capital, making it difficult to measure objective performance (Zahra & Bogner, 1999). In addition, it is argued that a mixture of subjective and objective indicators is necessary because there is no objective and unified indicator in measuring the start-up and operation performance of small business start-ups (or owners) (Na, 2016). Weong and Jung (2017) used sales, market share, customer preference, and company awareness as measurement tools to measure the influence relationship between entrepreneurial characteristics and business performance of small business start-ups. In the case of Hwang and Heo (2019), in order to verify the effect of individual propensity and market characteristics on management performance of small business start-ups, it was measured by non-financial performance such as sales, profitability, customer retention ratio, and new customer creation. To sum up, start-up performance can be defined as 'achieving the purpose of maximizing corporate profits and promoting the stabilization of sustainable business operation' due to the nature of start-up companies (Kim & Kwon, 2018).

## 4. Digital Transformation

Digital transformation is not a simple grafting of IT technology, but an "innovation" using digital technology, which creates results by providing differentiated experiences and values to consumers. For example, if a company creates a business model that enhances the core value of a brand by using consumer-oriented big data analysis, the company's growth can be expected. In the case of fashion companies, it is possible to create a business model that can increase consumer satisfaction through digital experiences that reflect consumer experiences (Yang & Han, 2020). To compete effectively in the ever-changing digital economy, and the development of technologies, realignment of business models and processes, or new investments to harness digital transformation to create new value for customers and employees will generate positive outcomes (Park, 2017).

In addition, real-time communication between consumers and producers creates a market where demand and supply meet in new ways, and not only

provides customized products and services, but also helps establish personalized product strategies as online and offline boundaries collapse (Park & Lee, 2019). As such, digital transformation is an important tool for creating new added value even for small business start-ups, and it is judged that it will contribute to the improvement of business performance.

### 5. The Utilization of Digital Transformation in Small Business

Even in the case of small business start-ups (or owners) and traditional market fields, it is necessary to change in the direction of providing differentiated experiences and values to customers in the digital era through practical digital transformation, not just digital application. In order to strengthen the competitiveness of small business start-ups through digital transformation, it is important to first change the perception of small business start-ups on digital transformation. Digital transformation is emerging as an important issue for small business owners in the social reality where non-face-to-face communication is common due to the advent of the 4th industrial revolution and the outbreak of Covid-19. This is because, above all, it is necessary to understand how small business owners accept the new competitive environment and how they perceive digital transformation as an opportunity to come up with a response strategy to promote digital transformation (Kim et al., 2020).

In order to overcome the COVID-19 crisis, the non-face-to-face business model and digital transformation of small business start-ups are recognized as 'essential', not 'optional'. However, it is also true that there is a gap between the business principle of following the times and the actual conditions. Anyway, services that directly affect the business of small businesses, such as mobile-oriented online shopping and online/offline connection (O2O), are rapidly expanding. In this situation, the digital transformation of small business start-ups cannot but be an important issue that cannot be avoided (Park, 2022).

## III. Research Design

### 1. Relationship between Self-efficacy and Start-up Intention

In the academic field dealing with startup intention, "self-efficacy" is a notable variable that predicts an intention (or will) to start a business (Krueger et al., 2000). The startup intention is an important variable in determining the intensity of the possibility that leads to start-up behavior (Boyd & Vozikis, 1994).

Research on the results of 'self-efficacy' explains the emergence of start-up intentions, and venture and start-up behavior based on social cognitive theory and planned behavior theory (Newnan et al., 2019). Park and Kang (2007) argued that self-efficacy refers to task-dependent self-confidence, and therefore acts as an important variable in identifying the startup intentions. Yang and Kim (2018) verified through research that self-efficacy is a predictable major factor in startup intentions. Also, according to Kim and Lee (2018), in the relationship between self-efficacy and the intention to start a business, it was found that self-efficacy had a positive effect on the intention to start a business. Hence, we propose the following hypothesis.

**H1:** Self-efficacy will have a positive effect on start-up intention.

### 2. Relationship between Start-up Intention and Start-up Performance

Start-up intention enables entrepreneurs to identify and exploit opportunities that emerge in the entrepreneurial environment and promotes the establishment of entrepreneurial strategies that lead to the growth of start-ups (Lee et al., 2014). According to Kuratko & Richard (2009), there is a virtuous cycle in which start-up performance causes external environmental factors or entrepreneur's intention to trigger entrepreneurial preparation behavior, and start-up performance in turn influences startup intention. For a successful

start-up performance, the strong start-up intention of the founder has a positive effect on the start-up capabilities, and these capabilities have a positive effect on the start-up performance (Kim, 2019). Hence, we propose the following hypothesis.

**H2:** Start-up intention will have a positive effect on Start-up performance.

## 3. Relationship between Self-efficacy and Start-up Performance

A recent research trend is that the success of a start-up can vary depending on not only the characteristics of the founder, but also the self-efficacy, which is the confidence to achieve something. Research results have been suggested that founders with a high level of self-efficacy can exhibit behaviors that can improve start-up performance, and that self-efficacy has a positive effect on outcome expectations (or start-up performance) (Kang & Ha, 2012; Wood et al., 1990). Judge and Bono (2001) confirmed the fact that in the relationship between self-efficacy and business performance, people with high level of self-efficacy had higher business performance. Finally, it was found that self-efficacy had a statistically significant positive (+) effect on start-up performance (Park & Kim, 2018). Park and Chae (2017) argued that female entrepreneurs' business self-efficacy had a significant positive (+) effect on business performance. Hence, we propose the following hypothesis.

**H3:** Self-efficacy will have a positive effect on start-up performance.

## 4. Mediating Effect of Start-up Intention

Self-efficacy promotes start-up behavior by increasing individual start-up intention (Schlaegel & Koenig, 2014). Boyd and Vozikis (1994) defined self-efficacy as an important explanatory variable in expressing the intensity of the possibility of starting a business while determining the intention to start a business. Ahn et al. (2017) revealed the results of a study that 'self-efficacy (or task challenge)' has a positive (+) significant effect on the intention to start a business for college students who have received start-up education. On the other hand, according to Kang and Ha (2012), the characteristics of small business start-ups (or founders) have a significant effect on start-up performance through self-efficacy. Hence, this study suggests the following hypothesis.

**H4:** Start-up intention will have a positive mediating effect between self-efficacy and start-up performance.

## 5. Moderating Effect of Digital Transformation

Small business owners in both Korea and China are suffering from the recent COVID-19, the Russia-Ukraine war, and the global economic slowdown. As mentioned above, if small business start-ups (or owners) take advantage of the 'digital transformation', they will be able to create an opportunity in these difficult times. For example, In the O2O (Online to Offline) sector, distribution & logistics sector, a wide range of changes in the consumption, distribution & logistics, and other services environment can be opportunities for small business (Kim, 2018).

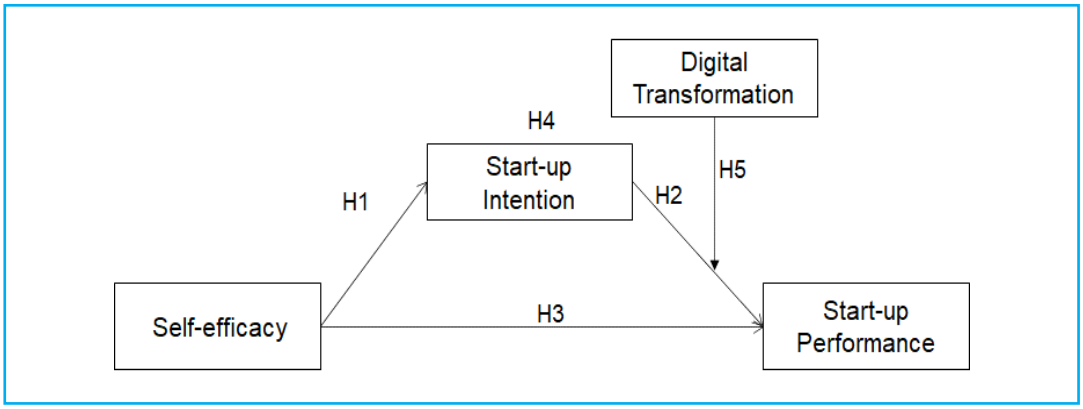
Namely, through digital transformation, which is widely used by large companies, small business start-ups and owners also need to actively use them in business and start-ups. For example, innovation in business models, participation in open ecosystems, and utilization of connectivity between data can unlock potential values and create new business opportunities (Yang & Han, 2020).

To sum up, 'the digitization of small business start-ups' can be seen as a process of establishing an environment in which small business owners utilize digital and smart technology to increase convenience, efficiency, and productivity in internal business activities such as production and operation and transaction activities with suppliers and customers (Nam, 2021). And the digitization of these small businesses can be an important business opportunity. Hence, we propose the following hypothesis.

**H5:** Digital transformation will have a positive moderating effect between start-up intention and start-up performance.

Based on the above discussion, the following research model was established in this study (Fig.1).

**Fig. 1.** Research Model.




## IV. Data Analysis

For empirical analysis, this study conducted a questionnaire survey on small business start-ups and operating business sites in Anyang, Ansan, Pyeongtaek and Daejeon cities in Korea and Anhui province (Hefei city) and Yanbian Autonomous Prefecture (Yanji city) in China. In selecting cities in the two countries, we considered the standard of living and economic level as the level of the second city. In other words, it was intended to increase the validity of the analysis by selecting and comparing the second city in both countries, not the best metropolitan cities in the two countries.

Therefore, it was judged that it was reasonable to compare small business start-ups and owners in these regions in Korea and China. The survey was conducted from April 1 to April 17, 2021. In the case of Korea, 200 samples were collected, and 192 samples were used for analysis excluding some samples which had errors. In the case of China, 200 copies were recovered, and the final 166 copies were used for analysis. The characteristics of samples are shown in Table 1.

The characteristics of the sample are as follows. In Korea, there are more males (73.4%) than females. As for the age, those over the age of 40 accounted for 35.9%, and the highest level of educational attainment was a college degree (39.6%), the number of cases with experience of family business start-up was 80.7%. In addition, 82.8% answered that there was no start-up support, and the fields of start-up were as follows: professional technology business (16.1%), wholesale and retail business (13%), personal service business (12%), and restaurant business (12%), etc.

In China, males accounted for 69.3% of the population, and those over 40 years of age accounted for the highest at 39.2%, and those with a college degree accounted for the highest at 41.6%. Regarding the experience of a family start-up, 83.1% answered ‘yes’, and 81.3% answered no support for start-up. In the field of start-up business were as follows: professional technology business (15.1%), wholesale and retail business (13.3%), personal service business (12.7%), and restaurant business (11.4%), etc.

**Table 1.** Characteristics of Sample

| Characteristics | | Korea | | China | |
|---|---|---|---|---|---|
| | | No. (Korea) | % (Korea) | No. (China) | % (China) |
| Gender | Male | 141 | 73.4% | 115 | 69.3% |
| | Female | 51 | 26.6% | 51 | 30.7% |
| Age | 15-25 | 29 | 15.1% | 33 | 19.9% |
| | 26-30 | 37 | 19.3% | 21 | 12.7% |
| | 31-35 | 23 | 12% | 24 | 14.5% |
| | 36-39 | 34 | 17.7% | 23 | 13.9% |
| | ≥40 | 69 | 35.9% | 65 | 39.2% |
| Education | High School Graduate | 39 | 20.3% | 37 | 22.3% |
| | Junior College Graduate | 22 | 11.5% | 17 | 10.2% |
| | College Graduate | 76 | 39.6% | 69 | 41.6% |
| | Master | 27 | 14.1% | 18 | 10.8% |
| | Doctor | 20 | 10.4% | 17 | 10.2% |
| | Etc. | 8 | 4.2% | 8 | 4.8% |
| Start-Up Experience | Yes | 106 | 55.2% | 89 | 53.6% |
| | No | 86 | 44.8% | 77 | 46.4% |
| Family Business | Yes | 155 | 80.7% | 138 | 83.1% |
| | No | 37 | 19.3% | 28 | 16.9% |
| Start-Up Support | Yes | 33 | 17.2% | 31 | 18.7% |
| | No | 159 | 82.8% | 135 | 81.3% |
| Field of Start-Up | Manufacturing | 15 | 7.8% | 16 | 9.6% |
| | Restaurant Business | 23 | 12% | 19 | 11.4% |
| | Wholesale and Retail Business | 25 | 13% | 22 | 13.3% |
| | Real Estate | 6 | 3.1% | 3 | 1.8% |
| | Professional Technology Business | 31 | 16.1% | 25 | 15.1% |
| | Education Service Industry | 12 | 6.3% | 6 | 3.6% |
| | Sports and Entertainment | 9 | 4.7% | 7 | 4.2% |
| | Repair Business | 5 | 2.6% | 3 | 1.8% |
| | Personal Service Business | 23 | 12% | 21 | 12.7% |
| | Others | 43 | 22.4% | 44 | 26.5% |

**Table 2.** Variables and Item Description

| Variables | Items | Korea | | China | |
|---|---|---|---|---|---|
| | | Factor Loading | Cronbach's α | Factor Loading | Cronbach's α |
| Self-Efficacy | I think that I have 'problem-solving ability' in relation to the task entrusted to me. | 0.711 | 0.720 | 0.749 | 0.708 |
| | I will continue without giving up even when there are difficulties in the progress of my work. | 0.817 | | 0.718 | |
| | I have 'money management skills' related to the work entrusted to me. | 0.774 | | / | |
| | I am better at the creative work of the company than anyone else. | 0.788 | | 0.793 | |
| | I am good at performing leaders and given roles. | / | | 0.714 | |
| | I have the ability to judge well what I can and cannot do. | / | | / | |
| Start-Up Intention | I have a clear plan to set up my own business (startup) in the near future. | 0.833 | 0.715 | 0.771 | 0.712 |
| | Although there are many risks in starting a business, I want to start a business. | 0.789 | | 0.749 | |
| | I plan to start a business within the next 5 years. | 0.769 | | 0.840 | |
| | I'm going to start a business whenever I have a great item. | 0.780 | | 0.766 | |
| | I want to start a new company rather than be an employee. | / | | 0.694 | |
| Start-Up Performance | Brand awareness is rising compared to competitors. | 0.760 | 0.713 | 0.768 | 0.683 |
| | Corporate productivity is increasing. | 0.802 | | 0.874 | |
| | The number of customers of the enterprise is increasing. | 0.816 | | 0.849 | |
| | Satisfaction with the performance of the established company is high. | 0.820 | | 0.800 | |
| | Compared to the current industry, the management performance is satisfactory. | 0.804 | | / | |
| Digital Transformation | The digital transformation of small business owners (or entrepreneurs) provides differentiated experiences and values to customers. | 0.858 | 0.811 | 0.773 | 0.722 |
| | Through digital transformation, we can respond positively to consumer buying behavior. | 0.825 | | 0.803 | |
| | If digital transformation is successful, it will be possible to quickly create competitiveness in the small business area. | 0.848 | | 0.850 | |
| | Digital transformation can create new high-value-added business models that are different from the existing ones. | 0.808 | | 0.791 | |
| | Through digital transformation, online sales or platforms in the small business area will be activated. | / | | 0.795 | |

## 1. Measurement of Variables, and Reliability and Variables

This study established a comprehensive research model by setting the self-efficacy of small business start-ups as an independent variable, start-up intention as a mediating variable, start-up performance as a dependent variable, and digital transformation as a moderator between the mediating variable (start-up intention) and the dependent variable (start-up performance). The questionnaire used a five-point scale (1 point, not at all; 5 points, very much). The main variables and item descriptions are shown in Table 2.

Cronbach's α was used for internal consistency testing. Results found that the reliability of items is valid since all variables exceeded 0.7. To assess the measurement qualities and discriminant validity of the variables, a confirmatory factor analysis was conducted. The factor loadings of each item were higher than 0.68 (Table 2).

For each variable, a correlation analysis between variables was conducted to examine the direction and degree of relationship between each other. The results of calculating Pearson's correlation coefficient are shown in Table 3.

**Table 3.** Correlation Analysis

| | Korea | | | | China | | | |
|---|---|---|---|---|---|---|---|---|
| | Self-Efficacy | Start-Up Intention | Start-Up Performance | Digital Transformation | Self-Efficacy | Start-Up Intention | Start-Up Performance | Digital Transformation |
| Self-Efficacy | 1 | | | | 1 | | | |
| Start-Up Intention | .576** | 1 | | | .457** | 1 | | |
| Start-Up Performance | .567** | .627** | 1 | | .498** | .444** | 1 | |
| Digital Transformation | .335** | .290** | .459** | 1 | .375** | .424** | .479** | 1 |

## 2. Hypothesis Testing

As shown in Table 4, in the case of Korea, self-efficacy (β=0.567, t=9.491) has statistically significant positive effects on start-up intention. Start-up intention (β=0.672, t=11.096) has statistically significant positive effects on start-up performance. Self-efficacy (β=0.576, t=9.703) has statistically significant positive effects on start-up performance. Therefore, hypotheses H1, H2, and H3 were adopted by Korean samples.

In the case of China, self-efficacy (β=0.457, t=6.575) has statistically significant positive effects on start-up intention. Start-up intention (β=0.444, t=6.353) has statistically significant positive effects on start-up performance. Self-efficacy (β=0.498, t=7.364) has statistically significant positive effects on start-up performance. Therefore, hypotheses H1, H2, and H3 were verified by Chinese samples.

In Table 5, let's look at the verification of the mediating effect of self-efficacy (Korea). In stage 1, the regression coefficient is 0.576, which has a positive (+) effect. In stage 2, the regression coefficient (β) is 0.567, showing a positive (+) effect, too. In stage 3, the independent variable (self-efficacy) represents 0.308 and the mediating variable (start-up intention) is 0.450. In step 3, all variables show a positive (+) effect. The t-value and p-value, which can measure the significance level, show significant results at all stages. In addition,

**Table 4.** Regression Analysis Results

| | Dependent Variables | Independent Variables | $R^2$ | Adjusted $R^2$ | F | β (T-Value) |
|---|---|---|---|---|---|---|
| Korea | Start-Up Intention | Self-Efficacy | 0.322 | 0.318 | 90.074 | 0.567(9.491***) |
| | Start-Up Performance | Start-Up Intention | 0.393 | 0.390 | 123.115 | 0.672(11.096***) |
| | Start-Up Performance | Self-Efficacy | 0.331 | 0.328 | 94.156 | 0.576(9.703***) |
| China | Start-Up Intention | Self-Efficacy | 0.209 | 0.204 | 43.226 | 0.457 (6.575***) |
| | Start-Up performance | Start-Up Intention | 0.197 | 0.193 | 40.354 | 0.444 (6.353***) |
| | Start-Up performance | Self-Efficacy | 0.248 | 0.244 | 54.230 | 0.498 (7.364***) |

Note: *$p$<0.1, **$p$<0.05, ***$p$<0.01.

the effect of the independent variable in step 2 is greater than the effect of the independent variable in stage 3. That is, the 'partial mediation effect' can be confirmed.

And let's look at the results of verifying the mediating effect of the start-up intention (China). In the first stage, in the case of self-efficacy, the regression coefficient is 0.457, showing a positive (+) effect. In the second stage, the regression coefficient of start-up intention is 0.498, which is statistically significant. In stage 3, the independent variable (self-efficacy) is 0.373 and the mediating variable (start-up intention) is 0.274. The t-value and p-value, which can measure the significance level, show positive (+) significant results at all stages. In addition, the effect of the independent variable (start-up intention) in the second stage is greater than that of the independent variable (start-up intention) in the third stage. Eventually, the 'partial mediation effect' was verified.

**Table 5.** Mediating Effect of Start-up Intention

| | | Stages | β | T | P | $R^2$ | Adj. $R^2$ | Result |
|---|---|---|---|---|---|---|---|---|
| Korea | Self-Efficacy/ Start-Up Intention/ Start-Up performance | Stage 1 | 0.576 | 9.703 | 0.000 | 0.331 | 0.328 | Partial Mediation |
| | | Stage 2 | 0.567 | 9.491 | 0.000 | 0.322 | 0.318 | |
| | | Stage 3 (Ind._Var.) | 0.308 | 4.702 | 0.000 | 0.457 | 0.451 | |
| | | Stage 3 (Med._Var.) | 0.450 | 6.857 | 0.000 | | | |
| China | Self-Efficacy/ Start-Up Intention/ Start-Up performance | Stage 1 | 0.457 | 6.575 | 0.000 | 0.209 | 0.204 | Partial Mediation |
| | | Stage 2 | 0.498 | 7.364 | 0.000 | 0.248 | 0.244 | |
| | | Stage 3 (Ind._Var.) | 0.373 | 5.098 | 0.000 | 0.308 | 0.299 | |
| | | Stage 3 (Med._Var.) | 0.274 | 3.738 | 0.000 | | | |

Note: *$p$<0.1, **$p$<0.05, ***$p$<0.01.

Meanwhile, the results of verifying the moderating effect of digital transformation between start-up intention and start-up performance of Korean samples are shown in Table 6. Comparing Model 1 (R=0.393. Adjusted $R^2$=0.390) and Model 2 ($R^2$=0.477, Adjusted $R^2$=0.472), the explanatory power of Model 2 is greater than Model 1. The explanatory power of Model 3 with the interaction term ($R^2$=0.515. Adjusted $R^2$=0.507) is greater than Model 2. In addition, in Model 3, the interaction term was statistically significant ($p < 0.001$). In other words, digital transformation had a positive moderating effect between start-up intention and start-up performance.

Meanwhile, Table 6 also shows the results of verifying the moderating effect of digital transformation between start-up intention and start-up performance of Chinese samples. Looking at Model 1 ($R^2$=0.197. Adjusted $R^2$=0.193), Model 2 ($R^2$=0.300, Adjusted $R^2$=0.292), and Model 3 ($R^2$=0.306. Adjusted $R^2$=0.293), explanatory power is gradually increasing. However, in Model 3, the interaction term showed no statistically significant moderating effect.

**Table 6**. Moderating Effect of Digital Transformation

| | | | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | β | t | p | β | t | p | β | t | p |
| Korea | Independent Variable | Start-Up Intention | 0.627 | 11.096 | 0.000 | 0.539 | 9.810 | 0.000 | 0.550 | 10.343 | 0.000 |
| | Adjustment Variable | Digital Transformation | | | | 0.303 | 5.507 | 0.000 | 0.334 | 6.219 | 0.000 |
| | Interaction Term | Start-up Intention x Digital Transformation | | | | | | | 0.198 | 3.839 | 0.000 |
| | $R^2$ | | | 0.393 | | | 0.477 | | | 0.515 | |
| | Adj. $R^2$ | | | 0.390 | | | 0.472 | | | 0.507 | |
| | Sig. F Change | | | 123.115 | | | 30.328 | | | 14.740 | |
| China | Independent Variable | Start-Up Intention | 0.444 | 6.353 | 0.000 | 0.294 | 4.07 | 0.000 | 0.304 | 4.172 | 0.000 |
| | Adjustment Variable | Digital Transformation | | | | 0.354 | 4.894 | 0.000 | 0.366 | 5.007 | 0.000 |
| | Interaction Term | Start-Up Intention x Digital Transformation | | | | | | | 0.075 | 1.114 | 0.267 |
| | $R^2$ | | | 0.197 | | | 0.300 | | | 0.306 | |
| | Adj. $R^2$ | | | 0.193 | | | 0.292 | | | 0.293 | |
| | Sig. F Change | | | 40.354 | | | 23.948 | | | 1.242 | |

## V. Case Analysis

With the advent of the Fourth Industrial Revolution, digital transformation was of great necessity not only for large companies but also for small business owners. However, it is not easy to push for digital transformation for small business owners who have difficulty in financial and other conditions due to the difficult global economy and the influence of COVID-19. Nevertheless, this study found the case of small business owners who were relatively successful in strengthening competitiveness through digital transformation to supplement the empirical analysis of Korea and China. Case discovery was made using expert interviews and literature surveys.

### 1. Successful Story of Digital Transformation by Korean Small Business Start-ups

#### 1.1. Ddeck King and Pizza Italy Ruwon City: Successful Introduction of Smart Robots

According to statistics from the Ministry of SMEs and Startups (MSS), the biggest difficulties that small business start-ups (or owners) face in the course of their business activities are sales channels (26.8%), funds (22%), products and services (19.4%), and location (11.8%). Considering this fact, the success of single-person producers and small-scale manufacturers who had difficulty developing markets through digital transformation helps lower barriers for small business start-ups (or owners) to enter the market in this sector (Park, 2017).

In Korean Daegu's chicken specialty restaurant 'Ddeck King' has succeeded in reducing risks and mistakes that may occur during the cooking process by introducing a frying robot and improving customer satisfaction by maintaining a consistent taste. After the introduction of the frying robot, the number of customers tripled, the monthly sales increased by 20 million won, and the number of employees increased from 2 to 4 people. Similarly, the Incheon pizza restaurant 'Pizza Italy Luwon City' introduced a serving robot and table order method to reduce store congestion and successfully increase customer satisfaction (Park, 2022).

#### 1.2. Sutomarket: Improving Distribution Efficiency through Digital Platforms[1]

Coupang revealed the story of Lim Jae-geun, CEO of Sutomarket, who sells watermelons. CEO Lim said that it has been difficult to manage freshness and quality as watermelons have been sold offline with many distribution stages. To overcome these difficulties, CEO Lim started selling online at Coupang. At Sutomarket, when a watermelon is ordered with Coupang Rocket Fresh, the quantity is checked at the production area and harvesting begins immediately. Freshly picked watermelons are delivered to the customer's house within 24 hours by delivery vehicle. Thanks to the fresh watermelon, Sutomarket's sales also surged. Sutomarket recorded sales of 50 billion won in 2021, growing into a company with 100 employees and 16,500 square meters of factory.

### 2. Successful Story of Digital Transformation by Chinese Small Business Start-ups

#### 2.1. Pang Mei Mian Guang: Application of Delivery Digital Platform and Development of Related Menus

In the wave of the digital economy, the job model is no longer limited to the traditional employment relationship of "company + employee", but a new individual economy characterized by "platform + individual" has appeared for self-employed people. In other words, it gives them a bigger stage and opens up new job spaces.

Due to COVID-19, many small business start-ups have had a hard time doing business. A restaurant in Beijing, 'Pang mei mian guang', has considered digital transformation. This store operates an online store through a delivery platform (meituan). In particular, it focused on developing food for delivery only. In the end, sales are increasing.

1. For the Sutomarket case, please visit: https://www.fnnews.com/news/202208190908449239

### 2.2. Laoxiangji: Broad Application of Smart Technology in the Value Chain

The small-store economy has important meanings for the development of the living economy in China by creating jobs, stimulating consumption, enhancing economic vitality, and improving people's living standards. In China, 89.4% of the number of employees at small service stores in China is less than 5. Hebei Laoxiangji, a representative of the small-store economy, has established a digital transformation strategy since 2019. This fast-food brand specializing in native chicken broth has made processes efficient through digitalization.

Today's Laoxiangji utilizes digital precision marketing tools to recommend each consumer's preferred cuisine through big data cloud analysis, increasing satisfaction and reducing latency. At the same time, the products researched and developed, and the services launched are more targeted than before, so that consumers can have a strong affinity after coming to Laoxiangji. In addition, through the membership system of the social platform, various preferential benefits were provided to members and the loyalty of the consumer group to the brand was greatly improved (Ning et al., 2022).

Table 7 summarizes the above-described cases of Korea and China.

**Table 7.** A Comparison of Case Analyses Between Korea and China

| Korea | | China | |
|---|---|---|---|
| Name of Cases | Methods of Application | Name of Cases | Methods of Application |
| Ddeck King and Pizza Italy Ruwon City | Successful introduction of smart robots | Pang mei mian guang | Application of delivery digital platform and development of related menus |
| Sutomarket | Improving distribution efficiency through digital platforms | Laoxiangji | Broad application of smart technology in the value chain |

## VI. Conclusions

As small business start-ups are recognized as playing an important role in the national economy, various studies are being actively carried out in academia. The purpose of this study is to empirically analyze small business start-ups in Korea and China focusing on self-efficacy, start-up intention, and start-up performance, which have an important influence on the performance of small businesses founded by small business start-ups. This study tried to contribute to the preparation of effective start-up support policies by the Korean and Chinese governments and to the theoretical development of related studies. In addition, "digital transformation", which is the core of the 4th industrial revolution, was judged to be applicable not only to large enterprises but also to small business start-ups. Therefore, we applied the role of digital transformation to the research model. In summary, through this study, the Korean and Chinese governments will be able to support small business start-ups in new innovative ways through 'support for digital transformation of small business owners', 'digital transformation through win-win cooperation with large companies', or 'develop new business models' and will contribute to the overall economic growth of the country.

Implications focusing on the empirical results of this study are as follows. First, looking at the relationship between self-efficacy and the start-up intention, it was found that self-efficacy had a

positive effect on the start-up intention. Through these results, it was confirmed that self-efficacy, which is an individual characteristic, acts as an important factor in the intention to start a business. If self-efficacy increases by belief in oneself, it has a positive and meaningful effect on the intention to start a business with confidence that it can be done. Empirical tests showed the same results for both Korea and China.

Second, looking at the relationship between the start-up intention and the start-up performance, start-up intention had a positive effect on the start-up performance. These tests also showed the same results for both Korea and China. In other words, the higher start-up intention, the better the start-up performance will be. Therefore, it is judged that the government's policy direction should be made for increasing the intention to start a business.

Third, looking at the relationship between small business start-ups' self-efficacy and start-up performance, self-efficacy had a positive effect on start-up performance. Namely, in order to increase business performance, it is important to enhance the self-efficacy, that is, the belief in one's ability to adapt to new situations or solve various business problems. These results suggest that small business entrepreneurs need various methods to increase their self-efficacy when starting a business. The fact that psychological self-efficacy ultimately influences visible and invisible corporate performance can lead to various academic and policy implications.

Fourth, in examining the mediating effect of 'startup intention' showed a positive 'partial mediating effect' in both Korea and China. In other words, while self-efficacy may directly affect start-up performance, it can indirectly affect start-up performance through 'start-up intention'. These results can also suggest various implications in start-up education and start-up policy, etc.

Finally, the verification results of the moderating effect of digital transformation were different in Korea and China. In the case of Korea, a positive moderating effect of digital transformation was found, whereas there was no moderating effect in China. The reasons could be speculated in a variety of ways. In the case of China, despite the rapid changes in the business environment such as the COVID-19 pandemic and the development of the 4th industrial revolution technology, small business start-ups and owners still lack awareness of digital transformation. Therefore, it is judged that the role of digital transformation did not affect the performance. Of course, this situation is likely to change over time. The Chinese government will need to prepare for these changes, and the Korean government will have to work harder to accelerate digital transformation of small business start-ups. These different empirical results will need more in-depth discussions in future studies.

On the other hand, related implications could be derived through successful case analysis of digital transformation in small business owners. In the end, small business start-ups and owners need to understand the positive changes that digital innovation will bring in various fields such as management, marketing, and sales activities, and change their perceptions and actions to quickly apply them to their business process and model. This is important for both managers and employees, and they will have to actively respond to the needs of consumers who are particularly sensitive to these changes.

If you look at the field of digital transformation for small business start-ups, the first is a marketing field. Due to the spread of COVID-19, many small business start-ups and owners switched to online sales. Namely, the development of ICT technology and changes in consumption trends have changed the structure of the distribution industry. Therefore, small business start-ups should be aware of the spread of online shopping and the emergence of a new distribution platform that combines new technologies (KPMG, 2017). Through online platforms, small business start-ups can not only promote their stores, but can also actively use them to develop new markets. In addition, it is possible to efficiently produce and service through the use of digital technology. In other words, it is possible to produce customized products and provide services by using digital technology, which can increase customer satisfaction and strengthen the competitiveness of the business. On the other hand, in the empirical tests, Korea and China showed

the difference in the moderating role of digital transformation, but in the case study, it is necessary to recognize that the achievements of digital transformation played a major role in the successful business performance for both small business start-ups in Korea and China.

The limitations of this study are as follows. First, since this study targeted specific regions of Korea and China, there are some limitations in generalizing the results. Therefore, it will be necessary to expand the scope of research to more regions and countries in the future. Second, small business start-ups can be classified into several types. Therefore, it should be recognized that there may be differences depending on industry, business model, size, etc. Third, we should recognize that there may be other important variables that affect the small business start-ups and their start-up performance in addition to self-efficacy. Therefore, continuous research on related variables will be required. However, since these limitations are often found in most of studies, the value of this study will not be undermined. Rather, these limitations can be used as good issues in future research.

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# Impact of COVID-19 on Korea-China Import and Export Trade and Countermeasures

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**ABSTRACT**

**Purpose –** This paper empirically investigates the changes and trends in export and import trade between Korea and China since 2000, especially after the establishment of Korea-China FTA and since the outbreak of COVID-19. This paper uses empirical analysis to determine the future trade types and trends of import/export trade between Korea and China and estimates the impact on import/export trade between Korea and China in the post-epidemic era.

**Design/Methodology/Approach –** This paper first reviews the theories related to regional economic integration, sorts out the process of Korea-China FTA, and summarizes the changes and trends in import and export trade since COVID-19; second, it analyzes the current situation of bilateral trade between Korea and China using quantitative analysis, and investigates the specific impact of COVID-19 on Korea-China import and export trade using empirical analysis; finally, it summarizes the above studies, a conclusion is drawn, and policy recommendations are made to better utilize the challenges brought by COVID-19 to effectively address the problems that may be encountered in Korea-China trade and to promote the development of bilateral trade between the two countries.

**Findings –** The global spread of the epidemic in Korea and China has led to the shutdown of both domestic and foreign operations, resulting in a foreign trade cliff effect in the short to medium term; the trade creation effect inspired by the international system dividend is no longer available in China in 2020, and the trade in goods is diminishing at the margin; the trade suppression effect is generated by the rise of international trade protectionism. The epidemic has led to a large upstream supply shortage pressure on the electronic information industry and the automobile manufacturing industry, and a large downstream demand shortage pressure on the energy industry and the electronic information industry.

**Research Implications –** The establishment of Korea-China FTA will significantly promote bilateral trade between the two countries, change the trade and industrial structure of the two countries, and help to promote the development of the FTA strategy of the two countries; the outbreak of COVID-19 has changed the trade pattern and type, and the import and export of related epidemic prevention products as a new trade growth point and strengthened the trade market relationship between Korea and China.

***Keywords:*** COVID-19, export competition between Korea and China, FTA, market sophistication
***JEL Classifications:*** F10, Q55

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## I. Introduction

From the perspective of East Asia, although East Asia is currently one of the three major regions (North America, EU, and East Asia) with the strongest economic and trade ties in the world, it is still slow in signing FTAs compared to the other two regions. For South Korea and China, which are also important countries in East Asia, the Korea-China FTA did not come into force until 2016 (Wang, 2016). The signing of the Korea-China FTA will, firstly, have an impact on bilateral trade between Korea and China, and secondly, the Korea-China FTA will not be a static free trade agreement, but will be revised in the future according to the changes in the world's political and economic situation and the changes in the economic and trade relations between Korea and China. The comparative advantages of Korea and China are in different industrial sectors, with China in labor- and resource-intensive industries and Korea in capital- and technology-intensive industries. The two sides have formed complementarities in trade due to their different endowments. Based on this complementarity, China and South Korea have maintained good economic and trade relations since the establishment of diplomatic relations in 1992. The establishment of the China-Korea FTA is bound to continue to explore the trade potential between China and South Korea and promote the growth of bilateral trade between the two countries to a greater extent.

However, there has been a massive halt in worldwide trade, especially within Asia, with trade stoppages and delays since the outbreak of COVID-19 in 2020. As one of the largest trading partner countries within Asia and worldwide, the import and export trade between Korea and China has decreased for the first time since 2000, especially since the establishment of Korea-China FTA. Therefore, a study of Korea-China trade in the post-epidemic era will help import and export companies in both countries to change their trade patterns and types and will be of great help in finding new trade growth points in the post-epidemic era.

The impact of COVID-19 on China's trade and global trade has been the focus of the literature. China's share of global industrial value added was only 6.8% in 2003, rising to 23.9% in 2017. The NCP outbreak affected China's exports of intermediate products to other countries, leading to disruptions in production processes in other countries (Xu, 2020). COVID-19 has adversely impacted many industries in China in the short to medium term, and there is a need to contain the epidemic, help companies resume production, and improve the business environment (Shen, 2020). The economic impact of the epidemic is greater in Hubei than outside the province, and provinces such as Jiangsu, Guangdong, and Zhejiang have a higher economic dependence on Hubei and face a more direct risk of economic shock (Liu et al., 2020). The global spread of the epidemic caused a comprehensive and severe impact on the already depressed world economy based on global value chains, with China, Germany, and the United States being the most affected by the epidemic on the global value chain network (Guo & Lun, 2021). Kenner and Jiang (2020) suggest that the Newcastle pneumonia epidemic may affect China's agricultural imports from the US as agreed in the first phase of the US-China trade agreement. Segal (2020) suggests that COVID-19 has led to a significant reduction in international travel, which will have a significant negative impact on global tourism and other services trade. Jaffe (2020) suggests that the Newcastle pneumonia epidemic will lead to a decline in demand for Chinese imports of energy products, such as oil, in the short term, which could lead to turbulence in the global energy market, and Segal (2020) suggests that the damage caused by Newcastle pneumonia will exceed that of SARS, and that China's quarantine response, among other things, will lead to a reduction in economic activity. If economic activity is reduced by two-thirds in half a month from United Nations Statistics Division, China's total GDP would be reduced by 2.7%, and annual growth would fall from 6.0% to about 5.8% (2020).

Based on previous studies in the literature, there is no detailed analysis of the impact of the changes in China's internal and external economic and

trade environment on Korea's and China's export and import trade and industrial chains under the global spread of COVID-19. The contribution of this paper on the impact of the global spread of COVID-19 on Korean and Chinese exports, imports and industrial chains is: first, it reveals the trade impact of the profound changes in China's internal and external economic and trade environment under the global spread of COVID-19: China's foreign trade situation becomes severe, and China suffers from the foreign trade cliff effect due to both domestic and foreign shutdowns; second, China no longer has the international system dividends inspired by the trade creation effect. We forecast the changes in exports and imports of epidemic prevention products between Korea and China under COVID-19. The supply of China's epidemic prevention products will increase significantly under the global spread of COVID-19, and it is necessary to effectively prevent and control the epidemic in China and actively export epidemic prevention products in parallel to maintain a smooth industrial chain and supply chain. Third, the impact of the spread of COVID-19 on the industrial chains of Korea and China is revealed, with the electronic information and automobile manufacturing industries under pressure from upstream supply shortages and the electronic information and energy industries under pressure from downstream demand shortages; the global spread of COVID-19 has led to significant adverse trade disruptions in the trade of intermediate goods between Korea and China in the first quarter.

## II. Bilateral Trade Development between China and Korea

Since the development of economic and trade relations between China and Korea, Korea has become one of the most important trade and investment partners of China, and is the third largest trade partner of China, while China is the largest trade partner of Korea. The bilateral trade volume between China and Korea exceeds 1/5 of Korea's total foreign trade and exceeds the combined trade volume between Korea and the United States and Korea and the European Union. China has become Korea's largest trading partner and the largest source of imports. China and Korea have a highly complementary economy and a good basis for cooperation, and the bilateral economic and trade integration is growing day by day. In terms of bilateral trade volume, the trade volume between China and South Korea has been rising since the establishment of diplomatic relations in 1992, showing a clear and continuous increase in general, and the export value of South Korea to China has also increased from 26.5 billion USD at the beginning of diplomatic relations. Korea's exports to China have risen 72 times, from $260.4 billion at the beginning of diplomatic relations to $360 billion by 2021, and imports have risen from $37.5 billion to more than $300 million. The import volume has also increased 53 times, from US$37.5 billion to over US$200 billion today . However, while the trade volume is expanding, the trade volume and growth rate also fluctuate due to the influence of world economic and political factors at certain times; for example, the U.S. subprime mortgage crisis in 2008 led to a decline in trade volume and a negative growth rate of about 24%, and China and South Korea were affected by the "Sade" incident and some other political factors in 2016. In 2006, China and South Korea were affected by the system analysis and design (SAD) incident and some other political factors, which led to negative growth, and the bilateral import and export trade volume and growth rate both decreased. In addition, from the perspective of trade balance, China has long had a trade deficit with South Korea, and the trade deficit is generally increasing in line with the trend of import and export trade volume.

### 1. Korea-China Export Relations Shift

Since the establishment of diplomatic relations between China and South Korea in 1992, the two sides have strengthened their economic cooperation and bilateral trade has grown significantly. The two countries have gradually become each other's important trading partners, and trade exchanges

have become increasingly close. Currently, China is the largest trading partner of South Korea. China is now the largest trading partner of South Korea, and South Korea is also a pivotal player in China's foreign trade, having overtaken Japan for the first time in the fourth quarter of 2015 as China's largest trading partner. In the fourth quarter of 2015, Korea overtook Japan for the first time to become China's second largest trading partner. The trade status of Korea and China in the last decade is shown in Table 1.

According to the table above, there is a decline in total import and export in 2019 and 2020 due to the impact of COVID-19. In contrast, in 2021, the trade volume between Korea and China rises significantly to $362.35 billion, an increase of 27% compared to 2020. This is due to the outbreak of COVID-19, which led to a serious impact on trade between the two countries, and the persistence of COVID-19 in 2021, which also changed the types and shares of trade between the two countries, especially the rise in imports and exports of types such as epidemic prevention materials and semiconductors

**Table 1.** China to Korea's Total Import and Export Trade and Growth Rate

(Unite: $ Billion)

| Year | Import and Export | Growth rate [%] | Import | Growth rate [%] | Export | Growth rate [%] |
|---|---|---|---|---|---|---|
| 2012 | 2564.1 | 4.39 | 1687.4 | 3.71 | 876.7 | 5.73 |
| 2013 | 2742.4 | 6.95 | 1839.7 | 9.03 | 902.7 | 2.97 |
| 2014 | 2904.9 | 5.93 | 1003.4 | -45.46 | 1901.5 | 110.65 |
| 2015 | 2758.1 | -5.05 | 1012.9 | 0.95 | 1745.2 | -8.22 |
| 2016 | 2525.7 | -8.43 | 937.0 | -7.49 | 1588.7 | -8.97 |
| 2017 | 2802.6 | 10.96 | 1027.5 | 9.66 | 1775.1 | 11.73 |
| 2018 | 3134.3 | 11.84 | 1087.9 | 5.88 | 2046.4 | 15.28 |
| 2019 | 2845.7 | -9.21 | 1110.0 | 2.03 | 1735.7 | -15.18 |
| 2020 | 2852.6 | 0.24 | 1125.0 | 1.35 | 1727.6 | -0.47 |
| 2021 | 3623.5 | 27.02 | 1488.6 | 32.32 | 2134.9 | 23.58 |

Source: Authors' calculation using UN Comtrade (2020).

## 2. Impact of Korea-China FTA on Trade between the Two Countries

The Korea-China FTA entered into force on December 20, 2015, with the first tariff reduction on the effective date and the second tariff reduction on January 1, 2016. Most zero-tariff products will be phased out of bilateral import tariffs over a 10-year period. According to Korea Customs, bilateral trade between South Korea and China showed a small increase from 2014 to 2018. According to a comparison of the trade volume and growth rate

between South Korea and China before and after the FTA came into effect, bilateral trade between South Korea and China declined significantly in 2015 and 2016 due to the slowdown of the Chinese economy, the deployment of the system analysis and design (SAD) system in South Korea, and several other political and economic factors. In 2016, the trade volume remained on a downward trend compared to the pre-effective period, with exports declining from $174.52 billion before the effective date to 158.87 billion USD. In 2017, trade between China and South Korea rebounded rapidly, with export trade increasing by 11.73 percent over the previous year. While still not as much as trade in 2014, the difference was not significant, with import trade reaching $102.75 billion and export trade reaching $177.51 billion, an increase of 10.96 percent over 2016. This is the largest value of South Korea's imports from China since the establishment of diplomatic relations between the two countries. In 2021, bilateral goods imports and exports between South Korea and China were $362.35 billion, up 26.9 percent year-on-year, with China exporting $148.86 billion to South Korea, up 32.4 percent, and importing $213.49 billion from South Korea, up 23.3 percent. Trade relations between the two countries have been developing in a positive direction, and the Korea-China FTA and its rules of origin have played an important role in this development.

### 3. Korea-China Bilateral Trade Structure

In terms of the specific products to be imported and exported by the two countries from 2016 to 2021, China's exports to Korea topped the list of the 16th category of products in China's Customs Import and Export Commodity Classification, corresponding to the Harmonized Commodity Description and Coding System. The export value of electrical equipment is more than twice the export value of machinery and apparatus, and China's exports to Korea in 2018 amounted to $50 billion, accounting for 45.5% of the total export value, and the export value has maintained a stable trend of increasing year by year, which is the most important category in China's export trade with Korea. After electrical machinery and equipment, steel, inorganic chemicals and optical, watches and clocks, medical equipment, etc. are also exported more products, the export value in recent years are more than 3 billion U.S. dollars, and finally textiles, plastics and their products, organic chemicals, and miscellaneous products are stable in the top ten of China's exports to Korea. Among the top ten products imported from Korea, the sixteenth category of electrical equipment and machinery and apparatus are always in the forefront; especially, the import value of electrical equipment has been growing steadily and rapidly, exceeding $66 billion in 2018, accounting for 40.78% of China's total imports from Korea, while machinery and apparatus, organic chemicals, and optical, watch and medical equipment are in the second, third and fourth places respectively. In the latter product categories, vehicle appliances, resin essential oils and mineral fuels are also imported products from Korea; for example, Hyundai and Kia are imported Korean cars in Korea, and Korea's more mature facial care products and essential oil creams are imported products in Korea. Our country imports a large number of products.

## III. COVID-19 Trade Impacts of Changes in China's Internal and External Economic and Trade Environment under Global Contagion

The adverse impact of COVID-19 on China's exports and imports has been quickly apparent in the short term, and to a much greater extent than the adverse impact of the SARS epidemic. According to China Customs statistics, in 2020, China's total imports and exports were $464.62 billion, an increase of only 1.5% year-on-year, and the import and export trade with South Korea increased by only 0.3% year-on-year. In contrast, during the SARS epidemic in 2003, China's total import and export trade was $851.21 billion, an

increase of 37.1% year-on-year. In comparison, China's foreign trade exports and imports have suffered serious adverse effects under COVID-19.

## 1. China's Foreign Trade Capacity Decreases

Due to the proliferation of COVID-19 in China, inter-provincial management has been implemented in China, causing difficulties in inter-provincial transportation and production, which has caused the first impact on Chinese enterprises, while the global spread of COVID-19 has caused a large number of enterprises in Europe and the United States to stop working and shipping, which has brought a second impact on Chinese enterprises, and the global production supply chain is experiencing a comprehensive shutdown crisis from the bottom to the top. This has had a systemic impact on the global manufacturing industry. From the semiconductor industry, the market share of wafers, photoresists, etc. is monopolized by Japanese companies, while in the field of memory chips, electronic components, LCD panels, etc., Korean companies occupy more than half. This is especially true in the automotive industry. As a result, the global spread of the epidemic caused many enterprises in Europe, the United States, Japan, and South Korea and other major economies to shut down, which will again "backfire" China's economic and trade recovery momentum. This will lead to two sets of shutdowns in China's provincial areas. In fact, the construction of transportation infrastructure, such as roads and high-speed railways, has an important role in promoting the development of foreign trade. Therefore, the global spread of the epidemic in China's provincial areas suffered from two sets of domestic and foreign shutdowns (Cosar & Demir, 2016).

## 2. China's International Trade Volume Decreases

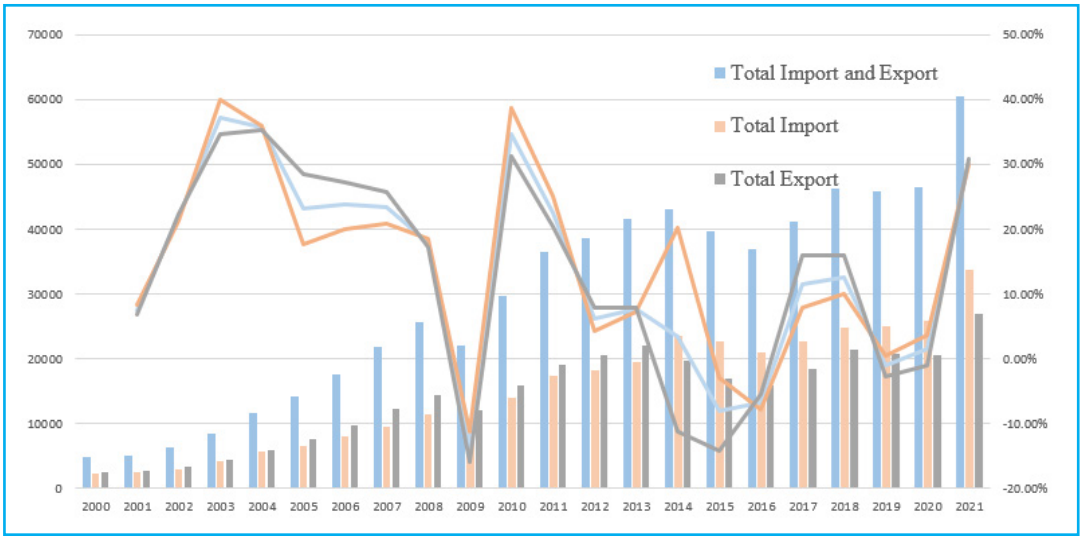
At the time of the SARS outbreak in 2003, China was still in a phase of rapid growth in foreign trade following its accession to the WTO. China has benefited from the tariff concessions and other agreements reached by WTO members and has actively explored a wide range of global markets. Studies in the literature show that the trade liberalization environment after WTO accession has greatly facilitated the export participation of Chinese foreign trade enterprises and enabled them to obtain higher profits for their products.

As shown in Figure 1, from the accession to the WTO at the end of 2001 to 2006, China's foreign trade had a golden period of booming development, with the trade volume and the ratio of trade to GDP climbing steadily, while the trade volume of foreign direct investment in China and the ratio of trade to China's total trade were also increasing. Since 2010, China's foreign trade has still increased in total volume, but the ratio of China's foreign exports and imports to GDP has been decreasing. In the same period, the proportion of exports and imports of foreign direct investment in China has also been declining. When the SARS epidemic broke out in 2003, the trade creation effect of the international system dividend after China's accession was sufficient to offset the negative impact of the epidemic on China's foreign trade at that time. But with the global spread of COVID-19, China no longer has the international institutional dividend to promote the expansion of foreign trade, and international trade protectionism continues to rise.

Moreover, from the perspective of China's foreign trade development space, compared with the SARS epidemic in 2003, China's market space for global trade in goods has shown a marginal diminishing trend under COVID-19 in 2020. According to the data published by the National Bureau of Statistics, in 2002, China's foreign exports accounted for 5.0% of the world's total exports, and imports accounted for 4.4% of the world's total imports; while in 2018, China's foreign exports accounted for 12.8% of the world's total exports, and imports accounted for 10.8% of the world's total imports. With the huge volume of China's foreign trade, it has become more and more difficult to further expand the global trade market space. Figure 2 compares the trends of

**Fig. 1.** China's Total Import and Export Trade and Growth Rate

(Unit: %, Billion)




Source: Authors' calculation using UN Comtrade (2020).

China's foreign trade before and after the SARS outbreak and before the outbreak of Newcastle pneumonia. The total foreign trade of China in 2019 is US$4,575.2 billion, which is a decline from the total foreign trade of China in 2018, which is US$4,622.4 billion. Therefore, even without the impact of the epidemic, China's foreign trade growth in 2020 has received a greater marginal growth engine dilemma. Therefore, the saturation of trade market space combined with the impact of the global spread of the Newcastle pneumonia epidemic will make China's foreign trade situation very severe in the future.

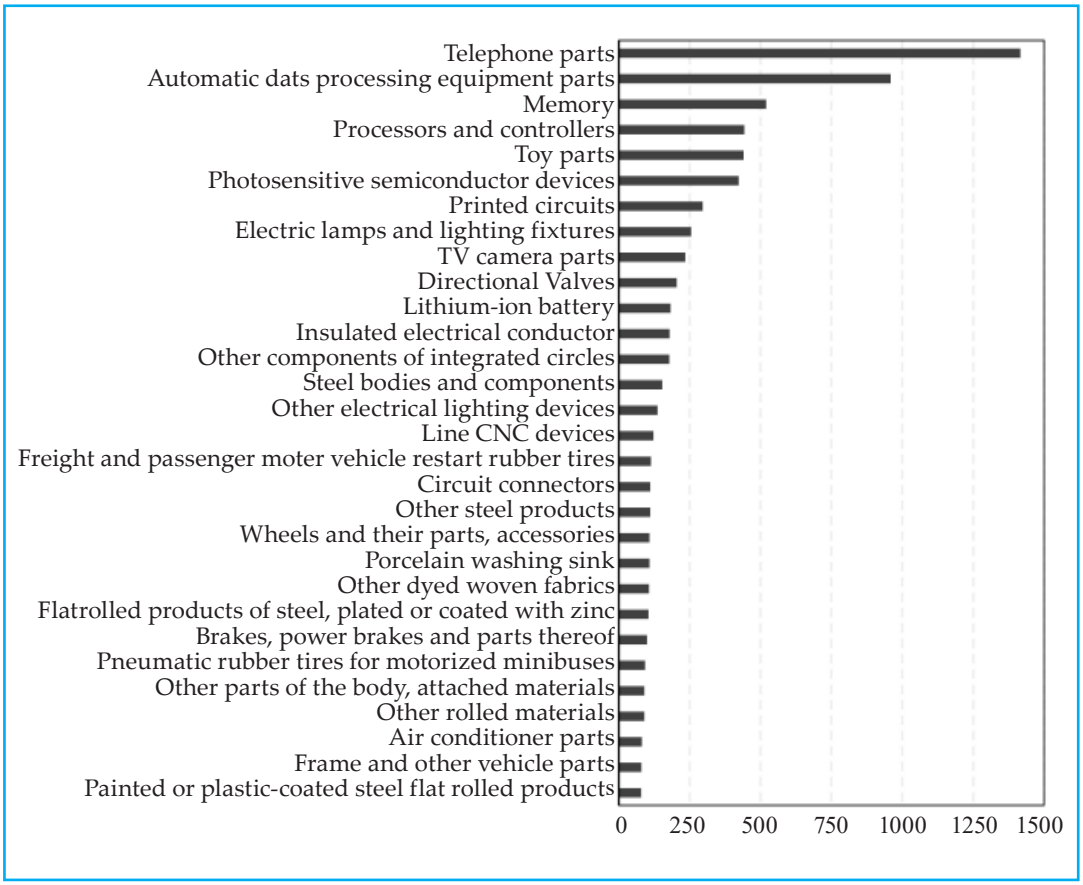
## 3. COVID-19 Global Spread Impact on The Global Industry Chain

China is a major exporter of consumer goods, as well as intermediate and capital goods. "Made in China" has become an indispensable and critical link in the global industrial supply chain. According to UN Comtrade (2018), China's foreign exports of intermediate goods accounted for 46% of total exports, and foreign exports of capital goods accounted for 30% of total exports in 2018, excluding products whose use cannot be identified. As a result, the global spread of the epidemic has triggered work stoppages and airline embargoes that have not only severely impacted the global consumer goods market but will also lead to a shortage of supply in the upper reaches of the global industrial chain, which in turn will lead to a global production and supply chain crisis. Fig. 2 shows China's major export intermediate goods and their export value in 2018; the top 10 major export intermediate goods are: telephone parts, automatic data processing equipment parts, memory, multi-device integrated circuits processors and controllers, toy parts, photosensitive semiconductor devices, printed circuits, other electric lamps and lighting devices, TV camera parts and reversing valves, etc. Since the specific use of capital goods is difficult to determine, the analysis here focuses on the main intermediate goods categories to determine the impact of the epidemic on Export sectors. Given that China's share of goods exports is already the first in the world and its share of goods imports

is the second in the world, the main intermediate goods exported by China have been widely used. Accordingly, China's exports of major intermediate goods have been widely involved in the production of various industries, including electrical machinery, electrical equipment, and parts thereof under Chapter 85 of the tariff code, and vehicles and parts thereof under Chapter 87. Among them, electrical machinery, electrical equipment, and parts thereof under Chapter 85 and vehicles and parts thereof under Chapter 87 of the Tariff Code contain the largest variety of products. Assuming no major changes in the pattern of China's major exports of intermediate goods as a result, the COVID-19 outbreak from January to March 2020 may lead to a shortage of upstream supply in the global industry chain in the short term for several industries. In particular, the electronic information industry and the automobile manufacturing industry are under high pressure of upstream supply shortage.

**Fig. 2.** The Main Intermediate Goods Exported by China and Their Export Value in 2018

(Unit: %, Billion)




Source: Authors' calculation using UN Comtrade (2018).

The impact of the COVID-19 outbreak on the downstream production of the electronic information industry and the automotive manufacturing industry has been rapidly apparent in the short term. From January to March 2020, in addition to the shutdown of Honda, Renault, and GM plants in China, overseas plants of Hyundai, Kia, Nissan, and Chrysler were also forced to reduce production or even shut down due to the shortage of parts supply. The electronic information industry, in addition to Apple's foundry in China production restrictions, Samsung's cell phone assembly plant in Vietnam is also facing the crisis of parts outages.

## IV. An Empirical Analysis of the Impact of COVID-19 on Import and Export Trade

Since the outbreak of COVID-19, studies on the impact of COVID-19 on various aspects of the Chinese economy have been conducted. In the first few months of the outbreak, a large number of scholars tried to predict the strength of the impact of COVID-19 on the economy from a theoretical perspective, and some scholars tried to predict COVID-19 using data from the SARS era, but it was not until the first quarter of 2021, one year after the outbreak of COVID-19, the gradual improvement of relevant statistics only gave us the possibility to analyze its impact from COVID-19 data itself. To analyze the impact of this new crown outbreak more accurately on China's import and export trade, in this chapter, we use an empirical approach to study the extent of the impact of COVID-19 on China's import and export trade.

### 1. Analytical Models

The empirical model in this paper uses a standard panel regression model, which is set as follows.

$$Y_{it} = \alpha_0 + \alpha_1 X_{it} + \alpha_2 pgdp_{it} + \alpha_3 lnrd_{it} + \alpha_4 reer_{it} + \beta_{it}$$

where $i$ denotes province, $t$ denotes different months, $Y_{it}$ denotes the growth rate of import and export trade (imeppit), imports of agricultural products (imncppit), export trade of textiles such as masks (extexpit), export trade of masks and medical devices (extexmmpit), import trade of chips (imchipspit), etc. $X_{it}$ denotes the core explanatory variable, i.e., the severity of the Covid-19, which is expressed in this paper as the cumulative number of confirmed cases (10,000) (*ttCovid19*), *pgdp* is GDP per capita, *rd* is expenditure on research and experimental development, reer is the real effective exchange rate of RMB, $\alpha_0$ denotes the intercept constant coefficient vector, and βit denotes the random disturbance term. The logarithm of R&D expenditures is taken to reduce the heteroskedasticity and to make the data series smoother without changing the characteristics of the variables.

To represent the impact of public health events on micro-individuals in each period, this paper selected the cumulative number of patients with COVID-19 at the end of each month from January to December 2020. The cumulative number of patients with newly diagnosed coronary pneumonia at the end of each month in 31 provinces, municipalities, and autonomous regions of China from January to December 2020 was selected as a core explanatory variable to represent the severity and development trend of two public health events. In this paper, the cumulative number of patients with COVID-19 at the end of each month from January to December 2020 was selected as the core explanatory variable to indicate the severity and development trend of the two public health events. During the study, we also tried to collect the number of new cases and deaths in each month as the core explanatory variables. However, due to the discrepancies between these data in various statistical databases and news reports, the accuracy of the data is somewhat biased. Therefore, this paper adopts the cumulative number of confirmed cases as the core explanatory variable. To reflect the impact of public health events on micro-economics, GDP per capita is selected as the control variable and used as the main explanatory variable to reflect the

size of economic development in a specific period. To capture the impact of public health events on micro-economics, GDP per capita is selected as the control variable and used as the main variable to reflect the scale of economic development in each period. The selection is based on the relevant derivation of Krugman's local market effect model.

## 2. Variable Analysis

Table 2 shows the results of descriptive statistics for the variables. When constructing a model using panel data for empirical analysis, it is necessary to ensure the smoothness of the data in order to avoid the phenomenon of "pseudo-regression" when estimating parameters in the subsequent regression process, and thus avoid the deviation of the estimated results from the actual results and affect the accuracy of the model results. In this paper, two methods, the LLC test and the IPS hypothesis, are used to test the smoothness of the data, as shown in Table 3.

**Table 2.** Descriptive Statistics

| Variable | Definition | Samples | Mean | Standard | Minimum | Maximum |
|---|---|---|---|---|---|---|
| imepp | Percentage growth of imports and exports during Covid-19 | 372 | 6.4205 | 38.2333 | -89.2910 | 330.9841 |
| lnimep Covid19 | Total import and export during the Covid-19/million yuan | 372 | 14.7292 | 1.9935 | 8.0054 | 18.1457 |
| ttCovid19 | Number of confirmed Covid-19 cases per 10,000 people | 372 | 0.2512 | 1.1449 | 0.0001 | 6.8149 |
| pgdp | GDP per capita / million yuan | 372 | 0.5918 | 0.2886 | 0.2008 | 1.8111 |
| lnrd | RMB Real Effective Exchange Rate | 372 | 12.5159 | 1.5012 | 7.91451 | 14.8560 |
| reer | R&D expenditure / million yuan | 372 | 116.9992 | 1.4941 | 114.9800 | 119.7300 |

**Table 3.** Stability Check

| | LLC test statistic | IPS test statistic |
|---|---|---|
| imepp | -19.2459*** | -14.3933*** |
| lnimepCovid19 | -3.2762*** | -3.2684*** |
| ttCovid19 | -3.7e+02*** | -2.4e+02*** |
| pgdp | -9.7309*** | -2.4980*** |
| lnrd | -9.1003*** | -3.4680*** |

## 3. Empirical Analysis

Before conducting the empirical analysis, the random effects model, the mixed effects model and the fixed effects model will be selected. The methods adopted in this paper are Hausman test, BP test and F test, in which Hausman test to determine whether to use the random effects model or fixed effects model, BP test to determine the random effect model and mixed-effects model, and the F-test to determine whether the model is a fixed-effects model or a mixed-effects model. The results of the Hausman test and the F-test showed that the fixed-effects model was supported, so the fixed-effects model was used in this paper. Therefore, the fixed-effects model was used to analyze the impact of import and export of COVID-19, and the results of the analysis are shown in the following table.

The empirical results showed that when the control variables were added to the model for regression on a case-by-case basis, the coefficient of the core explanatory variable COVID-19 confirmed number was always positive at 1% significance, and the addition of the control variables did not weaken the explanatory strength of the core explanatory variables with the significance of the other control variables. Therefore, the paper continues to select model 7 after the test by test, and adds all three control variables into the model to obtain the most comprehensive analysis results. The specific analysis of model 7 is as follows.

After the occurrence of COVID-19, the growth rate of import and export trade does not suffer a negative impact for each additional 10,000 patients diagnosed with COVID-19, and the growth rate perspective shows that the import and export trade become gradually better. Combined with the analysis of import and export trade data of provinces, cities, and autonomous regions in the process review chapter, the conclusion is also consistent with the development trend of import and export trade within the year, i.e., although there is a certain degree of decline in the early stage, the upward momentum is strong in the later stage, and the overall upward trend remains good. Combined with the research in the chapter on path analysis, the reason why the COVID-19 epidemic did not have a negative impact on import and export trade mainly stems from the fact that the micro-level impact was effectively neutralized by meso- and macro-level measures. Specifically, when a major public health event occurred, most micro-level individuals had experienced SARS, so the significance of self-preparedness had been increased; residents' conscious quarantine and active epidemic prevention effectively prevented a larger-scale spread; the enrichment of consumption and investment patterns to a certain extent prevented a more substantial decline in consumption and investment; and the transformation and changes in the meso-level industries using modern information technology not only effectively support the production of epidemic prevention materials, but also for enterprises to avoid certain business risks. At the national level, although COVID-19 was rampant, a mature emergency response system was established after the SARS epidemic, and the rapid response and the linkage of various departments worked with maximum efficiency, and the timely and sound economic support measures in the middle and late stages of the epidemic were also fruitful. The development of the import/export trade was excellent.

As for the control variables, the relationship between GDP per capita and import/export growth rate is significantly negative at the 1% confidence level, probably due to the outbreak of COVID-19 which led to the isolation of consumers at home, the longer shutdown of various industries, and the concern about the uncertainty of the future economic situation; the propensity to consume was severely suppressed later. The significant positive correlation between expenditure on research and experimental development and total import and export trade at the 1% confidence level is sufficient to reflect the central driving role of science and technology development in foreign trade, which is an important factor in promoting a country's foreign trade development. Finally, the empirical results show that the real effective exchange rate of RMB and the growth rate of import and export

trade are also highly significant and positively correlated at the 1% confidence level, which is also consistent with the economic theory of the relationship between exchange rate and import and export trade. Overall, the model demonstrates well the real impact of the SARS epidemic on import and export trade while adhering to the basic economic theory.

**Table 4.** Stability Check

| VARIABLES | m1<br>imepp | m2<br>imepp | m3<br>imepp | m4<br>imepp | m5<br>imepp | m6<br>imepp | m7<br>imepp |
|---|---|---|---|---|---|---|---|
| ttCovid19 | 4.3805***<br>(0.9195) | 5.5437***<br>(0.6980) | 4.8271***<br>(0.3888) | 4.8700***<br>(0.9141) | 5.0326***<br>(0.8755) | 3.9991***<br>(0.5172) | 5.8251***<br>(0.9288) |
| pgdp | 20.5384<br>(13.7054) | | | 12.2435<br>(12.1192) | -4.2036<br>(13.8474) | | -45.9229***<br>(14.7628) |
| lnrd | | 30.4291*<br>(15.7364) | | 26.0744*<br>(14.5388) | | 48.4239**<br>(18.0044) | 72.9228***<br>(19.2793) |
| reer | | | 3.2152***<br>(0.7694) | | 3.3449***<br>(0.8010) | 4.0232***<br>(0.9208) | 5.8488***<br>(1.1081) |
| Constant | -6.9093<br>(7.9131) | -375.8198*<br>(196.8871) | -370.9688***<br>(89.9792) | -328.3932*<br>(183.1411) | -383.7061***<br>(91.2940) | -1,071.3658***<br>(304.2606) | -1,564.8664***<br>(339.0117) |
| Observations | 372 | 372 | 372 | 372 | 372 | 372 | 372 |
| Number of provi | 31 | 31 | 31 | 31 | 31 | 31 | 31 |

Note: *** indicates significant at 1% confidence level, ** indicates significant at 5% confidence level,* is 10% and is applied to the regression results below.

## V. Conclusion

Based on the trade data between Korea and China since 2000, this paper studies the impact of the establishment of Korea-China FTA on the trade between the two countries, and deeply analyzes the trade effects of the changes in China's internal and external economic and trade environment under the global spread of COVID-19, reveals the impact of the global spread of the epidemic on the import and export of Chinese epidemic prevention products and the global industrial chain, and draws the following main conclusions.

First, the trade effects of profound changes in China's internal and external economic and trade environment under the global spread of the epidemic are: first, the global spread of the epidemic has caused China's provinces to suffer from both domestic and foreign shutdowns, resulting in a foreign trade cliff effect in the short to medium term; second, China no longer has the trade creation effect inspired by the international institutional dividend in 2020, and the market space for goods trade is diminishing at the margin.

The import demand and export supply of China's epidemic prevention products have increased significantly due to the global spread of the epidemic; the products with high import demand from 2020 onwards are mainly α-interferon, ECMO equipment, virus detection kits, methylprednisolone, ultrasonic CT, etc.; the epidemic prevention products with high export demand from 2020 onwards are mainly medical masks, disposable caps, medical gloves (made of plastic), ultrasonic CT, etc. plastic material), ultrasonic CT, medical goggles, protective

clothing, etc. In view of the increasing uncertainty of the spread of the epidemic, China needs to actively explore new international trade growth points. The global spread of the epidemic is expected to increase.

Third, the global spread of the epidemic has had a serious impact on the global industrial chain of many industries in the short to medium term. Among them, the electronic information industry and the upstream supply shortage pressure on the automobile manufacturing industry, and the downstream demand shortage pressure on the energy industry and the electronic information industry. China's trade in intermediate and capital goods with the U.S., EU, Japan and Korea has been adversely affected by the global spread of the epidemic. China's upstream enterprises have suffered from the adverse impact of insufficient downstream demand from major trading partners and the inability to produce products out of the market.

Lastly, the results of the empirical analysis show that the impact of COVID-19 on the growth rate of import and export trade is significantly and positively correlated. To further highlight the excellent performance of China's import and export trade under COVID-19, this paper takes SARS, which has a smaller impact, as a comparison. The results show that SARS, which has a smaller impact, has a negative impact on import and export trade, which is diametrically opposite to the foreign trade situation under COVID-19, and also affirms the development of China's import and export trade under COVID-19. The analysis results also indicate that this analysis results also show that this type of event does play a good role in promoting China's import and export, which strongly argues the empirical results that COVID-19 has less impact on import and export trade.

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# Impacts of CEO Incentives and Power on Employee Wages

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**ABSTRACT**

**Purpose –** This study investigates the impact of CEO incentive compensation and power on employee wages. While CEO compensation negatively affects employee wages, powerful CEOs may care for employees, and their compensation can have positive impacts on employee wages.

**Design/Methodology/Approach –** Using data from US capital markets during 1992 – 2017, we employ pay-performance sensitivity to measure incentive compensation and CEO pay slices to proxy CEO power. We also examined the potential interaction effects between CEO compensation and CEO power. We conduct a Heckman two-step analysis to address potential sample bias and two-stage regression to address potential endogeneity.

**Findings –** While incentive compensation negatively affects employee wages, CEO power positively affects employee wages. When examining the interaction effect between incentive compensation and CEO power, we note that the incentive effect is negative on employee wages only when the CEO is less powerful. However, when the CEO is more powerful, the incentive effect is positive on employee wages.

**Research Implications –** When firms grant incentive compensation to CEOs for firm performance, they must also consider CEO power. Our results imply that CEO incentive compensation has a positive impact on employee wages when a CEO becomes more powerful. More incentive compensation to less-powerful CEOs could suppress employee wages and hurt firm performance in the long run.

***Keywords:*** agency conflicts, CEO incentive compensation, CEO pay slice, employee wages, pay-performance sensitivity

***JEL Classifications:*** G30, J31, J33

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## I. Introduction

Corporate executives are hired to work hard for shareholders' best interests However, their interests can readily deviate from those of shareholders in pursuit of their own benefits. (Jensen & Meckling, 1976). Supporting optimal contracting theory, financial economists suggest that chief executive officer (CEO) incentive compensation helps executive interests align with those of shareholders because hard-working CEOs create firm value and increase their compensation (Jensen & Murphy, 1990; Murphy, 1999). If labor markets for managers are efficient, managers' performance increases because performance determines their compensation (Fama, 1980). Murphy (1999) shows that CEO incentive compensation has significantly increased since Jensen and Murphy (1990) found that it was not strong enough to motivate managers.

However, incentive compensation may worsen agency conflicts by increasing CEO power (Bebchuk & Fried, 2003). The increase in CEO incentive compensation also raises concerns about another conflict, as managers might abuse the incentive compensation by eroding the interests of other stakeholders (Sappington & Stiglitz, 1987), supporting the rent-extracting theory. Graefe-Anderson et al. (2018) show that average employee wages decrease in CEO incentive compensation, as measured by pay-performance sensitivities (PPS).

Another stream in the literature of executive compensation examines CEO power or dominance proxied by CEO pay slice (CPS) and its impact on firm performance (Bebchuk et al., 2011). CPS is defined as the proportion of CEO compensation over aggregate compensation for the top five executives, including the CEO. They found that CPS is negatively related to firm performance, as measured by Tobin's q and stock returns. However, they did not draw implications regarding the impact of CPS on employee wages.

Collecting data from the Center for Research in Security Prices (CRSP), Compustat, and Execucomp databases for the period 1992-2017, we examine the impact of incentive compensation and CEO power on average employee wages. Furthermore, we analyze the association between employee wages and control factors such as leverage ratio, market-to-book ratio, firm size, and physical capital intensity. We show that incentive compensation, measured by PPS, is negatively related to employee wages, as reported by Graefe-Anderson et al. (2018). However, CEO power proxied by CPS significantly affects this association, as we find significant interaction effects between PPS and CPS. While the impact of PPS on employee wages is negative when CPS is low, it becomes positive when CPS is high. It appears that managers with high CPS care more for their employees than those with low CPS. Conducting the Heckman two-step analysis to address potential sample bias, we find that the findings prevail over the small sample size on labor expenses. Subsequent analysis with a two-stage regression confirms that our findings are consistent addressing endogeneity concerns.

Further analysis shows that our results differ from those of Graefe-Anderson et al. (2018). We find that equity-based compensation (EBC) has a negative impact on employee wages in technology firms than in non-technology firms and that EBC has more negative impacts on those in financially safe firms than in financially distressed firms.

This study contributes to the literature in three ways. First, we examine the association between CEO incentive compensation and employee wages in the presence of CEO power, proxied by CPS. We show that while incentive compensation has a negative impact on employee wages only when CEO power is not strong, it has a positive impact when CEO power is strong. The pattern remains the same for technology and financially safe firms.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and develops the hypotheses. Section 3 describes our data and the models designed to test our hypotheses and robustness. Section 4 presents the empirical results of multiple regressions. Finally, Section 5 concludes.

## II. Literature Review and Hypotheses

### 1. Agency Conflicts and CEO Incentive Compensation

Agency conflicts between shareholders and managers are inherent in corporations because ownership is separated from control. Jensen and Meckling (1976) argue that while managers are supposed to work for the best interests of shareholders, they have incentives to seek their own benefits and destroy shareholders' interests. Jensen (1986) finds that agency conflicts are more severe for firms that accumulate large cash flows. Because firm size is positively related to compensation, managers want to scale up firm size to increase their compensation (Murphy, 1985). To reduce agency costs, shareholders offer EBC, which allows managers to align their interests with those of the shareholders. However, Jensen and Murphy (1990) state that CEO incentives are weak. They find that median CEO compensation increases by only $3.25 when firm value increases $1,000. They appear to stimulate the EBC. Kaplan (2012) shows that EBC increased significantly in the 1990s and decreased in the 2000s, supporting optimal contracting theory.

However, Bebchuk and Fried (2003) raise concerns on managerial power in setting up CEO compensation packages, resulting in worse agency conflicts. They suggest the rent-extracting theory, in which managers can extract lucrative compensation above what they deserve. Stiglitz (2012) also argues that managers in power receive extra compensation not from creating firm value but from inappropriately redirecting income to themselves.

The literature on CEO compensation reports mixed results regarding the relationship between managers' equity ownership and firm value. Morck et al. (1988) study the relationship between fractional stock ownership by managers and Tobin's Q. They show that Tobin's Q rises when the fraction stays between 0% and 5% and is also higher than 25%, while it declines when the fraction stays between 5% and 25%. Hermalin and Weisbach (1991) examine managers' tenure relative to fractional stock ownership and report similar findings. On the contrary, Lorderer and Martin (1997) report that firm performance is not positively related to stock ownership granted to managers. This implies that managers with a large fractional stock ownership may engage in wasting firm value. EBC is measured by pay-performance sensitivity (PPS), as suggested by Core and Guay (2002). PPS is defined as "Dollar change in the CEO's wealth associated with a 1% change in the firm's stock price".

### 2. Studies on Employee Wages Relative to Executives

Bertrand and Mullainathan (2003) study the relationship between managerial power and employee wages. Using plant-level data, they find that white-collar employee wages increase when managers are insulated from potential takeovers. Presenting a theory on managers' alliance with workers, Pagano and Volpin (2005) suggest that when they are allied with employees with significant voting rights, the discipline from the market for corporate control affects managers, who readily pursue negative net present value (NPV) acquisitions for empire-building with losses in shareholder value. To protect their wages, employees align with managers against takeovers. CPS appears to be positively related to employee wages.

Graefe-Anderson et al. (2018) study the impact of EBC on employee wages using two incentive measures: PPS and pay-volatility sensitivity (PVS). They show evidence that average employee wages decrease or are suppressed as CEO incentive compensation, measured by PPS, rises. However, they do not find evidence that employee wages are related to PVS. Furthermore, they find that employee wages are lower in technology firms than in non-technology firms and in financially healthy firms less than in financially distressed firms as CEO incentives rise. We focus on PPS and do not consider PVS in this study because of its insignificance to wages.

### 3. CEO Power by CEO Pay Slice

Bebchuk et al. (2011) suggest the CEO pay slice (CPS) as a proxy for a firm's CEO power. CPS is defined as the ratio of CEO compensation to total compensation of the top five executives, including the CEO. A CEO with a higher CPS is considered more powerful in operating the firm. Bebchuk et al. (2011) find evidence that CPS is negatively related to firm value, as measured by Tobin's Q. They also show that higher CPS is related to lower accounting profitability and lower stock returns and support the hypothesis that agency problems are prevalent with higher CPS.

Subsequently, Chintrakarn et al. (2014) report that lower CPS is related to CEO with more risk aversion, leading CEO to less risky investment decisions, whereas CEO with high CPS exhibit less risk aversion and lead to more risky investment strategies. More recently, Ning (2020) finds that more powerful CEOs tend to take on more debt in their firms. Anginer et al. (2020) argue that the CEO pay ratio, measured by CEO pay divided by the median employee wage, may be more informative than CPS in measuring CEO power. We focus on the CPS for CEO power as a commonly accepted measure.

Building on the findings of Graefe-Anderson et al. (2018), we study the impact of incentive compensation on employee wages in consideration of CPS and examine whether there are significant interaction effects between incentive compensation and CPS on wages. Therefore, we propose Hypothesis 1:

**H1:** While CEO incentive compensation, measured by PPS, is negatively related to employee wages, CEO power, measured by CPS, changes the impact of PPS on employee wages.

Chemmanur et al. (2013) study the relationship between leverage and employee pay, and report that leverage positively affects employee compensation. Capital structure appears to have a significant impact on employee pay. Highly leveraged firms have an increased probability of bankruptcy. Employees may demand higher wages to compensate for the higher probability of bankruptcy. More recently, adopting PPS as the main independent variable, Graefe-Anderson et al. (2018) find evidence similar to that of Chemmanur et al. (2013). We also add leverage to the main control variables. We examine whether these relations still hold in the presence of CPS. Therefore, Hypothesis 2 is as follows:

**H2:** Firm leverage positively affects average employee wages in the presence of CPS.

### 4. EBC and Employee Wages Relative to Technology Firms

Chemmanur et al. (2013) also compare the impact of leverage on CEO compensation and employee wages in technology and non-technology firms. They report that leverage has a greater impact on both CEO compensation and employees in non-technology firms than in technology firms. Subsequently, Graefe-Anderson et al. (2018) study the impact of CEO pay on employee wages in two industries separately. They provide evidence that CEOs with high PPS suppress employee pay in non-technology firms more than in technology firms. Therefore, we propose Hypothesis 3:

**H3:** The impact of PPS differs on employee pay between technology and non-technology firms in the presence of CPS.

### 5. EBC and Employee Wages Relative to Financial State

Chemmanur et al. (2013) note that bankruptcy potential is low when firms are in a good state and vice versa. By measuring bankruptcy potential with a Z-score, they divide the data into two groups: financially strong and weak firms. They find that the impact of firm leverage on employee pay is significant in financially strong firms but not in financially weak firms.

The impact of EBC on employee pay can

differ according to the financial state. More recently, Graefe-Anderson et al. (2018) study the relationship between CEO incentives and employee pay in different financial states. They measure bankruptcy probability with financial strength and show that CEO pay has a greater negative impact on employee wages in financially weak firms than in strong firms. We conjecture that the differential impact of CEO pay on employee wages in different financial states changes in the presence of PPS. Therefore, Hypothesis 4 is as follows:

**H4:** The differential impacts of PPS on employee wages in different financial states change in the presence of CPS.

## III. Data and Methodology

### 1. Data

We obtained compensation data for PPS and CPS from the Execucomp database from January 1992 to December 2017. We also collected data on stock returns from the Center for Research in Security Prices (CRSP) database. Noting that the reporting format in Execucomp has changed since 2006, we accommodate these changes in calculating PPS. In addition, we used the Black-Scholes model to compute the option's delta. PPS is measured as the dollar change in the CEO's incentive compensation associated with a 1% change in stock price. For "Treasury constant maturities," we obtained the monthly risk-free rates from historical data supplied by the Federal Reserve website. Following prior literature, we removed the finance and utility industries because they had different operating mechanisms and regulatory restrictions.

As a proxy for CEO power, we adopt the CPS suggested by Bebchuk et al. (2011), who define CPS as the ratio of the total compensation granted to the CEO to granted to the top five executives. Total compensation includes salary, bonus, other annual pay, total values of restricted stock grants and stock option grants in a year, long-term incentive pay, and all other compensation, as reported in Execucomp (item TDC1). When some firms reported executive compensation for more than five executives, we selected the top five executives for compensation.

To preserve consistency among the variables in running regressions, we employed the natural log of the PPS. Removing the missing values in the PPS, we obtained 219,378 executive-years and 35,512 firm-year observations during the sample period. The sample included 2,669 unique firms with non-missing data in our regression models. We rely on COMPUSTAT for data on firm characteristics. We computed the average employee wage from "Staff expense" (XLR) divided by "Number of employees" (EMP) and found that only 309 of 2, 669 firms reported their employee wages. With only 11.5% of the firms reporting their "Staff expenses," we were concerned on sample-selection bias. We conducted a Heckman two-step test to address potential bias concerns.

We add control variables that important to employee wages: firm size, leverage ratio, average sales per employee, market-to-book ratio (MTB), physical capital intensity (PCI), and quit rates. We measure firm size using the natural log of market capitalization, which is the number of common shares outstanding multiplied by the current market prices. Following Leary and Roberts (2010), we compute leverage by the market leverage ratio, which is total debt (DLTT+DLC) divided by the sum of total debt and the market value of equity (CSHO*PRCC_F). The average sales per employee are obtained by dividing sales by the number of employees (SALE/EMP). We define market-to-book ratio as the market value of assets to book value (Coles et al., 2006). We proxy the growth opportunities of firms according to physical capital intensity, which is computed as gross property, plant, and equipment scaled by total assets (PPEGT/AT), as in Chemmanur et al. (2013). We obtain data on quit rates from the Job Openings and Labor Turnover Survey (JOLTS), supplied by the U.S. Bureau of Labor Statistics.

To consider the industry effects in our tests, we recognize firms in different industries by the Standard Industrial Classification (SIC) codes and add industry dummies into regression models.

Table 1 reports descriptive statistics of the sample used in our regression models. Average employee wage, the dependent variable, has a mean of $56,771 and median of $51,887 with a standard deviation at $39,694. CEO pay slice has its mean and median at 0.37 with standard deviation at 0.12. We show that PPS for CEO has a mean of $745,208 and median of $228,840, which are in line with Graefe-Anderson et al. (2018), who show PPS with a mean of $879,276 and a median of $205,999. The differences between our study and theirs might reflect different sample periods.

**Table 1.** Descriptive Statistics of Key Variables

| Variable | N | Mean | Std. Dev. | Min | Q1 | Median | Q3 | Max |
|---|---|---|---|---|---|---|---|---|
| Wage | 2669 | 56,771 | 39,694 | 7,638 | 31,537 | 51,887 | 71,867 | 361,921 |
| CPS | 2669 | 0.37 | 0.1219 | 0 | 0.30 | 0.3682 | 0.44 | 1.00 |
| PPS | 2669 | 745,208 | 2,104,470 | 0 | 92,762 | 228,840 | 629,528 | 38,418,653 |
| Size | 2669 | 21.53 | 1.58 | 18.00 | 20.00 | 21.00 | 23.00 | 25.00 |
| Leverage | 2669 | 0.22 | 0.20 | 0.00 | 0.07 | 0.18 | 0.33 | 0.94 |
| Avgsale | 2669 | 249,700 | 279,706 | 24,870 | 95,220 | 172,900 | 292,700 | 2,145,000 |
| MTB | 2669 | 3.41 | 3.37 | 0.46 | 1.63 | 2.45 | 3.84 | 22.16 |
| PCI | 2669 | 0.75 | 0.41 | 0.02 | 0.38 | 0.76 | 1.07 | 1.70 |

Note: Wage is the average employee wage of a firm. CPS is CEO pay slice; PPS is pay-performance sensitivity for CEO; Size represents the firm size measured by the natural log of the market capitalization; Leverage is the firm market leverage ratio; Avgsale is the average sales per employee; MTB is market-to-book ratio; PCI is the physical capital intensity; and the units of the data on Wage, PPS, and Avgsale are one dollar.

Table 2 presents the sample correlations of the key variables. We observe that almost all the correlations are significant at the 1% level, which suggests that the change in one variable is significantly related to that in another variable. Moreover, Wage and Avgsale (average sales) have a strong relationship with a coefficient of 0.73. The absolute values of the coefficients of the correlations of Avgsale and Size, Size and MTB are both 0.32, which implies that the variables have a moderate degree of correlation. While these correlations might raise concerns on multicollinearity, we do not expect them to change the impact on employee wages. The absolute values of the coefficients of the correlations of the other pairs of variables are below 0.29, indicating a weak relationship between the two.

**Table 2.** Correlations of Key Variables

| | Wage | CPS | PPS | Size | Leverage | Avgsale | MTB | PCI |
|---|---|---|---|---|---|---|---|---|
| Wage | 1 | | | | | | | |
| CPS | -0.01 | 1 | | | | | | |
| PPS | 0.02 | **0.04**$^{*}$ | 1 | | | | | |
| Size | **0.25**$^{***}$ | **0.04**$^{*}$ | **0.44**$^{***}$ | 1 | | | | |
| Leverage | **0.11**$^{***}$ | **0.04**$^{**}$ | **-0.18**$^{***}$ | **-0.07**$^{***}$ | 1 | | | |
| Avgsale | **0.73**$^{***}$ | **-0.05**$^{***}$ | 0.03 | **0.32**$^{***}$ | **0.09**$^{***}$ | 1 | | |
| MTB | **-0.05**$^{**}$ | **0.04**$^{**}$ | **0.16**$^{***}$ | **0.32**$^{***}$ | **-0.22**$^{***}$ | -0.02 | 1 | |
| PCI | **-0.25**$^{***}$ | **0.04**$^{***}$ | -0.02 | -0.01 | **0.07**$^{***}$ | **-0.16**$^{***}$ | **-0.04**$^{**}$ | 1 |

Note: This table shows the Pearson correlations between the key variables. Wage is the natural log of the average employee wages; CPS is CEO pay slice; PPS is the natural log of the total PPS for CEO; Size represents the firm size measured by the natural log of market capitalization; Leverage is the market leverage ratio; Avgsale is the natural log of the average sales per employee; MTB is the market-to-book ratio; PCI is the physical capital intensity. Boldface indicates significance at the 1% level.

## 2. Equity-based Compensation to Executives

Core and Guay (2002) calculate option values based on the Black and Scholes (1973) model for European call options, which is modified by Merton (1973) to add dividends as follows:

$$\text{Option value} = Se^{(-dT)}N(Z) - Xe^{(-rT)}N(Z - \sigma\sqrt{T}), \quad (1)$$

where $Z = ln\left(\frac{S}{X}\right) + T\left(r - d + \frac{\sigma^2}{2}\right)/\sigma\sqrt{T}$, $N$ is the cumulative probability function for the normal distribution, S is the price of the underlying stock, $X$ is the exercise price of the option, $\sigma$ is the volatility of stock returns over the life of the option, $r$ is the risk-free interest rate, $T$ is the time to maturity of the option in years, and $d$ is the expected dividend yield over the life of the option.

Following Core and Guay (2002), we calculate the delta for each executive per year. We add the delta of both exercisable and unexercisable options and the delta of shareholdings for each firm year. Hence, we estimated PPS as follows:

$$\left[\frac{\partial(\text{option value})}{\partial(\text{stock volatility})} + \#\text{shr.own}\right] \times \left(\frac{\text{stock price}}{100}\right) =$$
$$[e^{(-dT)}N(Z) \times \#\text{options} + \#\text{shr.own}] \times \left(\frac{\text{stock price}}{100}\right), \quad (2)$$

where N is a normal distribution function.

## 3. Employee Wages, Capital Structure and Pay-performance Sensitivity

To test Hypotheses 1 and 2, we run an OLS model with year and industry dummy variables.

$$\begin{aligned}\text{Wage}_{i,t} &= \alpha_0 + \alpha_1\text{CPS}_{i,t} + \alpha_2\text{PPS}_{i,t} + \alpha_3\text{CPS}_{i,t}\times\text{PPS}_{i,t} + \alpha_4\text{Size}_{i,t} + \alpha_5\text{Lev}_{i,t} \\ &\quad + \alpha_6\text{Avgsale}_{i,t} + \alpha_7\text{MTB}_{i,t} + \alpha_8\text{PCI}_{i,t} + \alpha_9\text{Quits}_{i,t} + \text{year}_t + \text{ind}_{i,t} + \varepsilon_{i,t}\end{aligned} \quad (3)$$

where $\text{Wage}_{i,t}$ is calculated as the natural log of the average employee wage of firm $i$ in year $t$, CPS is the ratio of the total compensation granted to the CEO to that granted to the top five executives, PPS is the natural log of the total PPS to the top five executives, and CPS×PPS indicates potential interaction effects. Size is the firm size measured by the natural log of market capitalization, Lev is the market leverage ratio, Avgsale is the natural log of average sales per employee, MTB is the market-to-book ratio, and PCI is the physical capital intensity. We add the Quits for quits rate, which is the percentage of an industry's entire employment that quits their job by choice, as a proxy for labor specialization, which is related to lower labor specialization. Chemmanur et al. (2013) show that employee wages are negatively related to quit rates. We included a year dummy variable and an industry dummy variable. For Hypothesis 2, we expect the coefficient of Lev (leverage) $\alpha_4$ to be positive. As Avgsale is used to gauge employee productivity, we expect $\alpha_5$ to be positive. As Berk et al. (2010) fnd evidence that more capital-intensive firms tend to pay employees higher wages, we expect $\alpha_7$ to be positive.

## 4. Heckman Two-Step Analysis

As many firms do not report labor expenses, there can be a potential sample selection bias (Chemmanur et al., 2013). More specifically, if firms with high PPS (or CPS) and high employee wages choose not to report labor expenses, our regression results will be biased and spurious. To overcome this concern, we conduct Heckman's (1979) two-step analysis, which proposes a two-step model to solve for the ordinary specification bias that arises from a missing data problem.

In the first step, our dependent variable, $Pro_{i,t}$ is one if the firm reports data on labor expenses, and zero otherwise. We run the Probit model to examine whether data on employee pay are missing. We also include a dummy variable for firms' exchange listings to reflect the different reporting behaviors of firms in a specific exchange. The first-step model is as follows.

$$\begin{aligned}\text{Pro}_{i,t} &= \alpha_1\text{CPS}_{i,t} + \alpha_2\text{PPS}_{i,t} + \alpha_3\text{CPS}_{i,t}\times\text{PPS}_{i,t} + \alpha_4\text{Size}_{i,t} + \alpha_5\text{Lev}_{i,t} \\ &\quad + \alpha_6\text{Avgsale}_{i,t} + \alpha_7\text{MTB}_{i,t} + \alpha_8\text{PCI}_{i,t} + \text{year}_t + \text{ind}_{i,t} + \text{exchg}_{i,t} + \varepsilon_{i,t}\end{aligned} \quad (4)$$

In the second step, we select only the firms for which the data on employee wage are non-missing and run the OLS regression model to test the impact of PPS on employee wages as follows:

$$\begin{aligned}\text{Wage}_{i,t} &= \beta_0 + \beta_1\text{CPS}_{i,t} + \beta_2\text{PPS}_{i,t} + \beta_3\text{CPS}_{i,t}\times\text{PPS}_{i,t} + \beta_2\text{Size}_{i,t} + \beta_3\text{Lev}_{i,t} \\ &\quad + \beta_4\text{Avgsale}_{i,t} + \beta_5\text{MTB}_{i,t} + \beta_6\text{PCI}_{i,t} + \beta_7\text{Imr}_{i,t} + \text{year}_t + \text{ind}_{i,t} + \varepsilon_{i,t},\end{aligned} \quad (5)$$

where Imr is the inverse Mill ratio generated in the first step. Heckman (1979) and Tobin (1958) proposed that the inverse Mill's ratio could render the parameters derived from the regression model unbiased.

## 5. Employee Wages in Technology Firms versus Non-Technology Firms

In testing Hypothesis 3, we study the impact of PPS on employee wages in different industries. Using SIC codes, we divided our data into two groups: technology and non-technology firms.[1] We then run the regression for the technology and non-technology firms separately.

$$\begin{aligned}\text{Wage}_{i,t} &= \gamma_0 + \gamma_1\text{CPS} + \gamma_2\text{PPS}_{i,t} + \gamma_3\text{CPS}\times\text{PPS} + \gamma_4\text{Size}_{i,t} + \gamma_5\text{Lev}_{i,t} \\ &+\gamma_6\text{Avgsale}_{i,t} + \gamma_7\text{MTB}_{i,t} + \gamma_8\text{PCI}_{i,t} + \text{year}_t + \text{ind}_{i,t} + \varepsilon_{i,t}. \end{aligned} \quad (6)$$

To examine whether the PPS coefficients are statistically different between technology and non-technology firms, we conduct a Wald test.

## 6. Employee Wages during Different Financial States

For Hypothesis 4, we divide the sample into two financial states based on bankruptcy probability. To measure the probability of bankruptcy, we follow the method of Coles et al. (2006) and Chemmanur et al. (2013), based on the method of Altman (1968). They calculate the Z-score as

$$\text{Z}-\text{score} = 1.2T_1 + 1.4T_2 + 3.3T_3 + 0.6T_4 + T_5, \quad (7)$$

where $T_1$ is the working capital/total assets, $T_2$ is the retained earnings/total assets, $T_3$ is the earnings before interest and taxes/total assets, $T_4$ is the market value of equity/book value of total liabilities, and $T_5$ is the sales/total assets.

Based on the Z-score, we divided the sample into financially safe and distressed firms. Chemmanur et al. (2013) define firms with Z-scores above or equal to 2.99 to as financially safe firms, and those with Z-scores below or equal to 1.8 to as financially distressed firms. We run the regression in Eq.(6), for financially safe and distressed firms, respectively. We conduct a Wald test to examine whether the coefficients of PPS and CPS in one group are significantly different from those in the other group.

## 7. Robustness Tests

To address endogeneity concerns and alternative variable measures, we conduct robustness tests. As noted earlier, the leverage ratios reflect a firm's investment opportunities. In other words, a firm's leverage ratio increases with investment. Harris and Raviv (1991) and Parsons and Titman (2009) suggest that if a firm has high leverage, it implies that it has a large amount of investment or tangible assets to manage. To ensure that investments or assets operate well, firms need to pay high wages to employees. Therefore, the positive relationship between employee wages and leverage creates potential endogeneity concerns. To address this concern, we conduct a two-stage least squares (2SLS) regression following Wooldridge (2002).

In the first stage, we introduce an instrumental variable related to leverage but not employee wages. As the tax benefit of debt is positively related to a firm's marginal tax rate, there is also a positive relationship between the marginal tax rate and a firm's leverage ratio (Leary & Roberts, 2010). We could not find any literature suggesting a direct relationship between the marginal tax rate and average employee wages. Following Givoly et al. (1992) and Chemmanur et al. (2013), we use $\text{MTR}_{i,t}$ (marginal tax rates) based on income before interest expenses as the instrumental variable because it meets the requirements addressed above.

Following Chemmanur et al. (2013), we add

1. Following Chemmanur et al. (2013), technology firms are those with primary SIC codes: 3570, 3571, 3572, 3576, 3577, 3661, 3674, 4812, 4813, 5045, 5961, 7370, 7372 and 7373. Non-technology firms include those firms with SIC codes less than 4000 and are not included as technology firms.

the variable $(EBIT/AT)_{i,t}$ as a proxy for a firm's efficiency in generating profits from its assets. We also include $STD(EBIT/AT)_{i,t}$ to measure the volatility of a firm's efficiency in generating return from assets. The model in the first step is as follows:

$$\begin{aligned}\text{Lev}_{i,t} &= \theta_0 + \theta_1\text{MTR}_{i,t} + \theta_2\text{CPS}_{i,t} + \theta_3\text{PPS}_{i,t} + \theta_4\text{Size}_{i,t} + \theta_5\text{Avgsale}_{i,t} + \theta_6\text{MTB}_{i,t} \\ &+ \theta_7\text{PCI}_{i,t} + \theta_8\left(\text{EBIT/AT}\right)_{i,t} + \theta_9\text{STD}\left(\text{EBIT/AT}\right)_{i,t} + \text{year}_t + \text{ind}_{i,t} + \varepsilon_{i,t},\end{aligned} \tag{8}$$

In the first step, we obtain the fitted value of the leverage ratio and used it as an independent variable in the second step. The model for the second step is as follows:

$$\begin{aligned}\text{Wage}_{i,t} &= \alpha_0 + \alpha_1\text{CPS}_{i,t} + \alpha_2\text{PPS}_{i,t} + \alpha_3\text{CPS}_{i,t} \times \text{PPS}_{i,t} + \alpha_4\text{Size}_{i,t} \\ &+ \alpha_5\text{Lev}_{i,t} + \alpha_6\text{Avgsale}_{i,t} + \alpha_7\text{MTB}_{i,t} + \alpha_8\text{PCI}_{i,t} + \alpha_9\left(\text{EBIT/AT}\right)_{i,t} \\ &+ \alpha_{10}\text{STD}\left(\text{EBIT/AT}\right)_{i,t} + \text{year}_t + \text{ind}_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{9}$$

# IV. Results

## 1. Summary of Compensation to Executives and Employees

We examine income disparity during the following three sub-periods: 1992-2000, 2001-2007, and 2008-2017. Table 3 reports the average employee wages, total operating expenses, and ratio of average employee wages to annual operating expenses. We observe that employee wages decreased from $58,347 in Period 1 to $54,731 in Period 2 and increase to $71,161 in Period 3. The ratio of employee wages to operating expenses declined over the three periods from 0.58 to 0.33. Employee wages account for a very high portion of operating expenses.

**Table 3.** Executive Compensation and Employee Wages

| Compensation | Period 1 (1992-2000) | Period 2 (2001-2007) | Period 3 (2008-2017) |
|---|---|---|---|
| Staff Expenses | 1,925,181,351 | 2,208,144,646 | 2,029,027,891 |
| Operating Expenses | 3,313,323,933 | 4,583,042,627 | 6,066,920,769 |
| Ratio of Staff Expenses to Operating Expenses | 0.58 | 0.48 | 0.33 |
| TDC1 | 3,968,010 | 5,244,069 | 5,943,852 |
| PPS | 1,408,134 | 1,271,301 | 759,834 |
| CPS | 0.43 | 0.44 | 0.32 |
| Average Employee Wage | 58,347 | 54,731 | 71,161 |

Note: This table shows the average annual compensation to the CEO and the average annual employee wages, as well as the average annual staff expenses and operating expenses during the three time periods. TDC1 is the total compensation, which comprises salary, bonus, other annual, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other totals.

## 2. Analysis on Employee Wages

As Kong (2017) suggests that a high CEO Pay Slice (CPS) could have a negative impact on firm performance by demotivating employees and destroying team cooperation, we investigated the implications related to employee wages. Table 4 shows the relationship between employee and CEO compensation, as in Graefe-Anderson et al. (2018). The five columns show the relationship between employee wages and CEO PPS, along with the control variables. The significantly negative coefficients of PPS indicate the negative impact of CEO PPS on employee wages, consistent with Graefe-Anderson et al. (2018).

**Table 4.** Regressions on Employee Wages with CPS and PPS

| Wage | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| CPS | 0.1473** (0.0212) | 0.1540** (0.0159) | 0.1292*** (0.0009) | 0.1357** (0.0321) | 0.2149** (0.0165) |
| PPS | -0.0206*** (0.0012) | -0.0211*** (0.0009) | -0.0209*** (<.0001) | -0.0214*** (0.0007) | -0.0185** 00255 |
| Size | 0.0336*** (<.0001) | 0.0389*** (<.0001) | 0.2079*** (<.0001) | 0.0360*** (<.0001) | 0.0261*** (0.0027) |
| Leverage | 0.2267*** (<.0001) | 0.2079*** (<.0001) | 0.4591*** (<.0001) | 0.1985*** (<.0001) | 0.2250*** (<.0001) |
| Avgsale | 0.4600*** (<.0001) | 0.4591*** (<.0001) | 0.4748*** (0.0016) | 0.4738*** (<.0001) | 0.5102*** (<.0001) |
| MTB | | -0.0075*** (0.0016) | | -0.0070*** (0.0028) | -0.0084*** (0.0055) |
| PCI | | | 0.1728*** (<.0001) | 0.1707*** (<.0001) | 0.1929*** (<.0001) |
| Quits | | | | 0.1357** | 0.1808*** (<.0001) |
| Intercept | 4.1725*** (<.0001) | 4.1127*** (<.0001) | 0.1540** (0.0159) | 3.8062*** (<.0001) | 2.6415*** (<.0001) |
| Year Dummy | Yes | Yes | Yes | Yes | Yes |
| IndustryDummy | Yes | Yes | Yes | Yes | Yes |
| Obs. | 2,669 | 2,669 | 2,669 | 2,669 | 1,724 |
| Adj. $R^2$ | 0.7743 | 0.7749 | 0.7777 | 0.7782 | 0.7835 |

Note: This table reports the coefficients and standard errors of the regressions in the OLS regression model on employee wages with the CPS and PPS. The dependent variable is employee wage. The numbers in parentheses are standard errors. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4 also shows that all the coefficients in CPS are significantly positive at the 5% level. Using the summary statistics in Table 1, we compute the incremental change in employee wages relative to the change in CPS. With a median CPS of 0.3682, CPS becomes 0.4901 when it increases by one standard deviation at 0.1219. Taking the coefficient of CPS as 0.2149 in Column 5, we find that the natural log of average employee wage increases by 0.0262 (= 0.2149 × 0.1219). With the median employee wage at $51,887 in Table 1, we find that the natural log of average employee

**Table 5.** Regressions with Interaction Effects of CPS and PPS on Employee Wages

| Wage | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| CPS | -1.0007** | -0.7991 | -1.0032** | -0.8040 | -0.8125 |
| | (0.0471) | (0.1103) | (0.0462) | (0.1076) | (0.2509) |
| PPS | -0.0510*** | -0.0455*** | -0.0517*** | -0.0462*** | -0.0467** |
| | (0.0005) | (0.0018) | (0.0004) | (0.0015) | (0026) |
| CPS * PPS | 0.0903** | 0.0731* | 0.0910** | 0.0740* | 0.0808 |
| | (0.0217) | (0.0615) | (0.0204) | (-0.058) | (0.1434) |
| Size | 0.0333*** | 0.0307*** | 0.0387*** | 0.0358*** | 0.0258*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (0.0030) |
| Leverage | 0.2256*** | 0.2154*** | 0.2066*** | 0.1977*** | 0.2244*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Avgsale | 0.4615*** | 0.4757*** | 0.4606*** | 0.4747*** | 0.5110*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| MTB | | | -0.0075*** | -0.0071*** | -0.0083*** |
| | | | (0.0015) | (0.0026) | (0.0060) |
| PCI | | 0.1697*** | | 0.1676*** | 0.1867*** |
| | | (<.0001) | | (<.0001) | (<.0001) |
| Quits | | | | | 0.1798*** |
| | | | | | (<.0001) |
| Intercept | 4.5746*** | 4.1895*** | 4.5177*** | 4.1409*** | 3.0333*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Year Dummy | Yes | Yes | Yes | Yes | Yes |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes |
| Obs. | 2,669 | 2,669 | 2,669 | 2,669 | 1,724 |
| Adj. $R^2$ | 0.7743 | 0.7749 | 0.7777 | 0.7782 | 0.7835 |

Note: This table reports the coefficients and standard errors of the regressions in the OLS regression model on employee wages, with the interaction effect of CPS and PPS. The dependent variable is employee wage. The numbers in parentheses are standard errors.

wages increases from 10.8568 to 10.8830. When it is converted to dollar terms, the average employee wages increase by $1,376 from $51,887 to $53,263 when CPS increases by one standard deviation. It appears that CEOs care for employee wages as they become more powerful in terms of CPS.

Positive coefficients in the leverage ratios show that higher leverage ratios lead to higher employee wages, confirming Hypothesis 2, as in Chemmanur et al. (2013) and Graefe-Anderson et al. (2018). Regarding the other control variables, all the coefficients of firm size, average sales per employee, and PCI are significantly positive, implying a positive impact on employee wages. This suggests that firms with a larger size, higher leverage ratio, higher average sales, and higher physical capital intensity pay more to employees. These findings are consistent with those reported by Chemmanur et al. (2013) and Graefe-Anderson et al. (2018). The market-to-book ratio has a significantly negative relationship with employee wage. As MTB is one of the signals showing managers' ability to create wealth for shareholders, a higher MTB indicates better executive performance. However, the coefficients of MTB are significantly negative in Columns (2), (4), and (5). When a firm has a higher MTB, it appears that it is more likely to suppress employee wages.

Table 5 adds the interaction terms between PPS and CPS in Table 4, along with the control variables. The PPS coefficients remain negative in all five columns, as shown in Table 4.

While the coefficients on CPS change their signs to negative, only two coefficients in Columns 1 and 3 are significant at the 5% level. The interaction terms (CPS*PPS) are positive, but significant at the 5% level in Columns 1 and 3.

To illustrate the interaction effect between PPS and CPS, we focus on the significant coefficients in Column 3, as follows:

$$\begin{aligned}\text{Wage} = {} & 4.5177 - 1.0032 \times \text{CPS} - 0.0517 \times \text{PPS} + 0.091 \times \text{CPS} \times \text{PPS} \\ & + 0.0387 \times \textit{Size} + 0.0266 \times \text{Lev} + 0.4606 \times \text{Avgsales} - 0.0075 \times \text{MTB}\end{aligned} \tag{10}$$

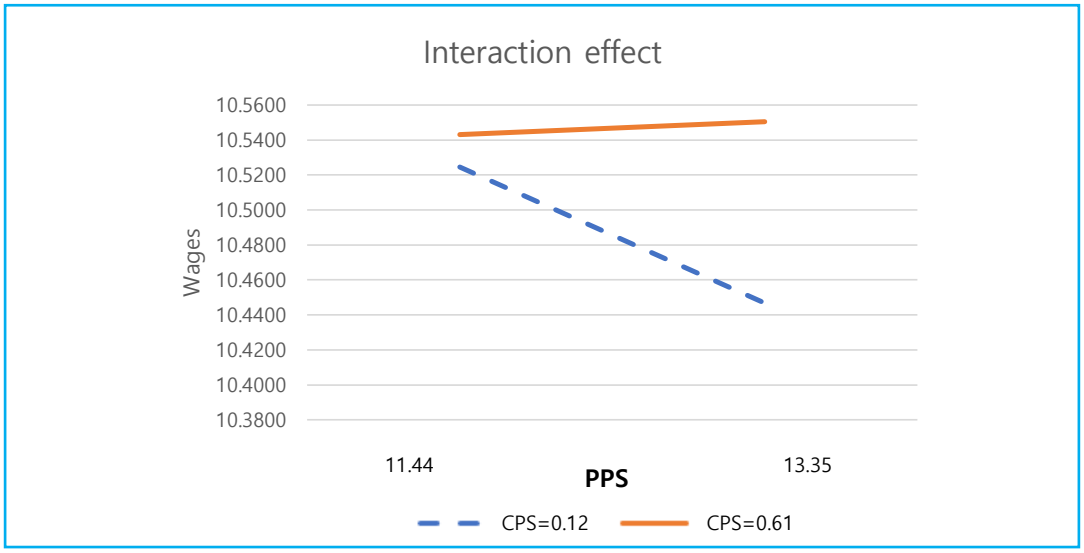
We consider two standard deviations above and below the mean value of CPS from the descriptive statistics as 0.61 and 0.12, showing the high and low values of CPS. As the standard deviation of PPS is greater than its mean, we take on values in the first and third quartile as 11.44 and 13.35. Plugging in those parameter values to Eq.(10), we compute wages as shown in Table 6.

**Table 6.** Interaction Effects between PPS and CPS on Employee Wages

| | | CPS | |
|---|---|---|---|
| | | 0.12 | 0.61 |
| PPS | 11.44 | 10.5246 | 10.5431 |
| | 13.35 | 10.4467 | 10.5504 |

The visual effects are shown in Fig. 1. When CPS is low (0.12), its impact on employee wages is significantly negative. An increase in PPS from 11.44 to 13.35 results in a decrease in employee wages from 10.5246 to 10.4467. However, when CPS is high, at 0.61, the impact of PPS on employee wages is minimal. An increase in PPS from 11.44 to 13.35 results in a slight increase in employee wages from 10.5431 to 10.5504. When CEOs are not powerful with low CPS, they are more concerned about their own compensation than about employee wages and even suppress employee wages. Conversely, when CEOs are powerful and have high CPS, they are concerned about both their own compensation and employee wages and do not suppress employee wages. Thus, we confirm Hypothesis 1.

**Fig. 1.** Interaction Effects between PPS and CPS on Employee Wages




## 3. Heckman Two-Step Analysis

As some firms do not report staff expenses, there may be a sample selection bias in the implications on employee wages. To address this concern, we perform a Heckman two-step analysis. Panels A and B of Table 7 report the two-step regression results.

As shown in Panel A, the coefficients of PPS and CPS are significantly negative, whereas the coefficients of the product term are significantly positive. Moreover, Firm size, leverage ratio, average sales, and PCI have significantly positive coefficients. These results suggest that firms with a lower CEO Pay Slice, larger firm size, higher leverage ratio, and larger PCI have higher probabilities of reporting lower staff expenses, which is consistent with the findings of Graefe-Anderson et al. (2018).

Panel B shows the results of Step 2. We only use the data on firms that reported staff expenses. The results suggest that CPS has marginally negative coefficients whose absolute values are greater than those in Step 1. The coefficients of the product term, CEO PPS, Firm size, leverage ratio, average sales, MTB, and PCI remain significant and are consistent with the results of Step 1. The negative and significant coefficients of the inverse Mill's ratio suggest that it contributes to making parameters unbiased. Hence, we find that after controlling for sample selection bias, there remain significantly negative relationships between CEO pay slices and employee wages, consistent with the results shown in Table 4.

We are also interested in the interaction effects between PPS and CPS, as shown in Table 5, and construct the OLS model in Eq.(3) to illustrate the impact of PPS on employee wages at different CPS levels.

$$\begin{aligned}\text{Wage} = {} & 5.3951 - 2.6743 \times \text{CPS} - 0.1690 \times \text{PPS} + 0.2613 \times \text{CPS} \times \text{PPS} \\ & + 0.1023 \times \text{Size} + 0.6584 \times \text{Lev} + 1.2281 \times \text{Avgsales} - 0.0292 \times \text{MTB}\end{aligned} \tag{11}$$

Using the parameter values, we create a two-way table as shown in Table 8.

**Table 7.** Heckman Two Step Analysis

**Panel A.** First Step-probit Model of Firms Reporting Data on Employee Wages

| Probit | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| CPS | -0.7102** (0.0491) | -0.6693*** (0.0081) | -0.7162*** (0.0067) | -0.7852*** (0.0012) |
| PPS | -0.2631*** (0.0059) | -0.1029*** (0.0073) | -0.2019*** (0.0027) | -0.1678*** (0.0003) |
| CPS * PPS | 0.4062** (0.0315) | 0.3889** (0.0476) | 0.3009*** (0.0362) | 0.3256*** (0.0484) |
| Size | 0.2516*** (<.0001) | 0.2803*** (<.0001) | 0.1901*** (<.0001) | 0.1020*** (<.0001) |
| Leverage | 0.7723*** (<.0001) | 0.6521*** (<.0001) | 0.8219*** (<.0001) | 0.7912*** (<.0001) |
| Avgsale | 0.8669*** (<.0001) | 0.8792*** (<.0001) | 0.8852*** (<.0001) | 0.9067*** (<.0001) |
| MTB | | | -0.0367***(<.0001) | -0.0287***(<.0001) |
| PCI | | 0.6052*** (<.0001) | | 0.4889***(<.0001) |
| Exchange Dummy | Yes | Yes | Yes | Yes |
| Year Dummy | Yes | Yes | Yes | Yes |
| Industry Dummy | Yes | Yes | Yes | Yes |
| Obs. | 32,019 | 32,019 | 32,019 | 32,019 |

**Panel B.** Second Step-regression of Employee Wages in Firms with Data on Staff Expenses

| Wage | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| CPS | -2.6413* (0.0665) | -2.1944* (0.0879) | -2.6743* (0.0633) | -2.2288* (0.0569) |
| PPS | -0.1631*** (0.0001) | -0.1477*** (0.0005) | -0.1690*** (<.0001) | -0.1535*** (0.0003) |
| CPS * PPS | 0.2547** (0.0238) | 0.2158* (0.0557) | 0.2613** (0.0203) | 0.2226** (0.0484) |
| Size | 0.0796*** (<.0001) | 0.0797*** (<.0001) | 0.1023*** (<.0001) | 0.1020*** (<.0001) |
| Leverage | 0.7373*** (<.0001) | 0.7271*** (<.0001) | 0.6584*** (<.0001) | 0.6497*** (<.0001) |
| Avgsale | 1.2275*** (<.0001) | 1.2843*** (<.0001) | 1.2281*** (<.0001) | 1.2846*** (<.0001) |
| MTB | | | -0.0292***(<.0001) | -0.0287***(<.0001) |
| PCI | | 0.4922*** (<.0001) | | 0.4889***(<.0001) |
| Inverse Mill's ratio | -0.9968** (<.0001) | -1.0009** (<.0001) | -1.0091** (<.0001) | -1.0122** (<.0001) |
| Intercept | 5.0912*** (<.0001) | 5.0023*** (<.0001) | 5.3951*** (<.0001) | 5.1283***(<.0001) |
| Year Dummy | Yes | Yes | Yes | Yes |
| Industry Dummy | Yes | Yes | Yes | Yes |
| Obs. | 2,728 | 2,728 | 2,728 | 2,728 |
| Adj. $R^2$ | 0.7091 | 0.7104 | 0.6891 | 0.7231 |

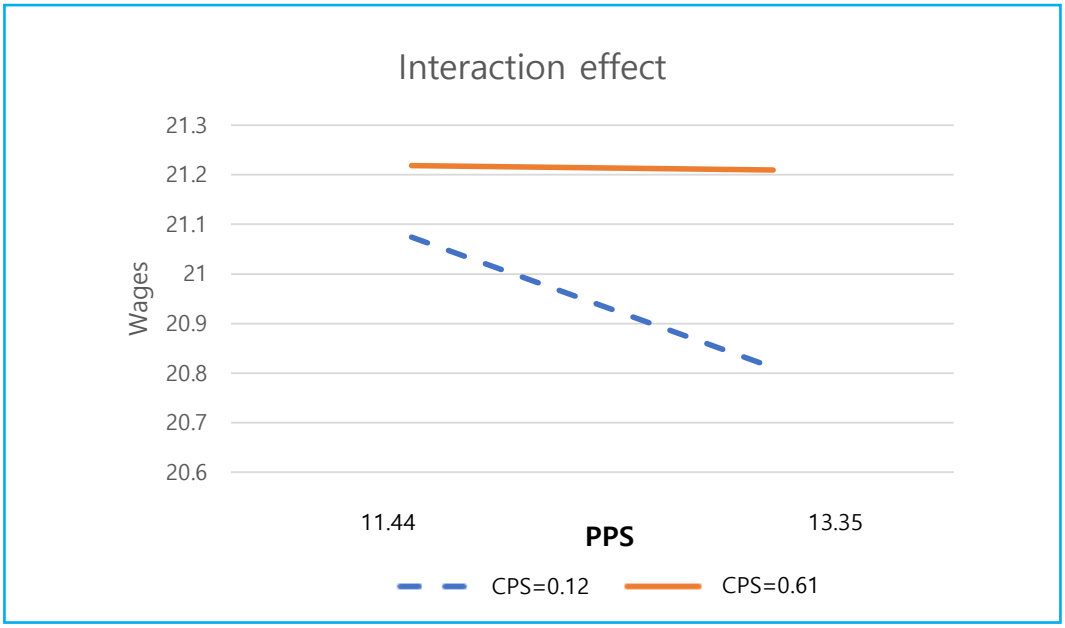
Note: This table reports the coefficients and standard errors obtained from the Heckman two-step analysis model for employee wages. In the first step, we employ a Probit model to determine whether the firm reports data on employee wages. The dependent variable in the first step is denoted as "pro". It is one if the employee wage data are not missing and zero otherwise. In the second step, we ran an OLS regression model for employee wages. The dependent variable in the second step is employee wage. The numbers in parentheses are standard errors.

In Fig. 2, we confirm that the visual effects are similar to those in Fig. 1. When CEOs are less powerful, they tend to suppress employee wages for their own incentives. However, when they are more powerful and have a higher CPS, they do not suppress employee wages for own compensation. In summary, the Heckman two-step analysis shows that the initial analysis does not suffer from sample selection bias, generating consistent results for a small sample of firms reporting staff expenses.

**Table 8.** Heckman-two Steps for Interaction Effects between PPS and CPS on Employee Wages

| | | CPS | |
|---|---|---|---|
| | | 0.12 | 0.61 |
| PPS | 11.44 | 21.0739 | 21.2183 |
| | 13.35 | 20.8110 | 21.2099 |

**Fig. 2.** Heckman-two Steps for Interaction Effects between PPS and CPS on Employee Wages




## 4. Employee Wages in Technology and Non-Technology Firms

Table 9 reports the results of OLS regression in technology and non-technology firms. Examining both groups, we find that the coefficients of PPS in technology firms are negative, while they are not significant in non-technology firms.

**Table 9.** OLS Regressions in Technology and Non-technology Firms

| Variables<br>Wage | Tech<br>(1) | Non-Tech<br>(1) | Tech<br>(2) | Non-Tech<br>(2) | Tech<br>(3) | Non-Tech<br>(3) | Tech<br>(4) | Non-Tech<br>(4) |
|---|---|---|---|---|---|---|---|---|
| CPS | -1.3546*** | 0.7072 | -1.3418*** | 0.6782 | -0.9856** | 0.9998 | -0.9810** | 0.9709 |
| | (0.0058) | (0.5918) | (0.0061) | (0.6075) | (0.0371) | (0.4499) | (0.0376) | (0.4635) |
| PPS | -0.0544*** | -0.0455 | -0.0541*** | -0.0475 | -0.0445*** | -0.0425 | -0.0443*** | -0.0446 |
| | (0.0002) | (0.2041) | (0.0002) | (0.1863) | (0.0017) | (0.2347) | (0.0017) | (0.2139) |
| CPS*PPS | 0.1120*** | -0.0208 | 0.1112*** | -0.0175 | 0.0800** | -0.0422 | 0.0798** | -0.0389 |
| | (0.0034) | (0.8438) | (0.0036) | (0.8684) | (0.0302) | (0.6891) | (0.0302) | (0.7128) |
| Size | 0.0238*** | 0.0564*** | 0.0301*** | 0.0586*** | 0.0176*** | 0.0529*** | 0.0227*** | 0.0551*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (0.0023) | (0.0003) | (0.0002) | (0.0002) |
| Leverage | 0.1505*** | 0.5699*** | 0.1337*** | 0.5524*** | 0.0858** | 0.5297*** | 0.0733* | 0.5110*** |
| | (0.0002) | (<.0001) | (0.0010) | (<.0001) | (0.0284) | (<.0001) | (0.0620) | (<.0001) |
| Avgsale | 0.4684*** | 0.4086*** | 04654*** | 0.4116*** | 0.5035*** | 0.4126*** | 0.5005*** | 0.4158*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| MTB | | | -0.0089*** | -0.0037 | | | -0.0071*** | -0.0039 |
| | | | (0.0004) | (0.4994) | | | (0.0034) | (0.4763) |
| PCI | | | | | 0.3246*** | -0.1175** | 0.3198*** | -0.1181** |
| | | | | | (<.0001) | (0.0359) | (<.0001) | (0.0349) |
| Intercept | 4.7141*** | 5.0873*** | 4.6559*** | 5.0375*** | 4.0062*** | 5.2182*** | 3.9704*** | 5.1666*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Yr.Dum. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Ind.Dum. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 1904 | 765 | 1904 | 765 | 1904 | 765 | 1904 | 765 |
| Adj. R^2 | 0.8512 | 0.5087 | 0.8523 | 0.5090 | 0.8626 | 0.5118 | 0.8633 | 0.5121 |

Note: This table reports the coefficients and standard errors of the regressors in the OLS regression model of employee wages in technology and nontechnology firms. Columns with Tech show the results for technology firms, and those with Non-Tech show the results of non-technology firms. The dependent variable is employee wage. Chi-square and *p*-value are Wald test statistics that test whether the coefficients of PPS differ between technology and non-technology firms. The numbers in parentheses are standard errors.

Our results indicate that the influence of PPS on employee wages is more pronounced in technology-based firms. Graefe-Anderson et al. (2018) find that the PPS provided to CEO is negative in both technology and non-technology firms. In absolute terms, their results show that the coefficients of non-technology firms are greater than those of technology firms. Our results are different from theirs, showing that incentive compensation has a more negative impact on employee wages in technology firms than in non-technology firms. It appears that the CPS added to the model changes the impact of PPS on employee wages.

We are also interested in the interaction effects between PPS and CPS on employee wages, and set up a simple equation abstracted from Eq.(10) in column (4) for technology firms.

$$\text{Wage} = 3.9704 - 0.9810 \times \text{CPS} - 0.0443 \times \text{PPS} + 0.0798 \times \text{CPS} \times \text{PPS} \quad (12)$$

Adopting two standard deviations above and below the mean value of CPS as 0.61 and 0.12 for the high and low values of CPS as before, we vary PPS according to their quartiles into the first and the third quartile by 11.44 and 13.35, respectively. Utilizing parameter values to Eq.(12), we compute wages as shown in Table 10.

**Table 10.** Technology for Interaction Effects between PPS and CPS on Employee Wages

| | | CPS | |
|---|---|---|---|
| | | 0.12 | 0.61 |
| PPS | 11.44 | 3.46 | 3.42 |
| | 13.35 | 3.39 | 3.43 |

Technology firms suppress employee wages from 3.46 to 3.39 as firms increase PPS to CEO when their CEOs have less power and lower CPS. However, they increase employee wages from 3.42 to 3.43 as firms increase PPS to CEO when they have more power and higher CPS. While the differences appear small in magnitude, they are significant because they are computed using significant coefficients. Less powerful CEOs tend to suppress employee wages when they receive more incentive compensation, whereas more powerful CEOs do not. It appears that CEO power is more important for employee wages, along with incentive compensation denoted by PPS, for technology firms than for non-technology firms. This analysis confirms Hypothesis 3.

## 5. Employee Wages during Different Financial States

To test Hypothesis 4, in Table 11 presents the results with Column “Safe” and Column “Distressed” for financially safe firms and distressed firms, respectively.

**Table 11.** PPS and Employee Wages over Financial States

| Variables<br>Wage | Fin. Safe<br>(1) | Distressed<br>(1) | Fin. Safe<br>(2) | Distressed<br>(2) | Fin. Safe<br>(3) | Distressed<br>(3) | Fin. Safe<br>(4) | Distressed<br>(4) |
|---|---|---|---|---|---|---|---|---|
| CPS | -1.2530* | -0.5078 | -1.2237** | -0.5714 | -1.0383* | -0.5975 | -1.0173* | -0.6526 |
| | (0.0414) | (0.6228) | (0.0461) | (0.5805) | (0.0899) | (0.5625) | (0.0962) | (0.5277) |
| PPS | 0.1061** | 0.0543 | 0.1043** | 0.0594 | 0.0897* | 0.0609 | 0.0885* | 0.0654 |
| | (0.0248) | (0.5115) | (0.0271) | (0.4773) | (0.0570) | (0.4651) | (0.0600) | (0.4338) |
| CPS*PPS | -0.0616*** | -0.0240 | -0.0609*** | -0.0266 | -0.0580*** | -0.0280 | -0.0574*** | -0.0302 |
| | (0.0006) | (0.4297) | (0.0006) | (0.3838) | (0.0011) | (0.3583) | (0.0012) | (0.3232) |
| Size | 0.0410*** | 0.0009 | 0.0466*** | 0.0051 | 0.0393*** | 0.0052 | 0.0444*** | 0.0089 |
| | (<.0001) | (0.9474) | (<.0001) | (0.7138) | (<.0001) | (0.7022) | (<.0001) | (0.5278) |
| Leverage | 0.1339 | 0.1520** | 0.1164 | 0.1415** | 0.0476 | 0.1538** | 0.0340 | 0.1442** |
| | (0.1566) | (0.0195) | (0.2188) | (0.0315) | (0.6194) | (0.0179)*** | (0.7229) | (0.0282) |
| Avgsale | 0.4506*** | 0.3655*** | 0.4514*** | 0.3655*** | 0.4658*** | 0.3726*** | 0.4661*** | 0.3724*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001)*** |
| MTB | | | -0.0068** | -0.0057 | | | -0.0061*** | -0.0052 |
| | | | (0.0156) | (0.2921) | | | (0.0280) | (0.3374) |
| PCI | | | | | 0.1552*** | 0.0905* | 0.1512*** | 0.0877* |
| | | | | | (<.0001) | (0.0834) | (<.0001) | (0.0940) |
| Intercept | 4.5586*** | 6.0362*** | 4.4589*** | 5.9987*** | 4.2192*** | 5.8335*** | 4.1378*** | 5.8056*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Yr.Dum. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Ind.Dummymy | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 1600 | 1600 | 1600 | 1600 | 1600 | 1600 | 1600 | 1600 |
| Adj. R^2 | 0.8098 | 0.8014 | 0.8106 | 0.8018 | 08123 | 0.8025 | 0.8129 | 0.8028 |

Note: This table reports the coefficients and standard errors of the regressors in the OLS regression model of employee wages in different financial states. Columns "Safe" show the results of financially safe firms, and Columns "Distressed" report the results of financially distressed firms. The dependent variable is employee wage. Chi-square and *p*-value are Wald test statistics that indicate whether the coefficients of PPS differ between firms in different financial states. The numbers in parentheses are standard errors.

We find that PPS has a positive relationship with employee wages in financially safe firms but no significant relationship in financially distressed firms. The results show that PPS has a greater impact on employee wages in financially safe firms than in financially distressed firms. Our results differ from those of Graefe-Anderson et al. (2018), who show that the impact of CEO EBC is more significant in financially distressed firms.

To examine the impact of CEO power on CPS, we investigated the interaction effects between PPS and CPS on employee wages for finically safe firms because PPS and CPS have no significant impact on wages in financially distressed firms.

To investigate the interaction effects for financially safe firms, we focus on Column (2), as the coefficients in other columns are marginally significant. Setting up a model as in Eq.(12)

$$\text{Wage} = 4.4589 - 1.2237 \times \text{CPS} + 0.1043 \times \text{PPS} - 0.0609 \times \text{CPS} \times \text{PPS} \tag{13}$$

and a table for interactions as in subsection 4.4, we estimate the changes in employee wages as shown in Table 12.

**Table 12.** Financial States for Interaction Effects between PPS and CPS on Employee Wages

| | | CPS | |
|---|---|---|---|
| | | 0.12 | 0.61 |
| PPS | 11.44 | 3.76 | 3.74 |
| | 13.35 | 3.67 | 3.75 |

For financially safe firms, firms suppress employee wages from 3.76 to 3.67 as PPS increases when their CEOs have less power and lower CPS. However, they do not suppress employee wages, as we find that wages increase from 3.74 to 3.75 in PPS when they have more power with higher CPS. Less powerful CEOs with higher CPS have a greater tendency to suppress employee wages when they receive higher incentive compensation with a high PPS. However, more powerful CEOs with higher CPS increase employee wages as they receive more incentive compensation. Thus, we confirm Hypothesis 4.

## 6. Robustness Tests

Table 13 shows results from the two-stage model to address potential endogeneity in the analysis. In the first stage, Panel A exhibits that marginal tax rates have significantly positive coefficients as in 0.6708 – 0.6873, which are consistent with Chemmanur et al. (2013). The partial F-test of marginal tax rates falls in 24.84 – 26.39. Stock et al. (2002) state that the critical F-value should be 8.96 when the number of instruments is just one. When the first-stage partial F-statistic is above the critical value, we confirm that the instrument is strong.

**Table 13.** Two-stage Least Square Regression Analysis

**Panel A.** First Stage-Leverage Is the Dependent Variable

| Leverage | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| MTR | 0.6824*** | 0.6708*** | 0.6873*** | 0.6757*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| CPS | 0.1633 | 0.1614 | 0.1674 | 0.1654 |
| | (0.4694) | (0.4747) | (0.4587) | (0.4642) |
| PPS | -0.0192*** | -0.0193*** | -0.0190*** | -0.0191*** |
| | (0.0038) | (0.0036) | (0.0041) | (0.0040) |
| Size | 0.0123*** | 0.0127*** | 0.0122*** | 0.0126*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Avgsale | 0.0344*** | 0.0342*** | 0.0348*** | 0.0346*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| MTB | | -0.0006 | | -0.0006 |
| | | (0.5976) | | (0.6051) |
| PCI | | | 0.0055 | 0.0053 |
| | | | (0.6473)*** | (0.6563) |
| EBIT/TA | -1.3082*** | -1.2988*** | -1.3063*** | -1.2972*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Std. (EBIT/TA) | -0.0240 | -0.0236 | -0.0235 | -0.0231 |
| | (0.2465) | (0.2556) | (0.2584) | (0.2672) |
| Intercept | 0 | 0 | 0 | 0 |
| Yr.Dummy | Yes | Yes | Yes | Yes |
| Ind.Dummy | Yes | Yes | Yes | Yes |
| Obs. | 2509 | 2509 | 2509 | 2509 |
| Adj. R^2 | 0.3849 | 0.3850 | 0.3850 | 0.3851 |
| Partial F-test of MTR F-statistic | 24.84 | 24.43 | 24.42 | 26.39 |
| p-value of partial F-test | <0.0001 | <0.0001 | <0.0001 | <0.0001 |

**Panel B.** Second Stage-Average Employee Wage is the Dependent Variable

| Wage | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| CPS | -1.2206** | -1.2149** | -1.1632** | -1.1581** |
| | (0.0111) | (0.0115) | ( 0.0156) | (0.0157) |
| PPS | -0.0578*** | -0.0606*** | -0.0522*** | -0.0548*** |
| | (0.0001) | (<.0001) | ( 0.0006) | (0.0003) |
| CPS*PPS | 0.1049*** | 0.1051*** | 0.0988*** | 0.0990*** |
| | (0.0050) | (0.0049) | ( 0.0083) | (0.0079) |
| Size | 0.0459*** | 0.0498*** | 0.0415*** | 0.0451*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Leverage | 0.0645 | -0.0465 | 0.2026 | 0.1005 |
| | (0.8381) | (0.8874) | ( 0.5205) | (0.7587) |
| Avgsale | 0.4752*** | 0.4782*** | 0.4785*** | 0.4811*** |
| | (<.0001) | (<.0001) | (<,0001) | (<.0001) |
| MTB | | -0.0039 | | -0.0036 |
| | | (0.1108) | | (0.1427) |
| PCI | | | 0.1058*** | 0.1054*** |
| | | | (<.0001) | (<.0001) |
| EBIT/TA | -1.0984*** | -1.1824*** | -0.8812** | -0.9588** |
| | (0.0046) | (0.0027) | ( 0.0229) | (0.0148) |
| Std. (EBIT/TA) | -0.0040 | -0.0038 | 0.0100 | 0.0101 |
| | (0.9289) | (0.9318) | ( 0.8224) | (0.8200) |
| Intercept | 4.0129*** | 3.8112*** | 3.5175*** | 3.0581*** |
| | (<.0001) | (<.0001) | (<.0001) | (<.0001) |
| Yr.Dum | Yes | Yes | Yes | Yes |
| Ind.Dum | Yes | Yes | Yes | Yes |
| Obs. | 2442 | 2442 | 2442 | 2442 |
| Adj. R^2 | 0.8077 | 0.8079 | 0.8080 | 0.8092 |

Note: This table reports the results from 2SLS robustness test. In the first stage, we use the marginal tax rate based on income before deducting interest expenses (MTR) as the instrumental variable. In the second stage, we include the fitted leverage value derived from the first stage as an independent variable. The numbers in parentheses are standard errors.

We find that the marginal tax rate is a strong instrumental variable. Panel B presents the results for the second stage. In the second stage, we adopt the fitted value of leverage as an independent variable. We find that the coefficients of both CPS and PPS are significantly negative, and the pattern is similar to those in Table 5. Observing that interactions between CPS and PPS are significant, we investigate the interaction effects on employee wages, as in Subsection 4.4.

We set up a simplified equation similar to Eq. (12) with the coefficients in Column (4) as

$$\text{Wage} = 3.0581 - 1.1581 \times \text{CPS} - 0.0548 \times \text{PPS} + 0.0990 \times \text{CPS} \times \text{PPS} \quad (14)$$

Adopting parameter values to Eq.(14) for high and low values in CPS and PPS, we estimate the wages as shown in Table 14.

**Table 14.** Two-Stage Analysis for Interaction Effects between PPS and CPS on Employee Wages

| | | CPS | |
|---|---|---|---|
| | | 0.12 | 0.61 |
| PPS | 11.44 | 2.43 | 2.37 |
| | 13.35 | 2.35 | 2.36 |

We find that the impact of CEO incentive compensation on employee wages in the presence of CEO power remain the same as that in Table 5. When CPS is low at 0.12, the increase in PPS from 11.43 to 13.35 decreases employee wages from 2.43 to 2.35. However, when CPS is high at 0.61, PPS does not significantly affect employee wages, which are 2.37 and 2.36, respectively. The coefficients of leverage become insignificant after controlling for potential endogeneity. In addition, the coefficients of firm size and average sales remain significantly positive, as shown in Table 5. That is, when we consider potential endogeneity concerns, CEO incentive compensation has a negative impact on employee wages. The results of the robustness tests are consistent with our main findings.

## V. Conclusion

Although EBC has been granted to CEOs to reduce agency conflicts between managers and shareholders, it also increases agency conflicts in different ways. Graefe-Andersen et. al. (2018) show that, as CEO incentive compensation increases, employee wages decrease on average. We contribute to the analysis by adding CEO power proxied by CPS.

Using data from 1992 to 2017, we examined how CEO incentive compensation affects employee wages in the presence of CEO power by investigating the interaction effects between PPS and CPS on employee wages. We find that a negative relationship between incentive compensation and employee wages remains only when CEOs are less powerful. When CEOs are powerful, this relationship becomes positive. Powerful CEOs care for employee wages when they are granted more incentive compensation. We consider a potential bias in the analysis because many firms do not report labor expenses for employee wages. By running the Heckman two-step analysis to address these concerns, we find that the main findings do not change. We also confirm the results using two-stage regression for robustness.

We also study how CEO incentive compensation with differential CEO power affects employee wages by industry and financial status. We show that PPS affects employee wages in technology firms but not in non-technology firms. When we review the interaction effects in technology firms, we find that, while less powerful CEOs suppress employee wages when they are granted more incentive compensation, more powerful CEOs do not. For financial states, while the impacts of PPS on employee wages are insignificant for financially distressed firms, they are positive for financially safe firms. However, we find that the interaction effects are consistent with the main findings: less powerful CEOs suppress employee wages with more incentive compensation, but more powerful CEOs do not.

This study contributes to the literature by examining how CEO incentive compensation affects employee wages in the presence of CEO power, and whether the interaction effects between incentive compensation and CEO power are significant. Our results show that CEO incentive compensation suppresses employee wages only when a CEO is less powerful. When CEOs are more powerful, they care for employee wages as they receive more incentive compensation.

The contribution to the literature stated above may suggest that when corporations grant incentive compensation to their CEOs, they have to consider CEO power relative to CEO compensation, because CEOs with less power and more incentive compensation can suppress employee wages and lose firm performance in the long run.

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# A Study on the Economic Effects of EU's CBAM on Korea

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**ABSTRACT**

**Purpose –** The Effect of EU foreign trade policy on global supply chains is growing. The EU's Carbon Border Adjustment Mechanism (CBAM), which is deeply involved in international trade, is expected to directly or indirectly affect the global supply chain. Although the discussion of CBAM is spreading, it is difficult to find a study analyzing the negative effect of CBAM on the supply chain. Therefore, this study aims to analyze the effect of the introduction of the CBAM on Korean exports.

**Design/Methodology/Approach –** For the analysis method, we use the GTAP model, which is a Computable General Equilibrium (CGE) model, and in particular, we use the GTAP-E model, a model specialized for environmental policies such as climate change. And for the database required for the CGE model, we use the GTAP-E database specialized for the GTAP-E model.

**Findings –** As a result of the analysis, it was analyzed that Korea's output and exports decreased. In particular, the decrease in output in the chemicals, metal, and machinery industries was the largest, and Korea's exports to China decreased by up to 322.7 million dollars in the chemical industry. As a means to overcome the introduction of CBAM, we analyzed the effects of support for renewable energy, introduction of low-carbon technology, and tax benefits. As a result of the analysis, the effect of expanding renewable energy support was limited, while the effect of introducing low-carbon technology and tax benefits was analyzed to expand exports by up to 2.6% and 4.86%, respectively.

**Research Implications –** From the analysis results of this study, it can be seen that the climate change response policies, which were introduced in a voluntary way by each country, spread in an involuntary way through the CBAM. Although there is a possibility that environmental measures may not conform to the WTO agreement, it is necessary for both the government and firms to actively participate in environmental issues as carbon-related measures are likely to be actively discussed in the international trade environment.

***Keywords:*** carbon border adjustment mechanism (CBAM), computable general equilibrium (CGE) analysis, EU, Korea

***JEL Classifications:*** F14, F17, F18

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# I. Introduction

The effect of EU foreign trade policy on global supply chains is growing. In particular, the Carbon Border Adjustment Mechanism (CBAM) of the EU, which is deeply involved in international trade, is expected to directly or indirectly affect the global supply chain. The EU, which is at the forefront of responding to climate change, is preparing to introduce CBAM from 2026, because a carbon tax is being cited as the most effective way to cope with climate change (IMF, 2019). Discussion on the CBAM is expanding mainly in the EU and the US. The EU intends to prevent damage from climate change and foster eco-friendly industries through CBAM. CBAM is expected to be introduced in earnest from 2026, and it is necessary to prepare a countermeasure in advance as it includes steel and plastics, which are Korea's main export products. The US climate change response policy is also expected to affect the supply chain. The Biden administration withdrew the Trump administration's decision to withdraw from the Paris climate agreement and rejoined the agreement, and the USTR's 2021 trade policy annual report made it clear that it was considering carbon border adjustments to reduce greenhouse gas emissions (USTR, 2021). Internationally, discussions on the introduction of carbon tax-related measures have been actively conducted since 2010. It mainly analyzes the economic effect of the introduction of a carbon tax, and a number of studies have revealed that the CBAM is effective in responding to climate change despite the decrease in welfare due to the additional tax burden as a policy to prepare for climate change (OECD, 2016, 2017, 2018, 2020; World Bank, 2015). Korea is expected to be directly impacted by the introduction of CBAM (Nielsen et al., 2020). This is because most industries, such as semiconductors, motor vehicles, steel, and petrochemicals, which are Korea's main export industries, emit large amounts of carbon. Although CBAM is currently being discussed, it is difficult to find a study analyzing the negative effect of CBAM on the supply chain. Many studies related to the CBAM have been conducted, but most studies are limited to the legal interpretation related to the feasibility of introducing a carbon-related system (Chang, 2010; Chung, 2017; Lee, 2017; Lee, 2018; Yi, 2010). In this situation, this study, which statistically analyzes the effect of the introduction of the CBAM on Korean exports, is judged to be different from prior studies. In addition, it is differentiated from prior studies in that it uses the GTAP model, which is a general equilibrium model, as a methodology, and the GTAP-E model, a model specialized for environmental policies such as climate change. Therefore, the purpose of this study is to closely examine the recent trends in the CBAM and to draw policy implications based on the results of economic analysis. In particular, by analyzing industries that are directly affected by the CBAM, such as motor vehicles, petrochemicals, and metals, which are Korea's main export industries, it is intended to seek countermeasures for Korean exporters. As a result, it is expected that this study will be able to present a sustainable countermeasure to realize the carbon neutral policy that is being promoted worldwide based on the effect of the introduction of the CBAM on the Korean economy.

# II. International Trade Environment on Climate Change

## 1. Discussion on Climate Change

The international discussion on climate change can be said to have begun in the late 1970s. Concerns that greenhouse gas emissions could lead to climate change were first raised by the Scripps Institute of Oceanography in 1957, and it was not until 20 years later that the World Meteorological Organization (WMO), an international organization, started discussing climate change. Concerns that climate change could also affect the international trade environment began to be raised in the GATT in the 1980s, but it is still a controversial situation. It was at the UN General Assembly in 1988 that the 'recognition' of the need to respond to climate change was officially made, and the United Nations Framework Convention on Climate Change

(UNFCCC), an international climate change response agreement, came into effect in 1994. Although the UNFCCC has encouraged several countries to reduce greenhouse gas emissions, the implementation remains declarative as there is no enforcement force (Condon, 2009).

Since then, efforts by the international community to reduce greenhouse gas have been made steadily, and as the Kyoto Protocol took effect in 2005, the UNFCCC has been supplemented. The Kyoto Protocol is an agreement that mandates a 5% reduction in greenhouse gas emissions compared to 1990. From 2008 to 2012, each country agreed on a mandatory greenhouse gas reduction plan. However, as the US failed to ratify the Kyoto Protocol as its domestic law, it included only 40% of global greenhouse gas emissions. Nevertheless, the Kyoto Protocol is evaluated as an innovative agreement in that it flexibly reflects the situation of each country and that it reflects the compulsory nature of responding to climate change for the first time.

Efforts to extend the Kyoto Protocol continued at the UNFCCC annual general meeting, and several meetings were held to adopt the agreement that included the participation of the United States and China. As a result of these efforts, the Post Kyoto Protocol was concluded in 2012, making it mandatory for each country to reduce greenhouse gas emissions by 15% by 2020.

However, the United States, China, India, and Japan, which emit the most greenhouse gases, have not been able to ratify the Post Kyoto Protocol in their own countries. So, the post-Kyoto Protocol did not enter into force because more than three-fourths of the member states did not meet the conditions for it to enter into force after ratification. The most important reason for the failure of the Post-Kyoto Protocol agreement is the difference of opinion between developed and developing countries. Developing countries have advocated Common But Differentiated Responsibilities (CBDRs), that is, the 'principle of shared but differentiated responsibility', which exempts their countries from their obligations to reduce greenhouse gas emissions and the opinion that developed countries should provide financial or technical support to them. However, an agreement could not be reached as developed countries did not accept it.

After the Kyoto Protocol failed to reach an agreement, developed countries began to introduce voluntary greenhouse gas reduction policies. In particular, European countries have actively introduced policies to respond to climate change, and the EU is promising to reduce emissions by 30% compared to 1990 through the emission trading system, and ultimately aims to achieve carbon neutrality by 2050. In addition to the EU, Switzerland, New Zealand, Japan, and Australia are also promoting voluntary greenhouse gas reduction policies. However, the climate change response strategy is a strategy that can only be successful when all countries in the world participate in the reduction of greenhouse gases, so it can fail with the participation of only some countries. For this purpose, the 'Paris Agreement' was adopted at the 21st UNFCCC General Assembly held in Paris in 2015 to respond to climate change. This was officially put into effect in 2016 as all countries were to reduce greenhouse gas emissions. Countries participating in the Paris Agreement are required to participate in climate action in earnest from 2020 and check the implementation status every five years. As such, as each country announced specific greenhouse gas reduction plans through the Paris Agreement, it was expected that the agreement on greenhouse gas reduction would be successful, but with the inauguration of US President Donald Trump in 2017, the Paris Agreement was withdrawn and the possibility of failure increased.

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Although the United States rejoined the Paris Agreement in 2021, the success of the agreement remains unclear. In the case of the Paris Agreement, unlike the Kyoto Protocol, each country must voluntarily set a plan to reduce greenhouse gas emissions, and developed countries still have to bear greater reduction obligations and developing countries demand greater aid. Also, the Paris Agreement checks the implementation of the agreement every five years, but there is no specific end time for the implementation period, so there is no strong incentive to reduce greenhouse gas emissions. In other words, failure to keep the greenhouse gas reduction promise may result in criticism from the international community, but if the country's economic interests are prioritized over this, there is a high probability that the agreement will not be implemented.

At the 26th UNFCCC Conference of the Parties (COP26) held in Glasgow, UK in November 2021, 120 countries including Korea promised to strengthen global climate action to curb the rise in global temperature within 1.5℃. Especially, in order to realize this goal, it was agreed that action based on CBRD principles and science should be upgraded, and the country strongly urged each country to fulfill its carbon emission reduction obligations. In the future, it is expected that specific countermeasures for climate change will be prepared centering on the UNFCCC, and the implementation of each country will be continuously checked.

Looking at the actual reduction targets for each country and the global share of carbon produced by that country through Fig. 1, the United States accounts for 17.9% of global carbon emissions and aims to reduce carbon emissions by 28% by 2025. China accounts for one-fifth of global carbon emissions and aims to reduce carbon emissions by 65% by 2030. In the case of India, Japan, and Korea, the proportion of carbon emission is 2~4%, and each country is setting a carbon reduction target of 26~37% by 2030.

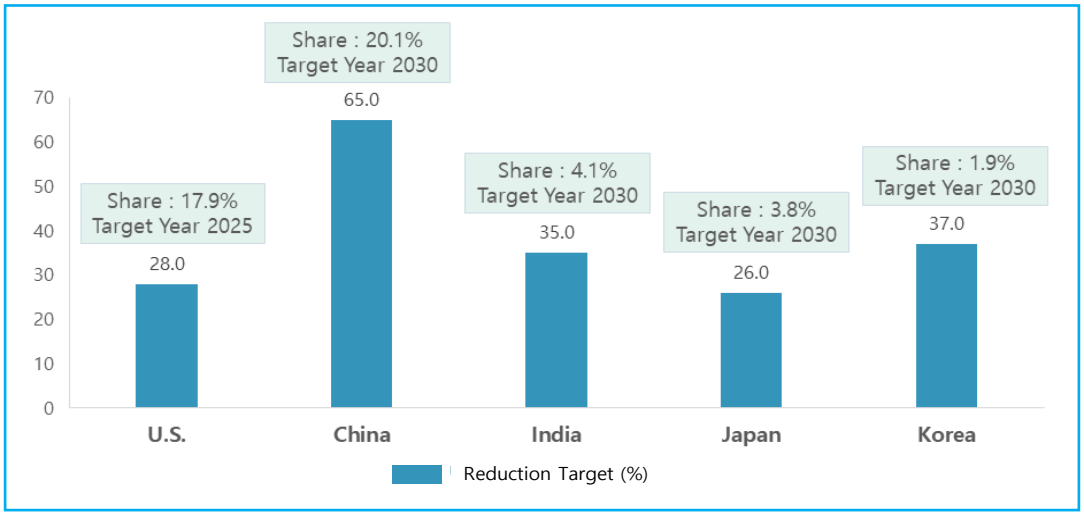
## 2. Response to Climate Change by Country

Countries around the world are actively trying to implement climate change response policies. South Korea, China, and Japan all declared carbon neutral in 2020, and the US Biden administration, which took office in 2021, declared that it would strongly push ahead with climate change response policies. Although many countries have declared that they will implement climate change response policies, the reality is that, except for the EU, there are not many countries that offer actual reduction paths or specific implementation plans for carbon neutrality. Even the EU, which is the most active in implementing carbon neutrality in the international community, has not yet presented a clear operation plan for the CBAM. From the EU's perspective, it is expected that specific operational plans will be presented after considering the current trade structure with trading partners and the degree of participation in international trade by industries within the EU.

Moon et al. (2021) presented the results of analysis on the effect of tariff increases by country when the EU implements the CBAM. Looking at Fig. 2, in the case of India, tariffs on metal, steel, and chemical industries are expected to increase by 4.6%, Russia by 3.9%, and China by 2.6%. In the case of Korea, the tariff is expected to increase by 1.9%, and if this is applied to Korea's steel exports of 37 trillion dollars as of 2019, it can be expected that an additional tariff of about 800 billion dollars

**Fig. 1.** Reduction Goals by Country and Global Share of Carbon Emitted by Each Country

(Unit: %)




Source: Moon et al. (2021).

will be borne.

The reason why Korea has to bear such a large amount of additional tariffs is that, as shown in Fig. 2, Korea has switched to a $CO_2$ exporting country since 2009. At that time, advanced countries were introducing low-carbon emission technologies, but Korea has been increasing its share in the world market, which was the existing advanced market, by emitting a lot of carbon by industry to increase exports.

Reducing carbon emissions in a short period of time is a very difficult task because Korea has gained a lot of benefits from carbon emissions. Nevertheless, Korea is an advanced country in the international community, and a plan for carbon emission policy has been established since 2016 and has been implemented until now. The first basic plan for 2016 includes the contents of promoting the use of renewable energy and of revitalizing the emission trading system. After that, in the second amendment bill in 2018, the domestic greenhouse gas reduction amount was raised from 25.5% to 32.5%, and on October 8, 2021, the target was raised again to reduce the absolute amount of greenhouse gas by 40%.

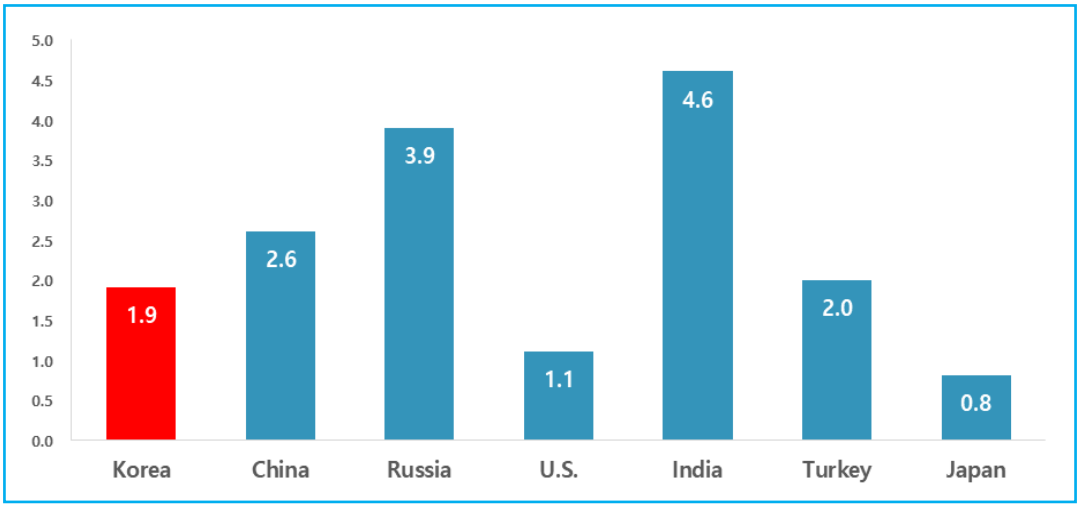
In this situation, if major trading partners, including the EU, introduce the CBAM, it is necessary to analyze the ripple effect on Korean exports in advance and prepare countermeasures. Therefore, this study analyzes the economic effect of Korea due to the introduction of the CBAM in major trading countries by using the CGE analysis methodology, and seeks strategies to respond to carbon neutrality policies and CBAM.

## 3. Quantitative Researches Related Carbon Tax

Studies were conducted to analyze the economic effect of CBAM using the CGE model. Chepeliev (2021) and Simola (2021) assumed the situation of imposing a carbon border tax of $26 per $CO_2$ ton and 60 EURO per $CO_2$ ton. As a result of the analysis, it was found that CBAM caused additional trade costs. Chepeliev (2021) showed that the impact on Ukraine and China would be rather large compared to developed countries, showing the reduction of welfare amount to be 451.3 million dollars and $703.6 million dollars respectively. Simola (2021) also found that the effect of CBAM

**Fig. 2.** Equivalent to Tariff Rates on $CO_2$ Embedded in EU Imports

(Unit: %)




Source: Rewritten based on Moon et al. (2021).

would be different by country. In the case of developed countries, the damage was limited, but the damage in developing countries could be greater. This is because the emission is mainly created from developing countries as production facilities are transferred to developing countries.

**Table 1.** Impacts of the CBAM on EU's Trading Partners

(Unit: Million Dollars, %)

| Group | Welfare | Per Capita Income |
|---|---|---|
| China | -703.6 | -0.01 |
| USA | -231.3 | 0.00 |
| Ukraine | -451.3 | -0.40 |

Source: Chepeliev (2021).

UNCTAD (2021) analyzed the scenario of charging $44 and $88 per $CO_2$ ton. It is a case of charging a higher level of cost than previous research. The analysis shows that the impact of CBAM on exports and GDP decline will be limited. However, as the previous study showed, the damage to developing countries would be larger than that of developed countries. Most of the existing studies have analyzed that the negative impact of CBAM on the economy of individual countries exists, but the impact will be limited. However, there are concerns that CBAM could widen the economic gap between developed and developing countries.

**Table 2.** Change in Real Income by Scenarios

(Unit: Million Dollars)

| Group | CBAM44 | CBAM88 |
|---|---|---|
| Developed | 2,485 | 1,937 |
| Developing | -5,867 | -10,208 |
| Total | -3,381 | -,8270 |

Source: UNCTAD (2021).

A number of analyses have been conducted on CBAM, but strategies for overcoming the negative impact of CBAM have not been considered yet. Countries are planning climate change strategies, and if these policies are introduced properly, it could help to reduce the negative impact of CBAM. In this regard, it would be helpful to consider the climate change policy in the quantitative model like CGE. By quantitatively analyzing the strategy, it could distinguish which policy effects would be substantial to reduce the emissions and to promote the economic impact.

This study is different from previous studies in that it considers both the CBAM and policies to respond to climate change. There could be different views of the amount of policy shocks, e.g. 3 to 10% of productivity increase though the investment on renewable energies. However, considering both the CBAM and the climate change policy could provide useful implications for policy makers. In this connection, this study expands and supplements existing research considering climate change policies as a simulation shock.

## III. Analysis Data and Methods

### 1. Data

Methods for analyzing the economic effect of changes in external conditions, such as the implementation of new government policies, are largely divided into methods using the Partial Equilibrium and General Equilibrium. Partial equilibrium analysis is a comparative static analysis methodology that analyzes based on the balance of supply and demand for a specific industry or item, and is a method of comparing the existing equilibrium with the equilibrium after the shock. On the other hand, the Computable General Equilibrium (CGE) is a method that considers the equilibrium state of all markets in a country or all markets in the world, not in a specific industry. It is a method that considers all indirect effects.

The most important thing to perform CGE analysis is the construction of a database. It is mainly data related to production, trade, consumption, etc., and all data is made in the form of linking one country to another based on a country input and output table. The CGE data to be used in this study is intended to be based on the GTAP database. The GTAP DB consists of households, companies, and governments, which are economic agents, and is constructed in the form of a matrix in which data such as trade and transport are linked with each other. GTAP DB was first published in 1990, and countries and industries are gradually expanding through networks of researchers around the world.

The most recently published GTAP DB is Version 10 and consists of 141 countries and 65 industries (Aguiar et al., 2019). This is the core data of this study, and includes statistical data on bilateral trade, transport, and tariffs that countries around the world are connected to. Bilateral trade data is based on UN COMTRADE, and based on SITC classification, not HS code, for industry classification. However, the reported trade volume is characterized by inconsistencies between

countries. This is mainly because exports use FOB standards and imports use CIF standards. Another reason is that the reported amounts differ between countries. The GTAP database performs data correction for different amounts between countries, and the difference between FOB and CIF amounts is set for shipping and insurance. World Bank and UN data are used for major macroeconomic data, while government consumption data is based on the IMF, domestic subsidies are based on OECD, and export subsidies are based on WTO notification. ITC MacMap was used for tariffs, IMF data for taxes, and World Bank data for population data.

**Table 3.** Composition and Source of GTAP DB Version 10 Data

| Data | GTAP Version 10 |
|---|---|
| Industry | 65 |
| Country | 141 |
| Macroeconomic | World Bank, UN data |
| Government Consumption | IMF |
| Trade | UN COMTRADE |
| Domestic Subsidy | OECD |
| Export Subsidy | WTO Notification |
| Tariff | ITC MacMaP |
| Tax | IMF |
| Elasticity of Demand | GTAP Database |
| Population | World Bank |

Source: Revised by referring to Aguiar et al. (2019).

## 2. Methods

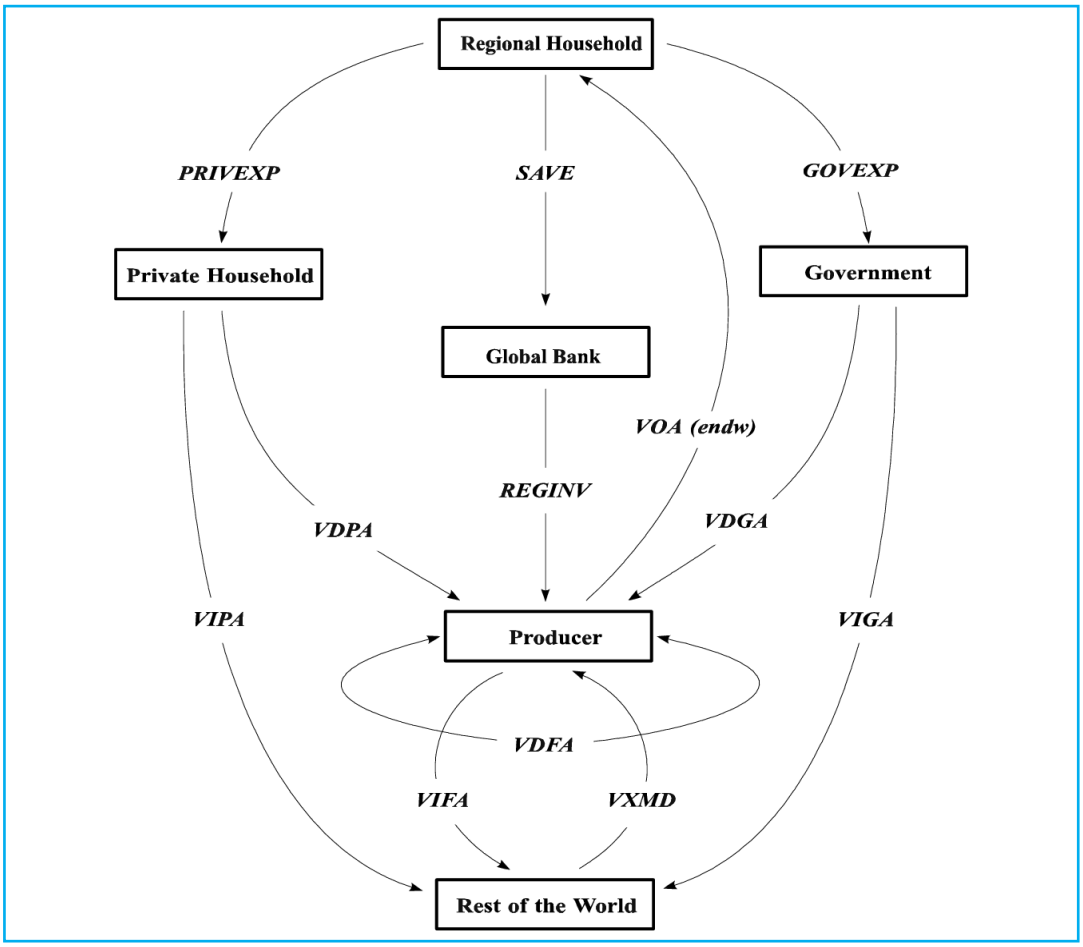
The GTAP model is the most widely used model in CGE research for international trade, and has the advantage of performing multi-country-multi-industry analysis based on the GTAP database provided by Purdue. The existing GTAP model was mainly used to analyze policy effects in fields such as agriculture and trade. A CGE model such as GTAP is a method of deriving the solution of a system of equations by making the number of supply and demand equations and the number of variables match. Variables in the GTAP model have characteristics that are interconnected, and it is a comparative static analysis method that finds a new balance point through shock from the initial equilibrium. GTAP is a model in which production, consumption, and international trade are linked across trade in goods and services (Fig. 3).

In the CGE model, prices and supply and demand are determined endogenously. The economic entities of the GTAP model are largely composed of six sectors: RH (Regional Household), PH (Private Household), Producer, Government,

Global Bank, and ROW (Rest of World). The model determines the goods and services demanded by households and governments. Saving also determines the size of savings and investment by region. The model includes the behavior of economic agents by industry. For each industry, a profit maximization assumption is made based on a production function using output factors and intermediate goods. The enterprise pays wages and rent to RH. Firms sell their output to other firms in the form of intermediate goods, and final goods are sold to governments and households. A business is an entity that exports or imports goods. International trade includes bilateral trade information. ROW includes many other countries.

The output factors of GTAP basically consist of land, labor, capital, and natural resources. Labor can be subdivided into skilled labor and unskilled labor. The output function of the GTAP model is a CES (Constant Elasticity of Substitution) function, and the consumption function is a CDE (Constant Difference of Elasticities) function (Narayanan et al., 2010; Rhee et al., 2013). Demand and supply functions, Market Clearing Conditions and other relationships are detailed in Hertel (1997).

**Fig. 3.** Basic Structure of GTAP Model

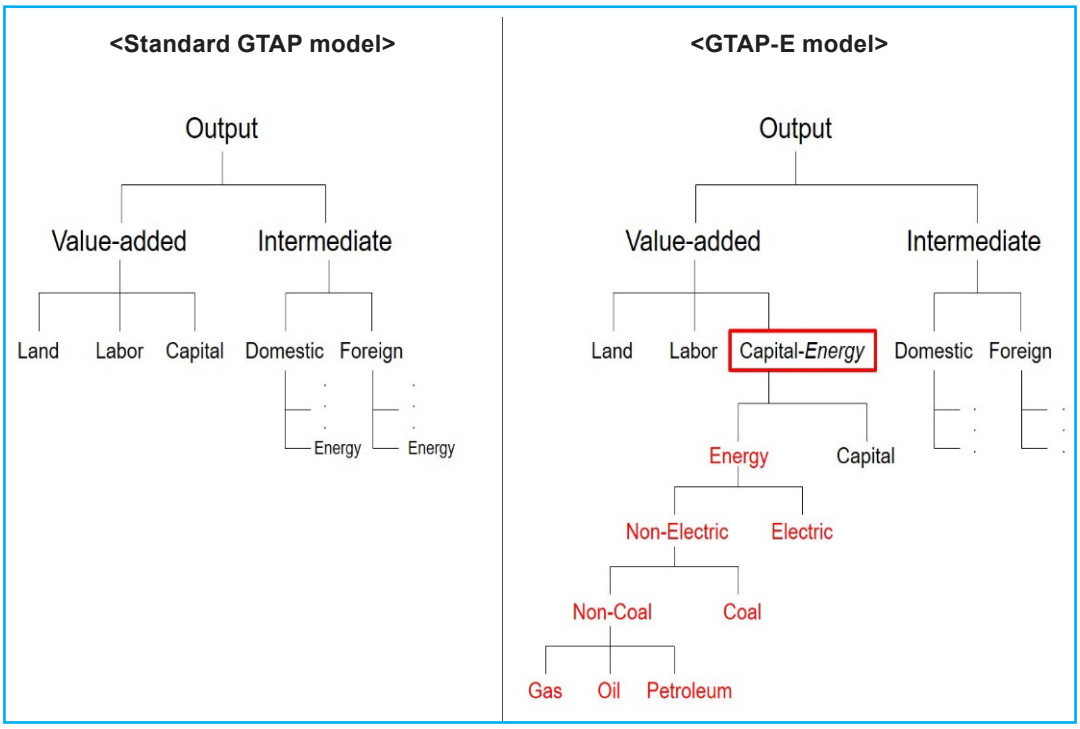



Source: Hertel and Tsigas (2000).

Existing GTAP models have limitations in determining the energy required for output endogenously. The GTAP-E model was developed as the need for quantitative analysis tools increased for policy design to respond to climate change (Burniaux & Truong, 2002; Truong, 1999; Truong et al., 2007).

The GTAP-E model is designed to exogenize energy as a factor of output by adding energy to the basic land, labor, and capital. As shown in Fig. 4, Capital-Energy is added as an output factor of the GTAP-E model, and energy is further subdivided into sub-elements.

**Fig. 4.** Structure of GTAP-E Model




Source: Revised based on Burniaux and Truong (2002).

## IV. Scenario and Analysis Results

### 1. Scenario

As the database required for the CGE model, the GTAP-E DB specialized for the GTAP-E model is used, and energy is divided into Coal, Oil, Gas, Petroleum, and Electricity. GTAP-E DB version 10 was released in February 2020. In this study, these countries and industries were integrated into 7 regions and 11 industries, and the integrated regions and industries are shown in Table 4.

The items subject to EU's 'Fit for 55' are shown in Table 3. According to the HS code, 4 items are of cement, 1 of electricity, 5 of fertilizer, 38 of steel and 8 of aluminum. Many steel and metal products are included, which is expected to have a significant effect on these industries. However, since there is a possibility that the items subject to CBAM may be expanded, in the scenario of this study, related

**Table 4.** Analysis Data of GTAP-E DB

| Country | Industry | |
|---|---|---|
| U.S., EU, Japan, Korea,<br>AZ (Australia, New Zealand),<br>MC (Mexico, Canada),<br>ASEAN, Middle East, China, Russia,<br>etc. (ROW) | Energy | Coal, Oil, Gas,<br>Refined Oil Products (Petroleum), Electricity |
| | Non-Energy | Chemicals, Motor Vehicles, Transport Equipment,<br>Metal, Machinery,<br>Agriculture, Other Industries, Services |

Source: Based on Aguiar et al. (2019).

industrial items will also be analyzed assuming an increase in cost.

In this study, based on the data of Moon et al. (2021), who calculated the differential additional cost by country and industry, the analysis was conducted by reflecting this in the CGE study. Since the current item is the first draft, there is a high possibility of expanding the items of the CBAM in the future, and the current analysis only for HS items can draw limited conclusions.

Moon et al. (2021) calculated the carbon dioxide emissions inherent in the export of the subject items based on EU's CBAM data, and calculated the estimated tariff rate assuming a cost of 30 euros ($36) per ton was charged.

Table 4 shows the estimated tariff rates based on the carbon dioxide contained in EU imports. Korea's machinery industry is expected to be subject to an additional tariff of about 0.8%, chemicals of 1.3% and metal of 2.7% are expected, and the equivalent of the overall weighted average tariff rate to be imposed on Korea is about 1.9%. In the case of China, Japan, and the United States, it is expected that different tariff rates will be imposed depending on the carbon dioxide emissions inherent in each country's industry. Particularly, the additional cost burden is expected to be the highest in China, followed by Korea, the US, and Japan.

**Table 5.** Items Subject to EU's CBAM

| Item | HS | HS Detail Code |
|---|---|---|
| Cement (4) | 25 | 252310, 252321, 252329, 252390 |
| Electric Power (1) | 27 | 271600 |
| Fertilizer (5) | 28, 31 | 280800, 2814, 283421, 3102, 3105 (Except for HS 310560) |
| Steel (38) | 72 | 7201, 7203, 7205, 7206, 7207, 7208, 7209, 7210, 7211, 7212, 7213, 7214, 7215, 7216, 7217, 7218, 7219, 7220, 7221, 7222, 7223, 7224, 7225, 7226, 7227, 7228, 7229 |
| | 73 | 7301, 7302, 730300, 7304, 7305, 7306, 7307, 7308, 7309, 7310, 7311 |
| Aluminum (8) | 76 | 7601, 7603, 7604, 7605, 7606, 7607, 7608, 760900 |

Source: KOTRA (2021).

**Table 6.** Estimated $CO_2$ Tariff Rates Embedded in EU Imports

(Unit: %)

| Country | Machinery | Chemicals | Metal | Coal, Oil | Weighted Average |
|---|---|---|---|---|---|
| Korea | 0.8 | 1.3 | 2.7 | 0.0 | 1.9 |
| China | 2.0 | 4.2 | 5.1 | 2.6 | 2.6 |
| Japan | 0.5 | 0.9 | 1.2 | 0.0 | 0.8 |
| U.S. | 0.3 | 0.9 | 1.3 | 0.7 | 1.1 |

Source: Revised Based on Moon et al. (2021).

Based on Table 4 above, the baseline scenario reflects the equivalent value of additional tariff rates of major countries when the EU introduces CBAM. Differential additional costing by country and industry is reflected in the model, and this is considered as [Scenario 1] - (standard). [Scenario 2] is a case in which the EU's additional tariffs are further expanded. In [Scenario 1], an additional tariff of 3% is imposed.

Also, in [Scenario 2], it is assumed that the EU's CBAM spreads to the world, and the case where all countries raise tariffs in related industries by 2% is reflected. [Scenario 3] is similar to [Scenario 2], but it is supposed that the EU increases tariffs by 5% in addition to [Scenario 2], and it is assumed that the global tariff rate will also increase by 5%.

**Table 7.** Baseline Scenario

| Scenario | S1 | S2 | S3 |
|---|---|---|---|
| Equivalent to Tariffs upon Introduction of EU's CBAM | Standard | S1 + 3% | S2 + 5% |
| Equivalent to Tariffs when CBAM spreads Worldwide | - | 2% | 5% |

In the simulation scenario, we will analyze how much government support for industries with additional costs can reduce output and trade damage. In this study, the expansion of industrial support was divided into three major categories. The increase in productivity due to the introduction of new and renewable energy and low-carbon technology is a widely used scenario for the restructuring of eco-friendly industries (Al Ghussain, 2019; Nijkamp et al., 2005; Peterson et al., 2011; Yusuf et al., 2012).

Korea has significantly raised its Nationally Determined Contribution (NDC) to a 40% reduction in total greenhouse gas emissions in 2018. The carbon-neutral promotion strategy is divided into Δ low carbon economic structure, Δ creating a low-carbon industrial ecosystem, and Δ strengthening the basis of carbon-neutral system. The economic structure low-carbon strategy consists of active conversion to new and renewable energy and technology development support for industries with high carbon emissions, such as steel and petrochemicals. The low-carbon industry ecosystem is created with support for promising technology

companies in the eco-friendly, low-carbon, energy industry, such as next-generation batteries and green hydrogen. Institutionally, it aims to create a new climate response fund and re-establish the carbon pricing system, including taxation, levy, and emission trading system. Accordingly, in this study, according to the purpose of government policy, we organized and analyzed a scenario that included (1) expansion of new and renewable energy support, (2) introduction of low-carbon technology, and (3) tax benefits. However, as all three scenarios are policies that have not been implemented, it is difficult to analyze their effects, and quantitative estimation is considered to be a difficult task as it should be done through future research. Although the quantitative numerical value of the scenarios has not been verified, this study is expected to provide sufficient implications in that the ripple effect of each scenario is analyzed in advance. The composition of the scenario is as follows.

First, the expansion of support for new and renewable energy. This is because, as a strategy to reduce carbon emissions, renewable energy such as nuclear power, solar heat, and wind power can be an alternative in a situation where the conversion of coal and oil resources must be made. Renewable energy support is a form of subsidy support for the 'Electricity' sector, and it is assumed that subsidies of 3%, 5%, and 10% are provided depending on the scenario.

Second is the introduction of low-carbon technology. Investment support for low-carbon technologies should be expanded to reduce carbon emissions. Therefore, it is assumed that industrial productivity is improved when an energy source that emits carbon, such as coal and petroleum, is input as an intermediate material.

Third is the grant of tax benefits. If productivity improvement through subsidies (Scenario 1) or government support (Scenario 2) is a direct support to respond to CBAM, in terms of re-creating the overall industrial ecosystem, such as the Green New Deal, to support companies' investment promotion and new technology introduction A method of directly exempting the related industry's tax could be applied. To reflect this, the scenario assumes output tax exemption, and the effects of differential reductions such as 0.5%, 1.0%, and 1.5% are analyzed depending on the scenario.

**Table 8.** Simulation Scenario of Korea

| Scenario | | S1 | S2 | S3 |
|---|---|---|---|---|
| Expansion of Industrial Support | (1) Expansion of Support for Renewable Energy<br>(2) Introduction of Low-carbon Technology | 3% | 5% | 10% |
| | (3) Offer Tax Benefits | -0.5% | -1.0% | -1.5% |

## 2. Analysis Results

As a result of the analysis, the change in output amount was different for each country as shown in Table 9. In [Scenario 1], Korea's exports increased by 8.1 million dollars despite the introduction of the EU's CBAM. This is due to the fact that the CBAM in the EU does not charge the same cost, but the cost charged according to carbon emissions. As a representative example, in the case of China, which emits a lot of carbon dioxide, it was found that the output of about 477 million dollars (Scenario 1) decreased. In the case of Korea, which emits relatively little carbon dioxide, there seems to be a niche market that can be entered into by the EU's CBAM entry into force.

However, in [Scenario 2] and [Scenario 3], where the EU's CBAM spreads globally, output

in all major countries is significantly reduced. In China, output fell by up to 3.956 billion dollars, and in the United States, output fell by up to 930.6 million dollars. It is analyzed that Korea's output will decrease by up to about 54.3 million dollars after ASEAN.

**Table 9.** Baseline: Changes in Output by Country

(Unit: Million Dollars)

| | Korea | China | Japan | ASEAN | U.S. |
|---|---|---|---|---|---|
| Scenario 1 | 8.1 | -477.0 | -2.5 | -93.6 | -13.9 |
| Scenario 2 | -197.9 | -1,854.2 | -149.7 | -268.3 | -374.6 |
| Scenario 3 | -504.3 | -3,956.3 | -373.7 | -538.6 | -930.6 |

Note: Output value is the sum of Chemical, Motor Vehicles, Transport Equipment (including Shipping), Metal, and Machinery industries.

Table 10 shows the change in the country's output by industry. In general, the chemical, metal and machinery industries saw the largest decline in output, and in particular, the output value of the chemical and metal industries in China decreased significantly by up to 2.42 billion dollars and 1.71 billion dollars. It is noteworthy that the output of motor vehicles and transport equipment has increased relatively. In the motor vehicles industry, Japan's output increased by up to 728 million dollars, and Korea's output also increased by 150 million dollars. This can be seen as the effect of (i) the transfer of output to other countries due to a disruption in the procurement of intermediate goods in the EU following the EU's CBAM imposition, and (ii) the balloon effect caused by the absence of direct costs for motor vehicles and transport equipment.

**Table 10.** Baseline: Changes in National Output by Industry

(Unit: Million Dollars)

| | Korea | China | Japan | AEAN | U.S. |
|---|---|---|---|---|---|
| Chemicals | [-1.4, -377] | [-342, -2,420] | [-19.0, -929] | [-98, -515] | [-19, -984] |
| Motor Vehicles | [3.9, 150] | [23.0, 60.0] | [15.0, 728] | [3.3, -25] | [7.5, 63] |
| Transport Equipment | [1.7, 50] | [17.0, 105] | [2.9, 133] | [2.7, -7] | [5.4, 136] |
| Metal | [3.5, -327] | [-172, -1,701] | [-1.0, -306] | [-2.9, 9.0] | [-10, -144] |
| Machinery | [0.5, -4.0] | [-3.0, 108] | [-1.5, -508] | [1.0, 54] | [2.8, -394] |

Note: Parentheses mean [minimum, maximum] by scenario, including all median values from scenario 1 to scenario 3.

Table 11 shows the change in export value by country. In [Scenario 1], Korea's exports increased by $5.3 million dollars despite the introduction of the EU's CBAM. It can be seen as a niche market that appears due to the country-specific differences in CBAM in the EU, as seen in the change in output value. However, if the CBAM spreads globally, the exports of all countries will decrease significantly. Exports to China decreased by up to 6,076.2 million dollars, and exports to the United States decreased by up to 233.1 million dollars. After Japan, it was analyzed that Korea's exports decreased by up to 798.4 million dollars.

**Table 11.** Baseline: Changes in Exports by Country

(Unit: Million Dollars)

| | Korea | China | Japan | ASEAN | U.S. |
|---|---|---|---|---|---|
| Scenario 1 | 5.3 | -432.2 | -8.8 | -78.6 | -24.1 |
| Scenario 2 | -317.1 | -2677.6 | -497.0 | -324.2 | -818.0 |
| Scenario 3 | -798.4 | -6076.2 | -1236.8 | -700.5 | -2033.1 |

Notes: 1. output value is the sum of Chemical, Motor Vehicles, Transport Equipment (including Shipping), Metal, and Machinery industries.
2. Parentheses mean [minimum, maximum] by scenario, including all median values from scenario 1 to scenario 3.

Table 12 shows the change in Korea's exports by country and industry. Korea's exports to the world were shown to decrease in [Scenario 2] and [Scenario 3], but countries with decreased exports and countries with increased exports were divided. Korea's exports to China decreased the most with a decrease of up to 322.7 million dollars in the chemical industry, and the metal and machinery industry also decreased in exports to China. On the other hand, exports to the US and EU are increasing. Exports to the US increased in the motor vehicles, metal and machinery industries, while exports to the EU increased in chemicals, motor vehicles, transport equipment, metal and machinery. This can be interpreted as Korea's export to the EU from major countries' exports to the EU, such as China, Japan, and ASEAN, following the introduction of the CBAM. For example, as the EU imposes additional tariffs on Chinese metal industry exports to the EU, it can be seen that the Korean metal industry's exports to the EU have increased. However, it should be noted that, compared with the increase in Korea's exports to the EU, Korea's exports to China, Japan, and ASEAN showed a greater decline, resulting in a decrease in overall exports.

The rate of change in Korea's output value by scenario is analyzed as shown in Table 13. As a result of the analysis, it was found that the increase in the total amount of output in Korea through the expansion of renewable energy support was only 0.03~0.13%. In the case of introduction of low-carbon technology, output increased by 0.5~1.17%, and in the case of granting tax benefits, it was analyzed that output increased more significantly compared to renewable energy support or introduction of low-carbon technology. When tax benefits were granted, output in Korea increased by 0.57-3.18%.

**Table 12.** Baseline: Changes in Korea's Exports by Country and Industry

(Unit: Million Dollars)

| | China | Japan | ASEAN | U.S. | EU |
|---|---|---|---|---|---|
| Chemicals | [-4.4, -322.7] | [-0.1, -31.5] | [-1.1, -19] | [0.2, -5.0] | [3, 9.1] |
| Motor Vehicles | [-0.3, 5.0] | [0.03, 1.4] | [-0.04, 2.2] | [0.3, 24.2] | [0.7, 15.8] |
| Transport Equipment | [0.05, 0.3] | [0.0, 0.02] | [0.02, 1.1] | [0.1, 1.5] | [0.4, 8.2] |
| Metal | [-0.7, -121.3] | [-0.2, -2.1] | [-0.5, -50.5] | [0.1, 21.3] | [2.4, 16.1] |
| Machinery | [-1.4, -61.9] | [-0.1, -1.0] | [-0.3, 12.1] | [0, 12.3] | [1.2, 17.3] |

Note: Parentheses mean [minimum, maximum] by scenario, including all median values from scenario 1 to scenario 3.

**Table 13.** Simulation: Changes in Output of Korea

(Unit: %)

| | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| Expansion of Support for Renewable Energy | 0.03 | 0.06 | 0.13 |
| Introduction of Low-carbon Technology | 0.50 | 0.86 | 1.73 |
| Offer Tax Benefits | 0.57 | 1.86 | 3.18 |

Table 14 shows the rate of change in Korea's exports by scenario. As a result of the analysis, output increased through the expansion of renewable energy support, but exports decreased slightly. This can be interpreted as the trade-restricting effect of the introduction of CBAM has a greater effect despite the expansion of renewable energy support. On the other hand, it was found that exports increase when low-carbon technology is introduced and tax benefits are granted. The introduction of low-carbon technology increased by up to 2.6% and tax benefits by up to 4.86%, resulting in the largest increase in exports due to tax benefits.

**Table 14.** Simulation: Changes in Exports of Korea

(Unit: %)

| | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| Expansion of Support for Renewable Energy | -0.37 | -0.40 | -0.48 |
| Introduction of Low-Carbon Technology | 0.60 | 1.18 | 2.60 |
| Offer Tax Benefits | 0.83 | 2.83 | 4.86 |

## V. Conclusion

The greenhouse gas reduction policy is spreading at the forefront of the EU. Especially, policies to respond to climate change, which were introduced in a voluntary way by each country, are highly likely to spread to the international community, including developing countries, in an involuntary way through the CBAM. Environmental issues are emerging as the core agenda of international trade.

As a result of this study, it was found that the CBAM of the EU and the international community has a negative effect on Korea's output and exports. A niche market or balloon effect may appear in some industries, but rather than focusing on short-term effects, strategies to reduce carbon emissions of major domestic industries should be prioritized from a long-term perspective.

As a result of analyzing the effects of support for new renewable energy, introduction of low-carbon technology, and granting tax benefits as a countermeasure to the introduction of the EU's CBAM, it was found that all of these policies increase Korea's output. Particularly, in terms of exports, it was found that the introduction of low-carbon technology had a significant effect on productivity increases and tax incentives inducing output motivation for companies. Therefore, in order to expand Korea's output and exports, sufficient support and benefits are needed to overcome the damage caused by the CBAM.

Changes in the international trade environment related to the environment are rapidly appearing. The EU is expected to enter into force the CBAM in 2023, and it is expected that the CBAM will be implemented in earnest from 2026 after going through a transition period. Although there are still five years left, there is a possibility that these measures will spread to countries around the world, including the EU, so it is necessary to constantly monitor the trend of greenhouse gas reduction policies in the EU and major countries. In particular, it is necessary to closely communicate with the EU-wide trends and the policies of individual member states within the EU. In addition, when discussing with the EU on the introduction of CBAM, it is necessary to sufficiently collect opinions from industries that are heavily affected by CBAM in Korea and deliver them to the EU along with government-to-government discussions.

In addition, there is a possibility that the CBAM may be introduced through bilateral or multilateral trade negotiations, led by developed countries. Although there is a possibility that these environmental measures do not conform to the WTO agreement, there is a high possibility that carbon-related measures will be actively discussed in the international trade environment to spread the introduction of climate change response technologies as new growth engines such as the Green New Deal. At the same time, as a net exporter of carbon dioxide, Korea has established a 'high and rapid' greenhouse gas reduction goal to quickly respond to the rapidly changing climate change environment. What should be noted here is that, if an international climate change response policy is introduced, it is highly likely to change the trade structure of Korea, which is highly dependent on trade. Therefore, in order for companies participating in trade to quickly adapt to the government's reduction goal, it is necessary to provide active and preemptive support and benefits for company's environmental technology development and investment.

Lastly, in the case of South Korea, rather than passively responding to the carbon-related measures that major propaganda countries, including the EU and the US, are trying to implement, they may come up with a policy to proactively respond to these measures. In other words, when FTAs with other countries are concluded, by inserting environmental chapters and provisions into the agreement, it is possible to actively respond to carbon-related measures to be implemented in the future.

Korea has already added environmental provisions while signing FTAs with other countries, and the Korea-EU and Korea-US FTAs also include environmental chapters. The chapter on sustainable development of the Korea-EU FTA contains provisions related to the environment. Specifically, (1) high level of environmental protection efforts, (2) obligations to effectively enforce environmental

laws, and (3) obligations to promote trade beneficial to sustainable development were introduced. In particular, if a high-level environmental protection effort clause is included and it is determined that certain issues related to the environment do not protect the environment, the agreement may be violated. Thus, from the perspective of Korea, it is necessary to continuously monitor the EU's implementation and compliance with environmental protection agreements, and to collect the results of violations of agreements in the EU and use them when negotiating environmental measures.

The Korea-United States FTA also includes an environmental chapter, and its obligations for environmental measures have been strengthened compared to that of the Korea-European Union FTA. First, the high level of environmental protection was made mandatory instead of the expression of effort. The obligation for effective enforcement of environmental laws is also stipulated to comply with multilateral environmental agreements, thereby implementing international norms as well as domestic laws. Simultaneously, a public participation system was introduced so that interested parties could directly request an investigation into violations regarding the enforcement and compliance of environmental laws, and a provision was included to create a channel through which the public could easily obtain information on environmental measures.

It is expected that international norms related to the environment will be proliferated through bilateral or multilateral agreements mainly using FTAs. As mentioned above, there is a possibility that environmental norms such as CBAM do not conform to WTO agreements at this time. In particular, since many environmental norms will appear in FTA agreements of countries that want to lead climate change response policies, such as the EU and the US, monitoring is also necessary.

If an environmental chapter is later introduced in each country's FTA agreements, trade in environmental products and services can be expanded, and positive effects can occur, such as revitalizing investment to develop environmental products and services. In this case, exporting companies need to use this as an opportunity to enter the global market if there is a clear incentive to use environmental technology or carbon labeling through FTA norms. In addition, the government needs to provide various supports and benefits so that exporting companies can be competitive in the global market while actively participating in environmental policies.

This study is meaningful in that it analyzed the effect of the introduction of the CBAM on Korea's output and exports. It is differentiated from previous studies in that the results of the analysis are presented by segmenting and presenting the results of Korea's main export industries.

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# A Study on the Relationship between ESG Performance Information and Value-Relevance: Focusing on Travel & Tourism Industry in Korea

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**ABSTRACT**

**Purpose –** This study investigates the value-relevance of ESG performance information in the Korean travel & tourism industry. ESG activities (environment, social, and governance) are critical factors for evaluating corporate value. However, when it comes to the travel and tourism section, whether the ESG performance information is incorporated in financial corporate value is questionable since the distinct guidelines on ESG performance does not exist.

**Design/Methodology/Approach –** This study hypothesizes that ESG performance information is not relevant to the corporate value in the travel and tourism industry. Using the KSE and KOSDAQ listed-firms in the travel & tourism industry for 2011-2020, this study conducts a univariate test as well as multiple regression analysis which estimates the relationship between stock price and ESG ratings. Ohlson (1995)'s model estimating value-relevance of accounting information is employed to test the hypothesis.

**Findings –** The analysis shows that both ESG reporting itself and ESG integration ratings are positively related to stock price as a proxy for corporate value. But the governance (G) factor only out of three- ESG individual components has a significantly positive relation with the corporate value. The findings hold after addressing a self-selection bias which is due to ESG reporting incentives.

**Research Implications –** In perspective of the usefulness of accounting information, this study extends the literature on value-relevance of ESG ratings as a nonfinancial accounting information. In addition, it adds the document on the effectiveness of ESG initiative by empirical results. Finally, it suggests the needs for guidelines which are appropriate for pricing the performance of social responsibilities (S) including sustainable environment € to be incorporated in corporate value.

***Keywords:*** ESG components, ESG performance, ESG ratings, travel & tourism industry, value-relevance
***JEL Classifications:*** M14, M41

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## I. Introduction

Focusing on the travel & tourism industry, this study investigates whether ESG performance information is incorporated into corporate financial value. From the beginning of the 2000s, as the global economy grew, environmental and social concerns spread throughout society, and the demand for companies to be socially responsible increased (Baden et al., 2011). The UN Global Compact's report <Who Cares Wins- Connecting financial markets to a changing world> in 2004 suggests that corporate sustainability in the capital market depends on the environment-friendly operation, social responsibility, and governance soundness (i.e., ESG factors) that contribute to a better society. This means that ESG factors-related activities eventually should be considered in corporate financial evaluation, and needs to be quantified to be reflected in corporate value.

ESG-engaged management comes to being imperative for corporate sustainability which determines corporate value in the long-term perspective. Particularly, companies in the travel & tourism industry are generally taken to depend on the risks and opportunities involved in ESG-related strategies, especially in terms of sustainable environment as well as social responsibility. They should not only engage with stakeholders including employees, consumers, executives, partners, and even local residents (Goh et al., 2018) but also develop so-called eco-friendly tourism (Kim, 2021) due to the relatively increased burden of environment costs on greenhouse gas emissions (Lenzen et al., 2018). Since such concerns are closely related to the reputation of the firm which in turn leads to corporate value, companies have tried to mitigate the negative views of consumers in environmental and social aspects through communication with stakeholders (Cowper-Smith & de Grosbois, 2011).

According to the UN Global Compact's report, ESG activities ultimately should play an important role in enhancing corporate value through actively exercising shareholder rights, meaning that ESG performance should be able to be connected to corporate value. However, whether the performance of ESG activities which are engaged in response to the social pressures in the travel & tourism industry is relevantly incorporated in corporate value is questionable. This is because there exists the objectivity and reliability problems with standardized criteria in evaluating ESG activities (Drempetic & Zwergel, 2020; Jang, 2021). Moreover, for the travel & tourism industry in Korea, the industry-specific guidelines for the performance disclosure have not been presented until a recent date.[1] This may cause the corporate ESG activities, especially environment and social activities, to be unrelated to the business operation which determines corporate value, regardless of increasing social benefits.

This is more plausible when companies make efforts to improve only their reputation or image through ESG ratings disclosure without economic effectiveness in ESG management. This is analogous to regarding CSR reporting as an instrument just for communication between business and society (Cowper-Smith & de Grosbois, 2011; Fombrun, 2005; Lii & Lee, 2012).[2] Taken together, the performance of ESG activities may not to be closely linked to corporate value, which is likely to be pronounced for the travel & tourism-engaged companies. The hypothesis of value-irrelevance of ESG performance information in the travel & tourism industry run counter to existing studies that document the value-relevance of ESG performance information from an industry-wide generalized perspective.

In this context, this study extends prior

1. As social demands for ESG in April 2021 are increased, the Ministry of Trade, Industry and Energy (http://www.motie.go.kr/www/main.do) established a Korean ESG evaluation index, a so-called K-ESG index, tailored to the domestic situation. Furthermore, by subdividing previously announced K-ESG guidelines, it has a plan to announce guidelines by industry within 2022.
2. According to stakeholder theory (Friedman & Miles, 2002), a company's ESG activity is expected to have a positive effect on corporate value through management that maximizes the interests of various stakeholders, while according to agent theory (Jensen & Mecklin, 1976), a company's ESG activity is an action seeking manager's private interests.

studies by examining the industry-specific value-relevance of ESG information for the travel & tourism industry. Based on previous literature and the current issues at hand, this study forms the null hypothesis on value-irrelevance of ESG information in the travel & tourism industry. By using not only ESG integration score but also its individual components, this study is expected to explore which component of ESG should be improved in order for ESG activities to be linked to corporate value. This will provide valuable implications for institutional policies on ESG disclosure guidelines for the travel & tourism industry.

Using the KSE and KOSDAQ listed-firms available for financial data in the travel & tourism industry for 2011-2020 and ESG ratings provided by Korea Corporate Governance Service (KCGS), the regression analysis provides several meaningful results. First, stock prices as a proxy for corporate value are higher in ESG reporting firms and an increase in ESG performance ratings in a basis of the integration score of ESG. Second, for ESG individual components, expectedly, environment (E) and social (S) factors which are considered relatively more important in the travel & tourism business are both not related to the corporate values, that is, value-irrelevant. Lastly, these results hold to the robustness test employing Heckman (1979)'s two-step approach to address a self-selection bias, which is the estimation error that arises from firm characteristics between treatment and control groups.

This means that ESG reporting itself is relevant to explain corporate values in the travel & tourism industry. Also, in pricing corporate values, market participants place weight on corporate governance rather than environment or social factors of ESG activities which are important for corporate sustainability in the travel & tourism industry. This study is meaningful in that it empirically verifies whether ESG information in the travel & tourism industry is related to corporate value with ESG-related information playing an important role for investors in making decisions. The finding that the performance information in the environment and social components of ESG activities are not value-relevant suggests that the guidelines concerned need to be presented more distinctly in policy.

The remainder of this paper is organized as follows. In section II, a literature review is presented regarding the ESG performance information, corporate value and ESG issues in the travel and tourism industry, and then the relevant hypotheses are developed. Next, the research methodology is described in section III. Then, the results of this study are provided in section IV. Finally, the paper presents a discussion and then concludes in section V.

## II. Research Background

### 1. ESG Performance Information and Value Relevance

Socially Responsible Investing (SRI) activities that consider ESG (Environment, Social, and Governance) information in investment decisions are aimed at a shareholder value-based return on investment, that is maximizing investor return (Kim et al., 2014). According to the "Comprehensive Improvement of the Corporate Disclosure System" announced by the government in January 2021, ESG information will be required to be disclosed to the large-sized companies listed on the Korean Stock Exchange from 2025 and will be expanded to all registered companies on the KOSDAQ by 2030 (Financial Services Commission, 2021). This implies that government authority promotes at least public companies to provide ESG information, and to be paid attention to ESG activities which can play a meaningful role in improving corporate sustainability and in lowering overall risk of management.[3]

3. In fact, more than 63% of investment professionals consider sustainability based on ESG performance to mitigate investment risk (CFA Institute, 2015), and 82% of asset managers worldwide reported that ESG information affects investment performance (Amel-Zadeh & Serafeeim, 2018).

Accordingly, ESG performance information is considered a factor that guarantees corporate sustainability from a long-term growth perspective, and its usefulness is reported in terms of relevance to corporate value (Gang & Jeong, 2020; Jang & Kim, 2013; Lim, 2019; Na & Lim, 2011). In particular, ESG-related studies have mainly analyzed the effect of ESG performance on cost of capital or credit ratings which is evaluated based on corporate value. Lee & Kim (2013) reported the value-relevance of ESG ratings information by showing a significant positive (+) relationship between ESG information such as ESG components' ratings and corporate value measured as Tobin Q.

Dhaliwal et al. (2011) and Eliwa et al. (2021) reported that the higher the ESG ratings, the lower the capital cost, and Kim & Lee (2015) reported that sustainable management had a positive effect on corporate value and credit rating. Furthermore, Leem (2019) who examines value-relevance of individual components of ESG (i.e., E, S, G) reported that the higher the social ratings (S), governance ratings (G), and ESG integration ratings, excluding environmental ratings (E), the higher the corporate value. Na et al. (2013) documented that the higher the ESG performance score, the higher the corporate bond ratings, and the lower the information asymmetry.[4]

However, the fact that ESG performance information can explain corporate value to this extent does not mean the accuracy of the estimation of corporate intrinsic value corresponds to the performance. This is because there still exists problems with objectivity of ESG performance indicators and linkage with corporate value (Drempetic & Zwergel, 2020; Jang, 2021). In particular, Jang (2021) who examines the status and problem of Korean ESG rating agencies pointed out that ESG evaluation institutions are concerned about the utilization of investors due to the extremely low level of transparency in evaluation methodology. These problems may appear more seriously depending on the characteristics of the industry.

Accordingly, many discussions are being held in the accounting-related academic and practical fields on the issue of the link between ESG activity performance and financial reporting. Here, the starting point of the discussion is that ESG performance is mostly related to intangible assets, but there is no clear standard for quantifying and measuring as non-financial information. Although ESG activity performance is communicated through an integrated report, it is hard to disentangle it into financial information. This is why it is also difficult to incorporate ESG performance information into corporate value.

## 2. ESG Issues in Travel & Tourism Industry

Since a travel & tourism business entails several ESG-related activities for various stakeholders in management strategies (Goh et al., 2018), it depends largely on the risks and opportunities involved in ESG strategies. First of all, the business should engage with stakeholders including employees, consumers, executives, partners, and even local residents. It is crucial to attract and maintain excellent executives and employees as an industry that is highly dependent on manpower, and to retain friendly relations with residents of nearby communities. Moreover, as tourism businesses

4. Similar to this, there are many studies analyzing the relationship between corporate social responsibility and corporate value, most of which are studies on social responsibility activities (CSR), corporate value, and financial performance (Ban, 2013; Chun & Kim, 2011; Kim & Hong, 2018; Yook & Choi, 2011). Most of the research results report that there is a significant positive (+) relationship between corporate social responsibility activities and corporate value, suggesting that the more active social responsibility activities are, the higher the corporate value. However, CSR is defined as corporate social responsibility, and unlike ESG, which aims to improve corporate value, it refers to companies taking responsibility for issues that may affect corporate activities such as consumers, employees, customers, communities, and the environment. In this respect, the studies listed above cannot be replaced with previous studies related to ESG.

tend to be operated through domestic and foreign linked products, it is necessary to pay attention to relationships with partners.

Due to its high carbon intensity and continuing growth, tourism constitutes a growing part of the world's greenhouse gas emissions.[5] This leads the travel & tourism industry to bear the burden of reducing greenhouse gases. Recently, the travel & tourism industry is required to have a relatively greater burden of environment costs on greenhouse gas emissions (Lenzen et al., 2018), and to develop so-called eco-friendly tourism (Kim, 2021). Moreover, the original appearance may be lost due to the location of new tourist facilities or the excessive commercialization tendency of local residents, which may leave a negative image for tourists (Kim, 2021).[6] Hence, the environmental impact of the business comes to be one of the management risks which the travel & tourism industry necessarily encounters.

Meanwhile, when it comes to the ESG evaluation standard linked to corporate value, for the travel & tourism industry, guidelines for disclosure items in Korea are insufficient when compared to the global trend.[7] This is why companies are often criticized about trying only to improve consumers' image without the real effectiveness of ESG management in financial performance. This implies that ESG performance ratings are likely to be not able to represent the information relevant to corporate value.

## 3. Research Question and Hypothesis

In response to the social demand and global trend, the ESG initiative which considers all stakeholders including not only shareholders but also members, customers, partners, and communities is relatively more critical for corporate sustainability for firms in the travel & tourism field in particular. Given that ESG essentially should play a crucial role for investment performance improvement in actively exercising shareholder rights, ESG performance should be able to be linked to corporate value, i.e., stock price in case of stock market listed firms. However, whether the performance ratings following ESG activities engaged are incorporated in corporate value is rather controversial.

This is because hundreds of ESG evaluation institutions around the world are rampant, and the objectivity and reliability of ESG indicators, which are evaluated and scored by different philosophies and standards, have a problem of corporate value linkage.[8] In addition, for the tourism industry, guidelines for disclosure items are not specified. ESG performance is embodied in ESG ratings in the Environment, Social and Governance subsection provided by the KCGS. While many studies have reported the value-relevance of ESG information in general, as stated above, whether ESG performance ratings in travel & tourism section actually can be a signal of increasing corporate value could be an

5. The tourism industry is responsible for 8% of the world's carbon emissions after considering transportation, agriculture, and manufacturing related to the tourism industry (Lenzen et al., 2018).
6. In the process of developing tourism resources, the natural environment can be destroyed due to the location of numerous accommodation facilities and stores, the expansion of roads, and the increase of tourism facilities.
7. World Travel & Tourism Council (WTTC) that represents the travel & tourism sector globally monitors the current status of ESG information disclosure by major companies in the travel tourism industry and presents ESG information disclosure guidance for 709 global tourism companies in 2017. The tourism industry ESG information disclosure generally describes issues related to climate change response and environmental impact reduction due to projects, and efforts to prevent forced labor and child labor issues that can occur in developing or underdeveloped countries in the value chain are also revealed. Accordingly, in April 2021, the Ministry of Trade, Industry and Energy (http://www.motie.go.kr/www/main.do) established a Korean ESG evaluation index, so-called K-ESG index, tailored to the domestic situation.
8. In particular, since ESG ratings differ not only in measurement methods but also in standards from institution to institution, many studies argue that unified standards are needed in the future (Berg et al., 2020; Chatterji et al., 2016). Interestingly, not only is each institution not standardized in data collection and scoring methods, but also determines which factors are important ESG factors for a company's financial performance, ESG data provider's raw data acquisition and estimation, and weighting methods.

empirical question. Thus, this study forms the null hypothesis as follows and examines whether ESG performance information (H1) and the individual components of ESG information (H2) are relevant to corporate values.

**H1:** ESG performance information is not relevant to the corporate value in the travel & tourism industry.
**H2:** Individual component of ESG performance information is not relevant to the corporate value in the travel & tourism industry.
**H2a:** Environment component of ESG is not related to the corporate value in the travel & tourism industry.
**H2b:** Social component of ESG is not related to the corporate value in the travel & tourism industry.
**H2c:** Governance component of ESG is not relevant to the corporate value in the travel & tourism industry.

## III. Research Methodology

### 1. Sample Selection

To test the hypothesis, this study uses the listed-firms available for financial data and for the travel & tourism industry.[9] Financial data are retrieved from the Data Guide Pro database provided by FnGuide (http://www.fnguide.co.kr). Restricted to the firm-years with non-missing data on financial variables for 2011-2020, the final sample consists of 208 firm-year observations as follows. The figures in parentheses represents the classification code based on the small category in the Korea Standard Industrial Classification (KSIC).

**Table 1.** Industry Subsector-Based Observations of Sample

| Classification (Code) | Obs. |
|---|---|
| Hotel (47100) | 11 |
| Land Transportation (49200) | 22 |
| Airline Transportation (51100) | 47 |
| Accommodation (55100) | 27 |
| Travel Agency Service (75200) | 68 |
| Amusement Facilities (91200) | 33 |

Until 2020, ESG ratings have been publicly reported by the Korea Corporate Governance Service (KCGS) (http://www.cgs.or.kr). In addition to the governance evaluation that has been conducted since 2003, the KCGS has developed its own ESG evaluation model that meets international standards such as OECD corporate governance principles and ISO 26000, evaluated the ESG level of all listed corporations, and announced the results. Environment (E) includes

9. According to the Korea Tourism Promotion Act (Article 2, Paragraph 1), tourism businesses are proposed as a total of seven industries: travel, tourism accommodation, tourist facilities, international conferencing, Kazino, amusement facilities, and tourism convenience facilities. According to the tourism-related industry classification table of the Korean Standard Industry Classification, tourism-related industries are largely presented as lodging and restaurant, transportation, travel and transportation-related services, machinery and equipment rental, and entertainment, culture and exercise-related industries. This study considered the standards in the Tourism Promotion Act and the Korea Standard Industrial Classification, but selected listed companies as the final samples of the tourism industry.

environmental management, environmental performance, and stakeholder responses; society (S) includes workers, partners and competitors, consumers and communities' responses; and governance (G) includes evaluation items related to shareholder rights protection, board of directors, audit bodies, and disclosure. The evaluation grades announced by KCGS consist of a total of 7 grades, from S to D.

## 2. Research Design

The ESG ratings of KCGS are provided into four categories, i.e., ESG integration, environment management, social responsibility, and governance. Since the ESG ratings are presented the form of the grade ranging from A+ to D, they are scored, A+ assigned to 10, A to 9, B+ to 8, B to 7, C to 6, and D to 5.[10] This method is in accordance with Hong & Anderson (2011) and Oh et al. (2020). Based on the scores, the hypothesis on the value relevance of ESG report and performance is tested. The test models are as follows.

$$Price_{i,t} = Const. + \alpha_1 EPS_{i,t} + \alpha_2 BPS_{i,t} + \Sigma SIND + \Sigma YEAR + \varepsilon_{i,t} \quad (1)$$

$$Price_{i,t} = Const. + \beta_1 EPS_{i,t} + \beta_2 BPS_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \beta_5 C.Ratio_{i,t} + \Sigma SIND + \Sigma YEAR + \varepsilon_{i,t} \quad (2)$$

where,

$Price_{i,t}$ : Stock price at the end of year $t$;
$EPS_{i,t}$ : Earnings per share at the end of year $t$, measured as net income divided by the number of outstanding shares;
$BPS_{i,t}$ : Book value per share at the end of year $t$, measured as total equity divided by the number of shares;
$SIZE_{i,t}$ : Firm size at the end of year $t$, measured as the logarithms of total assets;
$LEV_{i,t}$ : Debt ratio at the end of year $t$, measured as the total liability divided to the total assets;
$C.Ratio_{i,t}$ : Current ratio at the end of year $t$, measured as the ratio of current assets to current liabilities;
$SIND$ : Small category-based industry dummy variables;
$YEAR$ : Year dummy variables.

Firm is are omitted for all of the variables above.

Equations (1) and (2) are the regression models designed for examining the value-relevance of accounting information (Asthana & Chen, 2012; Burgstahler & Dichev, 1997; Collins et al., 1997; Feltham & Ohlson, 1995; Ohlson, 1995.). They estimate the relationship between accounting information such as earnings per share (EPS) or book value per share (BPS) and stock price reflecting corporate value, based on efficient market hypothesis (i.e., EMH). The equation (1) is a model for measuring the value-relevance of accounting information presented in previous studies, and the equation (2) is a model that adds a few variables expected to affect the value-relevance of accounting information to the equation (1) (Collins et al., 1997; Fama & French, 1992; Hayn, 1995.).

The firm size (SIZE) is measured as the natural logarithms of total assets, and affects the capital structure, affecting corporate value. Fama & French (1992) documents that small firms tend to outperform large firms when it comes to stock market returns. Firms with high financial risk (i.e., the high likelihood of insolvency) increase the explanatory power of net assets, which is measured total assets minus total liability, on stock price (Barth et al., 1998). That is, the financial risk is also a determinant factor of corporate values. As proxy variables of the financial risk, the debt ratio (LEV) and financial liquidity (C.Ratio) are taken into the estimation. Finally, the industry and year fixed effects on stock price are controlled by adding to the model.

10. There is no S which is the highest grade among the category of ESG rating within research sample.

If the accounting information (i.e., EPS and BPS) is value-relevant, the coefficients of EPS or BPS would show a statistically significant sign, which indicates the informativeness of accounting information on the corporate values. In this paper, we aim at examining the informativeness of ESG performance information on corporate value by adding ESG ratings to such base models. Equation (3) is the extended model from the equation (2).

$$\begin{aligned} Pricei,t = \ & Const. + \gamma 1EPSi,t + \gamma 2BPSi,t + \\ & \gamma 3ESGi,t + \gamma 4SIZEi,t + \gamma 5LEVi,t + \\ & \gamma 6C.Ratioi,t + \Sigma SIND + \Sigma YEAR + \\ & \pi i,t \end{aligned} \quad (3)$$

The estimates of ESG ($\gamma_3$) based on the regression implies the extent to which ESG reports or even performance information is value-relevant independently from other financial accounting information, i.e., EPS, BPS, and other control variables. Our interesting variable is ESG which represents ESG report or grade of the ESG-specific sections (i.e., environment management, social responsibility, and governance). If the ESG variables have value-relevance, the coefficients of ESG ($\gamma_3$) would show a statistically significant sign. Specifically, if a firm's ESG ratings is positively related to the stock price, the sign of $\gamma_3$ is expected to be positive, implying that ESG performance information per se plays as one of the indicators of conveying the corporate value.

# IV. Empirical Results

## 1. Descriptive Statistics

Table 2 provides the descriptive statistics of the test variables. The mean value of ESG is 0.63, indicating firm-year observations with ESG performance reporting accounts for approximately 63% of the total sample.[11] Price is the closing price of a stock. The mean value of Price is 26,000, which is similar to the average price (i.e., about 25,000 as of the end of 2020) of all securities in KSE and KOSDAQ-listed firms. An indicator of firm profitability EPS shows a negative value which implies a loss of earnings, which is presented as a minimum value of –7,044. Although not tabulated, approximately 31% out of all firm-year observations reports financial loss. BPS as an indicator of financial soundness has the mean value of 13,165 and shows that capital impairment which shows negative equity in the sample does not exist.

As one of the control variables, firm size SIZE which is measured as logarithms of total assets shows an average value of 27.13. The debt ratio LEV shows the mean value of 0.5, indicating that firm liabilities account for 50% of total assets, on average. Finally, C.Ratio is the current ratio, as an indicator of financial liquidity, which means the availability of cash to pay debt. The mean value of 1.42 indicates the current assets being 1.42 times higher than current liabilities. All variables show a large gap between minimum and maximum value.

**Table 2.** Descriptive Statistics

(n. of obs. = 208)

| Variable | Min | 25% | Mean | Median | 75% | Max | Std.dev. |
|---|---|---|---|---|---|---|---|
| ESG (indicator) | 0.00 | 0.00 | 0.63 | 1.00 | 1.00 | 1.00 | 0.48 |
| Price | 2,460 | 9,390 | 26,004 | 20,600 | 33,300 | 94,700 | 22,158 |
| EPS | -7,044 | -199 | 262 | 468 | 1,580 | 8,586 | 4,871 |
| BPS | 1,955 | 4,595 | 13,165 | 9,859 | 16,857 | 43,689 | 10,502 |
| SIZE | 24.71 | 26.02 | 27.13 | 26.94 | 28.12 | 30.82 | 1.53 |
| LEV | 0.11 | 0.32 | 0.50 | 0.48 | 0.62 | 0.93 | 0.22 |
| C.Ratio | 0.17 | 0.49 | 1.42 | 1.09 | 1.82 | 5.03 | 2.01 |

Variable Definition

ESG: Indictor of the existence of ESG performance reporting at year *t*;
*Price*: Stock price at the end of year *t*;
*EPS*: Earnings per share at the end of year *t*, measured as net income divided by the number of outstanding shares;
*BPS*: Book value per share at the end of year *t*, measured as total equity divided by the number of shares;
*SIZE*: Firm size at the end of year *t*, measured as the logarithms of total assets;
*LEV*: Debt ratio at the end of year *t*, measured as the total liability divided to the total assets;
*C.Ratio*: Current ratio at the end of year *t*, measured as the ratio of current assets to current liabilities;

Even within the same industry of travel & tourism, the distribution on ESG score may differ depending on industry-wide or firm-specific characteristics which promote or neglect the ESG-engaged management. Table 3 presents the ESG performance ratings and their score by industry sector. When based on the integrated ESG ratings (see Integration in ESG ratings), the sectors of Hotel, Airline Transportation, and Amusement Facilities show relatively high scores (i.e., higher than 7 which corresponds the rating B) compared to the other sectors. As considered to be the industry in which firms well-known and large in scale (such as HOTEL SILLA Co., LTD. or KOREAN AIR) belong, they are likely to drive the ESG initiative in the purpose of enhancing corporate value and reducing cost of capital (Dhaliwal et al., 2011; Eliwa et al., 2021). This is in line with the argument that firms motivated to establish high reputations, which is achieved through ESG activities, are likely to actively engage in ESG management and show high performance of ESG activities.

**Table 3.** ESG Score by Subdivided Sector in the Travel & Tourism Industry

| Sector | ESG Ratings | | | |
|---|---|---|---|---|
| | Integration | Environment | Social | Governance |
| Hotel | 7.50 | 7.40 | 7.40 | 7.50 |
| Land Transportation | 6.26 | 5.94 | 6.16 | 7.00 |
| Airline Transportation | 7.48 | 7.61 | 7.79 | 7.09 |
| Accommodation | 6.25 | 5.56 | 6.31 | 6.28 |
| Travel Agency Service | 6.58 | 5.19 | 6.96 | 6.91 |
| Amusement Park | 7.30 | 6.40 | 7.79 | 7.59 |

Note: This table presents the ESG performance ratings and their score by industry sector.

Table 4 presents the statistical difference in financial numbers between ESG-engaged firms and non-ESG firms, showing a notable financial gap exists between them. Particularly, ESG-engaged firms tend to be high priced by about two times of non-ESG firms and be larger in size. The mean

11. ESG ratings (scores) are presented in detail in Table 2.

values of Price are 31,672 in ESG firms and 16,160 in non-ESG firms. The differences are statistically significant, showing t-statistics of 6.01 from Mean difference t- test for Price. The t-statistics of 7.42 for SIZE is also significant at the 1% level. These results hold to the Wilcoxon Rank Sum Test, which is the difference test based on median values.

ESG information disclosure is limited by the capacity of a company's management resources (Drempetic & Zwergel, 2020). If the cost of information disclosure is strong in the nature of fixed costs that are not linked to sales, it is possible that firms with lower resources are not willing to disclose ESG information, but firms with large capacity of resources are willing to do so for the benefit of the economic impact of scale. The statistics for BPS and C.Ratio (financial liquidity) are also significant, which indicates that there exists a difference in capital structure between ESG firms and non-ESG firms.

**Table 4.** Statistical Difference of ESG Firms from Non-ESG Firms

| | | Variables | | | | | |
|---|---|---|---|---|---|---|---|
| | | Price | EPS | BPS | SIZE | LEV | C.Ratio |
| [1] ESG Firms (n=132) | Mean | 31,672 | -53 | 15,532 | 27.63 | 0.51 | 1.19 |
| | Median | 25,725 | 405 | 12,287 | 27.50 | 0.49 | 0.96 |
| [2] Non-Firms (n=76) | Mean | 16,160 | 810 | 9,054 | 26.27 | 0.47 | 1.82 |
| | Median | 13,125 | 491 | 6,420 | 26.15 | 0.47 | 1.24 |
| | | Mean Difference Test p>\|t\| | | | | | |
| [1]-[2] | t-stat. | 6.01*** | -1.59 | 4.89*** | 7.42*** | 1.20 | -1.70* |
| | | Wilcoxon Rank Sum Test p>\|Z\| | | | | | |
| | Z-stat. | 5.17*** | -1.24 | 4.75*** | 6.47*** | 0.98 | -2.10** |

Note: The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for variable definitions.

## 2. Correlation Analysis

Table 5 presents correlation analysis results on main test variables. ESG integration score (ESG) shows a significantly positive relation between all ESG individual components (i.e., Environ., Social, and Govern.), but is not related to Price which indicates corporate value. Among the individual components, Environ. (environment score) and Govern. (governance score) is positively associated with Price through the Spearman coefficient (ρ). This means that ESG performance reporting itself is not value-relevant, but ESG ratings which indicate the effort on protecting the environment or enhancing governance systems may help explain corporate values. Interestingly, Social component (Social) is negatively related to EPS (earnings per share) and BPS (book value per share), factors which explain firm values, while it is critical in corporate sustainability for firms engaged in the travel & tourism industry. In the next section, the analysis will test the hypothesis more elaborately through multiple regression analysis.

**Table 5.** Correlation Matrix of Test Variables

| | Price | EPS | BPS | ESG Score | | | |
|---|---|---|---|---|---|---|---|
| | | | | ESG | Environ. | Social | Govern. |
| Price | | 0.463*** | 0.721*** | 0.121 | 0.150* | -0.014 | 0.299*** |
| EPS | 0.176*** | | 0.359*** | -0.120 | -0.007 | -0.176** | 0.097 |
| BPS | 0.523*** | 0.205*** | | -0.094 | 0.271*** | -0.253*** | 0.080 |
| ESG | 0.141 | -0.079 | -0.091 | | 0.661*** | 0.806*** | 0.600*** |
| Environ. | 0.067 | -0.030 | 0.168* | 0.718*** | | 0.502*** | 0.240** |
| Social | -0.018 | -0.104 | -0.235** | 0.825*** | 0.598*** | | 0.363*** |
| Govern. | 0.292*** | 0.031 | 0.053 | 0.591*** | 0.218** | 0.363*** | |

Note: The figures in the lower left of diagonal empty represent the Pearson correlation coefficients and those in upper right of diagonal empty to the Spearman correlation coefficients. The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for variable definitions.

## 3. Regression Analysis

In this section, a series of multiple regression analyses are conducted to capture the relationship between ESG performance information and corporate value. If the estimate of ESG is statistically significant after the other explanatory variables of stock price (Price), ESG information would be value-relevant.

Table 6 presents the analysis results. In the first column, the Eq. (1) provides the evidence on whether the Ohlson (1995) model, which tests value-relevance of financial accounting information including accounting earnings (i.e., EPS) or book value of equity (i.e., BPS), is still effective in the travel & tourism industry as well. As presented, EPS (earnings per share) and BPS (book value per share) are all significantly related to Price (corporate value), indicating applicability of the Ohlson model in the travel & tourism industry.

Eq. (2) adds primary financial data to the Ohlson model, which allows the estimates to capture the effect of other financial data affecting on corporate value before taking ESG into account. Debt ratio (LEV) and current ratio (C.Ratio) are positively related to Price (corporate value), but firm size (SIZE) is not. Eq. (3) of the third column is our main test model that captures the value-relevance of ESG information, the existence of ESG reporting. The regression results show the significantly positive coefficient of ESG, implying that stock prices proxy for corporate values are higher for ESG reporting firms. That is, ESG reporting itself is relevant to explain corporate values in the travel & tourism industry.

**Table 6.** Value Relevance of ESG Performance Reporting

$$Price_{i,t} = Const. + \gamma_1 EPS_{i,t} + \gamma_2 BPS_{i,t} + \gamma_3 ESG(Reporting)_{i,t} + \gamma_4 SIZE_{i,t} + \gamma_5 LEV_{i,t} + \gamma_6 C.Ratio_{i,t} + \Sigma SIND + \Sigma YEAR + \pi_{i,t}$$

| | Eq. (1) | | Eq. (2) | | Eq. (3) | |
|---|---|---|---|---|---|---|
| Variable | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Const. | 1.5959 | 2.02** | -1.0986 | -0.96 | 0.5625 | 0.44 |
| EPS | 0.1379 | 3.57*** | 0.0618 | 1.49 | 0.0869 | 2.10** |
| BPS | 0.7341 | 9.30*** | 0.8805 | 9.56*** | 0.7771 | 8.01*** |
| ESG | | | | | 0.3241 | 2.80*** |
| SIZE | | | 0.0246 | 0.65 | -0.0094 | -0.24 |
| LEV | | | 1.0904 | 2.79*** | 1.1484 | 3.01*** |
| C.Ratio | | | 0.3064 | 4.20*** | 0.2850 | 3.98*** |
| ∑SIND | Included | | Included | | Included | |
| ∑YEAR | Included | | Included | | Included | |
| Adj.$R^2$ | 56.10% | | 61.41% | | 63.36% | |
| F-stat. | 17.49*** | | 17.14*** | | 17.37*** | |
| Obs. | 208 | | 208 | | 208 | |

Note: The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for the variable definitions.

Then, Table 7 shows the analysis results on the test model in which whether the ESG individual components (i.e., Environ., Social, Govern.) is significant in explaining corporate values is examined.[12] Interestingly, both environment factor (Environ.) and social factor (Social) are not related to the corporate values. This is not in accordance with the general expectation of a close connectivity between both environment and social-related activities in the travel & tourism industry leading to the corporate values (financial performance). The reasons that their performance ratings may not be incorporated separately in the corporate value are conjectured in twofold. First, market participants may perceive ESG activities regarding the environment (E) or social responsibility (S) as just an act for the image or reputation of travel & tourism companies that put their resources in activities that do not lead to the financial performance in effect. Second, although firm activities regarding sustainable environment and social responsibility aim to improve the financial performance in practice, the evaluating standards / disclosure guidelines to reflect the

12. The number of observations is restricted due to data availability of the individual components' ESG ratings.

related performance does not exist distinctively in the travel & tourism industry, as delineated in section 2.2. Taken together, activities of firms or guidelines from authority that are ambiguous may be responsible for the value-irrelevance of the performance ratings.

However, governance factor (Govern.) has a significant impact on the corporate values, consistent with prior studies of all industry-based analysis results (&Kim et al., 2020; Lee & Kim, 2013).[13] This means that in pricing corporate values, market participants are likely to place more weight on corporate governance soundness rather than the other components of ESG, even the travel & tourism industry. Corporate governance indicates the efficient management and operating system including the role of board of directors or internal auditor, and the separation of ownership and management, etc. (Kim et al., 2020). It represents a firm's normality of management system from which market participants predict a firm's future performance, which reflects essentially the future corporate values, in general.

**Table 7.** Value Relevance of ESG Performance Ratings

$$Price_{i,t} = Const. + \gamma_1 EPS_{i,t} + \gamma_2 BPS_{i,t} + \gamma_3 ESG(Ratings)_{i,t} + \gamma_4 SIZE_{i,t} + \gamma_5 LEV_{i,t} + \gamma_6 C.Ratio_{i,t} + \Sigma SIND + \Sigma YEAR + \pi_{i,t}$$

| | ESG | | | | | |
|---|---|---|---|---|---|---|
| | Environ. | | Social | | Govern. | |
| Variable | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Const. | 0.6607 | 0.32 | 2.6406 | 1.47 | 0.1794 | 0.11 |
| EPS | 0.0177 | 0.36 | 0.0148 | 0.30 | -0.0315 | -0.65 |
| BPS | 0.9720 | 6.69*** | 0.8795 | 6.03*** | 0.9729 | 7.98*** |
| ESG | -0.0701 | -1.03 | 0.0458 | 0.63 | 0.1443 | 1.89* |
| SIZE | -0.0672 | -1.01 | -0.1302 | -2.48** | -0.0902 | -2.15** |
| LEV | 2.1358 | 4.51*** | 1.8974 | 4.09*** | 1.9451 | 4.32*** |
| C.Ratio | 0.4539 | 4.33*** | 0.4184 | 4.15*** | 0.4849 | 5.15*** |
| ∑SIND | Included | | Included | | Included | |
| ∑YEAR | Included | | Included | | Included | |
| Adj.$R^2$ | 57.10% | | 53.83% | | 61.80% | |
| F-stat. | 8.10*** | | 7.68*** | | 11.03*** | |
| Obs. | 84 | | 87 | | 91 | |

Note: The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for the variable definitions.

13. Especially, Lee & Kim (2013) reported that both ESG integration ratings and those in ESG individual components (E, S, G) have a significant positive (+) relationship with corporate values which is measured as Tobin Q.

## 4. Robustness Check: Addressing Self-Selection Bias

The data is confined to firm-year observations in the travel & tourism industry, which is likely to cause the distributional uniqueness to affect the estimates of analysis. This may allow the estimates to be biased attributable for the endogeneity problem concerned with ESG engagement or reporting incentives in the travel & tourism industry. As stated in Table 3, there exists the financial difference between ESG firms and non-ESG firms. The disparity in financial property may make a difference in ESG reporting incentives as well as in the valuation process between ESG firms and non-ESG firms, resulting in estimation distortion (i.e., a self-selection bias).

**Table 8.** Value Relevance of ESG Report and Ratings: Heckman Two Step Approach ,

| | ESG | | | |
|---|---|---|---|---|
| | Report | | Integration Score | |
| Variable | Coeff. | t-stat. | Coeff. | t-stat. |
| Const. | 13.6073 | 2.55*** | 16.0124 | 2.46** |
| EPS | 0.1050 | 2.54*** | 0.0056 | 0.11 |
| BPS | 0.7557 | 7.91*** | 0.9531 | 6.69*** |
| ESG | 0.3238 | 2.85*** | 0.1520 | 1.69* |
| SIZE | -0.4386 | -2.50** | -0.6218 | -2.76*** |
| LEV | 1.1004 | 2.94*** | 1.8401 | 3.91*** |
| C.Ratio | 0.2751 | 3.92*** | 0.4181 | 4.17*** |
| IMR | -1.8933 | -2.51*** | -2.1412 | -2.21** |
| ∑SIND | Included | | Included | |
| ∑YEAR | Included | | Included | |
| Adj.$R^2$ | 64.83% | | 56.92% | |
| F-stat. | 17.36*** | | 7.86 | |
| Obs. | 208 | | 131 | |

Note: The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for the variable definitions.

To address the endogeneity concerns, Heckman (1979)'s 2-step approach, which produces the Inverse mills ratio (IMR) through first step model and then includes IMR as a control variable into the test model, is employed. In the first step model, ESG reporting (indicator) as a response variable is included into the model in which SIZE, BPS, and C.Ratio are chosen as the explanatory variables. This is because the capacity of firm resources, which are represented in firm size (SIZE), equity value (BPS), and financial liquidity (C. Ratio) out of the independent variables in this study, is likely to affect the public disclosure activity of ESG performance, as stated above.

The first step model is as below.

$$ESG(reporting)_{i,t} = Const. + \upsilon_1 SIZE_{i,t} + \upsilon_2 BPS_{i,t} + \upsilon_3 C.Ratio_{i,t} + \Sigma SIND + \Sigma YEAR + \varphi_{i,t} \quad (4)$$

Where, ESG (reporting) is the indicator variable which equals 1 if there exists ESG reporting information, 0 otherwise. By conducting the Probit regression of the first model, the estimation obtains the residual value ($\varphi_{i,t}$) by which IMR is calculated. The following equation is the second step model in which IMR is included as a control variable.

Table 8 shows the analysis result on the value-relevance of ESG reporting (Report) and ESG ratings (Integration Score), based on Heckman (1979)'s two-step approach regression. ESGs have significantly positive coefficients in both cases, indicating that both ESG reporting and ESG performance ratings are all value-relevant after addressing an endogeneity problem.

Table 9 provides the analysis results on the test model of each component variable (i.e., Environ., Social, Govern). Similar to Table 6, environment factor (Environ) and social factor (Social) are not significant to the corporate values. Governance factor (Govern) has a significant impact on the corporate values, showing the coefficient of 0.1346 (t-stat.=1.76).

$$Price_{i,t} = Const. + \mu_1 EPS_{i,t} + \mu_2 BPS_{i,t} + \mu_3 ESG(Reporting\ or\ Ratings)_{i,t} + \mu_4 SIZE_{i,t} + \mu_5 LEV_{i,t} + \mu_6 C.Ratio_{i,t} + \mu_7 IMR_{i,t} + \Sigma SIND + \Sigma YEAR + \theta_{i,t} \quad (5)$$

**Table 9.** Value Relevance of ESG Performance: Additional Test

| | ESG | | | | | |
|---|---|---|---|---|---|---|
| | Environment | | Social | | Governance | |
| Variable | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Const. | 13.3461 | 1.74* | 16.7911 | 2.60*** | 14.2473 | 2.38** |
| EPS | 0.0224 | 0.46 | 0.0208 | 0.43 | -0.0092 | -0.19 |
| BPS | 0.9909 | 6.90*** | 0.9417 | 6.52*** | 0.9595 | 8.11*** |
| **ESG** | **-0.0071** | **-0.09** | **0.0998** | **1.34** | **0.1306** | **1.76*** |
| SIZE | -0.5176 | -1.92* | -0.6386 | -2.78*** | -0.5540 | -2.83** |
| LEV | 2.1824 | 4.67*** | 1.9403 | 4.29*** | 1.9359 | 4.43*** |
| C.Ratio | 0.4359 | 4.20*** | 0.4261 | 4.35*** | 0.4923 | 5.39*** |
| IMR | -1.8467 | -1.72* | -2.2232 | -2.27** | -2.0867 | -2.42** |
| ∑SIND | Included | | Included | | Included | |
| ∑YEAR | Included | | Included | | Included | |
| Adj.$R^2$ | 58.36% | | 56.39% | | 64.05% | |
| F-stat. | 8.01*** | | 7.95*** | | 11.36*** | |
| Obs. | 84 | | 87 | | 91 | |

Note: The notations ***, **, and * denote the statistical significance at the 1%, 5%, and 10% level, respectively. Please refer to Table 2 for the variable definitions.

## V. Conclusion

This study investigates the value-relevance of ESG performance information in the travel & tourism industry. ESG activities (Environment improvement, Social responsibility, and Governance soundness) are considered to be crucial factors in evaluating long-term corporate

sustainability. However, for the travel & tourism industry in Korea, the industry-specific guidelines for the performance disclosure have not been presented until a recent date, which cause the objectivity and reliability problems with report items of ESG performance. Thus, whether the ESG performance information is incorporated in financial corporate value is questionable.

Using the KSE and KOSDAQ listed-firms available for financial data in the travel & tourism industry for 2011-2020 and ESG ratings which are provided by KCGS, the regression analysis provides some meaningful results. First, stock prices as a proxy for corporate value are higher in ESG reporting firms and increase in ESG performance ratings in a basis of ESG integration score. Second, for ESG individual components, interestingly, both environment factor (E) and social factor (S) are not related to the corporate values, but governance factor (G) has a significant impact on the corporate values. Lastly, these results hold to the robustness test employing the Heckman two-step approach (1979) to address a self-selection bias.

This means that ESG reporting itself is relevant to explain corporate values in the travel & tourism industry. And also, in pricing corporate values, market participants place greater weight on corporate governance rather than environment or social activities which are important for corporate sustainability even in the travel & tourism industry. Overall, ESG-related information can play an important role for investors in making decisions but not on the environment and social activity, suggesting rather weak informativeness of environment and social factors out of ESG activities due to low connection between the performance and pricing in those activities.

This study contributes to academics and the practical field. First, in perspective of the usefulness of accounting information, it extends the literature on value-relevance of ESG performance information as a nonfinancial accounting information. In addition, it adds the document on the effectiveness of ESG initiative by empirical results that industry-specific ESG information in the travel & tourism industry is value-relevant in part. Further, the finding that the social and environment components are not value-relevant suggests that the guidelines which are appropriate for pricing the performance to be incorporated in corporate value need to be presented distinctly in policy.

Even if this study is timely in the current situation where ESG management is recommended in domestic policy, there are several limitations in methodology. First, the findings are valid confined to the analysis employing Ohlson (1995)'s model and need to be cautious for generalization. Second, this study does not directly compare and analyze the effects of the entire industry and the effects of the tourism industry in verifying the value-relevance of ESG performance information. The difference in results according to based sample, i.e., entire industry and travel & tourism, or among the industry, needs to be examined more profoundly in future research. Lastly, this study uses only the ESG grade provided publicly by KCGS, while quantified score of ESG is available but private. To enhance the validity of results, the quantified score as the alternative measurement of ESG rating is recommended to be also considered in analysis as possible.

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# The Effects of Tangible and Intangible K-contents on Chinese Consumers' Purchase Intention to Korean Products: Focusing on the Moderating Effect of Ethnocentrism*

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**ABSTRACT**

**Purpose –** The purpose of this paper is investigating the moderating effects of ethnocentrism, which has been overlooked in the research on the effect of K-contents on the intention to purchase Korean products.
**Design/Methodology/Approach –** To test the hypothesis, a survey was conducted among Chinese consumers. The survey was conducted mainly through social media and online surveys. A total of 329 responses were collected, out of which 300 were used for empirical analysis, after excluding 29 incomplete responses.
**Findings –** As a result of the empirical analysis, it was found that the ethnocentrism of Chinese consumers negatively moderates the relationship between the perception of tangible K-content, which is classified as Korean fashion and Korean food, on their intention to purchase Korean products. On the other hand, it was found that Chinese consumers' ethnocentrism did not show a significant moderating effect in the relationship between their perception of intangible K-content classified as K-drama and K-pop and Chinese consumers' purchase intention to Korean products.
**Research Implications –** The results of this study can have important implications for multinational corporations in international markets, to manage their brand image in countries with strong ethnocentrism. It helps in identifying the negative moderating effect of ethnocentrism in the relationship between the Korean Wave (especially tangible K-content) and the consumers' intention to purchase Korean products.

***Keywords:*** ethnocentrism, intangible K-contents, K-contents, purchase intention, tangible K-contents
***JEL Classifications:*** F20, F23, M31

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## I. Introduction

Understanding the purchasing intentions of global consumers is an important task for firms pursuing internationalization. As consumers' intentions to purchase eventually may lead to the actual purchase of the product, it is important to understand the factors that positively influence consumers' intention to purchase. Long-term growth and survival of a firm can be guaranteed when consumers' purchase intentions lead to their purchasing behavior.

The importance of the effect of the Korean Wave content on the purchase of Korean products is increasing. Korean Wave (or Hallyu) refers to "*the phenomenon that young people in China are enthusiastic about Korean popular culture such as Korean dramas and popular songs* (Bae et al., 2017, 1)." The influence of the Korean Wave is expanding not only in Korean cultural content but also in the industry as a whole due to the recent Korean wave.

Previous studies have analyzed the direct relationship between the types of Hallyu content, purchase behavior, and purchase intention to understand the Korean Wave content and its relation to the purchasing behavior of overseas consumers (Liu & Kim, 2019; Lkhaasuren et al., 2018; Yen et al., 2020; Yu, 2017). However, there are very few studies that examine the effect of the types of Korean Wave content on the intention to purchase Korean products by classifying Hallyu content into tangible and intangible products.

Consumer ethnocentrism is defined as the "*ethnocentric views held by consumers in one country, the in-group, toward products from another country, the outgroup* (Han & Nam, 2020, 113)." From international marketing aspect, consumer ethnocentrism "*represents the beliefs and values held by consumers on the appropriateness and morality of purchasing foreign products* (Lee et al., 2020, 324). Considering that the results of previous studies indicate that ethnocentrism negatively affects the intention to purchase foreign products (Han, 2017; Han and Guo, 2018; Karoui & Khemakhem, 2019; Xin & Seo, 2020), ethnocentrism is an important factor in analyzing how Chinese consumers experience the Korean wave, and its moderating effect on their purchase intention of Korean products. Consumer ethnocentrism implies consumers' adequacy or morality in purchasing foreign-made products (Han & Nam, 2020; Lee et al., 2020); hence, a positive sentiment toward Korea due to the Korean Wave and its impact on the intention to purchase Korean products can be negatively affected by consumer ethnocentrism.

Product purchase intention is defined as an antecedent that promotes and induces consumers to purchase products and services (Lee, 2017). According to a previous study on the purchase intention of K-content and Korean products, the preference of Mongolian consumers toward K-content positively affects their intention to purchase Korean products by inducing positive feelings toward Korea (Lkhaasuren et al., 2018). In the early days of Hallyu, Korean dramas and Korean pop songs mainly gained popularity, but in recent years, the contents of Hallyu have expanded to include fashion, beauty, food, games, and animation (Bae et al., 2017; Kim and Park, 2020; Lee et al., 2020).

Previous research results indicate that as most consumers prefer to touch and feel a product before purchasing (Jha et al., 2019), it is highly likely that tangible K-content would have a stronger influence on Chinese consumers' purchase intentions than intangible K-content. In addition, the moderating effect of consumer ethnocentrism is expected to have a greater effect on the influence of tangible K-content, rather than intangible K-content, on purchase intention. Therefore, the purpose of this study is to examine the moderating effect of consumer ethnocentrism on the relationship between Chinese consumers' perceptions of these K-contents and their intention to purchase Korean products. More specifically, K-content is divided into perceptions of intangible and tangible K-contents. Tangible K-content refers to the perception of content that consumers can directly experience, such as K-fashion and K-foods. K-drama and K-pop are recognized as intangible K-content, as they cannot be directly experienced.

## II. Literature Review and Hypothesis Development

### 1. Consumer Ethnocentrism and Purchase Intention

Consumer ethnocentrism is defined as the belief held by consumers of a specific country about the validity and morality of purchasing foreign products (Shimp & Sharma, 1987). In other words, consumer ethnocentrism refers to the tendency shown by consumers who prefer domestic products over foreign products for patriotic reasons. Ethnocentrism is a concept closely related to the changing patterns of patriotism, conservatism and nationalism, as well as the degree of cultural openness and global mindedness (Wei, 2008).

Consumers with strong consumer ethnocentrism tendencies recognize that the purchase of foreign products have a negative impact on their economy, and believe that it is not patriotic to buy foreign products. Therefore, consumer ethnocentrism is known to have a negative effect on the intention to purchase imported or foreign products (Narang, 2016). It plays a self-defensive and reflective role for individuals, organizations, local economies, and governments against the threat of imports and foreign competition (Balabanis & Siamagka, 2017).

The national loyalty of consumers with high consumer ethnocentrism has been regarded as an important factor that can negatively affect consumers' purchasing behavior for overseas products, as they consciously choose domestic products or services (Chekima et al., 2018; Narang, 2016). In this respect, consumer ethnocentrism is also seen as a potential obstacle for firms while entering international markets (Karoui & Khemakhem, 2019).

Consumer ethnocentrism differs from country to country and by consumer class within the same country, and appears differently depending on the culture and the level of economic development of the country (Guo & Zhou, 2017; Han, 2017; Han & Nam, 2020; Wei, 2008;). According a recent study, young Chinese consumers were found to have stronger consumer ethnocentrism than young Korean consumers (Han, 2017). Also, another study showed that Indian consumers exhibited intense consumer ethnocentrism and another study argued that ethnocentrism' s influence on purchase intention varies between countries (Guo & Zhou, 2017; Narang, 2016). In particular, consumers in countries with strong collectivist tendencies are more likely to show strong consumer ethnocentrism tendencies (Han, 2017). Considering the great influence of the Korean Wave on Chinese consumers (Yu et al., 2019), analyzing the consumer ethnocentrism of Chinese consumers on the intention to purchase Korean products is an important academic and practical task.

Hallyu content has a positive effect on international consumers for Korean products or brands (Lee et al., 2020; Lee et al., 2015), and thus, has a positive economic effect. In fact, according to prior research, ASEAN countries consumers become interested in Korean products after being made aware of Korean-made products through the Korean Wave content (Kim & Park, 2020). The popularity of Korean dramas supported the sales of various products such as mobile phones and electronic products by raising the awareness of Korean brands in Taiwan, and it has also been reported that the Korean Wave had a positive effect on the export of Korean products (Kim & Park, 2020). A study conducted in the United States, China, Japan, and Hong Kong also showed that K-content had a positive effect on tourism demand to Korea (Bae et al., 2017).

### 2. Tangible K-contents and Intangible K-contents

Consumers' perceptions of K-content that can be directly experienced, such as K-fashion and K-food, are recognized as tangible K-contents, and K-content that cannot be directly experienced, such as K-drama and K-pop are classified as intangible K-content. In this study, the moderating effect of consumer ethnocentrism on the influence of Chinese consumers' perception of these K-contents and their intention to purchase Korean products is analyzed.

As consumer ethnocentrism is a concept related to consumer ethnocentrism, where people evaluate themselves and other external groups from a cognitive point of view (Balabanis & Siamagka, 2017), perceptions of K-contents can be highly related to the product purchase intentions of consumers. Considering that the favorable feeling of overseas consumers for K-content is related to their cognitive understanding of Korea or Korean products, the positive sentiment of Chinese consumers toward Korea due to K-content would positively relate to their intention to purchase Korean products. However, Chinese consumers' ethnocentrism will negatively impact the positive relationship between K-content and their intention to purchase Korean products.

According to previous studies, consumer ethnocentrism weakens the motivation for interaction with other cultures and has a negative relationship with intercultural interactions (Han, 2017). In addition, considering that the image of the country of origin affects the purchase attitude or purchase intention of consumers (Xin & Seo, 2020), the intention to purchase Korean products due to the positive national image generated by the Korean Wave is likely to be affected by consumer ethnocentrism. In fact, according to a study by Xin and Seo (2020) that investigated the effect of consumer ethnocentrism on the intention to purchase in 361 Chinese consumers for Korean functional foods, consumer ethnocentrism showed a negative effect on the intention to purchase Korean functional foods.

Consumers with strong ethnocentrism tend to interpret the world from the perspective of ethnic groups (Siamagka & Balabanis, 2015). Therefore, it is possible to think of the cognitive perspective of the Korean Wave in terms of product purchase intentions. Chinese consumers with strong ethnocentrism think that purchasing Korean products is not patriotic because they are purchasing foreign products. Therefore, the ethnocentrism of Chinese consumers is highly likely to negatively moderate the positive impact on purchasing Korean products caused by the perception of tangible K-content.

Also, we expected that this effect will appear differently depending on whether the K-content is intangible or tangible. In fact, the information consumers get from touch is important for evaluating a product (Peck & Childers, 2003). In light of the research findings that consumers prefer to touch and feel products before purchasing (Jha et al., 2019) and tangible satisfaction affects consumers more quickly than intangible satisfaction (Hellen & Gummerus, 2013), Hallyu perception, perceived by direct tactile or olfactory experiences, may have different degrees of influence on consumer perception.

Therefore, we can expect that if the Korean Wave is encountered through direct or tangible mediums, such as food or fashion, or through a tactile or olfactory medium, the cognitive influence on consumers might be greater than the intangible K-contents (drama or music). Thus, we propose the following hypotheses:

**H1a:** Chinese consumer ethnocentrism in Chinese consumers negatively moderates the relationship between the perception of K-fashion and the intention to purchase Korean products.

**H1b:** Chinese consumers' ethnocentrism negatively moderates the relationship between the perception of K-Food and their intention to purchase Korean products.

We argue that consumer ethnocentrism negatively affects the influence of tangible K-content on product purchase intentions to a greater degree than intangible K-content, due to a higher possibility of recognizing the influence of tangible K-content on product purchase intentions. The tangible K-content can be noticed by others in the process of using the content after purchase (for instance, clothes), therefore the relationship between content recognition and purchase intention may be affected by ethnocentrism in a greater degree in that of intangible contents. However, listening to K-music or watching K-drama is not easily observed by others. Therefore, we propose

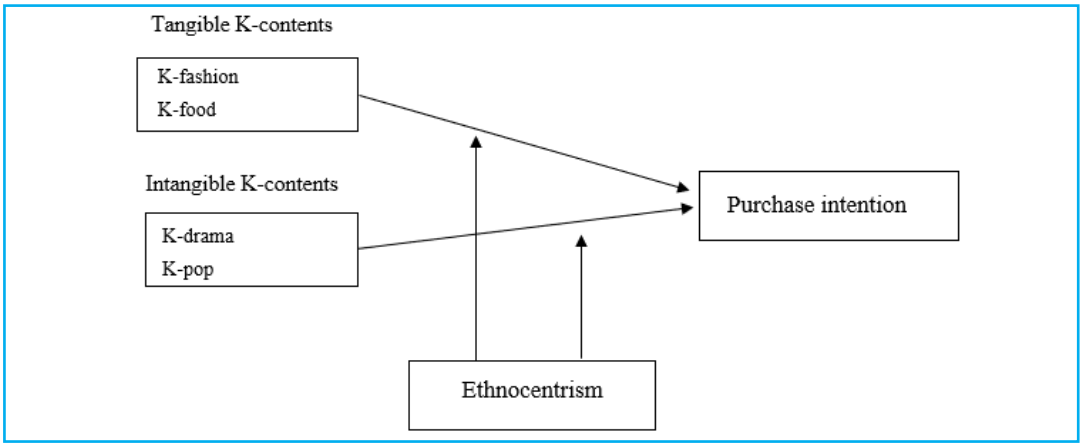
the following hypotheses:

**H2a:** Chinese consumers' ethnocentrism negatively moderates the relationship between the perception of K-drama and their intention to purchase Korean products in the negative direction.

**H2b:** Chinese consumers' ethnocentrism negatively moderates the relationship between the perception of K-pop and their intention to purchase Korean products.

The research model of this study is shown in Fig. 1.

**Fig. 1.** Research Model




## III. Methodology

### 1. Data Collection

This study empirically analyzes the influence of Chinese consumers' perception of K-content on their intention to purchase Korean products, focusing on the moderating effect of ethnocentrism. To test this hypothesis, a survey was conducted among Chinese consumers. The questionnaire was first written in Korean, and then translated into Chinese. Efforts were made to reduce translation errors through a reverse translation process, in which it was translated back into Korean. In addition, during the process of reverse translation, efforts were made to improve the completeness of the questionnaire with advice from a native Chinese speaking professor. The survey was conducted mainly through social media and online surveys for about two months, from May to June 2016. A total of 329 responses were collected, out of which 300 were used for empirical analysis, after excluding 29 incomplete responses. Table 1 presents the characteristics of the detailed study samples.

### 2. Measurement

The dependent variable in this study was the intention to purchase Korean products. Based on the existing literature (Lee et al., 2017), the intention to purchase Korean products was measured based on a 5-point Likert scale, as follows: i) If I have a chance, I will buy Korean products. ii) I will definitely purchase Korean products; and iii) I will never purchase Korean products (reverse coding). iv) I will avoid purchasing Korean products (reverse coding).

In this study, K-fashion and K-food were considered tangible K-content. Following the existing literature (Lee et al., 2017), K-fashion was evaluated according to the degree of agreement with the following five items on a 5-point Likert scale: i) Korean fashion has excellent design (style), ii) Korean fashion reflects the customers' needs aptly, iii) Korean fashion has strengths that can

**Table 1.** Characteristics of Research Sample

| | | N | % |
|---|---|---|---|
| Gender | Female | 200 | 66.7 |
| | Male | 100 | 33.3 |
| Age | Below 20 | 4 | 1.3 |
| | 20-29 | 203 | 67.7 |
| | 30-39 | 54 | 18.0 |
| | 40-49 | 28 | 9.3 |
| | Above 50 | 11 | 3.7 |
| Education Level | Middle School or less | 24 | 8.0 |
| | High School | 76 | 25.3 |
| | College or University | 173 | 57.7 |
| | Graduate School or Higher | 27 | 9.0 |
| | Total | 300 | 100 |

be recommended to others, iv) Wearing Korean fashion will make customers feel proud, and v) Overall, I positively evaluate Korean fashion.

Intangible K-content were defined as K-drama and K-pop. K-drama was evaluated according to the degree of agreement regarding six items (5-point Likert scale) based on Lee et al. (2017): i) Korean dramas are excellent in content, ii) Korean dramas are reliable, iii) Korean dramas reflect the needs of customers, iv) Korean dramas have the strength to be recommended to others, v) I want to be constantly exposed to Korean dramas, vi) Overall, I positively evaluate Korean dramas. K-pop was evaluated according to the degree of agreement with six items (5-point Likert scale) based on Lee et al. (2017): i) Korean music has excellent quality, ii) Korean music is reliable, iii) Korean music reflects the needs of customers, iv) Korean music has the strength to be recommended to others, v) I want to continuously listen to K-pop, and vi) Overall, I positively evaluate Korean music.

In this study, we considered ethnocentrism as a moderating variable. Ethnocentrism was measured with seven items (5-point Likert-scale) based on the study by Shimp and Sharma (1987): i) Purchasing foreign products is not Chinese behavior, ii) Purchasing Chinese-made products is the best way, iii) It is not correct to purchase foreign products as it reduces jobs for Chinese workers in related industries, iv) I have to buy Chinese products in order not to transfer China's wealth to other countries, v) Buying a foreign product directly or indirectly drives my family and friends out of work; vi) Foreigners selling their products to the Chinese market should not be allowed, vii) Genuine Chinese people should only buy Chinese products.

In addition to the variables given above, this study included demographic variables such as gender, age, and education level as control variables in the analysis. Regarding gender, a dummy variable with a value of 0 for men and 1 for women is created, and the age of respondents is directly included in the analysis.

Regarding education level, there are three levels. Level 1 is middle school or lesser with a dummy variable, with a value of 1 for middle school and 0 otherwise. Education level dummy 2 is a dummy variable with a value of 1 for high school and 0 otherwise. Finally, education level dummy 3 is a dummy variable that has a value of 1 for college or university and 0 otherwise.

## 3. Results

Table 2 presents the results of the validity and reliability analysis. As shown in this table, it can be confirmed that there were no major problems with the validity and reliability of the measured variables.

**Table 2.** Results of Validity and Reliability Tests

| | Factor Loadings | Communality | Eigen Value | Variance Ratio (%) | Cronbach's α |
|---|---|---|---|---|---|
| K-fashion 1 | 0.851 | 0.867 | | | |
| K-fashion 2 | 0.82 | 0.843 | | | |
| K-fashion 3 | 0.813 | 0.868 | 3.798 | 11.508 | 0.926 |
| K-fashion 4 | 0.603 | 0.601 | | | |
| K-fashion 5 | 0.668 | 0.747 | | | |
| K-food 1 | 0.727 | 0.752 | | | |
| K-food 2 | 0.776 | 0.821 | | | |
| K-food 3 | 0.803 | 0.844 | 4.144 | 12.558 | 0.945 |
| K-food 4 | 0.818 | 0.863 | | | |
| K-food 5 | 0.795 | 0.841 | | | |
| K-drama 1 | 0.825 | 0.837 | | | |
| K-drama 2 | 0.787 | 0.813 | | | |
| K-drama 3 | 0.809 | 0.821 | 4.939 | 14.966 | 0.955 |
| K-drama 4 | 0.84 | 0.864 | | | |
| K-drama 5 | 0.797 | 0.793 | | | |
| K-drama 6 | 0.778 | 0.82 | | | |
| K-pop 1 | 0.851 | 0.836 | | | |
| K-pop 2 | 0.859 | 0.865 | | | |
| K-pop 3 | 0.858 | 0.866 | 5.33 | 16.152 | 0.964 |
| K-pop 4 | 0.868 | 0.864 | | | |
| K-pop 5 | 0.841 | 0.823 | | | |
| K-pop 6 | 0.83 | 0.847 | | | |
| Ethnocentrism 1 | 0.544 | 0.543 | | | |
| Ethnocentrism 2 | 0.693 | 0.574 | | | |
| Ethnocentrism 3 | 0.865 | 0.751 | | | |
| Ethnocentrism 4 | 0.878 | 0.785 | 4.44 | 13.456 | 0.896 |
| Ethnocentrism 5 | 0.854 | 0.751 | | | |
| Ethnocentrism 6 | 0.814 | 0.698 | | | |
| Ethnocentrism 7 | 0.795 | 0.648 | | | |
| Purchase Intention 1 | 0.809 | 0.865 | | | |
| Purchase Intention 2 | 0.802 | 0.85 | 3.4 | 10.304 | 0.942 |
| Purchase Intention 3*(R) | 0.823 | 0.863 | | | |
| Purchase Intention 4*(R) | 0.805 | 0.828 | | | |

Note: *(R): Reverse Coding.

Table 3 presents the descriptive statistics and correlation analysis results of the variables. Additionally, the VIF and CI values were checked to confirm the possibility of multicollinearity, and these values were all within the tolerances suggested by previous studies, confirming that multicollinearity was not a possible concern for this study (Hair et al., 1998).

**Table 3.** Descriptive Statistics and Correlation Analysis

| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ | ⑪ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ① Purchase Intention | 1 | | | | | | | | | | |
| ② Gender | .253** | 1 | | | | | | | | | |
| ③ Age | -.017 | -.029 | 1 | | | | | | | | |
| ④ Education Level Dummy 1 | -.047 | -.125* | .120* | 1 | | | | | | | |
| ⑤ Education Level Dummy 2 | .031 | .038 | -.243** | -.680** | 1 | | | | | | |
| ⑥ Education Level Dummy 3 | .055 | .099 | -.070 | -.183** | -.367** | 1 | | | | | |
| ⑦ Perception of K-fashion | .563** | .200** | -.150** | .030 | .020 | .085 | 1 | | | | |
| ⑧ Perception of K-food | .621** | .164** | -.062 | .009 | .029 | .082 | .652** | 1 | | | |
| ⑨ Perception of K-drama | .556** | .355** | -.036 | -.114* | .134* | .035 | .553** | .565** | 1 | | |
| ⑩ Perception of K-pop | .450** | -.004 | -.284** | -.052 | .112 | .019 | .545** | .523** | .543** | 1 | |
| ⑪ Ethnocentrism | -.069 | -.093 | .052 | .175** | -.150** | -.034 | -.008 | -.055 | -.215** | -.034 | 1 |
| Mean | .283 | .670 | 29.62 | .253 | .576 | .090 | 3.12 | 3.00 | 3.33 | 3.17 | 2.46 |
| S.D. | 1.07 | .472 | 8.45 | .435 | .494 | .286 | .869 | .893 | .959 | .877 | .836 |

Note: *$p$<0.05, **$p$<0.01 (two-tailed).

Table 4 shows the results of regression analysis. First, Model 1 includes control variables, independent variables, and moderating variables in the analysis, and Models 2 to 5 show the results of the moderating effects of ethnocentrism.

**Table 4.** Results of Regression Analysis

| Variables | | | DV: Purchase Intention | | | | |
|---|---|---|---|---|---|---|---|
| | | | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| CV | Gender | | .093† (1.956) | .098* (2.059) | .100* (2.110) | .095* (1.993) | .096* (2.007) |
| | Age | | .052 (1.077) | .054 (1.118) | .049 (1.022) | .053 (1.098) | .055 (1.131) |
| | Education Level Dummy 1 | | -.102 (-1.308) | -.089 (-1.143) | -.089 (-1.143) | -.100 (-1.283) | -.101 (-1.292) |
| | Education Level Dummy 2 | | -.098 (-1.153) | -.087 (-1.014) | -.087 (-1.025) | -.097 (-1.136) | -.098 (-1.149) |
| | Education Level Dummy 3 | | -.058 (-.933) | -.062 (-1.004) | -.064 (-1.031) | -.061 (-.977) | -.064 (-1.015) |
| IV | Tangible K-contents | Perception of K-fashion | .188** (3.070) | .376** (3.111) | .186** (3.052) | .180** (2.900) | .187** (3.045) |
| | | Perception of K-food | .347*** (5.747) | .353*** (5.870) | .579*** (4.524) | .356*** (5.820) | .348*** (5.767) |
| | Intangible K-contents | Perception of K-drama | .179** (2.826) | .169** (2.679) | .186** (2.958) | .286* (2.163) | .177** (2.802) |
| | | Perception of K-pop | .091 (1.517) | .090 (1.515) | .086 (1.439) | .091 (1.518) | .194 (1.465) |
| MV | Ethnocentrism | | .000 (.008) | .231† (1.706) | .262† (1.944) | .126 (.881) | .126 (.839) |
| IE | Perception of K-fashion × Ethnocentrism | | | -.308† (-1.802) | | | |
| | Perception of K-food × Ethnocentrism | | | | -.351* (-2.055) | | |
| | Perception of K-drama × Ethnocentrism | | | | | -.153 (-.924) | |
| | Perception of K-pop × Ethnocentrism | | | | | | -.164 (-.875) |
| | $R^2$ | | .483 | .488 | .490 | .484 | .484 |
| | Adjusted $R^2$ | | .465 | .469 | .471 | .465 | .464 |
| | $\triangle R^2$ | | | | | | |

Notes: 1. Numbers are standardized regression coefficients.
2. Numbers in parentheses are t-value.
3. †$p$<0.1, *$p$<0.05, **$p$<0.01, ***$p$<0.001 (2-tailed).

Model 1 presents regression analysis results including both control variables, independent variables, and the moderating variable.

As can be seen in this model, both perception of K-fashion and K-food were found to have a positive effect on Chinese consumers' intention to purchase Korean products. Perception of K-drama was found to have a positive effect on Chinese consumers' intention to purchase Korean products, but perception of K-pop did not have a significant effect on Chinese consumers' intention to purchase Korean products.

Model 2 and model 3 analyze the moderating effect of ethnocentrism in the relationship between perception of tangible K-contents (perception of K-fashion and K-food) and Chinese consumers' intention to purchase Korean products.

As can be seen in model 2, ethnocentrism was found to weaken the positive effect of perception of K-fashion on Chinese consumers' intention to purchase Korean products. Therefore, hypothesis 1a was accepted.

As can be seen in model 3, ethnocentrism was found to weaken the positive effect of perception of K-food on Chinese consumers' intention to purchase Korean products. Hypothesis 1b was therefore accepted.

Similarly, model 4 and model 5 are also analyze the moderating effect of ethnocentrism in the relationship between perception of intangible K-contents (perception of K-drama and K-pop) and Chinese consumers' intention to purchase Korean products.

As can be seen in model 4, ethnocentrism did not show a significant moderating effect in the relationship between the perception of K-drama and the intention of Chinese consumers to purchase Korean products. Therefore, hypothesis 2a was rejected.

Finally, as can be seen in model 5, ethnocentrism did not show a significant moderating effect in the relationship between the perception of K-pop and the intention of Chinese consumers to purchase Korean products. Therefore, hypothesis 2b was also rejected.

## V. Conclusion

This study categorizes K-content into tangible (K-fashion, K-food) and intangible (K-drama, K-pop) categories, and examines their effects on the Chinese consumers' intention to purchase Korean-made products, focusing on the moderating effect of ethnocentrism. The results of an empirical analysis of 300 Chinese consumers are as follows:

The ethnocentrism in Chinese consumers has weakened the positive influence of the perception of tangible K-content, that is, K-fashion and K-food, on their intention to purchase Korean products. These results show that, as emphasized by previous studies, although a positive perception of tangible K-content has a positive effect on the intention to purchase Korean products (Wakefield & Blodgett, 1999), stronger ethnocentrism, which is a tendency for consumers to prioritize their own country, the weaker a positive relationship between tangible K-content and purchase intention (Sharma et al., 1995; Shimp & Sharma, 1987).

Conversely, ethnocentrism does not play a significant moderating role in the relationship between intangible K-content (such as K-drama and K-pop) and the intention to purchase Korean products. In other words, since tangible content can be easily observed by others in the process of using the content after purchase, the relationship between content perception and purchase intention can be affected by ethnocentrism. This result might imply that these different results were derived because there is no need to be conscious of other people watching during the process of using or experiencing intangible K-contents. In-depth future research on this issue can provide insightful implications.

This study has implications for the following aspects: in the relationship between K-content and the intention to purchase Korean products, ethnocentrism may have a moderating effect, but there have been insufficient studies to clarify this. This study presents meaningful implications because it presents how ethnocentrism plays a significant role in moderating the relationship between tangible K-content and the intention

to purchase Korean products. In particular, the analysis results of this study show that the positive relationship between the tangible K-content such as K-fashion and K-food and Chinese consumers' purchase intention to Korean products can be weakened by ethnocentrism. Therefore, in the case of Korean companies that want to enter the Chinese market based on the tangible K-content such as K-fashion or K-food, it will be necessary to formulate and implement marketing strategies that do not stimulate Chinese consumers' ethnocentrism. In addition, since empirical analysis was conducted by dividing K-content into tangible K-content and intangible K-content in this study, more in-depth theoretical implications for the field of Korean Wave research can be presented.

This study has the following limitations. First, in the case of China, consumers' purchasing behavior may vary depending on the region of residence and this study does not control the regional characteristics of respondents sufficiently. In addition, in this study, most respondents are in their 20s. Therefore, in future studies, it is necessary to conduct an empirical analysis targeting consumers of various ages, and from various regions, in order to generalize the research results.

Second, both the national image and the corporate image are factors that can have a significant influence on product purchase intentions, but such factors are not fully considered in this study. Therefore, in future research, it is necessary to try to increase the explanatory power of the research results by considering both the national image and the corporate image.

Third, this study measured variables included in the research model through a survey of Chinese consumers. However, although various political issues between Korea and China may affect respondents' responses recently, the study did not sufficiently control those political issues. Therefore, in future studies, it is necessary to design a research model that can effectively control political issues between Korea and China, and to conduct research using secondary data for more objective analysis.

Finally, in this study, Korean products were not limited to specific product groups. However, research results may vary depending on the product category. Therefore, in future studies, it is necessary to conduct empirical analysis by setting a more specific research model for each product category.

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