The effects of a geopolitical policy—Case Study of "Korea Limitation Order" upon the Cultural Entertainment Industry in China

Zhilin(Helen) Li

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Department of Economics, University of Washington

Advisor: Dennis O'Dea

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Abstract

This paper examines the impact on the South Korean Cultural Entertainment Industry(CEI) of China's "Korea Limitation Order". In November 2016, Beijing restricted South Korean artists from holding concerts and the broadcast of South Korean TV dramas and banned cooperation between the two countries in the entertainment industries. This paper focuses on the effect this had on exports of cultural products and relating industries from Korea, and how Korea was able to adjust to this geopolitical shock. I examine exports from Korea to China, Japan, and the United States using data from Cultural Entertainment Industry Products Exports, such as Korean music and filming industries, and South Korean inbound foreign tourism statistics from 2011 to 2019. Utilizing the deviation from an estimated autoregressive moving average (ARMA) model specification of exports from Korea after the "Korea Limitation Order" and a Difference-in-Difference (DID) Model, I found that South Korea's tourism industry was particularly affected, with the most significant decline relative to the other two countries. The film and broadcasting industries saw similar but less dramatic declines. There is no evidence that sectors of the cultural industry that are not included in this restriction category, such as the cartoon industry, were impacted by this shock.

Keywords: Geopolitical Shock, Cultural Entertainment Industry, Cultural Export

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1 Introduction

1.1 Understanding CEI

The cultural entertainment industry (CEI), also known as "Hallyu", made cultural industrialization come true in Korea as a generator of growth and national wealth[15]. As a mature commercial profit-making system (known as K-pop), the Korean entertainment industry contributes to a certain percentage of the Korean people's economy. In South Korea's GDP from 2012 to 2019, the average share of entertainment and culture industry in GDP is about 2.08%(Table 1). CEI is about joy and impressive delight that creates high profits in cultural and economic values[15]. Ten of the best hit-products in the Korean market in the twenty-first century, all (excepting long-term housing loans ranked at ninth) are CEI products: this shows the consumption trends and preferences in the country[15].

	2012	2013	2014	2015	2016	2017	2018	2019
GDP (cultural)	31.09	31.13	31.17	30.85	30.81	30.55	31.38	32.2
GDP	1278.05	1370.63	1484.49	1466.04	1499.36	1623.07	1725.37	1651.42
Proportion %	2.43	2.27	2.10	2.10	2.05	1.88	1.82	1.95

Table 1: GDP proportion of the cultural and other service sector (in million USD)

Through the "Supply" of massive circulation of culture and joy [15], CEI has a powerful global appeal that transcends cultural differences and borders. The Korean Wave was originally called the "Hallyu" by Chinese media. In the late 1990s (Korea Times, 2005), reference was made to the speed of cultural influence on neighboring countries, as the wind of Korean pop culture swept through China in 1996[15]. The Korean Wave is now a sign or symbol of the vibrant Korean culture, started in China by Korean entertainers, and is now going worldwide.

In the meantime, China's media and entertainment industry has grown rapidly under the government's 12th Five-Year Plan (The State Council, 2012). With increased government support and financial resources, Chinese media companies are actively engaging in

cross-border commerce, significantly changing the dynamics of the global media and entertainment landscape. South Korean companies, especially in the cosmetics and tourism industry prompted by CEI, saw significant success in the Chinese market. Over the past few decades, China has also added more local and Korean co-operative entertainment companies, based on some Korean influences, which are similar in structure and content production to the major Korean entertainment companies, and have expanded aggressively in the Chinese market.

1.2   Geopolitical shock–"Korea Limitation Order" upon Hallyu

The political relations between China and South Korea have experienced difficulties, which will have a significant impact on the local industries in South Korea and China. In November 2016, Beijing consistently expressed its concerns about a U.S. defense system being so close to its border and issued the "Korea Limitation Order" upon Hallyu.

China severely restricted the ability of Korean artists to hold concerts in China, restricted the broadcast of South Korean TV dramas, banned cooperation between the two countries in the entertainment sector, and prohibited South Korean folk cultural industry companies from investing in China. In 2017, major Chinese tourism companies and travel agencies began to no longer sell South Korean tourism products, while cruise companies no longer sold South Korea-related route products[11]. Some industry insiders argue that the issue offers China a "perfect" convenient excuse to curb the increasing influence of Hallyu[15].

There has been a significant economic backlash: the losses, which come from the South Korean tourism industry could amount to 10 billion U.S. dollars(The Korea Economic Daily 2017). In February 2021, relations between China and South Korea eased slightly. The China Media Group has signed cooperation agreements with South Korean broadcasters, and some South Korean movies and TV dramas have been reintroduced to the Chinese mainland. The issues among China and South Korea have highlighted the intricate and fragile relationship between economic interests and cultural diplomacy.

At the same time, South Korea is also looking for more diversified markets beyond China. Among Korea's 2023 trade and import statistics, Japan is the country with the highest export volume of 157.06 million dollars (about 137.7 billion Korean won), followed by the United States and China with 54.322 million dollars (about 70.8 billion Korean won) and 23.335 million dollars (about 30.4 billion won), respectively. South Korea has been highly successful in the Japanese market in the early days before China. Through the structure and localization strategy of promoting Korean songs in Japanese, Japan has always been Hallyu's largest market[13]. Hallyu is also quietly growing in the U.S. market. South Korean bands have also gained prominence in American pop culture circles, consistently playing sold-out concerts in the United States, and performing at prestigious music festivals, albeit with some stigmatized labels[8].

2 Literature Review

2.1 The cultural effect on the economy

The economic impact of culture has been established historically, particularly in relation to the interplay between arts, cultural clusters, wages, and the creative economy[2]. Using Mincer's classic model of wages to test the impact of different measures of Arts and Cultural clustering (henceforth 'cultural clustering') on worker wages, Nesta investigated wage differences by analyzing the impact of arts and cultural clustering within English cities, using individual characteristics, city-specific attributes, and regional dummy variables to discern the nuanced relationship between cultural richness and economic compensation. A negative link between cultural clustering and wages has been made which mean skilled workers sacrifice higher salaries to live in places with vibrant cultural scenes, and cities with high levels of cultural clustering enjoy a wage premium[2].

2.2 The uncertainty of Korea

The geopolitical shock, synonymous with an uncertainty shock, exerts a notable influence on the economy. Lee, So and Ha used high-frequency data on financial asset returns and volatility within a structured VAR framework to measure the volatility of uncertainty caused by geopolitical events. The results show that an increase in geopolitical uncertainty has a negative relationship with Korea's macroeconomic outcomes, while a decrease in uncertainty has a positive relationship on Korea's macroeconomic outcomes[9]. In their further study, they pointed out that the response of financial markets to uncertainty is highly significant, while the macroeconomic response is slightly significant in the short term. Though the initial shock significantly adjusted financial asset prices by increasing risk premiums, the subsequent depreciation of exchange rates mitigated these adverse effects, particularly in equity markets[5].

Uncertainly plays an important role not only in Korea. In Eyup's Analyzing the impacts of geopolitical risk and economic uncertainty on natural resources rents, influence of economic policy uncertainty on resource rent varies in different quantiles by the gross domestic product (GDP) as a single independent variable in estimating natural resources rents (NRR). Uncertainty increases natural resource rents at low quantiles and decreases natural resource rents at high quantiles[14].

2.3 The role of politics in China

The role of political pressure in China's economic and social development has been recognized. "Guidance on Energy Work in 2021" issued by the National Energy Administration in China proposes to improve the level of technological innovation in renewable energy[3]. In order to explore the influence of political promotion pressure on China's renewable energy technology innovation (RETI) and its mechanism, spatial econometrics methods were applied to study the influence of political promotion pressure on the retired population and its spatial transmission mechanism based on panel data of 30 provinces and regions in China

from 2007 to 2018. The conclusion shows that with less political pressure, RETI's development can be boosted locally and elsewhere. The negative effects of political promotion pressure on RETI are indeed geographically and temporally heterogeneous. The reduction of political promotion pressure can promote RETI by increasing marketization level, that is, marketization level acts as an intermediary variable[3].

2.4   Geopolitical Impact on Trade and Economic Relationships

Similar international cases of geopolitics restriction trade are common and studied among other countries extensively. On May 19, 2019, U.S. President Donald Trump made an executive decision to blacklist Chinese technology giant Huawei, which has a large customer base in the U.S. market. If the two countries and the world's first and second largest economies (the U.S. and China) fight a trade war and blame each other, it will not do any good: Real GDP fell by $317 billion (-1.35%) in the United States and $427 billion (-1.41%) in China[7].

Another relevant paper is Heilmann[6], who investigates the 2012 episode of the Chinese consumer boycotts of Japanese products, especially automobiles. He reports an average 2.7% trade disruption yearly due to the event from the synthetic control method, and a decline in trade of automobiles of about 30% when focusing on specific industries. Other notable examples of proxy boycotts include American consumers boycotting French products[1][4][12] and Chinese consumers boycotting Japanese products, which both shows negative impacts to both trading countries. The paper that is most relevant to ours is Luo and Zhou(2019)[10], who decomposed the Chinese consumers' boycott effect of Japanese cars that immediately followed the anti-Japanese demonstrations in September 2012. They found that the cancellation effect accounts for more than 90% of the total decline in Japanese car sales in the short run, whereas the substitution effect is tiny[7].

At present, the specific importance of the Chinese market to the Korean entertainment industry in the impact of geopolitical changes is still not clear. Drawing on Luo and Zhou's

different-in-difference (DID) model and Autoregressive Moving Average (ARMA) model, the study examines consequences of China's policy shock on particular segments of CEI products in South Korea.

3 Data

The affected Products are mainly divided into two categories: Cultural Content Industry Products Exports, which are tangible or intangible goods that can create economic added value (including cultural content, digital cultural content, and multimedia cultural content), such as K-pop music and Korean movies; South Korea inbound foreign tourism statistics, which is reflected by the number of foreign tourists visiting South Korea. The Cultural Content Industry Products Exports consist of two different data sources from the Korea Custom and Korean Statistical Information Service (KOSIS). The customs data is mostly about tangible goods exports, whereas the KOSIS data is for both intangible and tangibles generated from the cultural industry. Despite certain limitations inherent to the data sets, they remain invaluable for extrapolating insights through our methodical application of models and analysis.

3.1 Trade Statistics

The Trade Statistics are generally collected from monthly reports from the Korea Customs Service from January 2011 to November 2019. The decision to halt data gathering in November 2019 was primarily motivated by a proactive measure to mitigate potential disruptions caused by the emerging COVID-19 pandemic. This precautionary step coincided with China's initiation of a lockdown policy in December 2019. The exporting destination countries for this study are three countries: China, Japan, and the United States. Therefore, there are 107 observations in each category in summary statistics which are presented in Table 2. Among industry classification systems, Harmonized System (HS) Codes are used

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throughout the export process for goods. HS code 37, 48, and 85 are chosen in this study, which will be introduced in the following.

	China			Japan			U.S.		
	HS37	HS48	HS85	HS37	HS48	HS85	HS37	HS48	HS85
Observations	107	107	107	107	107	107	107	107	107
Mean	30349	25215	4128057	3281	17412	437176	7040	38239	1057284
Max	66138	46065	6504442	8889	29976	860481	12834	63713	1510898
Min	7080	13260	2233680	1452	11639	255410	3085	26751	731412

Table 2: Data Summary for Trade Statistics(in thousand USD)

3.1.1   HS code 37: Photographic or Cinematographic goods

HS code 37 stands for the photographic or cinematographic goods, which includes the Photographic plates and films, and other products from the film industry. Fig.1 shows the general trend among three countries. China has an obvious increasing trend compared to Japan or U.S.
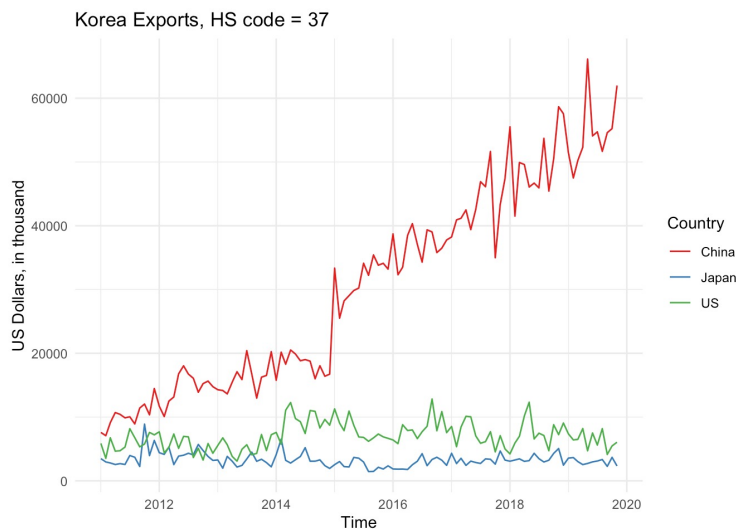

Figure 1: Korea Exports(in thousand USD), HS code = 37

3.1.2   HS code 48: Paper and Paperboard

This category stands for the paper and paperboard; articles of paper pulp, of paper or of paperboard goods, which includes the Posters and other paper-based products from Hallyu.

The Fig.2 is the general trend comparison between China-Japan and China-United States. Chinese market fluctuates most among the three markets, and Japanese market was generally decreasing while the U.S. market has a relatively large positive shock around 2018.
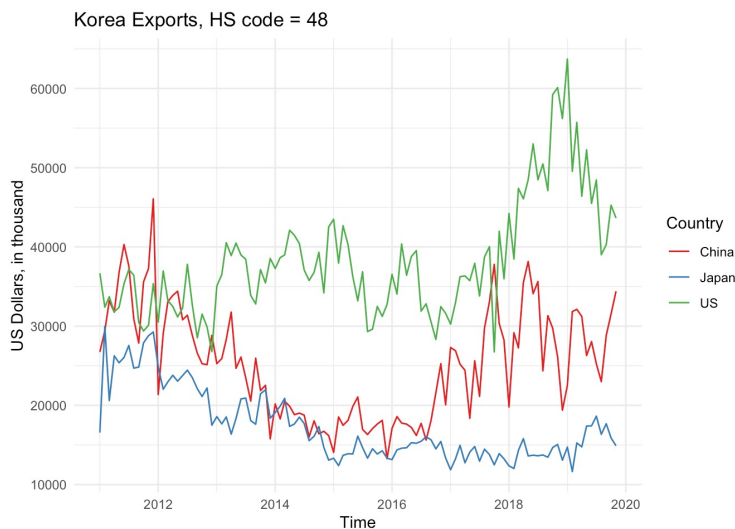

Figure 2: Korea Exports(in thousand USD), HS code = 48

3.1.3 HS code 85: Electrical Machinery and Equipment

This category stands for electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles, which includes the albums and other electrical machinery products from Hallyu. The followings are the general trend comparison between China-Japan and China-United States. Fig.3 shows that Chinese market has the largest demand from Korean Export in this category.

3.2 Cultural Exports

The cultural goods data category comprises annual reports from the Cultural Industry Survey conducted by the Korean Statistical Information Service (KOSIS) and sourced from the the Korea Creative Content Agency (KOCCA) from 2011 to 2020. Table 3 shows that there are 10 observations in each category for each country except the Film industry export
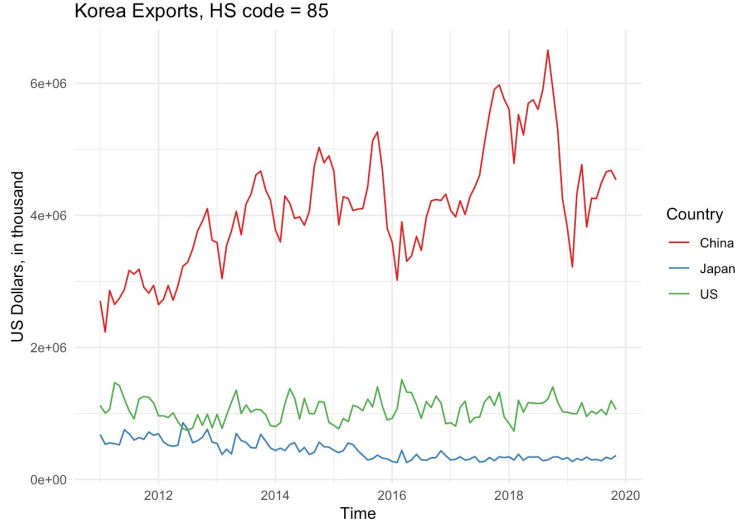
Figure 3: Korea Exports(in thousand USD), HS code = 85

data because the data of U.S. in 2020 is not available. The main reason for collecting data collection until 2020 was based on the assumption that the virtual products will not be restricted during quarantine time when the COVID-19 hits. Due to the limitation of different accuracy of statistical classification of exports of major countries and regions in each industry, I mainly divide the data into two categories: regional group (Fig.4) and national group (Fig.5). Also because of the limitation from raw data, I choose 6 subordinate branches out of 11 for research, which are Music, Character, Knowledge Information (shown as Knowledge), Cartoon Image (shown as Cartoon), Film and Broadcasting among the many cultural industries, which will be introduced in the following.

3.2.1 Music

This category encompasses industries associated with music, notably including K-pop songs from the Hallyu. It constitutes a significant component of the Cultural and Entertainment Industry (CEI) in Korea and is particularly susceptible to "shocks." The music category falls within the regional group, and the subsequent analysis offers a comparative overview(Fig.4) of trends between Big China-Japan and Big China-North America.

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	Big China				China	
	Music	Cartoon	Character	Knowledge	Film	Broadcasting
Observations	10	10	10	10	10	10
Mean	72090	124303	25226	48691	3882	29420
Max	117542	172051	30980	60104	9253	78179
Min	6836	86347	20322	36287	833	7474

	North America				United States	
	Music	Cartoon	Character	Knowledge	Film	Broadcasting
Observations	10	10	10	10	9	10
Mean	18651	148043	22025	17749	3752	29517
Max	86723	183180	25983	36597	9615	80596
Min	587	102565	17937	8802	1653	3523

	Japan					
	Music	Cartoon	Character	Knowledge	Film	Broadcasting
Observations	10	10	10	10	10	10
Mean	272,188	42,879	58,248	219,681	5,314	93,237
Max	389,484	73,974	76,290	265,266	9,679	138,687
Min	157,938	20,256	43,469	176,925	3,663	70,975

Table 3: Data Summary of Cultural Exports(in thousand USD)

3.2.2 Character

This category comprises industries associated with Character, encompassing copyrights of comics derived from film and television productions. Movie theater sales data are sourced from the Korea Film Council's Movie Theater Ticketing Network (www.kobis.or.kr), while broadcaster exports are based on statistics from the broadcasting industry provided by the Korea Communications Commission. The character export is not directly affected by the "shock". It's part of the regional group. The following(Fig.4) is the general trend comparison between Big China-Japan and Big China-North America.

3.2.3 Cartoon Image

This category represents virtual cartoon images of online malls, home shopping, convenience stores, traditional markets, Internet/mobile/game content (avatars, etc.). It is not directly affected by the "shock". The cartoon image industry is part of the regional group, the following(Fig.4) is the general trend comparison between Big China-Japan and Big China-North America.

3.2.4 Knowledge Information

This category represents Digital cultural content, user-made cultural content and multimedia cultural content collection, processing, development, production, production, storage, retrieval, circulation and a series of related service industries. It is not directly affected by the "shock". The Knowledge infomation category is part of the regional group, the following(Fig.4) is the general trend comparison between Big China-Japan and Big China-North America.

3.2.5 Filming

This category represents movie-related industries based in part on a survey of the Korean film industry conducted by the Korea Film Promotion Council. It is a particularly essential part of the CEI industry in Korea, and significantly affected by the "shock". It's part of the country group, the following(Fig.5) is the general trend comparison between China-Japan and China-United States.

3.2.6 Broadcasting

This category represents Broadcasting and Media-related industries based in part on Korea Communications Commission Broadcasting industry survey report. It is a particularly essential part of the CEI industry in Korea, and directly affected by the "shock". The

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broadcasting industry is part of the country group, the following(Fig.5) is the general trend comparison between China-Japan and China-United States.

3.3 Foreign tourists visiting South Korea

The Foreign tourists visiting South Korea data category is generally collected from monthly reports of foreign tourists visiting the Republic of Korea from Korea Tourism Data Laboratory from January 2011 to November 2019. Similarly, Table 4 shows that there are 107 observations total for each country. The main reason for collecting data collection until 2020 was based on the assumption that the virtual products will not be restricted during quarantine time when the COVID-19 hits. Consistent with the above, I focus on tourists visiting South Korea from China, Japan, and the United States, and the general trend is shown in Fig.6.

	China	Japan	United States
Observations	107	107	107
Mean	374501	226617	68124
Max	894643	375119	105398
Min	92090	81748	43500

Table 4: Data Summary of Foreign tourists visiting South Korea

3.4 Data preview

From the preliminary data analysis, it appears that exports in certain industries, particularly those not subject to restrictions, are on the rise and show lesser impact from policy shocks. However, industries such as film and tourism exhibit notable declines, particularly around 2017. The tourism data provides clear evidence of a substantial decrease in Chinese visitors to South Korea around early 2017. The subsequent sections of the paper will delve into quantifying the effects within each category.
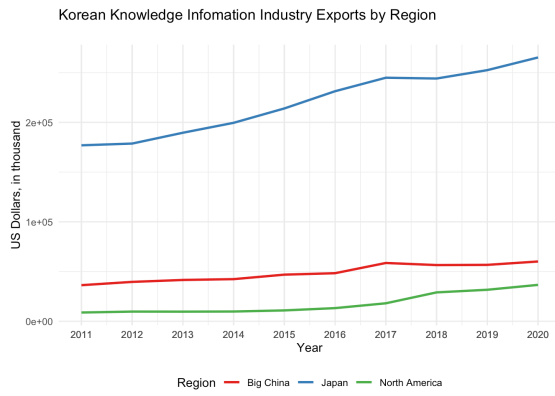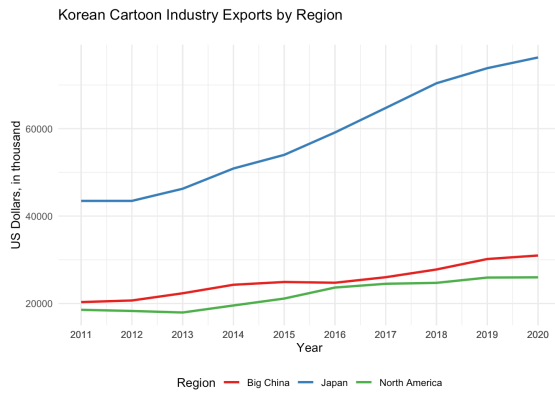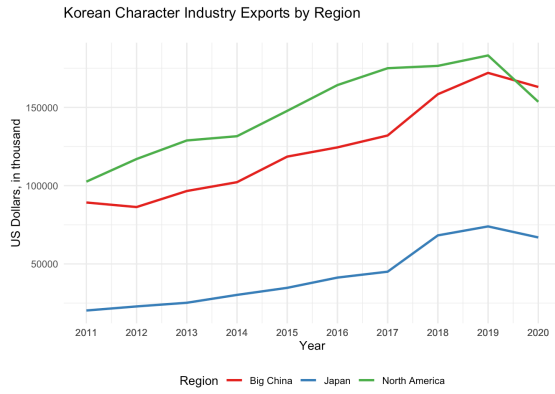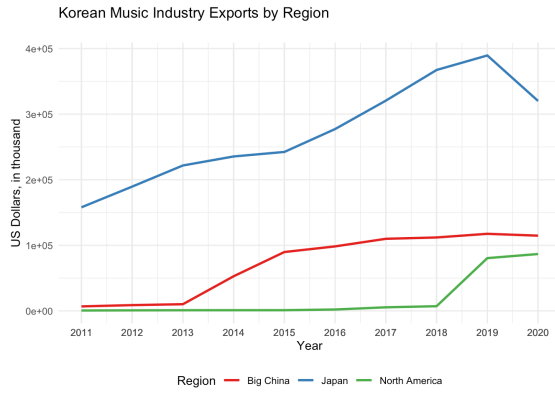
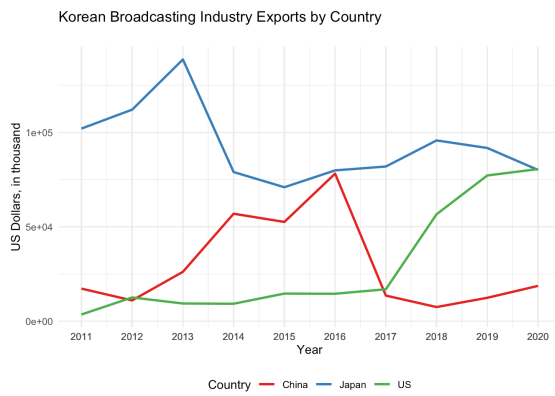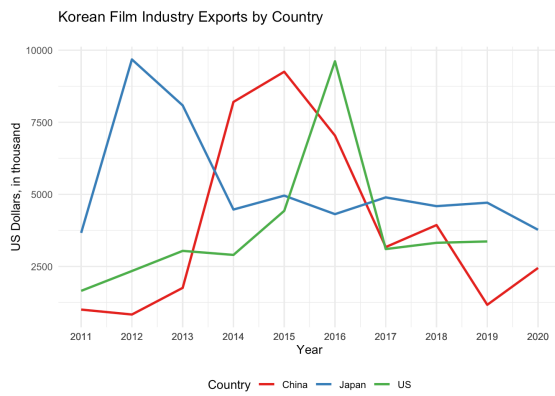Figure 4: Korean Cultural Industry Exports by Region

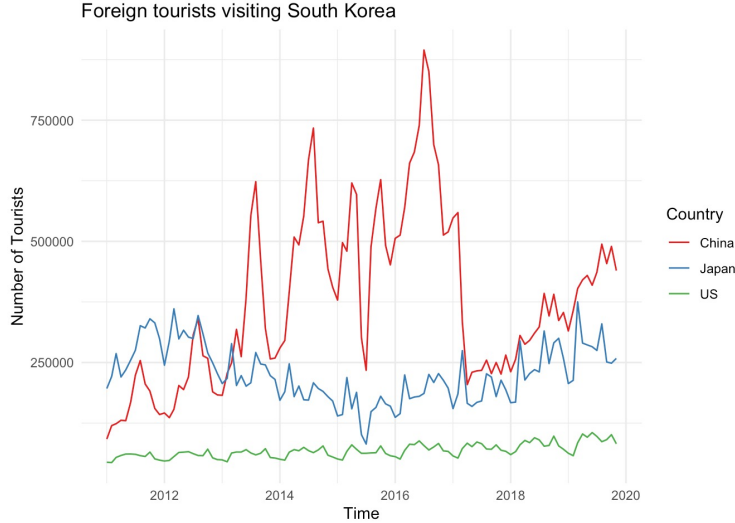
Figure 5: Korean Cultural Industry Exports by Country

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Figure 6: Foreign tourists visiting South Korea

4 Methodology

The main goal of this study is to examine the impact of the "Korea Limitation Order" on selected Korean entertainment industry sectors. Following the approach of the model posited by Luo and Zhou[10], I apply a forecasting approach to estimate post-event values based on preceding trends. Then, I utilize Difference-in-Difference (DID) model of the residuals derived from comparing forecast and actual values to explore the specific effects on the Chinese market's Korean CEI product categories relative to Korean cultural exports.

4.1 Trend Prediction

Three primary distinctions between my research and theirs. Firstly, my study implemented a more constrained control group. I specifically selected Japan and the United States as the control group, considering their longstanding and stable relationships with South Korea. Moreover, given that their combined cultural industries represent an average of 55%, this approach enhances the experiment's credibility by mitigating the influence of other countries' political issues. Secondly, the significance of politics in China cannot be neglected. In addition to examining "Cultural Exports" such as the music and broadcasting markets,

I also delved into the South Korean inbound foreign tourism industry. This exploration involved assessing the changes in Chinese visitors' behavior regarding the tourism industry, as reflected by the number of foreign tourists visiting South Korea. Thirdly, I employed the Autoregressive Moving Average (ARMA) model to forecast values, which were then utilized as the predicted values. Subsequently, I calculated the residuals by comparing the forecasted values with the actual values. Each industry is modeled as an ARMA (1,1) process to predict trends based on pre-treatment observations.

$$X_t - \phi X_{t-1} = Z_t + \theta Z_{t-1} \quad \text{for every } t, \tag{1}$$

where $\{Z_t\} \sim WN(0, \sigma^2)$ and $\phi + \theta \neq 0$.

I estimated this ARMA model upon cultural exports data in different industries using pre-shock trends which provides me with the preliminary results of this policy shock on each industry. By forecasting post-shock trends using the corresponding model, I generated predictions for the period after 2017. Through a comparison of actual values with predicted values across three different countries, the significance of the residuals in each model becomes evident. Some cultural industries that are severely impacted by this Chinese Policy, such as Cartoon (Fig.8) and Knowledge Information (Fig.9), are growing. Figure 11 and Figure 12 highlight the substantial impact on the filming and broadcasting industry, while the Music market (Fig.7) demonstrates a lower growth rate compared to the other two countries, suggesting the possibility of a substitution effect. Further exploration is warranted, and Trade Statistics data is required to facilitate this due to limitations in the available data.

I also conduct ARMA modeling for each HS code category using Trade Statistics Data, which may encompass Music, Filming, and Broadcasting industries separately. Our available data is limited to two-digit HS code categories, namely HS code 37, 48, and 85, which could include exports beyond cultural products (as depicted in Fig.13, Fig.14, and Fig.15). Nonetheless, utilizing monthly exports data to Chinese, Japanese, and U.S. markets, I pro-

jected exports post-January 2017 based on observations preceding this month, under the assumption that the shock would manifest with a lag effect approximately one month after November 2016. Remarkably, the figures(Fig.13, Fig.14 & Fig.15) reveal that, in comparison to the exporting markets of the other two countries, the Chinese Market exhibits superior performance in these three HS code categories according to the preliminary ARMA results.

Finally, I estimated an ARMA model of foreign tourists visiting South Korea from China, Japan and US, the results can be seen in Figure 16. I predicted the number of foreigners visiting South Korea after January 2017 with the observations before this year with the monthly data of foreigner visitors from China, Japan, and U.S. By comparing the Figure 16 between three countries, it's clear to see that the actual value of visitors from China is way less than the predicted value, whereas the other two countries' actual value is aligned with the predicted values.
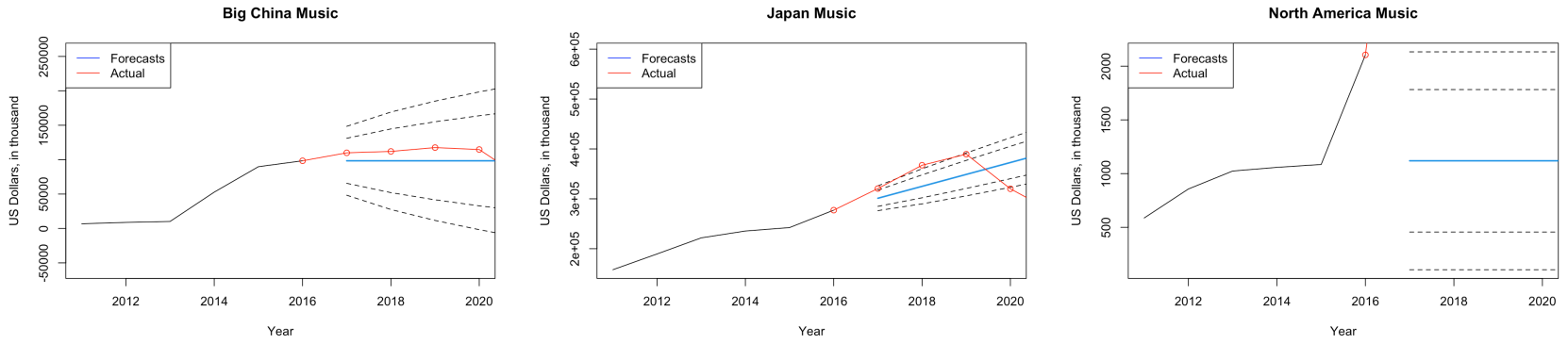
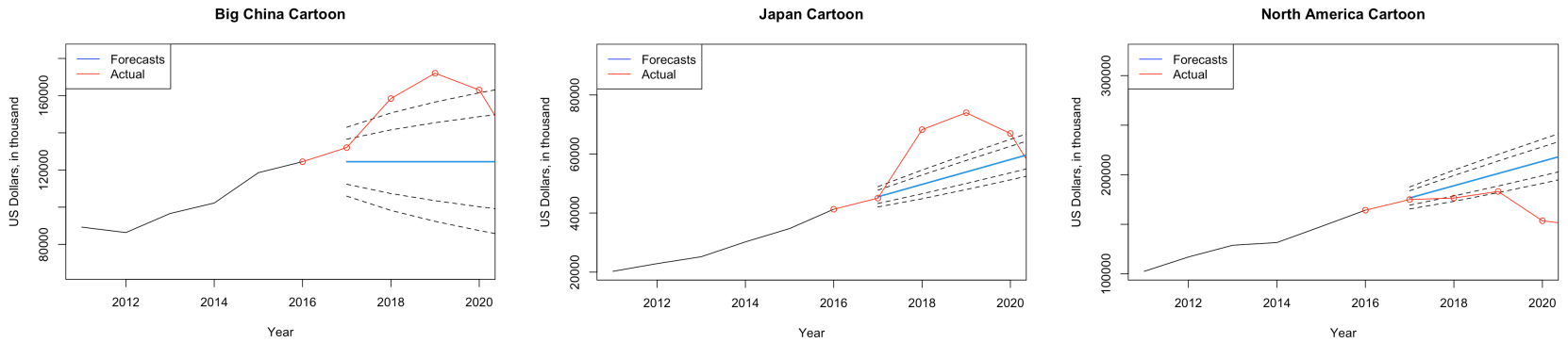Figure 7: ARMA Prediction of Korean Cultural Music Industry Exports by Region

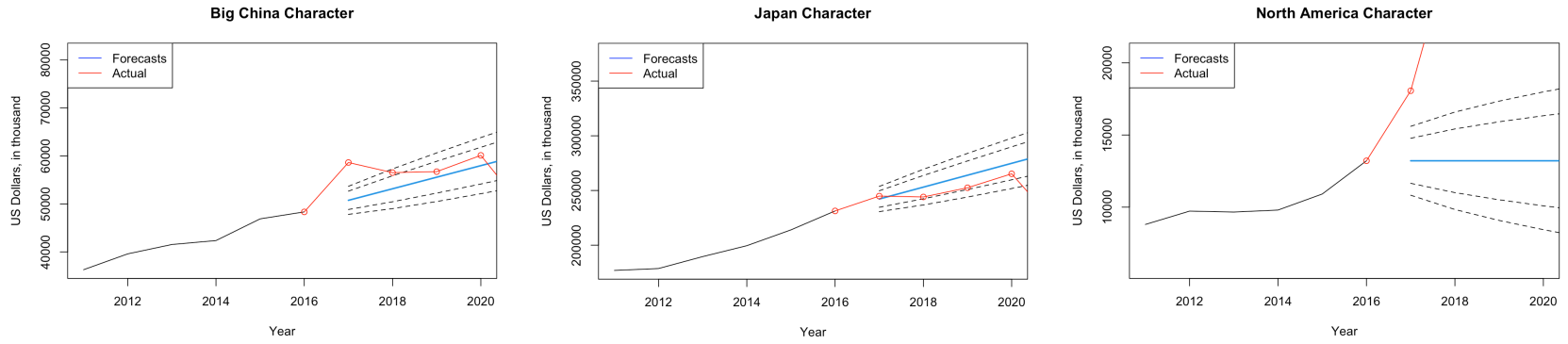Figure 8: ARMA Prediction of Korean Cultural Cartoon Industry Exports by Region

Figure 9: ARMA Prediction of Korean Cultural Character Industry Exports by Region
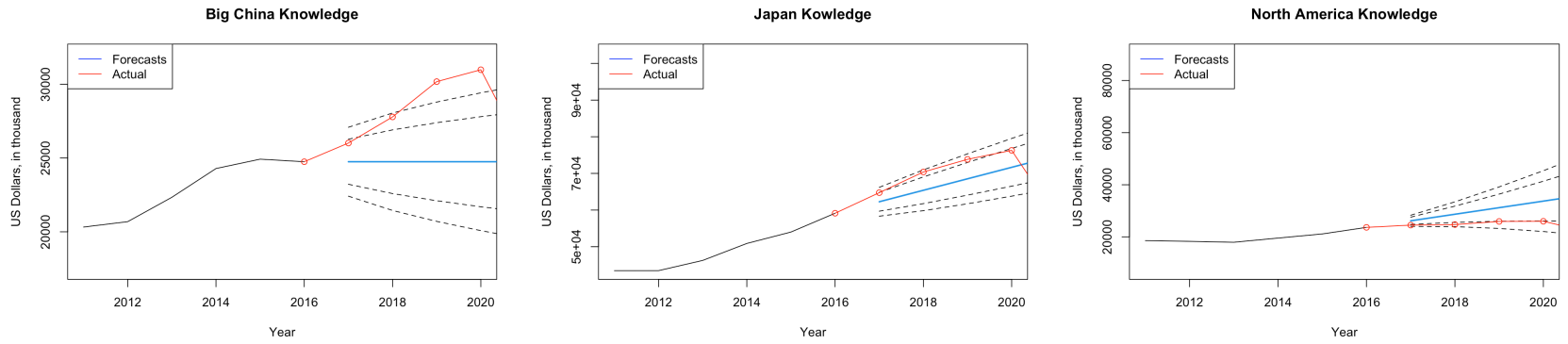
Figure 10: ARMA Prediction of Korean Cultural Knowledge Industry Exports by Region
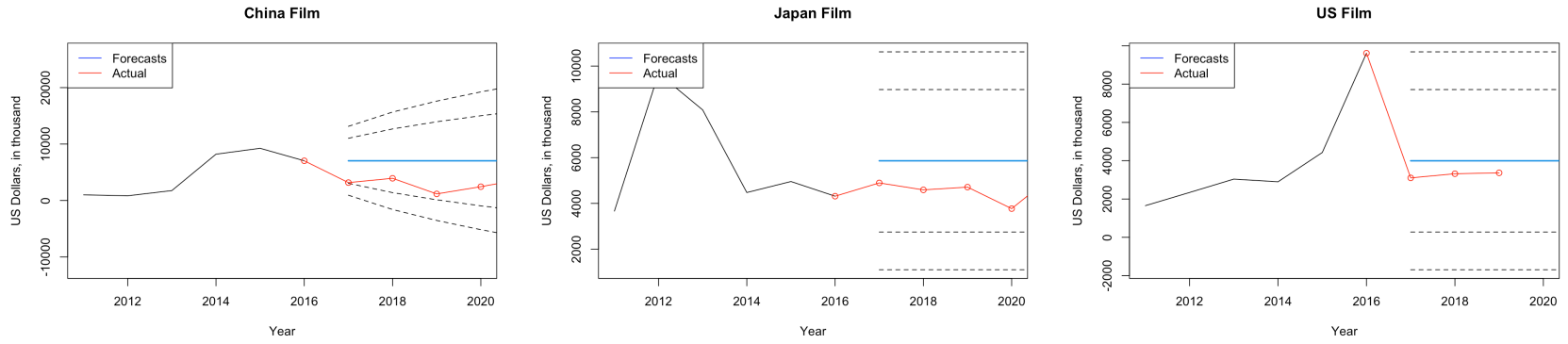
Figure 11: ARMA Prediction of Korean Cultural Film Industry Exports by Country
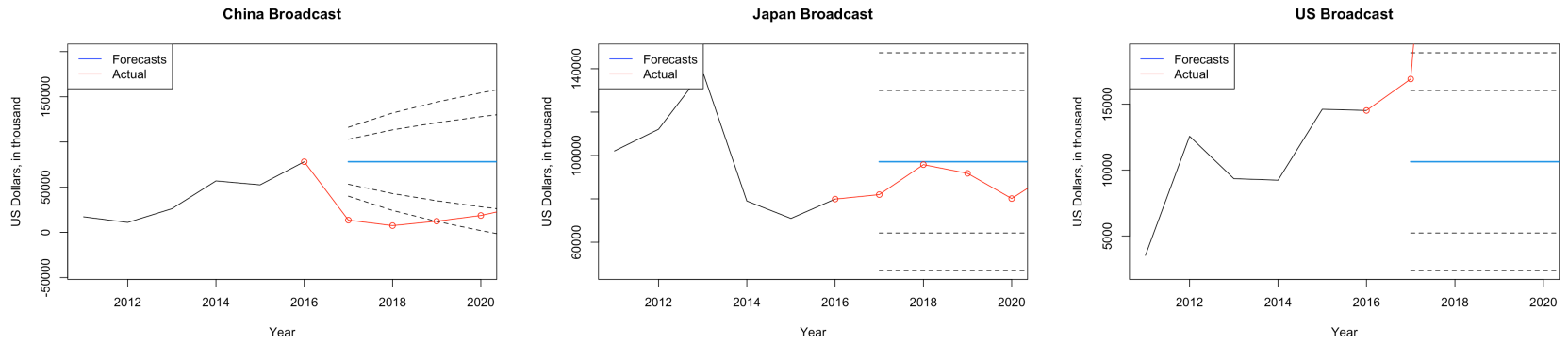

Figure 12: ARMA Prediction of Korean Cultural Broadcasting Industry Exports by Country
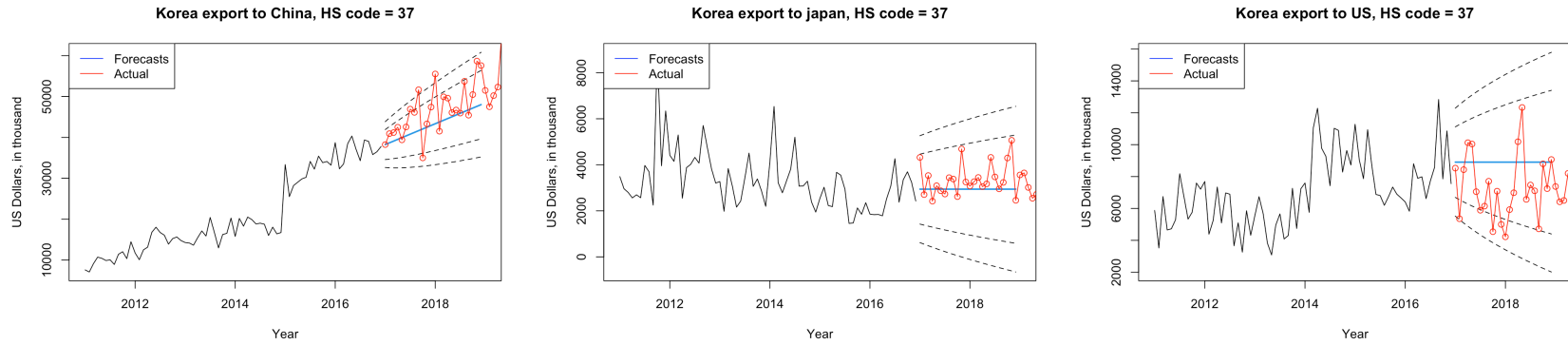
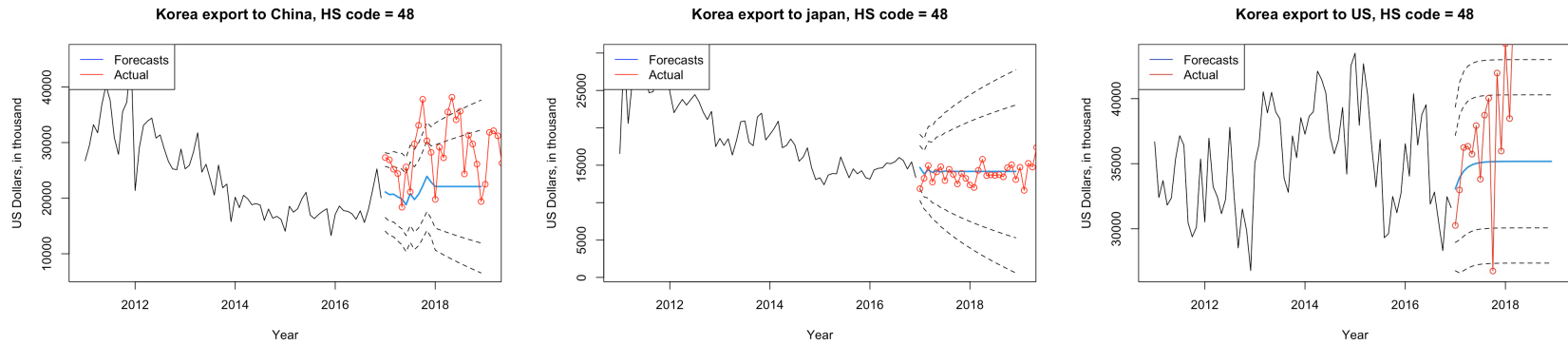Figure 13: ARMA Prediction of Korean Exports to each Country, HS code = 37

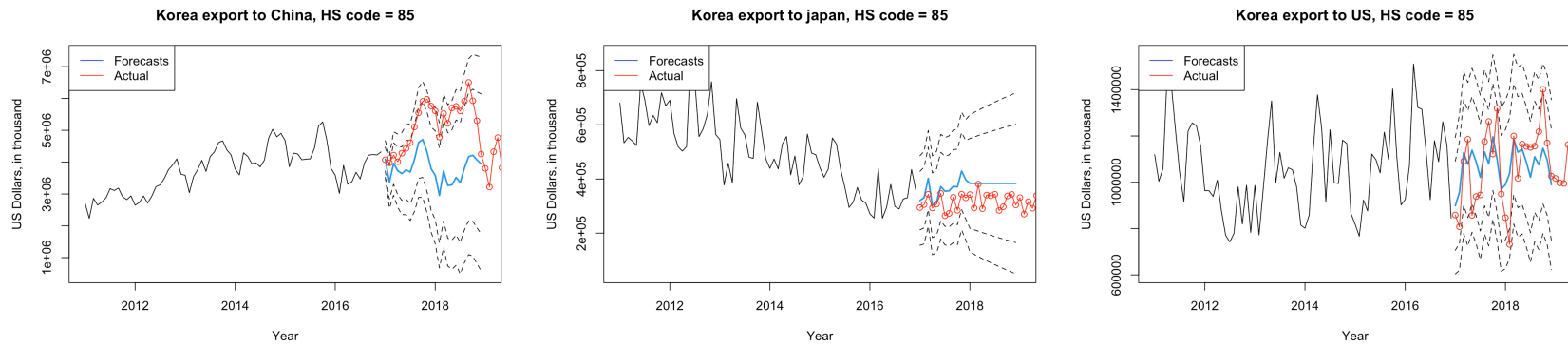Figure 14: ARMA Prediction of Korean Exports to each Country, HS code = 48

Figure 15: ARMA Prediction of Korean Exports to each Country, HS code = 85
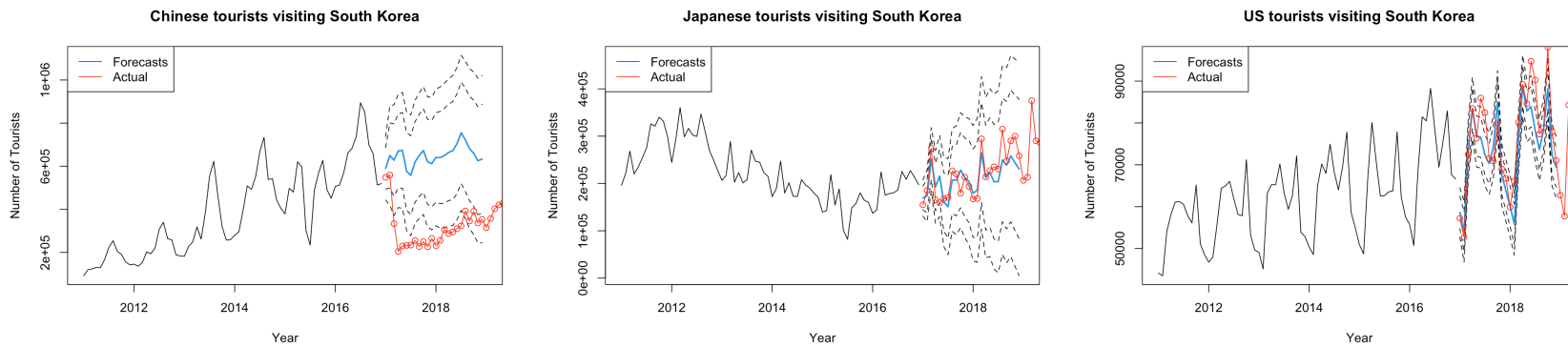
Figure 16: ARMA Prediction of South Korean Visitors from each Country

4.2 Residuals

After the preliminary trend from ARMA for each category, I calculated deviations from the trends, which I would use to compare cross countries. In this way, I am able to model the changes beyond the pre-existing trends through different initial levels from each country category. For each sector and market (China, Japan, and the U.S.), the model forecasts values post-January 2017, using data prior to this date. The discrepancy between the forecast (predicted) values and the observed (actual) values is captured through residuals, which are computed as:

$$r_{ict} = y_{ict} - \hat{y}_{ict} \tag{2}$$

Where r_{ict} denotes the residual of industry i in country c market at the time t; y_{ict} denotes the actual value of industry i in country c market at the time t; $\hat{y}_{ict}$ denotes the predicted value of industry i in country c market at the time t.

These residuals are crucial as they highlight the differential impacts of the policy across different markets. Preliminary analysis shows significant discrepancies, particularly in the Chinese market, suggesting unique effects of the policy on South Korean entertainment industries.

4.3 Difference-in-Difference Analysis

With the residuals from the equation2, I utilize a Difference-in-Difference (DID) model to compare the Korea exporting market between China and the other two countries. Following Luo and Zhou[10], the efficacy of the DID method hinges on the assumption that the control and treatment groups exhibit parallel trends prior to the intervention. I confirm these parallel trends both visually and statistically. In the accompanying Figure 17, I present plots of the ARMA residuals for the Chinese market compared with the other two countries. Although the trends are not perfect, they are in general parallel before the event month of November 2016.
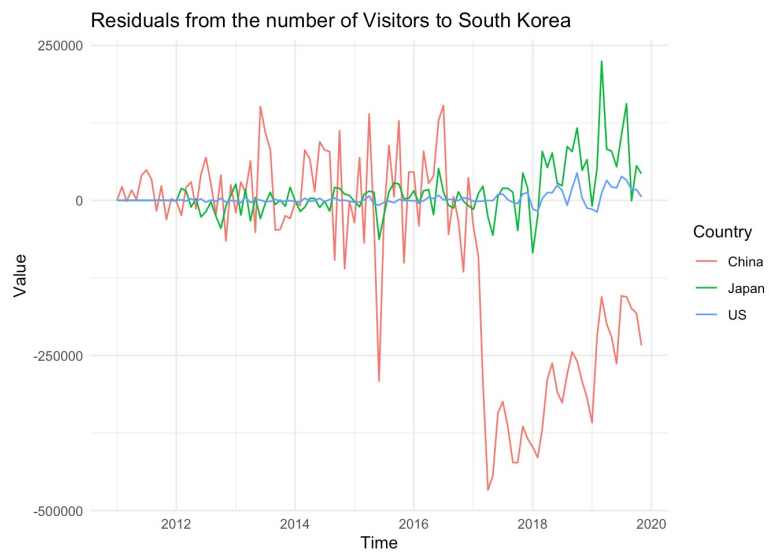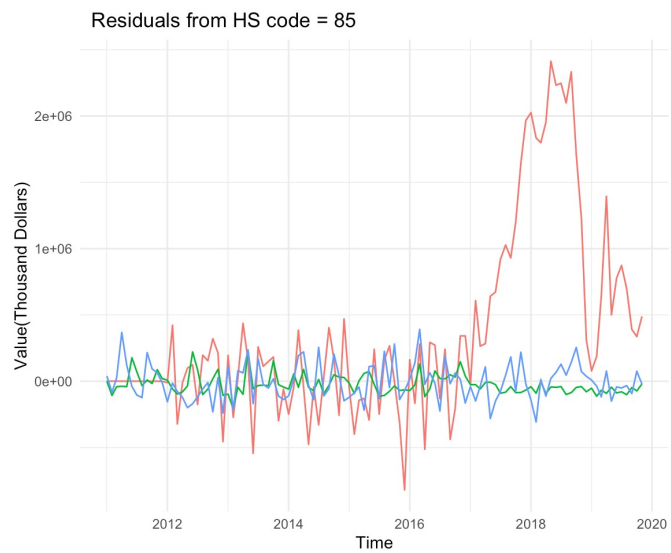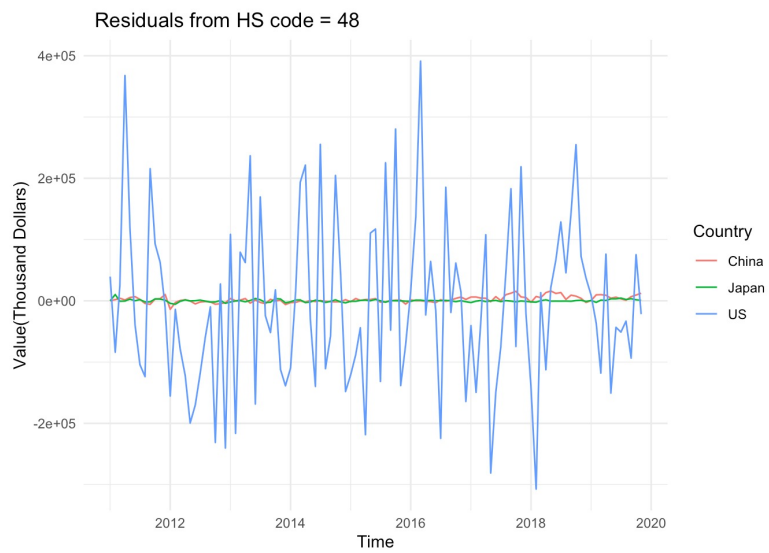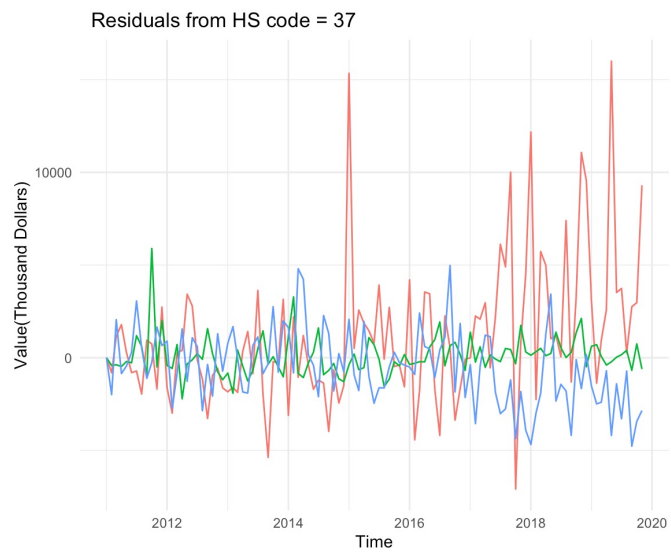
Figure 17: Residuals from ARMA trends from each category

As Fig.17 shows, the residuals for China in Korean exports category HS37 and HS85 show significant spikes in certain periods, suggesting substantial deviations from the predicted values based on historical trends. These spikes might indicate sudden increases or decreases in trade volume, possibly linked to policy changes or market disruptions. In contrast, the residuals for Japan and the U.S. are relatively stable, indicating that the trade volumes were closer to what was predicted by the ARMA model, hence less affected by external shocks during the same periods. In HS48 category, the residuals are quite stable for China and Japan but volatile for U.S. The erratic nature of these residuals could reflect the inherent volatility in the specific trade items classified under this HS code, or it might suggest that external factors have a pronounced impact on the trade of these items.

Based on the above the observations, we therefore obtain the DID model of residuals from ARMA model to quantify the impact of external shocks on Korean exports in each HS category:

$$\text{Export}_{ict} = \beta_{0i} + \beta_{1i}\text{Post}_T + \beta_{2i}\text{China}_c + \beta_{3i}\text{Post}_T \times \text{China}_c + \theta_i + \epsilon_{ict} \tag{3}$$

Where ric_t denotes the residual of industry i in country c market at the time T; ric_t includes 3 different exports markets in Total: HS code37, 48, 85; and the number of the Visitor to South Korea. Post_T is the dummy variable that the set policy effect time January 2017, with $T-12$ and $T+12$ denoting pre-treatment value "0" and post-treatment value "1", respectively. China_c is the dummy variable that targeting export country, to China and Japan/U.S. denoting treatment group value "1", and control group value "0", respectively.

The tourism industry in the Fig.17 shows that after controlling from the residuals, the Chinese Market's Value are not statistically significantly different from that of the rest of the country right at the policy shock, while for several months after November 2016, the values are significantly lower. This could be a direct result of the "Korea Limitation Order" affecting Chinese tourism to South Korea. The trends for Japan and the U.S. do not show

such dramatic shifts, suggesting that the policy impact was more pronounced or specifically targeted towards China. Based on the above the observation, we therefore obtain the DID model of residuals from ARMA model of foreign tourists visiting South Korea:

$$\text{Visitor}_{ct} = \beta_0 + \beta_1 \text{Post}_T + \beta_2 \text{China}_c + \beta_3 \text{Post}_T \times \text{China}_c + \epsilon_{ct} \qquad (4)$$

Where ric_t denotes the residual from the number of the Visitor to South Korea in country c market at the time T. Post_t is the dummy variable that the set policy effect time January 2017, with $T-12$ and $T+12$ denoting pre-treatment value "0" and post-treatment value "1", respectively. China_c is the dummy variable of the Visitors' nationalities, from China and Japan/U.S. denoting treatment group value "1", and control group value "0", respectively.

As mentioned above, it is reasonable to have Japanese and U.S. market be the control group, and the Chinese market be the treatment group. In this model, β_{1i} quantifies the differential between the predicted trends (via the ARMA model) and the actual values observed in the control group over a specified two-year period. If the shock event did not impact the Japanese or U.S. market, this coefficient value should be zero. A non-zero value would suggest deviations from the expected trends. A positive β_{1i} could be indicative of substitution effects between the markets of China and those of Japan or the U.S. On the other hand, a negative β_{1i} could suggest that the relative importance of the Chinese market is such that South Korean companies might struggle to operate effectively without it.

Moreover, the coefficient β_{2i} captures the baseline difference in trends between the treatment group (China) and the control group (Japan or the U.S.) prior to the event. Our assumption suggests that the ARMA model has effectively captured parallel trends in the absence of any policy shock, the theoretical value of this coefficient should be zero, indicating no inherent differences between the groups' pre-event trends. A non-zero value indicates discrepancies in the ARMA model's ability to predict these trends accurately. This deviation could indicate that the pre-event trends between the control and treatment groups were not as aligned as assumed. Such a finding should be considered significant, as it challenges

the assumption of parallel trends and may necessitate a reassessment of the model's parameters or the inclusion of additional variables to capture these underlying differences more effectively.

β_{3i} is the most curial parameter as it quantifies the difference-in-difference between China and the other two countries. Knowing the previous two coefficients is helpful for us the decompose the difference-in-difference cofficients and seeking reasonable explanations in the real-world situations. A positive β_{3i} suggests that the Chinese market has experienced growth relative to the control groups since the implementation of the shock. Conversely, a negative value indicates a decline in the Chinese market compared to the trends observed in Japan or the U.S.

Statistical tests are essential as well. The previous two coefficients may yield zero, but a null result still validates the ARMA predictions and sustains the credibility of the difference-in-difference analysis. On the other hand, a situation in the Fig.17 shows that some trends of residuals, such as the residual from Korean Export to U.S. in category HS48, display more noise compared to other countries. Such situation might decrease the quality of the ARMA fit and increase the noise for DID model.

5   Result Analysis

5.1   Trade Statistics Analysis

Tables 5 and 6 present the results of the DID model with Japan and the United States as control groups respectively. A review of these tables indicates no significant diversion effect between using Japan and the United States as controls, as the magnitude of coefficient values across each industry category remains consistent. This consistency may be attributed to the initial scale and rapid growth of the Chinese market, which was significantly larger than those of the other two countries during 2016-2018. In contrast, the markets in Japan and the U.S. show more stability in their import values across categories. Subsequent analysis

Table 5: Japan Difference-in-Difference Model Result Analysis

Variables	HS37	HS48	HS85	Visitor
Residuals Mean of Japan Trend(β_1)	56.25	-808.5	-69397	-11425
	(1171.79)	(1180.51)	(145222)	(31585)
Residual Mean initial Gap(β_2)	-510.95	886.35	20006	16867
	(1195)	(1180.51)	(148098)	(32211)
Difference-in-Difference Value(β_3)	3316.6	5563.61**	964641***	-346742***
	(1657.16)	(1669.43)	(205375)	(44668)
Adjusted R^2	0.1318	0.4112	0.5549	0.7854
Observations	214	214	214	214

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

Table 6: United States Difference-in-Difference Trade Statistics Result Analysis

Variables	HS37	HS48	HS85	Visitor
Residuals Mean of U.S. Trend(β_1)	-2421.1	1805.7	-67334	-572.6
	(1283.1)	(1608.4)	(150399)	(30437.7)
Residual Mean initial Gap(β_2)	-717.1	1303.8	4393	20752.8
	(1308.5)	(1640.4)	(153377)	(31030.3)
Difference-in-Difference(β_3)	5794.0**	2949.4	962578***	-357594***
	(1814.6)	(2276.4)	(212696)	(43031.3)
Adjusted R^2	0.2208	0.2127	0.5298	0.7989
Observations	214	214	214	214

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

will further dissect these effects and explore the underlying reasons.

5.1.1 Trade Statistics compared with Japan

There is no significant evidence of a positive or negative response from the Chinese market relative to the Japanese market in the HS37 category from South Korea, as indicated by an insignificant difference-in-difference coefficient. Moreover, the adjusted R-squared value is approximately 0.1849, suggesting that the model explains only about 18% of the variance in the response residuals. Several factors might account for these results: firstly, HS code 37 encompasses a broad range of products, not just cultural goods; it includes items such as filming tape but also extends to X-ray devices. Due to data limitations, it is unclear whether cultural products dominate this category over less relevant goods. Observations from the figures show that demand in the Japanese market for this category remains relatively stable over time, whereas the Chinese market exhibits greater variability. Thus, it is not surprising to have the insignificance of the model's results.

The residuals estimators β_1 and β_2 are not significant in export category HS48 and HS85. The AMAR did perform an ideal trend prediction. β_3 is significant in the data results from the Korea exports in Category HS code48. Also, the adjusted R-squared value is about 0.4473 and 0.5549, which means that the model has been able to explain about 45% of the variance in the response residuals variables in category HS48 and 55% in the export category HS85 from South Korea. The value of adjust R-squared is over 50% means the statistical test result is ideal. Although the statistical test results the result from HS85 is but HS48 is not ideal, we still could validate those results to obtain more implications.

The Chinese market for HS48 products from Korea initially exceeds that of the Japanese market. The estimated difference-in-difference (β_3) of 5563.61 indicates a larger residual increase in the Chinese market than in the Japanese market due to the policy shock. This suggests that the Chinese market for this export category has expanded more significantly than its Japanese counterpart, possibly indicating a substitution effect. Several factors could

explain this outcome: firstly, HS code 48, which covers Paper and paperboard; articles of paper pulp, paper, or paperboard, spans a broader range than just cultural goods. It includes items like postcards featuring Korean pop culture but also extends to products like raw paper. Data limitations prevent an accurate determination of whether cultural products dominate this category over other less affected goods. Secondly, the fluctuating geopolitical relationship between Korea and Japan during 2015-2017 might suggest that Korea was exploring new markets for HS48 exports, and China could be one of the possible answers.

In HS85 market compared with Japan, the initial volume of Chinese market is relatively the same as the Japanese market. However, the Japanese market had been decreased over two years. The estimated difference-in-difference (β_3) of 964641 suggests that the increase of residual that was affected by the policy shock in the Chinese market more than the Japanese market. This leads to the implication that the Chinese market in this export category has grown more than the Japanese market from Korea. The total volume of HS85, Electrical machinery and equipment in South Korea is much larger than the former two exports category. The category of HS 85 not only includes Cultural content products such as K-pop albums, but also includes circuit boards and semiconductors, which the well-known Korean companies Samsung and LG are best at. In the data, we see a surge in China's imports of this category to South Korea after January 2017. Considering the growth of China's GDP after 2017, we have reason to suspect that the growth in our conclusion is related to the imports of these products with comparative advantages to South Korea.

5.1.2 Trade Statistics compared with United States(U.S.)

There is no significant evidence of a differential response by the Chinese market to the policy shock compared to the U.S. market in the HS48 category from South Korea, as indicated by an insignificant difference-in-difference coefficient. Additionally, the adjusted R-squared value is approximately 0.2127, suggesting that the model explains only about 21% of the variance in the response residuals. Several assumptions could explain these findings: first, HS

code 48, which includes Paper and paperboard; articles of paper pulp, paper, or paperboard, encompasses a broader range than mere cultural goods. It includes cultural items like Korean pop culture postcards as well as products like raw paper. Due to data limitations, it's unclear if cultural products significantly outweigh other goods in this category. Furthermore, the residuals in the U.S. market for HS48 are relatively noisier than those in the Chinese or Japanese markets, as observed in Figure 17. This may be due to the inconsistent popularity of the Hallyu trend in the U.S., which contrasts with its more sustained appeal in Asian markets where CEI companies primarily focus. As the literature review notes, some K-pop songs have fleeting popularity, failing to establish a lasting presence akin to broader Asian K-pop culture. Thus, the insignificance of this model's results is not unexpected.

The coefficients β_1 and β_2 for export categories HS37 and HS85 are found to be insignificant, indicating that the ARMA model provided an accurate prediction of trends in these categories. β_3 is significant in the data results from the Korea exports in both categories. Also, the adjusted R-squared value is about 0.2208 and 0.5298, which means that the model has been able to explain about 22% of the variance in the response residuals variables in category HS37 and 53% in the export category HS85 from South Korea. Although the statistical test results the result from HS85 is but HS37 is not ideal, we still be able to obtain more implications through our results from the DID model.

The estimated difference-in-difference is 5794 in HS37 market, indicating that the residual increment of the Chinese market affected by the policy shock is larger than that of the U.S. market. The Korean HS37 export to U.S. had generally decreased over two years, while the Chinese market might be even lower than the U.S. market initially. As a result, it's reasonable to suspect that Chinese market is growing rapidly and substituting the U.S. market in HS37 export products. This may be due to that the exporting to U.S. might has higher delivery cost than that of China, which Chinese market will have a comparative advantage on. Additionally, U.S. has rooted a different culture than the Asian countries, plus U.S. has an even more sophisticated filming industry like Hollywood. China has more

population generates more market, the demand of filming market in U.S. might much lower than the country which is closed to the Korea in both sense of geographically and culturally.

The significant difference-in-difference (β_3) value of 962578 for the HS85 category, when compared with the U.S. market, indicates that the residuals affected by the policy shock were greater in the Chinese market than in the U.S. Additionally, while the U.S. market for HS85 contracted over time, the Chinese market aligned closely with the ARMA model's predictions. This suggests that the Chinese market for this category has expanded more significantly than the U.S. market. HS85, which encompasses electrical machinery and equipment, is a major export category for South Korea and includes not only cultural content products like K-pop albums but also high-value electronics like circuit boards and semiconductors, with major Korean companies like Samsung and LG leading production. The data shows a noticeable increase in China's imports from this category post-January 2017. Given the concurrent growth in China's GDP, it's plausible that this surge is linked to the comparative advantages South Korea holds in these products.

5.2   Foreign Tourist visiting South Korea

The effects of policy shock in visitor DID models are observable compared with both control groups. The difference-in-difference coefficients β_3 in Foreign Visitors to South Korea in both countries are highly significant. Also, the adjusted R-squared are both ideal as the value of adjust R-squared is over 50% means the statistical test result is ideal.

Over two years before and after the policy shock, the Japanese visitors to South Korea had decreased a certain number, while the Chinese visitor has been increased slightly although β_2 is highly insignificant. The estimated difference-in-difference (β_3) of -34742 suggests that the decrease of residuals that was affected by the policy shock in the Chinese market more than the Japan market, which implies that the Chinese consumers' willingness visiting Korea as their trip has been decreased by the policy shock compared to Japan. This result implies that the policy shock has influenced the consumers in the Chinese market. The power of the social

media can not be neglected based on the literature review. Although both countries, China and Japan, had experienced up and down in geopolitical relationships with Korea during those two years, the population in China, as our common knowledge goes, are multiple times more than Japan's. The population that the media power could affected with, is surly more in China than Japan. Those might lead to the result that even though Japanese and Chinese visitors are both less willing to visit South Korea, the data from Chinese Visitors might more obvious in the result analysis.

Visitor from U.S. to South Korea had kept a steady low number throughout those two years. Compared U.S. with China, China's visitor was more than the ARMA predicted if we set the steady U.S. trend as the prediction base for the number of visitors to South Korea from China. However, the estimated difference-in-difference (β_3) of -357594 suggests that the decrease of residuals that was affected by the policy shock in the Chinese market more than the U.S. market even with its steady trend as prediction base, which implies that the Chinese consumers' willingness visiting Korea as their trip has been decreased by the policy shock compared to U.S. Several factors could explain this outcome. Firstly, as previously noted, the U.S. was not a primary target for Korea at the time, as cultural differences between North America and Asia made it challenging for Korean Hallyu (the Korean Wave) to gain popularity in the U.S. market. It is both easier and more cost-effective for Korea to expand its market within Asia, where countries share closer cultural ties. Additionally, the geographical proximity of other Asian countries to South Korea makes travel more affordable for visitors from these regions. Therefore, despite a growth in the number of Chinese visitors to South Korea after the session, the after-shock level was still below what the ARMA model had predicted.

6   Conclusion

Upon employing the Autoregressive Moving Average (ARMA) model on Cultural Exports Data across various industries, several insights emerge. I found that industries unaffected by Chinese policy, such as Cartoon and Knowledge Information, exhibit self-sustained growth. Conversely, the filming and broadcasting sector experiences significant impact, while the Music market demonstrates a lower growth rate compared to Japan or the United States. Despite cultural products representing a small proportion of general exports, the Difference-in-Differences (DID) model reveals a substantial increase in all three categories of Korean Exports to China, surpassing even the predicted trends from ARMA when contrasted with the Japanese and United States markets. This growth trend extends beyond cultural products, encompassing South Korea's renowned electrical machinery and equipment industries.

Nevertheless, the number of Chinese tourists visiting Korea notably declined in the 12 months following the policy shock, compared to Japan or the United States. The shock garnered widespread media coverage in 2017, suggesting that the behavior of Chinese consumers may have been influenced by the pervasive reach of social media.

Certain limitations have been recognized in this research. Firstly, the cultural exports data is annually reported which cannot show the effects of shock perfectly. The Trade statistics data categories are way broader than mere cultural products. Besides, some of the cultural products, such as knowledge information, are more likely to not be physical goods that can not be recorded by customs services from South Korea. Therefore, I had difficulties in spotting the exact data for my research questions. The number of visitors to South Korea is one of the best indicators of tourism industry, but further information could still be provided in this subsection.

Further research efforts should focus on better data sources and research methods. The HS codes category I am using now is a two-digit one. More digits mean the category is more specified. Unfortunately, those data are not available to foreigners like me. If more Korean scholars are interested in such topics, they will be able to obtain a better data source than

I have. Furthermore, the impact of the tourism industry is not fully exploited. More foci should be considered. Up to 2023, the United States has been the top importer of Korean Cultural products. Therefore, more viewpoints, such as in long-term perspectives, should be considered if we intend to see an obvious effect.

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