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Sectoral FTA gains, conflicts, and the role of interindustry factor mobility: Evidence from Korea's free trade agreement

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Abstract

Free trade agreements (FTAs) can ignite domestic conflicts between export- and import-competing industries over trade gains. However, if the factors of production, such as capital and labour, move freely across industries, the returns to factor owners will quickly converge. Then, sectoral conflicts over FTAs will be less likely to arise. We analyse the case of South Korea's FTAs to measure (a) sectoral FTA gains and (b) interindustry factor mobility and to examine (c) the role of interindustry factor mobility in mitigating sectoral conflicts over trade policies. South Korea is an ideal case study due to the low barriers to domestic geographic mobility and high trade dependence. Based on data on its trade with 252 countries and factor returns between 2002 and 2017, we find that export industries did not gain much from the FTAs, while the import-competing agricultural sector was the winner. Sectoral conflicts greatly decreased over 2008–2010. Interindustry capital mobility plays a significant role in weakening the sectoral conflicts, while the impact of interindustry labour mobility is limited.

1 | INTRODUCTION

1.1 | Background and motivation

A free trade agreement (FTA) is an outcome of trade liberalization policies of two or more countries that aims to increase the amount of international trade among them. For each of the trade partners, if the factors of production move freely across its local industries, the factor owners in different industries would not conflict with each other because their factor returns would be identical. However, if one factor of production (e.g., capital or labour) is immobile between industries, a domestic conflict can arise between the factor owners in internationally competitive industries and those in import-competing industries.

The role of this interindustry factor mobility in sectoral conflicts over FTAs is largely overlooked in the literature despite its economic and social significance. For example, in South Korea (Korea hereafter), the government anticipated the benefits of FTAs and signed FTAs with 52 countries up to 2017, including the USA, China, and the EU, after its first FTA with Chile in 2003 (Table 1). However, the agricultural sector strongly objected to the idea of FTAs well before its first FTA with Chile (Cheong & Wang, 1999). They feared that the government was abandoning the agricultural sector for the more competitive manufacturing sector (Choi & Oh, 2011; H.-H. Kim & Ahn, 2007).[1] Farmers and activists organized national protests and criticized the FTA negotiations and deals throughout the 2000s and 2010s. The government's decision to resume US beef imports during the negotiation over Korea–US FTA in 2008, which was suspended in 2003 after a bovine spongiform encephalopathy, met with great anger among citizens (BBC, 2008) and led to severe social unrest (Jang, 2015). The Korea–US FTA was finally ratified in 2011, but Korean farmers again fiercely opposed the revised Korea–US FTA in 2017 (H. Kim, 2017). In contrast, the manufacturing sectors, led by the Federation of Korean Industries and the Korea Chamber of Commerce and Industry, hailed the FTAs, expecting higher profits from the larger volume of international trade (Jang, 2015).

The main reasons for this lack of investigation are the difficulties in measuring sectoral conflicts and interindustry factor mobilities and finding proper sample countries. First, few studies have formally estimated the degree of sectoral conflicts because the direct measurement is difficult. Instead, we can devise an indirect measure based on how much individual industries earn and lose from FTAs (i.e., sectoral FTA gains). For instance, the import-competing agricultural industry of Korea did not lose to imported goods, contrary to their prior belief. The export of US beef to Korea was only 169,000 tons in 2016, compared with 249,000 tons in 2003. Therefore, the agricultural sector is less likely to conflict with other sectors. In general, if the difference in sectoral gains is smaller, the likelihood of sectoral conflicts will be lower. Specifically, we estimate sectoral FTA gains from trade data first and then employ their dispersion as a measure of domestic sectoral conflicts over FTAs.

Next, the level of interindustry factor mobility is also rarely measured in studies of international trade and economics. Instead, it is commonly assumed that the factors of production move freely to different industries. However, in reality, their movement can be restricted. As a result, the owners of those factors in each sector may earn different rates of returns (e.g., wages to labour owners and profits to capital owners). Then, we can measure the degree of interindustry factor mobility within a country based on the dispersion of these returns to factor owners.

Finally, even with these two measures, one cannot reliably estimate the impact of interindustry factor mobility on sectoral conflicts over FTAs if the selected sample countries have

TABLE 1 FTA partners of South Korea

Country	FTA	Top 30	Total trade	Total exports	Total imports	Country	FTA	Top 30	Total trade	Total exports	Total imports
Chile	14	Y	6,644,700	2,307,356	4,337,343	Luxembourg	7		182,604	116,718	65,886
Iceland	12		83,131	59,605	23,525	Malta	7		1,650,240	1,410,259	239,982
Liechtenstein	12		14,021	5,553	8,468	Netherlands	7	Y	9,559,100	5,314,017	4,245,083
Norway	12		4,691,398	2,134,336	2,557,062	Peru	7		2,315,009	1,001,289	1,313,720
Singapore	12	Y	25,807,194	16,722,960	9,084,234	Poland	7		3,967,823	3,503,414	464,408
Switzerland	12		3,192,940	742,657	2,450,282	Portugal	7		706,908	548,840	158,068
Brunei	9		1,567,763	145,149	1,422,614	Romania	7		967,767	574,614	393,153
Cambodia	9		568,719	463,171	105,548	Slovakia	7		3,434,433	3,296,068	138,365
Indonesia	9	Y	21,855,913	9,388,741	12,467,172	Slovenia	7		1,139,446	1,057,494	81,952
Laos	9		130,317	106,696	23,621	Spain	7		4,455,295	2,923,189	1,532,105
Malaysia	9	Y	17,444,295	7,446,681	9,997,615	Sweden	7		2,570,925	954,253	1,616,672
Myanmar	9		884,373	588,321	296,052	UK	7	Y	12,238,144	6,859,497	5,378,647
Philippines	9	Y	11,004,493	7,450,147	3,554,346	USA	6	Y	109,578,499	63,535,151	46,043,348
Thailand	9	Y	11,772,467	6,896,279	4,876,187	Turkey	5		5,521,836	4,955,591	566,245
Vietnam	9	Y	23,356,647	17,445,213	5,911,434	Australia	3	Y	27,916,211	8,822,661	19,093,550
India	8	Y	16,245,663	10,803,116	5,442,547	Canada	3	Y	9,753,846	4,975,279	4,778,568
Austria	7		2,134,810	943,925	1,190,886	China	2	Y	201,351,918	121,558,244	79,793,674
Belgium	7		4,062,990	2,616,992	1,445,997	Colombia	2		1,546,002	1,206,998	339,004
Bulgaria	7		278,663	168,166	110,497	New Zealand	2		2,579,565	1,208,838	1,370,727
Croatia	7		182,118	166,036	16,083	Top 30 partners without FTA					
Cyprus	7		1,133,369	859,811	273,558	Brazil	0	Y	11,408,373	6,791,925	4,616,448
Czech Republic	7		1,914,486	1,433,464	481,022	Hong Kong	0	Y	31,876,859	29,362,944	2,513,915
Denmark	7		1,756,054	922,365	833,689	Iran	0	Y	11,162,580	4,497,966	6,664,614

(Continues)

TABLE 1 (Continued)

Country	FTA	Top 30	Total trade	Total exports	Total imports	Country	FTA	Top 30	Total trade	Total exports	Total imports
Estonia	7		186,010	94,586	91,424	Iraq	0	Y	6,546,712	1,114,598	5,432,114
Finland	7		2,242,524	1,175,277	1,067,247	Japan	0	Y	97,677,973	33,178,571	64,499,402
France	7	Y	9,216,229	3,690,909	5,525,320	Kuwait	0	Y	13,482,251	1,191,126	12,291,125
Germany	7	Y	28,115,328	10,293,051	17,822,277	Marshall Islands	0	Y	5,773,262	5,722,546	50,716
Greece	7		2,364,162	2,160,617	203,545	Mexico	0	Y	11,545,393	9,322,599	2,222,795
Hungary	7		2,082,161	1,617,573	464,588	Qatar	0	Y	16,293,273	881,621	15,411,652
Ireland	7		1,704,219	663,463	1,040,756	Russia	0	Y	17,863,430	7,918,370	9,945,060
Italy	7	Y	9,297,201	4,250,196	5,047,006	Saudi Arabia	0	Y	34,870,412	6,200,332	28,670,080
Latvia	7		152,574	113,990	38,584	Taiwan	0	Y	29,903,446	15,316,928	14,586,517
Lithuania	7		211,640	173,288	38,352	United Arab Emir	0	Y	19,993,838	5,924,963	14,068,876

Notes: This table shows the list of free trade agreements (FTA) partners of Korea and the number of years since each FTA became effective (as of the end of 2017). Total trade, exports, and imports are annual averages in 000$. "Top 30" indicates the top 30 largest trade partners of Korea.

high barriers to domestic geographic mobility or little trade dependence. Our choice of Korea is motivated by the fact that Korea is technologically advanced and relatively developed (i.e., first and sixth in the global ranking for information technology adoption and infrastructure, respectively, World Economic Forum, 2018) but a physically small country (approximately 100,000 km^2). That is, the geographic mobility of the factors of production is restricted little within Korea, which makes it ideal for isolating the impact of interindustry factor mobility. In large countries like the USA, low geographic mobility is shown to affect factor price convergence (Cecchetti et al., 2002). In addition, Korea is known for its trade openness and dependence, so the effects of international trade on industrial sectors can be fully magnified. In contrast, Korea is not involved in regional economic unions (e.g., the EU), which likely enforces changes in domestic policies (Ederington, 2002) and even harms national interest (Duina & Buxbaum, 2008). Thus, the effect of FTAs can be more easily identified.

In essence, we estimate a sector-level gravity equation on the trade data of Korea, which includes a dummy for country-years following its FTAs. We find that the agricultural sector enjoyed more trade benefits than some other sectors. This is surprising because the import-competing agricultural sector was expected to lose after the FTAs. Then, we construct a time series of the cross-sector dispersion of FTA gains. We find that this is dynamically related to factor mobility, specifically capital mobility across domestic sectors. It shows that strong interindustry factor mobility can reduce the likelihood of sectoral conflicts over trade policies.

1.2 | Literature review

Sectoral or industry-based conflict over trade policies can arise because of limited domestic factor mobility across industries (i.e., low interindustry factor mobility, according to the theories of international trade) (Ladewig, 2006). The Ricardo–Viner model argues that if one factor of production (e.g., capital or labour) is completely immobile between industries, that particular factor is fully tied with the specific industry (Maneschi, 1992). Then, a conflict over trade policies arises between the members of the same class employed in different industries. For instance, labour and capital suppliers in the exporting industries benefit from increased international trade so are eager to support FTAs, but those in the import-competing industries will likely object to them.

In contrast, the Stolper–Samuelson theory (Samuelson, 1971) suggests that where factor mobility is perfect, international trade affects the owners of each domestic factor in the same way, regardless of the industries their factors are utilized in. That is, interindustry factor mobility can eliminate sectoral imbalances, just like domestic geographical factor mobility adjusts regional imbalances within a country or an economic union (Abiad et al., 2009; Begg, 1995). As a result, the owners of a relatively abundant factor will benefit due to the comparative gains from international trade (Rogowski, 1987). However, the owners of a relatively scarce (i.e., intensively-used) factor will lose because more of the factor will be freed up than newly employed elsewhere because a lower price of imports reduces domestic production. Then, the real price of the factor decreases. For example, in the USA, where capital is more abundant, capital owners are likely to win while labour owners lose in the liberal trade environment (Thorbecke, 1997). Eventually, a class-based, non-sectoral conflict arises over trade policies.

The dominant type of conflict over trade policies may change due to social, economic or regulation changes (Felbermayr et al., 2015). According to Hiscox (2001, 2002), when factor mobility is relatively high, a class-based conflict is more likely to occur, but when the mobility is

relatively low, a sectoral conflict is more likely to arise. In the USA, for example, factor mobility generally rose over the 1980s and 1990s, which led to lower sectoral divisions over trade liberalization policies (Ladewig, 2006). Likewise, in Korea, the industrialization in the 1970s and 1980s started moving labour and capital from agriculture to other industries. The neoliberal economic reforms since the 1990s have further increased the interindustry factor mobility (B. Lee & Shin, 2017).

A sectoral conflict can arise with an element of class-based conflict. The mobility of labour and capital may not vary in a parallel way over time, and then the owners of each factor would asymmetrically react to new trade policies like FTAs. For instance, if interindustry capital mobility is strong while labour mobility is weak, capital owners may be happy to unite and support FTAs, but labour owners could be divided depending on which industry they provide labour to. In contrast, sluggish interindustry capital mobility with perfect labour mobility can weaken capital owners' support for FTAs (H. S. Kim & Wong, 2008).

To research the sectoral conflicts over trade policies, it is imperative to estimate sectoral trade benefits first. However, studies on sectoral trade benefits, particularly from multiple FTAs within one country, are near non-existent. Some studies examined a single FTA deal to evaluate its expected or actual impact on a range of industries. For example, the Korea–EU FTA was expected to provide benefits to textile, leather/clothing, car and transport equipment sectors of Korea (Decreux et al., 2010) but to cause a loss to the processed food industry (Francois et al., 2007). Regarding the Korea–US FTA, Korea's livestock industry was estimated to experience a loss, while its textile, apparel, and electronic equipment manufacturers would gain (Cooper et al., 2011). From the Korea–EU FTA, Korea did not realize the expected benefits in the knowledge-intensive manufacturing sectors (Cho, 2018), while the EU enjoyed a relatively large increase in exports in many sectors (Lakatos & Nilsson, 2017). The Korea–China FTA benefited the car, agricultural, food, medical, and precision machinery industries of Korea (Baek et al., 2018). Other studies investigated the impact of Korea's FTA network on a single industry (e.g., seaborne logistics) (Inkyo Cheong & Cho, 2013). It contrasts with the extant literature, which has examined the impact of FTAs on trade or economic growth of a single or group of countries (Baier & Bergstrand, 2007; Hur & Park, 2012; S.-C. Lee, 2018; Martuscelli & Gasiorek, 2019; Sohn & Lee, 2010).

However, interindustry factor mobility is relatively overlooked in the studies of international trade and economics because the factors of production are assumed to move without restrictions within a country. It contrasts with international factor mobility, of which the relationship with international trade has been widely studied since Mundell (1957)'s seminar work. For example, international trade between countries can facilitate international factor mobility because the factors of production will find and move to where they are scarce and expensive due to higher demand (Markusen, 1983) until factor returns are equalized (Yenokyan et al., 2014). However, this factor price convergence can eliminate the motivation for the factors to move to another country, as in the Hecksher–Ohlin–Samuelson model (Goldberg & Klein, 1999). Similarly, the domestic factors of production can be motivated or discouraged to move to another sector as trade policies change.

An empirical link between interindustry factor mobility and sectoral conflicts over trade policies has also received little attention in the literature. The exceptions are from the political economy literature. For example, Hiscox (2001, 2002) suggests interindustry factor mobility as a source for internal social/political conflicts over international trade policies after investigating several developed countries in the nineteenth and twentieth centuries. He concludes that stronger factor mobility leads to a class conflict, while weaker mobility creates a sectoral conflict,

which compromises the Stolper–Samuelson and the Ricardo–Viner theories. Thorbecke (1997) shows that the North American Free Trade Agreement (NAFTA) creates a sectoral cleavage in the USA between export industries and import-competing industries, specifically when factor mobility is low. Beaulieu (2002) quantifies the survey data from the 1988 Canadian federal election and shows that interindustry factor mobility is, indeed, an important determinant of preferences for the US–Canada FTA. Likewise, lobbying competition among sectors is associated with the introduction of new trade policies (Gawande et al., 2012). However, earlier studies often measured the level of conflicts based on infrequent political behaviour and provided only descriptive evidence.

1.3 | Aims and contributions

Therefore, this paper aims to fill the gaps in the literature by testing the following hypotheses:

(1) Export industries benefit from FTAs, but import-competing ones lose, while sectoral FTA gains generally differ across industries. We suppose this differential reflects the degree of sectoral conflicts surrounding FTAs.

(2) Interindustry factor mobility varies over time. We also expect each factor of production, capital, and labour to show a different pattern of change, where we define capital as financial capital or industry-wide investment, which can be turned into fixed/working capital, and labour as the body of wage earners.

(3) Strong interindustry factor mobility alleviates the sectoral conflicts over FTAs. We focus on the empirical investigation of this relationship.

We test the hypotheses using Korea's 52 FTAs, which came into effect between 2002 to 2017. A degree of sectoral conflict is estimated based on a dispersion of sectoral trade gains from FTAs, in terms of increased exports or decreased imports, using the trade data with 252 trading partner countries. The interindustry factor mobility of Korea is measured using the returns to capital and labour owners.

Our study contributes to the existing literature on international trade and policy. First, this study sheds new light on the role of interindustry factor mobility in reducing sectoral conflicts induced by trade policies. Second, we suggest new measures for the degree of sectoral conflicts over trade policies and the level of interindustry factor mobilities. Third, we provide extensive evidence of sectoral gains and losses from FTAs and important insight into the issues specific to Korea. Finally, we also propose policy suggestions for the countries expecting or suffering from a sectoral conflict surrounding trade policies.

Our results show that sectoral trade gains from the FTAs are only marginally different across industries. Contrary to the earlier belief, these FTAs increased the export of direct consumer goods, including agricultural products, and did not affect Korea's manufacturing industry's exports. Interindustry capital mobility rapidly increased in Korea after 2008, but labour mobility slowly declined through the entire sample period, driven by segmented non-regular workers. The empirical analysis revealed that stronger interindustry capital mobility, indeed, reduces the degree of sectoral conflict and the role of labour mobility is not significant. Therefore, it can be suggested that interindustry capital mobility should be facilitated to alleviate potential sectoral conflicts over trade policies. However, in the case of Korea, another type of conflict between workers in different industries can still arise due to limited labour mobility across industries.

The remainder of the paper is structured as follows. Section 2 estimates sectoral FTA gains and the degree of sectoral conflicts over them. Section 3 measures the level of interindustry

factor mobilities. Section 4 examines the impact of interindustry factor mobilities on sectoral conflicts. Section 5 synthesizes the results and concludes.

2 | SECTORAL FREE TRADE AGREEMENT GAINS AND CONFLICTS

Sectoral FTA gains (i.e., the gains of individual industries from FTAs) are estimated using the modified version of the gravity equation. The gravity equation of international trade has recently received even stronger support, since it was successfully derived from economic theories (e.g., Baldwin and Taglioni, 2006; Anderson, 2011; Head and Mayer, 2013). A structural gravity model of bilateral trade between exporter country X and importer country M is:

$$X_{XM} = \frac{Y_X}{\Omega_X} \times \frac{E_M}{\Phi_M} \times \phi_{XM}, \tag{1}$$

where Y_X is the total export of X, and E_M is the total expenditure of M. ϕ_{XM} is bilateral accessibility of M to exporter X, and Ω_X and Φ_M are called exporter and importer multilateral resistance terms, which can be detailed depending on the purpose.

There is also an advance in the empirical estimation of the gravity equation. In particular, the Poisson pseudo maximum likelihood (PPML) method is combined with the time-varying fixed effects to eliminate the issues in the OLS methods in dealing with heteroscedasticity, measurement errors and zero trades when using log form (Fally, 2015; Silva & Tenreyro, 2006). The fixed effects can replace the first and the second terms in Equation (1) (Anderson & Yotov, 2012; Fally, 2015) or be added alongside it (Anderson & van Wincoop, 2003; Silva & Tenreyro, 2006). Following Fally (2015) and modifying the sector-specific gravity model of Anderson and Yotov (2012) and Anderson and van Wincoop (2004), we estimate the model below for the impact of FTAs on international trade in sector k of a single country:

$$X^k_{XM,t} = \exp\left[\alpha^k_0 + \sum\nolimits_{i=1}^{K} \alpha^k_i \phi^k_{XM,t,i} + \gamma^k \mathrm{FTA}_{XM,t} + \xi^k_{X,t} + \delta^k_{M,t}\right] \epsilon^k_{XM,t}, \tag{2}$$

where ξ_X is the time-varying exporter fixed effects that control for Y_X and Ω_X, δ_M is the time-varying importer fixed effects that control for E_M and Φ_M, $\epsilon^k_{XM,t}$ is the error term, "α"s are coefficients, and $\mathrm{FTA}_{XM,t}$ is the dummy for the FTA agreement between the exporter X and the importer M. In this study, either X or M is South Korea depending on whether its exports or imports are investigated.

Sectoral FTA gains and losses are represented by the estimated value of γ in (2). In contrast, $\phi^k_{XM,t}$ is the set of variables that represent accessibility or barriers between X and M. For these variables, we cannot adopt some of the conventional variables like contiguous border, common language or colonial ties because South Korea does not share a land border, language or colonial ties with other countries except North Korea. Instead, we employ port capability as transport infrastructure, which represents the physical capacity to process both bulks and containers in the trade of South Korea where maritime transport covers 99.7% of the international trade of goods (National Logistics Information Center, 2017). Larger capability is expected to be associated with a larger amount of trade. Then, import tariffs are added as an adverse trade barrier (Chang & Hayakawa, 2010). We use two model specifications. Exporter and importer fixed

effects will account for all other resistance terms related to South Korea and its trading partners in Model 1. The gross domestic product (GDP) of Korea and its trade partners are also employed in Model 2. The relationship of their GDP with the amount of trade is expected to be positive.

The degree of sectoral conflict is then measured as the dispersion of the sectoral FTA gains. In particular, we adopt the quartile range (QR), also known as the interquartile range, of γ from (2). It can minimize the impact of outliers, which can arise from industry-specific events rather than the impact of trade policies. QR is calculated as:

$$\mathrm{QR} = (\mathrm{Q3} - \mathrm{Q1}), \tag{3}$$

where Q3 is the third quartile, the middle number between the median and the maximum value, and Q1 is the first quartile, the middle number between the median and the minimum value. Thus, it can minimize the impact of both upper and lower extremes.

Sectoral trade gains and subsequently sectoral conflicts over FTAs are calculated from the data of the Korea Customs Service (KCS), which is a governmental tax organization. The data contains all exports and imports between Korea and its 252 trading partner countries from 2002 to 2017 in US dollars. KCS adopts its own product categorization system that divides both exports and imports into three main categories: consumer goods, raw materials, and capital goods. These main categories are further classified into 12 major categories and 58 subcategories (Table 2). This classification system represents the Korea-specific industry characteristics in its international trade better than internationally recognized systems like the Harmonized System (HS). The control variables are obtained as follows. Tariff and GDP data are compiled using the data from the World Trade Organization and the World Bank. Tariff is the weighted mean of applied tariffs, and GDP is in US dollars. The transport infrastructure is the sum of port capacities obtained from the Ministry of Oceans and Fisheries of Korea.

The largest export and import products of Korea out of the three main categories are capital goods and raw materials, respectively (Figure 1). The size of international trade steadily increases over the sample period but has two dips. They are possibly caused by the aftermath of the global financial crisis in 2007–2008 and the global economic slowdown accompanied by the oil price plunge in 2015–2016.

The major export industries of Korea are semiconductor, automotive, shipbuilding, steel and communication equipment, and general machinery (Figure 2a), and the main exporters are Hyundai, Kia, SK Hynix, and POSCO. Korea also exports a large amount of refined petroleum and petrochemical products using imported oil, which comprises the largest proportion of Korea's imports. Korea imports a considerable number of intermediate products, such as silicon wafers, controllers, processors and chemical compounds, and other machinery, which are used to manufacture export goods such as semiconductors (Figure 2b).

Sectoral FTA gains in Korea are estimated as follows. First, when three main categories (consumer goods, raw materials, and capital goods) are employed, Korea's FTAs do not clearly show any impact on either its exports (Panel A in Table 3) or imports (Panel B). For instance, the exports by Korean industries to FTA partners are not significantly lifted by FTAs, in contrast to the prior expectation of the government. The reason could be that their impact on international trade is too diverse across individual products, so their net effects are likely to be averaged out under broader sector categories. However, among the control variables, the capacity of the transport infrastructure and the economic size of Korea and trade partners positively affect both exports and imports, as expected. The negative impact of tariffs is relatively weak but strongly observed in the export of raw materials and the import of consumer goods.

TABLE 2 Industry/product classification by the Korea Customs Service

Main	Major	Sub (product type)				
Consumer goods	Direct	Agricultural	Livestock	Aquatic	Prepared food	Drink
		Alcoholic	Tobacco			
	Durable	Electronics	Car	Bicycle	Household durable	Arts/collectibles
		Jewellery	Other durable			
	Non-durable	Prints	Clothes	Leather	Bags	Cosmetics
Raw materials	Animal and plant	Agricultural raw	Oil and fat	Sugar	Tobacco leaves	Leather
		Fur	Paper	Rubber	Timber	Other
	Textile	Textile raw	Yarn	Fabric		
	Minerals	Minerals	Fossil fuel			
	Steel and metal	Steel	Non-ferrous metal			
	Chemicals	Petrochemical	Fine chemicals	Compound	Fertiliser	Plastic
Capital goods	Transportation	Heavy goods vehicle	Train	Aeroplane	Ships	Elevator/escalator
		Parts				
	Machinery	Metal structures	Components and tools	General machine	Electronic machine	Precision machine
	IT product	Wired comm.	Wireless comm.	IT	Broadcasting	
	IT parts	Semiconductor	Panel display			

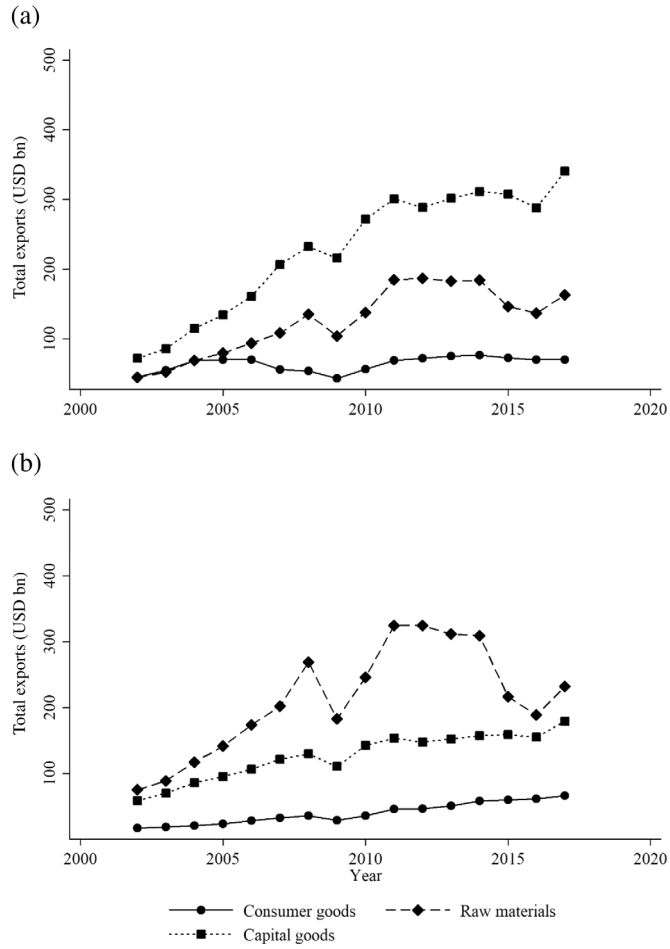

FIGURE 1 Total export and import of consumer goods, raw materials, and capital goods. (a) Total exports. (b) Total imports. *Source*: Korea Customs Service

Second, 12 more detailed categories provide a clearer picture of sectoral FTA benefits in Korea (Tables 4 and 5). Regarding Korea's export to the FTA partners (Table 4), the positive impact of FTAs is more apparent in the direct consumer goods (e.g., food, drink, and alcohol and textile products). It is consistent with the research on a single FTA of Korea, such as the Korea–EU FTA in Decreux et al. (2010) and the Korea–US FTA in Cooper et al. (2011), although not anticipated by some earlier studies like Francois et al. (2007). However, the exports of transportation products and machinery did not change, and those of IT products and parts were even adversely affected. This is contrary to the predicted benefits, which had originally led to the past sectoral conflict in Korea.

Likewise, Korea's imports from the FTA partners were weakly affected by the FTAs (Table 5), although the domestic markets were more open to international competitors after the FTAs were established. Only consumer goods, both durable and non-durable, were imported more from the FTA partners. However, the import of raw animal and plant products actually significantly declined, which supports that the agricultural industry of Korea did not lose from the FTAs. The effect of control variables, such as infrastructure, tariffs and economy size, on

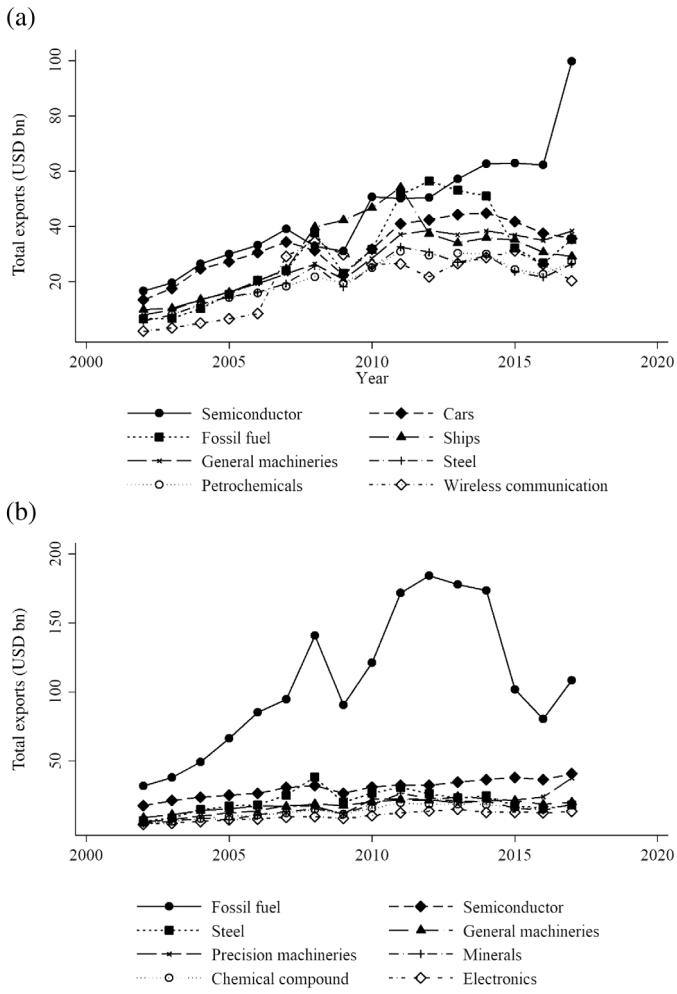

FIGURE 2 Main exports and imports of Korea. (a) Top eight exports of Korea (2002–2017). (b) Top eight imports of Korea (2002–2017). *Source*: Korea Customs Service

international trade is mostly as anticipated. Overall, Korea's FTAs did not have a universally positive impact on the export industries of Korea but, rather, helped its import-competing industries (e.g., the agricultural sector).

Finally, the most detailed classification of 58 industries also provides a similar outcome (Table 6). The impact of FTAs is only found within a limited number of industries. For example, the export of agricultural and textile-related products increased due to the FTA deals, but IT and electronics products decreased. On the other hand, consumer products and cars are imported by a larger amount from the FTA partners, but the import of agricultural, paper, and steel/metal products declined. In terms of which specific industry gained or lost from the FTAs, the results are broadly consistent with Tables 4 and 5.

Our findings indicate that the positive impact of the FTAs on sectoral trades cannot be easily identified nor anticipated. It rejects our Hypothesis (1) that export industries would gain. For example, in Korea, the agricultural industry is the winner in terms of both increased exports and decreased imports, but the IT industry is a relative loser. It contrasts with the prior

TABLE 3 Sectoral FTA gains in consumer goods, raw materials, and capital goods

Export	Consumer [1]	Raw materials [2]	[1]	[2]	Capital goods [1]	[2]
FTA	−0.0114	−0.0003	0.0687	0.0649	−0.1075	−0.0612
	0.0709	*0.0664*	*0.1285*	*0.1255*	*0.0742*	*0.0760*
Infra	1.1194***	0.2283*	1.1385***	0.6274***	1.1687***	−0.0433
	0.1053	*0.1379*	*0.1483*	*0.2128*	*0.1323*	*0.1970*
Tariff	−0.0177	−0.0143	−0.0362*	−0.0332**	0.0039	0.0002
	0.0136	*0.0116*	*0.0187*	*0.0167*	*0.0066*	*0.0056*
GDP		0.4878***		0.1704*		0.7122***
		0.1311		*0.0992*		*0.1923*
GDPK		0.2743**		0.3166**		0.3081
		0.1301		*0.1471*		*0.1904*
N	**7,120**	**5,765**	**3,344**	**2,869**	**3,776**	**2,896**
Import	**[1]**	**[2]**	**[1]**	**[2]**	**[1]**	**[2]**
FTA	−0.1048	−0.0794	−0.1874**	−0.1585*	0.0154	0.0165
	0.0897	*0.0741*	*0.0841*	*0.0823*	*0.1382*	*0.0697*
Infra	1.2909***	0.3348	1.5277***	0.7453***	0.8772**	−0.3019
	0.2333	*0.2706*	*0.2011*	*0.2588*	*0.4098*	*0.2600*
Tariff	−0.0342	−0.0277	−0.0573	−0.0481	−0.0266***	−0.0229***
	0.0274	*0.0243*	*0.0381*	*0.0348*	*0.0083*	*0.0045*
GDP		0.4872***		0.3505***		0.6832***
		0.1178		*0.1204*		*0.0672*
GDPK		0.3854***		0.3399**		0.5178***
		0.1040		*0.1420*		*0.1674*
N	7,328	5,765	3,376	2,869	3,952	2,896

Notes: This table presents the impact of free trade agreements (FTAs) on trade based on Models 1 and 2 by the main industry categories using the Poisson pseudo maximum likelihood (PPML) method. FTA is the dummy for post-FTA periods. Its coefficient (γ) is measured as sectoral FTA gains. Infra is port capacity in Korea. Tariff is the weighted mean applied tariff in either destination (if exports, upper panel) or Korea (if imports, lower panel). GDP is the GDP of destination/origin countries, and GDPK is the GDP of Korea. The numbers in italics are standard errors. ***, **, and * indicate the statistical significance at 1, 5, and 10%, respectively.

belief that internationally competitive industries would benefit from the new free trade deals while import-competing industries lose. However, it is consistent with the recent evidence of mixed national FTA gains (e.g., Zhou, 2019). In addition, the average sectoral FTA gains almost disappeared after 2010 (Figure 3a). Thus, Korean industries may no longer have a solid initiative to conflict with each other over FTA gains.

Our measure of sectoral conflicts (i.e., the cross-sector dispersion of FTA gains) confirms this (Figure 3b). That is, the difference among industries decreased in terms of how much more they gained from the FTAs. In particular, the degree of sectoral conflicts strongly decreased from 2006 to 2010, with a declining average impact, and has remained relatively low and stable since

TABLE 4 Sectoral FTA gains in major product categories: Exports

Model	[1]	[2]	[1]	[2]	[1]	[2]
	Direct		Durable		Non-durable	
FTA	0.3808**	0.6968***	−0.1112	−1.4722***	0.0857	−0.2743
	0.1599	*0.1400*	*0.2327*	*0.3787*	*0.1115*	*0.3599*
Infra	1.0755***	0.0051	0.2004	−0.0091	0.4357	−0.0347
	0.3274	*0.0068*	*0.2595*	*0.015*	*0.3323*	*0.0216*
Tariff	0.0034	0.5880***	−0.0272*	0.4853**	−0.0584**	0.5862***
	0.0101	*0.1125*	*0.0157*	*0.2452*	*0.0293*	*0.1306*
GDP		−0.1403		1.2806***		0.1156
		0.0963		*0.2496*		*0.2194*
GDPK		0.2980***		−0.0019		0.1292
		0.108		*0.2308*		*0.1175*
N	**3,232**	**2,764**	**3,376**	**2,869**	**3,344**	**2,869**
	Animal and plant (raw)		**Textile**		**Minerals**	
FTA	0.1212	0.2075	0.2966**	−0.564*	0.0282	1.005**
	0.0747	*0.3475*	*0.129*	*0.3422*	*0.1718*	*0.4169*
Infra	0.4214**	−0.048***	−0.2841**	−0.0471	1.4453***	−0.0339
	0.1871	*0.0175*	*0.1296*	*0.031*	*0.266*	*0.0321*
Tariff	−0.0497***	0.0518	−0.0495	0.0932	−0.038	0.3984*
	0.0191	*0.1518*	*0.0324*	*0.1295*	*0.0338*	*0.2162*
GDP		0.1625		0.1801		−0.0286
		0.2727		*0.1484*		*0.4076*
GDPK		0.1235*		0.2953**		−0.0015
		0.0734		*0.1335*		*0.1315*
N	**3,136**	**2,760**	**3,232**	**2,807**	**3,184**	**2,738**
	Steel and metal		**Chemicals**		**Transportation**	
FTA	0.0961	0.3887	0.0298	0.8654***	−0.0405	1.7387***
	0.1140	*0.3912*	*0.1377*	*0.189*	*0.1828*	*0.3453*
Infra	0.9608***	−0.0725***	1.4772***	−0.017	1.5407***	0.0078
	0.1707	*0.0180*	*0.1639*	*0.0232*	*0.1900*	*0.0116*
Tariff	−0.0735***	−0.0006	−0.0185	0.1237*	0.0094	0.0181
	0.0182	*0.2102*	*0.0236*	*0.0659*	*0.0131*	*0.0939*
GDP		0.6573***		0.4785***		−0.268
		0.1786		*0.0909*		*0.3884*
GDPK		0.1005		0.0235		−0.0302
		0.1189		*0.1442*		*0.1760*
N	**3,200**	**2,775**	**3,328**	**2,854**	**3,360**	**2,855**
	Machinery		**IT product**		**IT parts**	
FTA	−0.0363	1.0185***	−0.3186***	0.2658	−0.4030***	−0.5668

TABLE 4 (Continued)

N	3,200 Machinery	2,775	3,328 IT product	2,854	3,360 IT parts	2,855
	0.0753	*0.2886*	*0.0883*	*0.7448*	*0.1392*	*0.5804*
Infra	1.8436***	−0.0296	0.6656***	−0.1298**	1.7689***	−0.1155*
	0.1621	*0.0271*	*0.2513*	*0.0582*	*0.4922*	*0.0622*
Tariff	−0.0366	0.3118***	−0.1351**	0.1316	−0.1365*	1.1469***
	0.0322	*0.1184*	*0.0601*	*0.2621*	*0.0820*	*0.2421*
GDP		0.4691**		0.2800		0.7633***
		0.1941		*0.5304*		*0.2694*
GDPK		−0.0230		−0.3080***		−0.4439***
		0.0765		*0.0757*		*0.1004*
N	3,360	2,869	3,328	2,839	3,264	2,801

Notes: This table presents the impact of free trade agreements (FTAs) on exports based on Models 1 and 2 by the major industry categories using the Poisson pseudo maximum likelihood (PPML) method. FTA is the dummy for post-FTA periods. Its coefficient (γ) is measured as sectoral FTA gains. Infra is port capacity in Korea. Tariff is the weighted mean applied tariff in the destination. GDP is the GDP of destination/origin countries and GDPK is the GDP of Korea. The numbers in italics are standard errors. ***, **, and * indicate the statistical significance at 1, 5, and 10%, respectively.

2010. This lower degree of sectoral conflicts could be a consequence of stronger interindustry factor mobility. If factor owners can move more easily from one industry (e.g., agricultural) to another (e.g., manufacturing), sectoral imbalance in terms of FTA gains can decrease more quickly. Then, the expected gains in exporting industries or the loss to importing industries will be difficult to determine, while the variation across all industry sectors will decline.

3 | INTERINDUSTRY FACTOR MOBILITY

Interindustry factor mobility is measured as the inverse of the dispersion of returns/payoffs to labour and capital owners (Frankel, 1992; Hiscox, 2001, 2002). The use of dispersion-type measures is justified by the fact that stronger factor mobility enables easier arbitrage from factor-abundant to factor-scarce industries, and the costs of hiring factors will quickly find a new equilibrium between industries. Consequently, it reduces the differentials in returns or payoffs to the factors of production across industries (Hiscox, 2001). We also employ their QR in Equation (3) to minimize the effects of sector-specific outliers instead of the more commonly used standard deviation and the coefficient of variation of wages and profits (e.g., Frankel, 1992; Hiscox, 2001). When QR can be misleading (e.g., data with a large non-zero median, such as the payoffs to factors), we adopt the quartile coefficient of dispersion (QCD):

$$\mathrm{QCD} = (\mathrm{Q3} - \mathrm{Q1})/(\mathrm{Q3} + \mathrm{Q1}). \tag{4}$$

Interindustry capital and labour mobilities are calculated using the following data. First, capital mobility is calculated from three measures of company profitability: return on equity (ROE), ordinary income to total assets, and ordinary income to total sales. These data are originally from the Korea Exchange (KRX) and then compiled by Statistics Korea, a governmental

TABLE 5 Sectoral FTA gains in major product categories: Imports

Model	[1]	[2]	[1]	[2]	[1]	[2]
	Direct		Durable		Non-durable	
FTA	0.0714	0.0563	0.4169**	0.3916*	0.2002*	0.1848
	0.0443	*0.0604*	*0.178*	*0.2054*	*0.1145*	*0.1402*
Infra	1.2332***	0.9116***	0.9879***	0.0667	1.3887***	0.4657
	0.1026	*0.2381*	*0.3567*	*0.6495*	*0.2564*	*0.3143*
Tariff	0.002	0.015***	−0.0455***	−0.0172	−0.0125***	0.0067
	0.0065	*0.0054*	*0.0084*	*0.0119*	*0.0039*	*0.0082*
GDP		−0.0306		0.0171		0.1424
		0.1522		0.2367		0.2737
GDPK		0.4824**		1.1633***		0.89***
		0.239		*0.177*		*0.163*
N	**3,472**	**2,810**	**3,552**	**2,785**	**3,776**	**2,837**
	Animal and plant (raw)		**Textile**		**Minerals**	
FTA	−0.1807*	−0.1607*	0.0547	0.0468	−0.1191	−0.0126
	0.0962	*0.0956*	*0.1553*	*0.1267*	*0.1255*	*0.1455*
Infra	1.0582***	0.6024**	0.4218	−0.3416*	1.3339***	−0.3024
	0.1687	*0.2427*	*0.2872*	*0.1962*	*0.1841*	*0.3966*
Tariff	0.0178	0.023*	0.0124	0.0106	0.0119	−0.0071
	0.0125	*0.0125*	*0.0121*	*0.0104*	*0.0081*	*0.0086*
GDP		0.1833		0.4173***		1.0460***
		0.1723		*0.1011*		*0.2362*
GDPK		0.2663		0.1644		0.0445
		0.2091		*0.1947*		*0.1697*
N	**3,328**	**2,662**	**2,768**	**2,337**	**3,328**	**2,695**
	Steel and metal		**Chemicals**		**Transportation**	
FTA	−0.0714	−0.1309	−0.0085	−0.0422	0.0125	0.0641
	0.1357	*0.1229*	*0.069*	*0.0514*	*0.1997*	*0.1649*
Infra	0.6351***	−0.7502**	1.1542***	0.4129***	1.1636**	0.6898
	0.2108	*0.3316*	*0.158*	*0.1388*	*0.462*	*0.5074*
Tariff	−0.0346***	−0.0116	−0.0022	0.0012	0.0157	0.0029
	0.0061	*0.0143*	*0.0045*	*0.0058*	*0.02*	*0.0229*
GDP		0.4981***		0.5698***		0.6394***
		0.1034		*0.0513*		*0.1606*
GDPK		1.0238*		0.3768***		−0.1489
		0.5264		*0.1322*		*0.4898*
N	**3,472**	**2,727**	**3,392**	**2,646**	**3,312**	**2,551**
	Machinery		**IT product**		**IT parts**	
FTA	0.0159	0.0022	0.0844	0.0208	−0.081	−0.0716

TABLE 5 (Continued)

N	3,472 Machinery	2,727	3,392 IT product	2,646	3,312 IT parts	2,551
	0.1474	*0.0789*	*0.1523*	*0.0495*	*0.1579*	*0.0654*
Infra	1.0131**	0.0236	0.8587*	−1.4205***	0.6842	−1.0546***
	0.4031	*0.3313*	*0.5143*	*0.211*	*0.454*	*0.1923*
Tariff	−0.0308*	−0.0198	−0.0439***	−0.04***	−0.0247***	−0.0318***
	0.0176	*0.0145*	*0.0134*	*0.0146*	*0.0081*	*0.0119*
GDP		0.631***		1.0743***		0.9045***
		0.1207		*0.1582*		*0.1095*
GDPK		0.602***		0.7598***		0.5406*
		0.1756		*0.2341*		*0.2888*
N	3,808	2,896	3,584	2,767	3,680	2,792

Notes: This table presents the impact of free trade agreements (FTAs) on imports based on Models 1 and 2 by the main industry categories using the Poisson pseudo maximum likelihood (PPML) method. FTA is the dummy for post-FTA periods. Its coefficient (γ) is measured as sectoral FTA gains. Infra is port capacity in Korea. Tariff is the weighted mean applied tariff in Korea. GDP is the GDP of destination/origin countries, and GDPK is the GDP of Korea. The numbers in italics are standard errors. ***, **, and * indicate the statistical significance at 1, 5, and 10%, respectively.

agency. Next, labour mobility is calculated based on labour costs reported by companies or wages earned by workers. Their annual data are sourced from the Ministry of Employment and Labour of Korea (2019). The labour costs of companies are reported in Korean won based on 58 subcategorised industries in total, covered yearly from 2004 to 2017. Although the data between 2004 and 2007 follows the 8th Korea Standard Industry Classification and the remaining data is reported according to the 9th Korea Standard Industry Classification, its impact is minimal because the factor mobilities are calculated cross-sectionally. Wage data, including permanent/regular workers and non-regular workers, is obtained from the same source and measured as the average monthly wage in Korean won across 18 industries. The comparable wage data is only available from 2009, so its role is to complement the analysis of labour cost.

Our findings show that the interindustry labour and capital mobilities across industries in Korea vary over time. It supports both the Stolper–Samuelson and the Ricardo–Viner theories in this regard (Figure 4) and also our Hypothesis (2). However, the two mobilities show distinctively different patterns. Interindustry labour mobility slowly decreases during the sample period despite ups and downs (Figure 4a). In other words, workers become less likely to move between sectors over time. When workers are separated into regular and non-regular workers, strong downward pressure on the mobility of non-regular workers is observed between 2010 and 2013, which shows that the main driver of this decline in labour mobility is non-regular workers. They are less experienced and young and, thus, are likely to be stuck in low-skill industries. This result also corresponds to labour market segmentation caused by Korea's neoliberal labour policy, which widens the gap in the employment conditions between the two types of workers (B. Lee & Shin, 2017).

In contrast, interindustry capital mobility greatly increased from 2008 to 2011 and remained relatively unchanged afterwards (Figure 4b). In other words, capital moves across different industries much more easily after this period. The reason for this large increase could be the

TABLE 6 The impact of free trade agreements (FTAs) on exports and imports of individual product types

Panel A. Exports			
Positive		**Negative**	
Model 1	**Model 2**	**Model 1**	**Model 2**
Prepared food	Prepared food	Arts/collectibles	Arts/collectibles
Bags	Drink	Jewellery	Jewellery
Cosmetics	Bags	Tobacco leaves	Fertiliser
Agricultural raw	Cosmetics	Wired communication	Wired communication
Textile raw	Agricultural raw	Wireless communication	Wireless communication
Fabric	Textile raw	Panel display	Semiconductor
Fine chemicals	Fabric		Panel display
	Fine chemicals		
	Components/tools		

Panel B. Imports			
Positive		**Negative**	
Model 1	**Model 2**	**Model 1**	**Model 2**
Livestock	Prepared food	Agricultural	Agricultural
Prepared food	Drink	Prints	Arts/collectibles
Tobacco	Tobacco	Paper	Agricultural raw
Car	Electronics	Metal structures	Paper
Other durables	Car		Non-ferrous
Clothes	Cosmetics		Steel
Cosmetics	Sugar		Metal structures
Fine chemicals	Fine chemicals		Panel display
Broadcasting	Broadcasting		

Notes: This table summarizes the impact of free trade agreements (FTAs) on the exports and imports of the subcategories of product types. It only shows the products with a significant impact at the 5% level in terms of the estimated coefficient γ in Models 1 and 2 based on the Poisson pseudo maximum likelihood (PPML) method.

restructuring of the Korean financial sector after the global financial crisis in 2007/2008. For example, stronger investor protection (Ko, 2014) could have made investors move their capital to another industry with confidence, at least domestically. In addition, the increased capital inflow to Korea from abroad after the global financial crisis (Chwieroth, 2015) may have created stronger competition among capital owners and reduced the dispersion of the gains. The rise of international capital mobility around the financial crisis among the OECD countries (But & Morley, 2017) could be partly responsible. However, interindustry capital mobility did not decline again after 2009, unlike international capital mobility (But & Morley, 2017). They are fairly independent of each other in Korea.

FIGURE 3 Sectoral free trade agreement (FTA) gains and sectoral conflicts. (a) Mean and median of the estimated coefficient (γ) of the FTA variable in terms of the average impact of FTA on the exports and imports of the industries. Five-year moving window estimation is used. (b) Its quartile range (QR) and standard deviation (SD), which represents the dispersion of the impact of the FTAs on individual industries (i.e., the degree of sectoral conflicts). The Poisson pseudo maximum likelihood (PPML) method is used

4 | THE ROLE OF INTERINDUSTRY FACTOR MOBILITY IN SECTORAL CONFLICTS

Our expectation is that the stronger interindustry factor mobility would mitigate sectoral conflicts over trade policies. We use three approaches to investigate this. First, we compare the changes in sectoral conflicts with those in interindustry factor mobilities measured as Equations (3) and (4). Their movement will be the opposite if our expectation is right. Second, to test it more formally, we estimate the link between the changes in sectoral factor

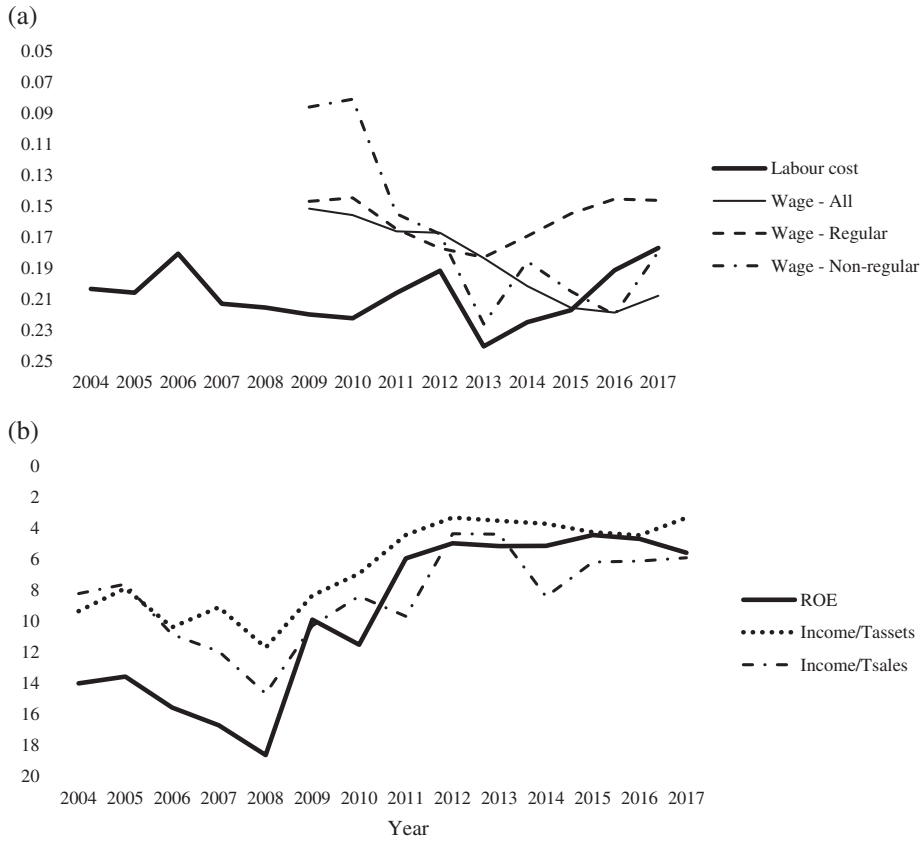

FIGURE 4 Interindustry labour and capital mobility of Korea. (a) Labour mobility: Quartile coefficient of dispersion (QCD). (b) Capital mobility: Quartile range (QR). The figures present interindustry factor mobility: labour (a) and capital (b) as the cross-sector dispersion of wage, labour costs, and company profits. The vertical axis is reversed to represent factor mobility, not the dispersion itself. ROE is return on equity. Tassets and Tsales are total assets and total sales, respectively

returns (e.g., wage) and sectoral FTA gains. If labour and capital owners cannot easily move to other industries, their factor returns will be more closely tied with FTA gains in their industries. Then, the factor owners are more likely to be involved in sectoral conflicts. However, if the factor owners can freely move across industries, this link will be weakened, and sectoral conflicts are less likely to occur. Therefore, we regress the changes in sector returns to labour or capital owners on sectoral FTA gains (λ^k) to determine their cross-sectional relationship. The significant/insignificant relationship indicates a low/high degree of factor mobility and strong/weak sectoral conflicts. This approach does not require dispersion-based measures like Equations (3) and (4), but the evidence is rather indirect.

Finally, we build a two-equation vector autoregression (VAR) model of order one between the degree of sectoral conflict and interindustry factor mobility. This model is often atheoretical but is widely used to investigate causation (e.g., the Granger causality tests). For technical details of VAR models, see Sims (1980). The model is as follows:

$$SC_t = \beta_{10} + \beta_{11} SC_{t-1} + \beta_{12} FM_{t-1} + \boldsymbol{\omega_1}' \boldsymbol{c_t} + \epsilon_{1,t}$$

$$FM_t = \beta_{20} + \beta_{21} SC_{t-1} + \beta_{22} FM_{t-1} + \boldsymbol{\omega_2}' \boldsymbol{c_t} + \epsilon_{2,t}, \quad (5)$$

where SC is the measure of the degree of sectoral conflict as the dispersion of sectoral FTA gains, FM is the measure of capital or labour mobility (as QR or QCD), and β and ω are coefficients. Significant β_{12} indicates the role of interindustry factor mobility in sectoral conflicts. The data for SC in Equation (5) is generated by a 5-year moving window estimation of Equation (2). Five-year averages of capital and labour mobilities are employed as factor mobilities to minimize noise. We also add control variables (c), such as the inflow of capital and labour from abroad, to represent the external influence on domestic factor mobility, which are proxied by inward foreign direct investment and immigrants, respectively. Specifically, we employ the amount of foreign direct investment to Korea obtained from the International Monetary Fund and the number of net immigrants to Korea supplied by Statistics Korea.

The changes in sectoral conflicts and interindustry factor mobilities are presented in Figures 3b and Figure 4b, respectively. A drop in the level of sectoral conflicts coincides with the surge of capital mobility in the early sample period. One implication of stronger capital mobility is that capital owners become much less likely to conflict with other capital owners in different industries. The earlier sectoral conflict over the FTAs in Korea could have weakened, mainly due to this change, as also expected by Kim and Wong (2008). However, the owners of labour (i.e., workers) may still be aggressive to other workers in other industries as they cannot switch easily. Additionally, the widening mobility gap between regular and non-regular workers (Figure 4a) can worsen already-existing tensions between the two classes of workers because regular workers are known to be protected excessively and paid higher wages in Korea (Park, 2017). This kind of conflict between workers was previously observed in the car industry (B. H. Lee & Frenkel, 2004).

There could be other reasons that mitigated sectoral conflicts over trade policies in Korea. Some import-competing industries (e.g., the agricultural industry) may have gained competitiveness or at least enough resources from governmental support to negate the adverse impacts (e.g., the market price support). For instance, Korea is near the top among the OECD member countries in terms of the producer assistant and protection coefficient in the agricultural industry (OECD, 2019). However, agricultural producer support, as a percentage of gross farm receipts, fell slowly between 2000 and 2017 (OECD, 2019), and thus its role may be limited. In contrast, the sectoral trade gains of exporting industries may have been affected by the market size and prior tariffs of FTA partners. For example, IT or manufacturing industries may enjoy the gains only after large FTA deals (e.g., Korea–EU and Korea–US, as in Decreux et al. (2010) and Cooper et al. (2011)) because the Korean companies can improve market share and revenue substantially in the large partner markets. In contrast, Magee (2017) argued that if tariffs are already low before FTAs, trade diversion in FTA partners to Korean industries may not occur. However, the economy size and the tariffs of the FTA partners are controlled in our models.

Our more formal approaches provide the evidence to support the link between sectoral conflicts over trade policies and interindustry factor mobilities (Tables 7 and 8). First, Table 7 shows the cross-sectional links between sectoral factor returns and sectoral FTA gains. The sample is divided into two sub-periods of high/low labour mobility and low/high capital mobility as in Figure 4. The link is significant on two occasions. Prior to 2011, the sectoral returns to capital owners were significantly related to the sectoral FTA gains in exports (Figure 4a). That

TABLE 7 Sectoral returns to factor owners and sectoral FTA gain/loss

Panel A. Sector return to capital owners and FTA gain/loss				
	ΔROE on exports		**ΔROE on imports**	
	2004–2010	**2011–2017**	**2004–2010**	**2011–2017**
FTA gain/loss (γ_k)	1.2184**	−4.7073	−0.1735	−0.8224
	0.4539	*4.7979*	*0.1647*	*0.6997*
Constant	0.0640	−0.6554	0.2083	−0.5029
	0.2442	*0.6459*	*0.2873*	*0.5803*
N	15	15	15	15
Panel B. Sector return to labour owners and FTA gain/loss				
	ΔLC on exports		**ΔLC on imports**	
	2004–2010	**2011–2017**	**2004–2010**	**2011–2017**
FTA gain /loss (γ_k)	−0.0011	0.0089	−0.0025	−0.0375***
	0.0164	*0.0205*	*0.0031*	*0.0098*
Constant	0.0446***	0.0465***	0.0441***	0.0469***
	0.0051	*0.0038*	*0.0045*	*0.0030*
N	24	24	24	24

Notes: This table shows the relationship between the change in sectoral returns to capital and labour owners and the gains and losses in the corresponding sector (γ^k) from free trade agreements (FTAs) in terms of exports and imports. Larger γ^k in exports and smaller γ^k in imports are interpreted as the gains to domestic sector *k*. ΔROE is the change in return on equity the previous year. ΔLC is the growth rate of labour costs (LC) over the preceding year. The numbers in italics are standard errors. ***, **, and * indicate the statistical significance at 1, 5, and 10% levels, respectively.

is, capital owners were tied with their industries and likely behind sectoral conflicts over FTA gains in exports in this period, as shown in the "Exports" graph in Figure 3a. After 2011, the return to labour is significantly linked to sectoral FTA gains in imports. In other words, more recently, labour owners are likely to be involved in sectoral conflicts regarding imports as they cannot easily move to other industries. The recent increase in this type of sectoral conflict is briefly seen in Figure 3b (Imports). This evidence generally supports our Hypothesis (3).

Next, the causality test using the VAR model in Equation (5) highlights the role of interindustry capital mobility in mitigating sectoral conflicts (Table 8). Consistent with our earlier findings and Hypothesis (4), stronger interindustry capital mobility (ΔCM) indeed reduces sectoral conflicts (ΔSC) (i.e., lowers the variation in gains and losses across industries) over FTA gains in exports (Equation 1, Panel A). However, the role of interindustry labour mobility (ΔLM) is insignificant (Panel B). Therefore, interindustry capital mobility, not labour mobility, seems to be the main factor in relieving sectoral conflicts. Note that the evidence in Table 8 is somewhat limited due to insufficient observations. In contrast, interindustry labour mobility is reversely caused by sectoral conflicts and has a certain degree of momentum (Equation 2). That is, stronger sectoral conflicts, in terms of more diverse FTA gains, gradually lead to higher interindustry labour mobility. This may reflect workers slowly moving to a better-performing sector. The influx of foreign capital and labour does not affect sectoral conflicts over FTAs, but foreign labour increases labour mobility.

TABLE 8 Sectoral conflicts over free trade agreements (FTAs) and interindustry capital and labour mobility

	Panel A		Panel B	
	ΔSC on ΔCM		ΔSC on ΔLM	
Eq1	**Export**	**Import**	**Export**	**Import**
ΔCM_{t-1}	−0.0488*	−0.0173		
	0.0272	*0.0382*		
ΔLM_{t-1}			0.0013	−0.0011
			0.0012	*0.0015*
ΔSC_{t-1}	−0.4776*	−0.1282	−0.1111	−0.3257
	0.2814	*0.3210*	*0.3217*	*0.3320*
ΔEx.Cap	−0.0001	−0.0090		
	0.0074	*0.0083*		
ΔEx.Lab			0.0004	−0.0010
			0.0005	*0.0006*
Constant	0.0398	−0.0109	0.0808	−0.1016
	0.0409	*0.0558*	*0.0881*	*0.1030*
	ΔCM on ΔSC		**ΔLM on ΔSC**	
Eq2	**Export**	**Import**	**Export**	**Import**
ΔCMt-1	0.4184	0.4597		
	0.3020	*0.3128*		
ΔLMt-1			0.7671**	0.4845
			0.3618	*0.4083*
ΔSCt-1	−3.7417	−2.0402	177.287*	−10.2760
	3.1295	*2.6302*	*94.4101*	*92.5213*
ΔEx.Cap	−0.0999	−0.0418		
	0.0818	*0.0680*		
ΔEx.Lab			0.3262**	0.2648
			0.1395	*0.1758*
Constant	0.6467	0.5094	−7.2455	−30.6595
	0.4553	*0.4572*	*25.8580*	*28.6893*
N	11	11	10	10

Notes: This table shows the relationship between sectoral conflict (SC) and interindustry capital and labour mobility (CM and LM) using the causality test based on the two-equation vector autoregressive (VAR) model (Eqn. 1 and 2) with lag 1. ΔSC is the change in sectoral conflicts over free trade agreements (FTAs). ΔEx.Cap is the change in external capital inflow as the flow of capital invested from abroad to Korea, proxied by FDI. ΔEx.Lab is the change in external labour flow as net arrivals to Korea, staying for more than 90 days. Δ represents the change from the previous period. Exports and imports indicate whether SC is measured based on the gains/losses in exports and imports. The numbers in italics are standard errors. ***, **, and * indicate the statistical significance at 1, 5, and 10% levels, respectively.

5 | CONCLUDING REMARKS

The purpose of this paper was to estimate sectoral gains from trade policies and to find evidence of the link between sectoral conflicts and interindustry factor mobilities based on the case of

Korea's FTAs. Contrary to the prior expectation during the social unrest in the early 2000s, the agricultural sector in Korea benefited from the FTAs, but the manufacturing and IT industries did not experience gains. In addition, the dispersion of FTA benefits across industries declined until 2010. This indicates that the sectoral conflicts over trade policies weakened. In contrast, interindustry labour mobility across industry sectors slowly declined between 2004 and 2017, driven by the declining mobility of non-regular workers. However, interindustry capital mobility has jumped since 2008, which implies a positive role of capital mobility to equalize the trade gains across industries from the FTAs.

Our formal analysis confirms the link between sectoral conflicts over trade policies and interindustry factor mobilities. It also shows that stronger interindustry capital mobility contributes to the redistribution of the FTA benefits and, thus, decreases sectoral conflicts. In other words, capital owners can move to another industry more quickly and enjoy similar returns, so they have less reason to conflict with each other. However, another type of sectoral conflict can still arise among workers in various industries and with different employment statuses.

The implications for policy measures to alleviate sectoral conflicts over trade policies are as follows. First, the role of interindustry capital mobility is essential. For example, stronger financial liberalization makes investors more able to freely switch to different industries. Industry policies can help specific industries to attract larger investment. In addition, investor protection can be strengthened to boost investor confidence when investing in less-familiar industries. Next, interindustry labour mobility can be facilitated to respond to sectoral conflicts, albeit its slow impact. The mobility of non-regular workers could be quite low because they are inexperienced and less skilled. Therefore, policies to equip these workes with the skills required to move to another industry would be effective. The immigration of skilled workers can also be encouraged.

However, there are some reasons to be cautious about the findings. First, our study is essentially based on a single country, despite covering all of its FTAs, industries, trade, and partners. Its applicability could be limited to small and open economies similar to Korea. Thus, an international or regional study is necessary in the future. Second, sectoral gain is defined in terms of the gains from international trade. The use of market share or revenue may provide different outcomes, although these factors can be highly correlated to trade gains. Third, the link to intraindustry trade is not considered, which may lead to firm-level, not sector-level, conflicts (I. S. Kim & Osgood, 2019; Madeira, 2016). Finally, the impact of FTAs could decrease with more new deals. These can be modelled in the follow-up studies. Further research on this topic is crucial not only for international trade and domestic economic policies but also for social policies to better understand the role of labour and capital mobility in sectoral conflicts.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

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ENDNOTE

[1] Korea's electronics, machinery, chemicals, shipbuilding, semiconductor, oil refinery, steel, and automotive industries were known to be competitive internationally (Jang, 2019).

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