

# The Great Trade Collapse and Contraction of Exports in Korea during the Global Crisis

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## 1. Introduction

During the current global crisis, an unpleasant fact unfolded for many international economists. A large body of literature has reported that the world trade had shrunken far more than the world GDP during the crisis and argued that this fact could not be easily reconciled with standard international macroeconomic theories such as Backus, Kehoe, and Kydland (1995). The phenomenon is named as “the great trade collapse” and the jargon has become very popular among international economists presently. Responding to this unpleasant fact, many international economists have proposed various explanations for it.<sup>1</sup> Among them, the compositional effect, internationalized supply chain and trade credit hypothesis have been most frequently discussed in related literature.<sup>2</sup>

The compositional effect hypothesis notes differences between durable goods and nondurable goods and emphasizes a special role of durable goods in generating volatility of trade flow. It is a well-known fact among macroeconomists that the demand of durable goods is more volatile than that of nondurable goods. Also, it is recently reported that durable goods occupy a larger portion in the world trade rather than in the world GDP. The direct implication of these differences between two types of goods is that the world trade can be more volatile than the world GDP.

The presence of internationalized supply chain provides another hypothesis. It is based on the observation that production process has been involved increasingly with vertical trading

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<sup>1</sup> Baldwin (2009) provides a great survey of literature on the great trade collapse.

<sup>2</sup> Besides these hypotheses, inventory adjustment and protectionism are also suggested as an explanation for the world trade collapse. See Alessandria, Kaboski, and Midrigan (2010) for inventory argument.

chain across many countries over time. According to Hummels, Ishii, and Yi (2001), the trade flow related with the so called vertical specialization accounts for 21% of total exports of 10 OECD countries and four emerging market countries and it grew almost 30% between 1970 and 1990.<sup>3</sup> Given its quantitative importance, the internationalized supply chain can be considered as another mechanism generating sudden collapse of the world trade. This is because if only one part of the chain is gone due to some reasons such as financial distress, the whole chain would break down and the whole related trade flows can disappear together.

Finally, the trade credit hypothesis notes empirical evidence that financial distress in the banking sector had affected trade flows adversely through reduced availability of external finance on exporters including trade credit in past financial crises.<sup>4</sup>

In this perspective, this paper investigates what factor contributes most to the unexpected large drop in exports in Korea during the crisis. For this purpose, I will evaluate these main hypotheses on the great trade collapse with regard to the Korean experience.

The main result of this paper is that the compositional effect hypothesis turns out to be the most relevant for understanding the collapse of exports in Korea during the crisis. In fact, Korea is regarded as one of the countries with a very high share of durable goods exports. The share amounted to about 65% just before the crisis. During the crisis, durable goods exports had experienced severer contraction than nondurable goods exports and about 75% of the contraction of total exports came from the collapse of durable goods exports.

To the contrary, the other hypotheses do not seem so relevant for the Korean case. The decomposition of total exports into intensive and extensive margin shows that the most part of exports contraction in Korea was generated through intensive margin and the fact implies that internationalized supply chain related to the exporting sector of Korea had kept working without serious abruption even during the crisis. Also, broad evidence on the trade credit market in Korea suggests that the overall condition of trade credit market had not so much deteriorated to induce such a large drop in trade flows.

Another main result of this paper comes from a simple cross-country comparison with regard to the relationship between the share of durable goods exports and the drop of exports

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<sup>3</sup> For various implications of vertical specialization on world trade and international business cycle, see Yi (2003), Kose and Yi (2006), and Giovanni and Levchenko (2010).

<sup>4</sup> For details, see Amiti and Weinstein (2009) and Iacovone and Zavacka (2009).

during the current crisis. The cross-country comparison suggests that a country with higher share of durable goods exports is likely to experience more harsh contraction of exports to a negative demand shock. This empirical evidence presented in this paper can be considered as adding to the empirical findings and emerging consensus of recent literature on the great trade collapse such as Baldwin (2009), Bems, Johnson, and Yi (2010), and Levchenko, Lewis, and Tesar (2009) which identify the compositional effect as a major driving force generating the recent trade collapse. Also, it supports recent theoretical literature such as Boileau (1999), Erceg, Guerrieri, and Gust (2006) and Engel and Wang (2009) which emphasizes the special role of durable goods in generating realistic volatilities of trade flows in the framework of international DSGE models.

The remainder of the paper is organized as follows: The next section will briefly review recent trend of trade of Korea. In section 3, I investigate broad data on Korean exports to identify main source of large drop of Korean exports during the crisis and show that the compositional effect hypothesis is the most relevant one in understanding the Korean experience. The final section concludes with a brief summary of the main results of this paper and discussion on remaining issues.

## **2. Recent Trends of Real Economy and Trade in Korea**

Due to an unprecedented scale of the current global recession since the Great Depression, Korea had also experienced severe contraction of real economy and trade during the crisis as other countries. Figure 1 draws the recent trends of real GDP and trade. As the figure displays, real economy and trade of Korea fell into a recession in 2008 Q4 and the recession lasted to the next quarter. Then, from 2009 Q2, both started to recover.

An interesting observation from Figure 1 is that the recession of imports was much deeper and lasted longer than exports. The growth rates of exports and imports had been quite similar until 2008 Q4 but started to diverge from 2009 Q1. The relatively severer recession of imports led to large amount of trade surplus in goods and the surplus contributed in mitigating the negative effect of drastic fall of domestic demand.

Figure 2 displays contributions of domestic demand and net exports of goods to real GDP growth. It is clear that the trade surplus played an important role in the recovery of real economy

in Korea. It significantly offset the negative effect of depressed domestic demand on real GDP particularly in 2009.<sup>5</sup>

Figure 1. Recent Trends of Growth Rate of GDP and Trade

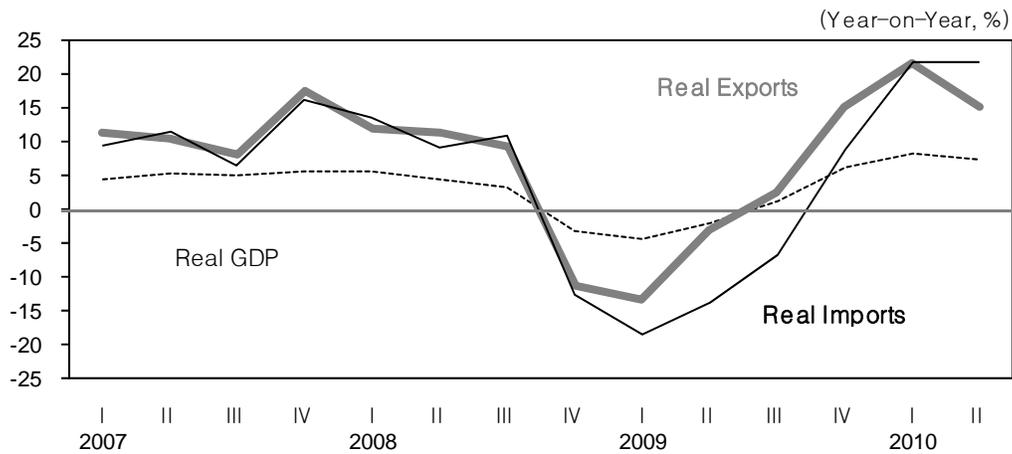
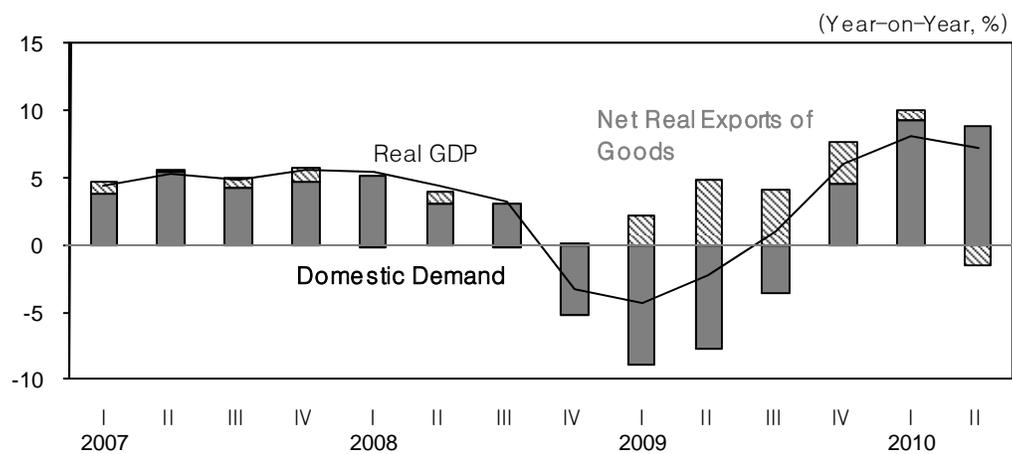


Figure 2. Contributions of Domestic Demand and Net Exports of Goods to GDP Growth



<sup>5</sup> What induces earlier recovery of exports compared to imports in Korea is also an interesting research issue. However, the issue is not covered in this paper.

### **3. Great Trade Collapse and Contraction of Exports in Korea**

#### *(1) The Compositional Effect Hypothesis*

As briefly surveyed in the introduction, in explaining the great trade collapse, the compositional effect hypothesis emphasizes a special role of durable goods in magnifying the effect of global demand shocks on the world trade volume. It is a well-known fact among macroeconomists that the demand of durable goods is more volatile than that of nondurable goods. In addition, as Baldwin (2009) and Wang (2010) report, durable goods occupy a relatively small portion of the world GDP but a large portion of the world trade. From these facts, it is natural to expect that a global demand shock can deliver a disproportionate effect on the world GDP and world trade. That is, the response of world trade to a demand shock is expected to be much bigger than that of the world GDP.

One of the direct theoretical predictions of the compositional effect hypothesis is that a country with higher share of durable goods exports tends to experience a bigger reduction of exports with a negative demand shock. To test this prediction with the current global crisis experience, a simple cross-country comparison is attempted below.

#### *Cross-Country Comparison*

In order to implement a cross-country comparison, I construct a data set on shares of durable goods exports and real export growth rates of 23 major countries. Each country's share of durable goods exports is obtained and calculated from the UN Comtrade data base which provides disaggregate trade series based on the BEC (broad economic classification) code in annual basis.<sup>6</sup> Each country's share of durable goods is measured as average of the share in 2005 to 2007. Meanwhile, each country's nominal exports obtained from IMF DOT data base are deflated with a proper deflator for each country to calculate real exports growth rate.<sup>7</sup> To highlight the effect of durable goods, the exports growth rates are measured in 2008 Q4 to 2009 Q1 in which the crisis was at the peak.<sup>8</sup>

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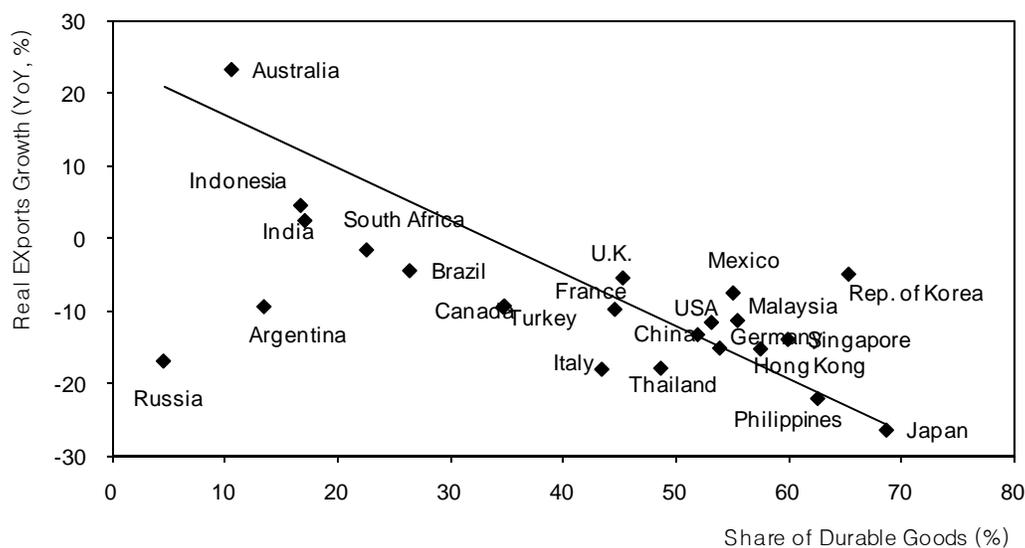
<sup>6</sup> For the details of classification strategy of durable and nondurable goods based on the BEC code, see Table 1 of Appendix.

<sup>7</sup> In most cases, export price index obtained from IFS is used as a deflator but for some cases in which export price indices are not available, PPI or WPI in dollar terms obtained from the Global Insight are used.

<sup>8</sup> Shares of durable goods and real export growth rates are provided in Table 2 of Appendix.

Figure 3 visualizes the relationship between the shares of durable goods and real export growth rates during the crisis. As predicted by the hypothesis, the figure displays a clear negative relationship.

Figure 3. Share of Durable Goods Exports and Drops of Exports: 2008 Q4-2009 Q1



For a more formal analysis, I also estimate with the same data set a simple regression equation which includes the share of durable goods exports and real exchange depreciation rate as explanatory variables for real exports growth rate.<sup>9</sup> The result of the regression analysis is given in Table 1. Again, the result indicates a tight negative relationship between the share of durable goods exports and the reduction of total exports during the crisis. The coefficient of the share of durable goods exports is estimated at 0.26 and it implies that on average, a country with higher share of durable goods exports by 10%p had experienced 2.6%p further reduction in total export growth during the crisis.

A similar cross-country comparison can be made with the IT bubble burst episode in 2001 as well. It is believed that there had been a mild global recession and synchronized drops of aggregate demands over the world at that period. So, if the compositional effect hypothesis is truly valid, a similar negative relationship is expected to emerge in the IT bubble burst episode too. To verify this conjecture, I collect similar data of the same 23 countries in the episode of IT

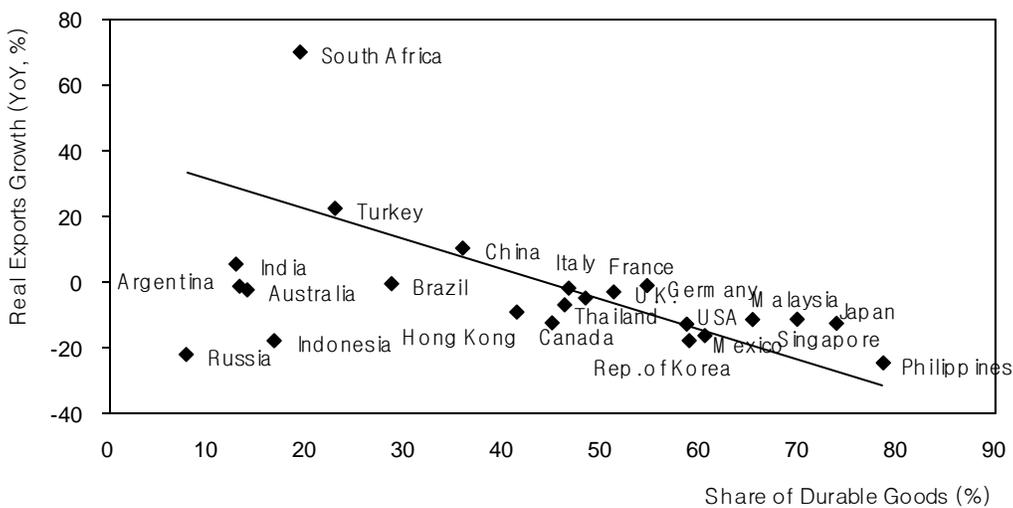
<sup>9</sup> Real exchange rates are defined with reference to U.S. dollar and based on the average of 2005.

bubble burst. In this case, the shares of durable goods exports is measured as the value in 2000 just before the burst of IT bubble and real exports growth rates measured as the value in 2001 Q4. Figure 4 is a scatter-diagram based on the data set. As clearly shown in Figure 4, a similar negative relationship between the two variables emerges again. This additional cross-country comparison suggests that the validity of the compositional effect hypothesis might be quite robust.

Table 1. Regression of Total Export Growth Rate on Share of Durable Goods Exports and Real Exchange Rate Depreciation Rate

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	-0.86	3.85	-0.22	0.83
Share of durable goods	-0.26	0.08	-3.27	0.00
Real Depreciation Rate	0.33	0.11	3.07	0.01
Adjusted R <sup>2</sup> = 0.52				

Figure 4. Share of Durable Goods Exports and Drops of Exports: 2001 Q4



The empirical evidence from the cross-country comparisons can be considered as adding to the empirical findings and emerging consensus of recent literature on the great trade collapse such as Baldwin(2009), Bems, Johnson, and Yi(2010), and Levchenko, Lewis, and Tesar(2009) In addition, it supports recent theoretical literature such as Boileau (1999), Erceg, Guerrieri, and Gust (2006) and Engel and Wang (2009) which emphasizes the special role of durable goods in generating realistic volatilities of trade flows in the framework of international DSGE models.

### *Crucial Role of Durable Goods Exports in Contraction of Korean Export*

As discussed before, one of the key implications drawn from the cross-country comparisons above is that a country with higher share of durable goods exports is likely to experience severer exports reduction to a negative demand shock. In this sense, the contraction of Korean exports during the crisis can be regarded as a natural consequence of the global recession because the share of durable goods exports of Korea was very large before the crisis. As observed in Figure 3, Korea is one of the countries with the highest share of durable goods exports and the share amounted to about 65% just before the crisis.

To investigate how durable goods exports had contributed to the large contraction of exports in Korea during the crisis, I decompose monthly exports data into durable goods and nondurable goods. To classify durable and nondurable goods, I convert monthly exports data using the conversion table of 6 digit HS code to the UN's BEC code. Then, I assess durability of each category and classify it based on the assessment.<sup>10</sup> Figures 5 and 6 are results of the decomposition.

From Figures 5 and 6, it is clear that the high share of durable goods exports plays a crucial role in large drop of exports in Korea. As Figure 5 displays, the growth rate of durable goods exports fell much deeper than nondurable goods exports during the crisis. During the period of 2008 Q4 to 2009 Q1 when the crisis was at its peak, the volume of durable goods exports (ship exports excluded) recorded an average growth rate of -27.0% while that of nondurable goods (oil-related exports excluded) -15.2%.<sup>11</sup> Figure 6 provides contribution of

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<sup>10</sup> For detailed information about the classification, see Table 1 of Appendix.

<sup>11</sup> Ship exports are excluded because, since ship building usually takes a long time and it is planned in advance, it is hard to consider ship exports to reflect the current changes of the world economy conditions on time.

each component to the reduction of total exports and shows that more than 3/4 of the drop of total exports came from the collapse of durable goods exports during the period.

Figure 5. Durable and Nondurable Goods Exports Growth Rate

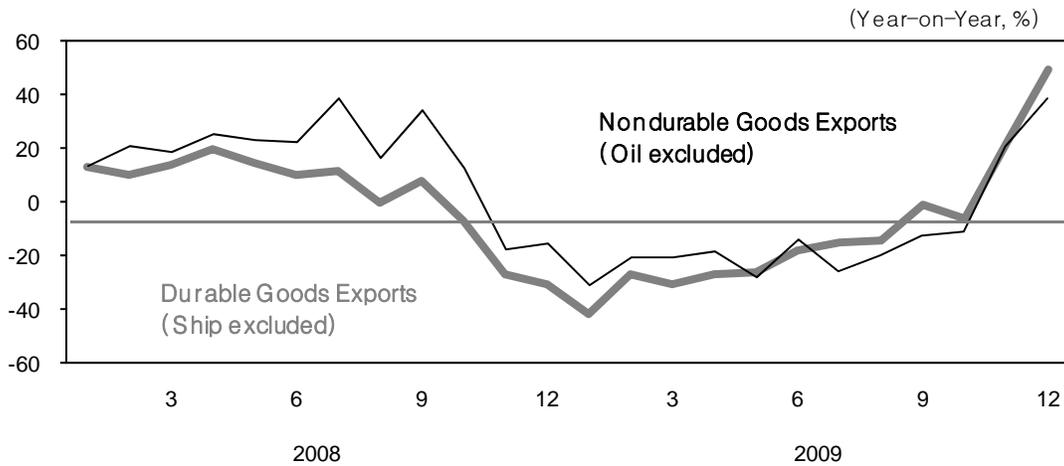
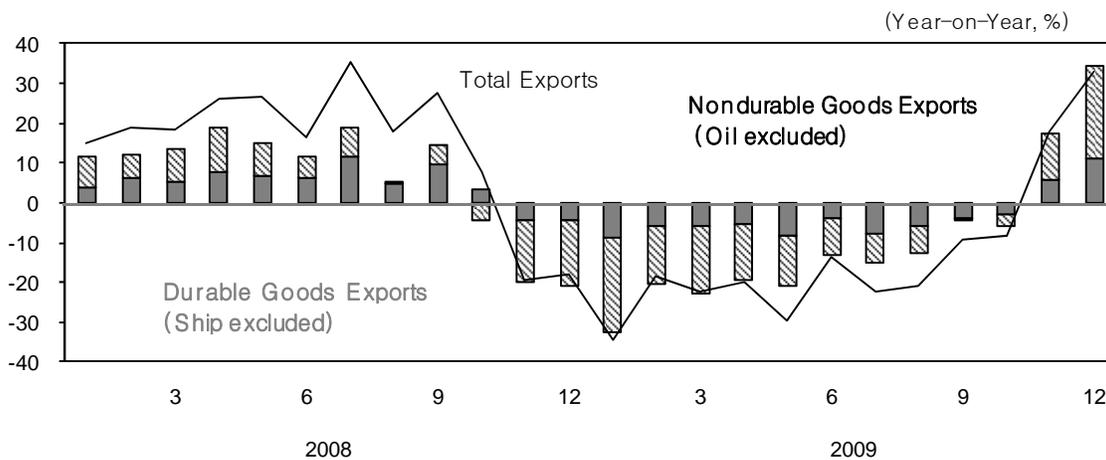


Figure 6. Contributions of Durable and Nondurable Goods to Total Exports Growth

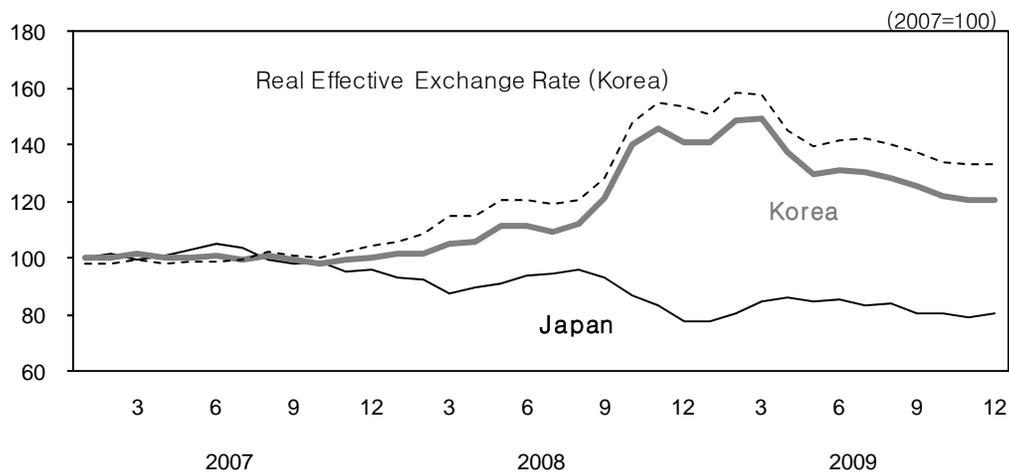


### Exchange Rate Depreciation Moderating Contraction of Korean Exports

Let's return to Figure 3 again. Another interesting observation of the figure is that the fall of Korean exports was quite moderate compared to other countries with a similar level of share of durable goods exports, particularly Japan. While Japan and Korea had quite similar share of durable goods exports before the crisis, Japan had experienced far deeper fall of exports

during the crisis than Korea. In 2008 Q4 to 2009 Q1, real exports growth rate of Japan was -26.3% while that of Korea was only -4.8%. One potential factor contributing to this large discrepancy can be found in Figure 7 which draws movements of real exchange rates to U.S. dollar of Korean Won and Japanese Yen.

Figure 7. Real Exchange Rate to U.S. Dollar of Korean Won and Japanese Yen



The figure shows that the two countries had followed starkly different paths of real exchange rate since the onset of the global crisis. During the crisis, Korean Won had experienced a rapid depreciation of both nominal and real exchange rate due to the turmoil in the foreign exchange market driven by large capital outflows. The depreciation rate of real exchange rate to U.S. dollar amounted to almost 50% at the peak of the global crisis. Meanwhile, Japanese Yen had been appreciated since beginning of the crisis and the appreciation rate reached about 20% in 2008 Q1 to 2009 Q4.

## (2) Internationalized Supply Chain Hypothesis

As Hummels, Ishii, and Yi (2001) document, production process has been involved increasingly with vertical trading chain across many countries over time. According to their estimates, that type of trade flow, the so-called vertical specialization, accounts for 21% of total

exports of 10 OECD countries and four emerging market countries, and it grew almost 30% between 1970 and 1990.<sup>12</sup>

Given its quantitative importance, the internationalized supply chain can serve as a source of sudden collapse of the world trade. This is because if only one part of the chain is gone due to some reasons such as financial distress, the whole chain would break down and the whole related trade flow can disappear at the same time.

In order to examine whether the internationalized supply chain had influence on the contraction of exports in Korea during the crisis, I investigate trends of intensive and extensive margin of Korean exports to major 10 trading partners during the crisis, similarly in Schott (2009), Wakasugi (2009), and Bernard, Jensen, Redding, and Schott (2009).<sup>13</sup> However, the definition of intensive and extensive margins is taken mainly from Wakasugi (2009) because the number of export products and values at firm level are not available in Korea as in Japan. Hence, the extensive margin is defined as the number of products in a disaggregate level of 6 digit HS code whose exports values are positive and the intensive margin is simply defined as total value of exports divided by the number of products. The results are summarized in Tables 2 and 3.

As observed from Table 2, it is hard to find any evidence of the extensive margin variation in Korean exports during the crisis. The extensive margins are kept almost the same before and during the crisis in both total and individual country level. On the contrary, the intensive margins plummeted drastically in 2008 Q4 and 2009 Q1 in both total and individual country level. From the result, it is clear that the contraction of exports in Korea during the crisis had happened mainly through the intensive margin rather than the extensive margin, and it implies that the internationalized production chain hypothesis did not play any significant role in the contraction of exports in Korea. Also, this result is consistent with Bernard, Jensen, Redding, and Schott (2009) in that the variation of extensive margin is related mainly to trade growth and intensive margin to cyclical fluctuations of trade.<sup>14</sup>

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<sup>12</sup> For various implications of vertical specialization on world trade and international business cycle, see Yi (2003), Kose and Yi (2006), and Giovanni and Levchenko (2010).

<sup>13</sup> I select 10 countries based on the size of direct investments abroad and exports to the destination country.

<sup>14</sup> Schott (2009) and Wakasugi (2009) report that a similar pattern as in the Korean case emerged in the U.S. and Japan.

Table 2. Extensive Margin: Number of Export Products

Year	Quarter	Total	China	China + Hong Kong	India	Indonesia	Thailand	Viet Nam	Czech	Slovakia	Netherlands	Poland	USA
2007	Average	4,104	3,122	3,270	1,477	1,764	1,652	2,035	423	393	935	658	2,448
2008	1	4,126	3,060	3,194	1,480	1,804	1,712	2,101	477	435	963	700	2,458
	2	4,152	3,193	3,333	1,545	1,824	1,702	2,154	506	458	965	702	2,498
	3	4,182	3,186	3,341	1,564	1,812	1,682	2,144	484	449	981	687	2,496
	4	4,185	3,136	3,293	1,512	1,769	1,710	2,253	504	462	963	707	2,544
2009	1	4,148	3,088	3,233	1,495	1,722	1,628	2,183	471	424	920	674	2,496
	2	4,178	3,147	3,299	1,575	1,852	1,684	2,293	494	470	927	688	2,491
	3	4,184	3,172	3,319	1,614	1,842	1,745	2,345	540	464	946	737	2,551
	4	4,171	3,199	3,371	1,626	1,848	1,760	2,352	579	470	974	766	2,494

Table 3. Intensive Margin: Export Value per Product (thousands USD)

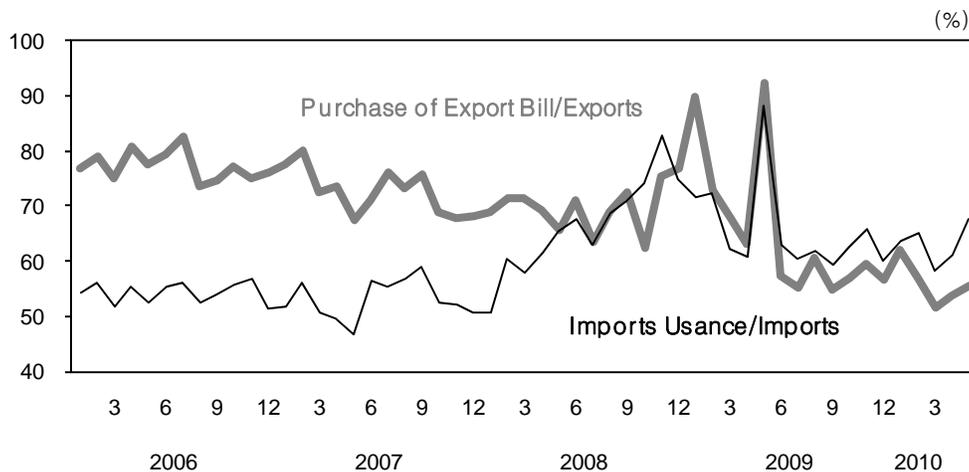
Year	Quarter	Total	China	China + Hong Kong	India	Indonesia	Thailand	Viet Nam	Czech	Slovakia	Netherlands	Poland	USA
2007	Average	22,623	6,564	7,693	1,117	818	679	705	568	1,728	1,201	1,333	4,673
2008	1	24,102	7,204	8,270	1,314	841	807	1,065	540	1,828	1,340	1,518	4,517
	2	27,575	8,229	9,489	1,463	1,087	885	1,057	352	1,937	1,217	1,448	4,932
	3	27,499	8,032	9,379	1,635	1,291	1,005	901	388	2,500	2,071	1,671	4,619
	4	22,239	5,574	6,616	1,465	1,185	702	603	408	1,424	1,982	1,259	4,491
2009	1	17,942	5,344	6,352	1,061	595	594	604	391	1,514	1,192	1,261	3,328
	2	21,628	6,652	7,725	1,307	805	599	781	358	1,726	1,052	1,472	3,810
	3	22,653	7,511	8,768	1,268	931	659	803	341	1,751	1,089	1,510	3,848
	4	24,927	7,954	9,268	1,427	958	796	917	391	1,854	1,464	1,529	4,023

### (3) Trade Credit Hypothesis

The last potential explanation of the great trade collapse examined in this paper is related to trade credit. The trade credit hypothesis is originally based on literature reporting that financial distress in banking sectors had affected trade flows adversely through the reduced availability of external finance on exporters including trade credit in past financial crises.<sup>15</sup> So, the original idea of the hypothesis is associated with broader financial instruments than trade credit. However, the majority of recent literature on the issue has limited its analysis to trade credit. Similarly in the literature, the analysis of this paper on trade credit hypothesis will also be limited to investigating the changes of overall condition of trade credit market during the crisis.

At first, Figure 8 shows recent behaviors of the amounts outstanding of purchase of export bills and issuance of import usances by domestic banks. Both series are scaled with corresponding trade flows. According to the figure, both ratios had rather increased during the crisis. Considering the rapid shrinkage in both exports and imports, it can be inferred that trade credit did not slow down or slowed down more moderately than exports and imports. This means that the overall condition of trade credit market had not frozen so much during the crisis, at least.

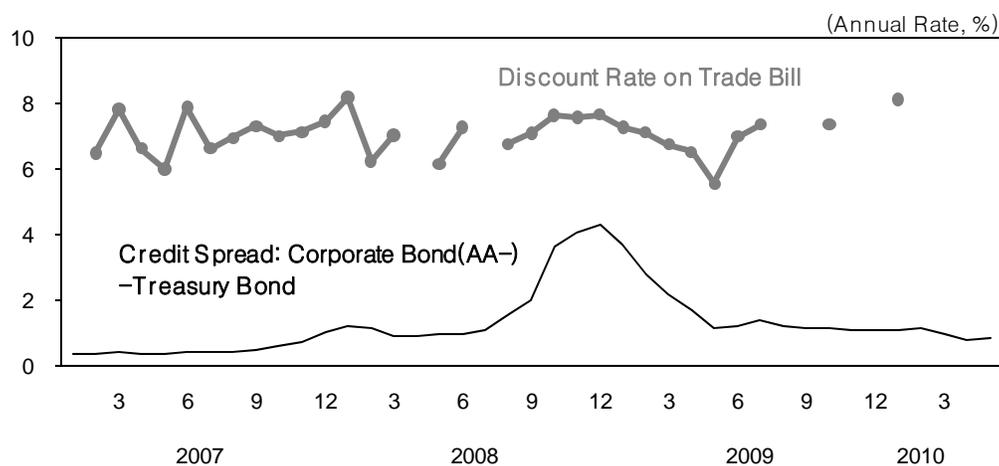
Figure 8. Trade Credit Extended by Domestic Banks



<sup>15</sup> For details, see Amiti and Weinstein (2009) and Iacovone and Zavacka (2009).

The inference can be augmented with Figure 9. The figure draws recent trend of discount rate applied to new trade bills. While the credit spread between corporate bonds and Treasury bonds had widened in Korea during the crisis, the discount rate had stayed around at the pre-crisis level.

Figure 9. Discount Rate on Trade Bill and Credit Spread



Admittedly, the simple observation of Figures 8 and 9 might not show any strong evidence. However, at least from the observation, it can be concluded that the overall availability of trade credit in Korea had not deteriorated so significantly to induce such a large drop in trade flows.<sup>16</sup>

#### 4. Summary and Remaining Issues

This paper tries to find the most contributing factor to the unexpected large drop in exports in Korea during the crisis by evaluating several hypotheses on the great trade collapse with regard to the Korean experience. The main results of this paper can be summarized as follows: First, this paper shows that the compositional effect hypothesis is the most relevant for explaining the collapse of exports in Korea during the crisis. Actually, durable goods exports had experienced severer contraction than nondurable goods exports and about 75% of the contraction of total exports came from the collapse of durable goods exports. Second, the cross-

<sup>16</sup> Similarly, based on the fact that U.S. cross-border bank financing bounced back earlier than bank financing from other sources, Mora and Powers (2009) argues that due to massive policy responses, trade finance declined only moderately despite global credit market crunches

country comparisons presented in this paper suggest that a country with higher share of durable goods exports is likely to experience more harsh contraction of exports to a negative demand shock. This empirical evidence contributes to growing literature on the great trade collapse and literature emphasizing the special role of durable goods in generating realistic volatilities of trade flows in the framework of international DSGE models.

A key implication of this paper is that the high share of durable goods exports of Korea can be a main source of volatilities of exporting sectors and possibly of the whole economy even in the future. However, it is unclear whether the volatilities of exporting sectors can lead directly to large fluctuations of the whole economy. This paper totally misses analyses about the important link between exporting sectors to the whole economy. In this regard, Bems, Johnson, and Yi (2010) and Johnson and Noguera (2009) seem to provide a very helpful insight for further research. They argue that measures of aggregate openness and bilateral exposure to foreign demand changes must be modified to consider the presence of intermediate goods trade which is reported to have increased over time. In other words, exposure to changes in foreign demand should be measured with value-added basis, not with the share of exports in GDP. To draw more realistic policy implications from this paper, similar analysis should follow.

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Appendix Table 1  
UN's BEC Code and Durable/Nondurable Goods Classification

Broad Economic Classification	Classification
1 Food and Beverage	Non-durable goods
11 Primary	Non-durable goods
111 Mainly for industry	Non-durable goods
112 Mainly for household consumption	Non-durable goods
12 Processed	Non-durable goods
121 Mainly for industry	Non-durable goods
122 Mainly for household consumption	Non-durable goods
2 Industrial Supplies, n.e.s.	Non-durable goods
21 Primary	Non-durable goods
22 Processed	Non-durable goods
3 Fuel and Lubricants	Non-durable goods
31 Primary	Non-durable goods
32 Processed	Non-durable goods
321 Moto spirit	Non-durable goods
322 Other	Non-durable goods
4 Machinery, Capital Equipment(except transport) and accessories thereof	Durable goods
41 Machinery and other capital equipment except transport	Durable goods
42 Parts and accessories	Durable goods
5 Transport Equipment and accessories thereof	Durable Goods
51 Passenger motor cars	Durable goods
52 Other	Durable goods
521 Industrial	Durable goods
522 Non-industrial	Durable goods
53 Parts and accessories	Durable goods
6 Consumer goods, n.e.s.	-
61 Durable	Durable goods
62 Semi-durable	Non-durable goods
63 Non-durable	Non-durable goods
7 Goods, n.e.s.	Non-durable goods

Appendix Table 2

## Share of Durable Goods Exports and Real Export Growth Rates of 23 Major Countries

	<b>Share of Durable Goods</b> (Average of 2005-2007)	<b>Real Exports Growth</b> (2008 Q4-2009 Q1)	<b>Real Exchange Rate Depreciation Rate</b> (2008 Q4-2009 Q1)
Argentina	13.45	-9.28	1.11
Australia	10.57	23.39	22.29
Brazil	26.36	-4.32	11.50
Canada	34.64	-9.32	14.91
China	51.90	-13.14	-12.44
Hong Kong	57.47	-15.10	-2.75
France	45.26	-5.31	4.59
Germany	53.85	-14.98	4.53
India	17.07	2.58	8.03
Indonesia	16.69	4.66	11.54
Italy	43.39	-17.90	3.53
Japan	68.63	-26.28	-18.17
Malaysia	55.43	-11.19	0.86
Mexico	55.04	-7.38	18.35
Philippines	62.53	-21.93	-4.04
Rep. of Korea	65.28	-4.80	44.31
Russian Fed.	4.53	-16.77	0.71
Singapore	59.90	-13.78	-5.10
South Africa	22.54	-1.46	24.91
Thailand	48.63	-17.76	0.71
Turkey	34.76	-9.17	9.81
United Kingdom	44.55	-9.65	32.89
USA	53.12	-11.45	0.00

Source: UN Comtrade database, International Financial Statistics, Global Insight and author's calculations