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**Research Report**

## Trade liberalization and manufacturing productivity changes in Korea during the past three decades

KDI Policy Forum, No. 278

**Provided in Cooperation with:**

Korea Development Institute (KDI), Sejong

*Suggested Citation:* Song, Yeongkwan (2020) : Trade liberalization and manufacturing productivity changes in Korea during the past three decades, KDI Policy Forum, No. 278, Korea Development Institute (KDI), Sejong, <https://doi.org/10.22740/kdi.forum.e.2020.278>

This Version is available at:

<https://hdl.handle.net/10419/244727>

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### KDI Policy Forum

July 01, 2020 (No. 278 (2020-03), eng.)

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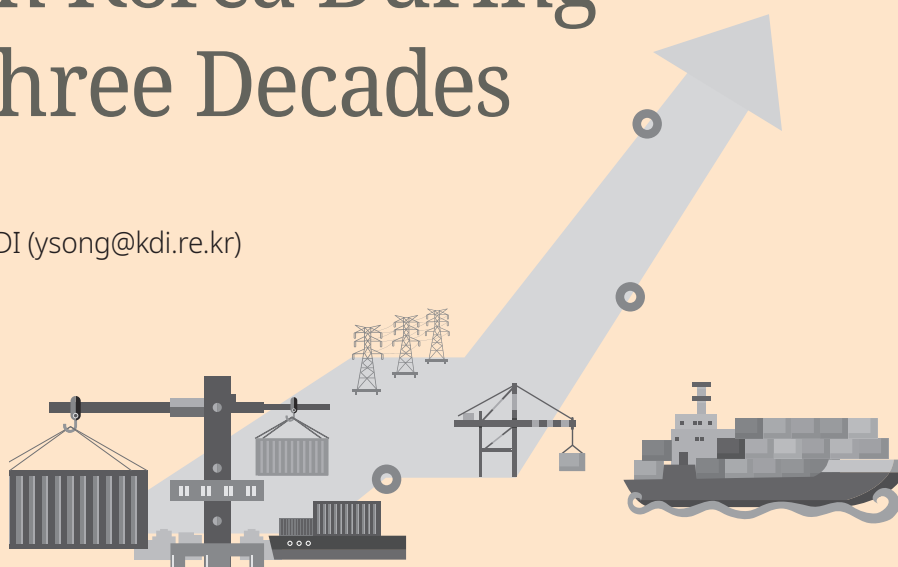
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# Trade Liberalization and Manufacturing Productivity Changes in Korea During the Past Three Decades

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\* Rewritten from Song, Yeongkwan, "Trade Liberalization and Manufacturing Productivity Changes in Korea During the Past Three Decades," in Yeongkwan Song, Taeho Lee, and Kwansoo Kim, *Transformation of Korean Foreign Economic Policy for Innovation Growth: Manufacturing, Agriculture, and Agro-food Industry*, Chapter 2, Research Monograph 2019-05, Korea Development Institute, 2019 (forthcoming) (in Korean).

# Summary

- One of the key goals of trade policy, which includes FTAs, should be the enhancement of productivity in the overall economy through the improved productivity of the tradable sector.
  - This can be achieved by ① enhancing the productivity of existing firms, and ② eliminating low-productivity firms to improve overall industrial productivity.
- This study examines the effects of Korea's trade policies in terms of bolstering the productivity of existing firms in the tradable sector. It shows that Korea's FTAs with major trade partners, such as the EU, US and China, have failed to provide meaningful impetus.
- As for raising productivity through firm exits, this study confirms that it has a positive impact on raising total factor productivity (TFP) across industry. However, further studies are needed to substantiate that this is owed to trade liberalization.
- To raise overall economic productivity, future trade policies should be designed ① to enhance the productivity of existing firms, and ② expel those with low productivity.
  - A trade policy-driven expansion of imports and exports could brighten the prospects for the tradable sector, encouraging firms to boost productivity.
- It is imperative that efforts are made to increase the positive effects of trade liberalization and minimize the negative effects on society by shifting the focus of the current Trade Adjustment Assistance system towards supporting workers instead of firms, and improving retraining and vocational programs for the unemployed, among others.

## 1

### Issues

- The impact of the various trade liberalization policies pursued by the Korean government on manufacturing productivity has garnered significant attention.
  - The government has pushed through numerous trade liberalization policies since the 1990s.
    - In the 1990s, the second Advance Notice System (1989-1994) for tariff reduction was introduced for the Uruguay round of WTO negotiations.
    - In the 2000s, the Korea-Chile FTA (2004), Korea-Singapore FTA (2006), Korea-EFTA FTA (2006), and Korea-ASEAN FTA in Goods (2007) entered into force.
    - In the 2010s, the Korea-India FTA (2010), Korea-EU FTA (2011), Korea-US FTA (2012), and Korea-China FTA (2015) entered into force.
  - However, these policy efforts could be called into question if the productivity of the manufacturing industry does not increase.
    - Conflict between the beneficiaries and casualties of trade liberalization is not a new phenomenon.
    - Improving the productivity of the manufacturing industry is a crucial expected effect of these policies.

# 2

## After the 1990s: Share of Industry, Firm Exits, and Productivity by Trade Type

- Using Pavcnik (2002)'s methodology, this study analyzes the impact of Korea's trade policies on manufacturing productivity since the 1990s.
  - Besides trade liberalization, variables such as investment and macroeconomics also affect firm productivity. As such, empirically analyzing the direct effects of trade liberalization on productivity could entail a host of problems including endogeneity.
  - Assuming that the impact of trade liberalization is centered around the tradable sector, Pavcnik (2002) indirectly estimates the impact of Chile's trade liberalization policies in the late 1970s to early 1980s on productivity by comparing ① the productivity of existing firms in the tradable sector compared to their counterparts in the non-tradable sector, and ② the exit of firms from both.
    - For instance, an increase in imports owed to trade liberalization could induce a withdrawal of low-productivity firms, which could bolster overall industrial productivity.
- Based on Pavcnik (2002), this study examines ① the productivity changes in the tradable sector compared to the non-tradable sector to infer the effects of trade liberalization since the 1990s on Korea's manufacturing productivity as well as ② the impact of firm exits on productivity.

- The following outlines the analysis periods for this study, which examines the firm-level statistics from Statistics Korea's Mining and Manufacturing Survey in 1991-2017 in conjunction with the import and export data from UN Comtrade, and classification of samples.
  - While the analysis period is from 1991 to 2017, the period was divided into three phases: 1991-1997 (1<sup>st</sup>), 2002-2007 (2<sup>nd</sup>) and 2012-2017 (3<sup>rd</sup>).
    - The Asian financial crisis (1998-2001) and global financial crisis (2008-2011), during which there was drastic economic change, were excluded.
  - Based on the first year of each phase, the manufacturing industry was classified into 'tradable sector' and 'non-tradable sector,' and the former was again broken down into 'intra-trade,' 'export-driven,' and 'import-competing.'<sup>1)</sup>

The definition for 'manufacturing industry' used in this study includes industries that fall within the 17-37 range of the two-digit codes of the 8<sup>th</sup> Korea Standard Industrial Classification (KSIC).

<Table 1> Classification and Definition for Tradable and Non-Tradable Sectors

Tradable sector			Non-tradable sector
Intra-trade industry	Export-driven industry	Import-competing industry	
Intra-trade share over 15%	Export share over 15%	Import share over 15%	Intra-trade share below 15%

1 The definition for industry by trade type is based on the three-digit code industries in the Korea Standard Industrial Classification (KSIC), and the criterion of '15% share of intra-trade.' Additional analyses using criteria of 10% and 20% find similar results. Refer to the Appendix in Song (2019) for further details.

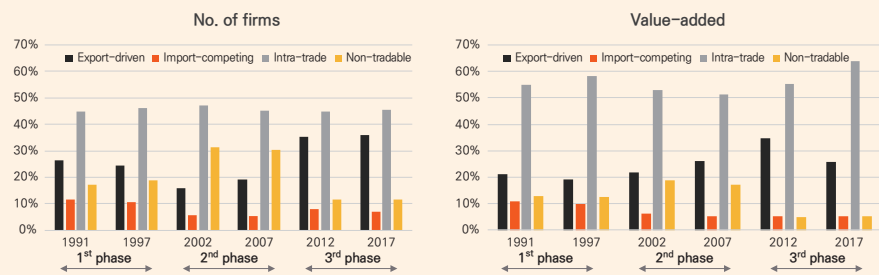
- In terms of the number of firms and value-added, the intra-trade industry accounts for nearly half of the manufacturing industry while the share of the export-driven industry is also high (Figure 1).
  - The intra-trade industry includes Korea's flagship manufacturing industries such as refined petroleum products, chemicals, steel, non-ferrous metal, and electrical and electronics.

- The share of the export-driven industry (light industries including rubber products, and automobiles, shipbuilding, etc.) grew dramatically after the 2008 crisis.
- Meanwhile, the non-tradable sector (textile, paper, printing, cement, metal casting, furniture, etc.) grew during the second phase—following the 1997 crisis—but retreated sharply in the third.

■ When the share of firm exits is examined, the share of firms is higher than the share of value-added in all industries. As such, firms that exited are those that are small in scale and have low value-added (Table 2).

- It is expected that the exit of low value-added firms had a positive impact on industrial productivity.
  - But, the share of firm exits based on the number of firms gradually decreases in all industries.
- During the first year of each phase, the export-driven industry has the highest number of firm exits in the first phase while the import-competing industry has the highest number in the second and third phases.

[Figure 1] Changes in the Share of Industries by Trade Type



Source: By author using <Table 2-2>, <Table 2-5>, and <Table 2-8> from Song (2019).

<Table 2> Share of Firm Exits by Trade Type

(%)

Industry by trade type	1 <sup>st</sup> phase (1991-1997)		2 <sup>nd</sup> phase (2002-2007)		3 <sup>rd</sup> phase (2012-2017)	
	No. of firms	Value-added	No. of firms	Value-added	No. of firms	Value-added
Export-driven	62.3	29.8	45.4	12.4	36.4	12.4
Import-competing	53.5	25.7	50.3	17.1	46.3	20.2
Intra-trade	54.4	14.8	49.2	13.6	35.0	15.6
Non-tradable	54.2	25.5	47.1	31.4	33.5	17.5

Source: By author using <Table 2-3>, <Table 2-6>, and <Table 2-9> from Song (2019).

2 Total factor productivity (TFP) was extracted using Levinsohn and Petrin (2003), and the decomposition of growth factors is based on the methodology in Melitz and Poanec (2015).

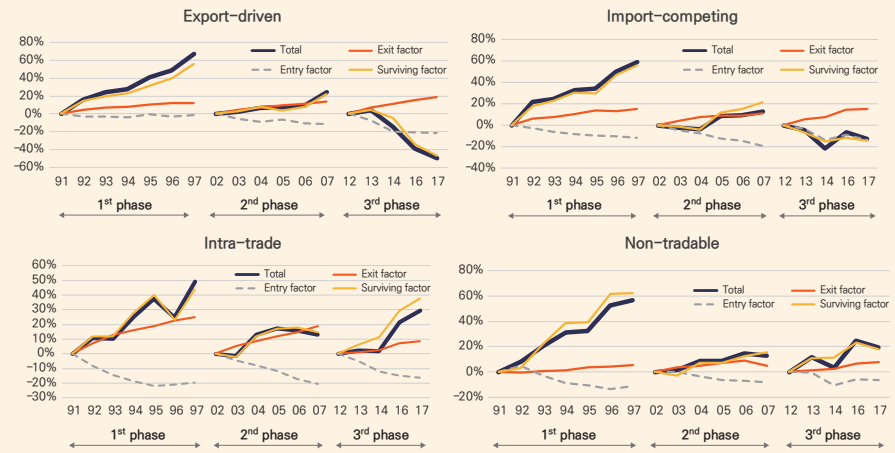
3 The exit factor only had a negative impact on the TFP growth in the non-tradable sector in 1992.

■ With the exception of the third phase, there is a distinct growth in total factor productivity (TFP) in all industries. The cause was divided into ‘entry,’ ‘surviving’ and ‘exit,’ and it was found that ‘exit’ played a positive role during all of the analysis periods (Figure 2).<sup>2)</sup>

- Changes in the TFP of surviving firms had the strongest impact on the TFP of each industry.
- Exits had a positive impact in all industries during the analysis period.<sup>3)</sup>

- The TFP growth rate is highest in all industries during the first phase when the share of firm exits is also high.
- The withdrawal of firms with low TFP increases the average TFP of surviving firms.

[Figure 2] Decomposition of TFP Growth Factors by Trade Type



Source: By author using <Table 2-11-13> from Song (2019).

# 3

## Empirical Analysis Result

- A regression analysis was conducted 1) to estimate the yearly change in the TFP of existing firms in the tradable sector compared to their non-tradable counterparts, and 2) to compare the TFP of exit and existing firms classified by trade type.

$$\ln TFP_{it} = \alpha_0 + \alpha_{11}(ex)_{it} + \alpha_{12}(im)_{it} + \alpha_{13}(bi)_{it} + \alpha_{20}(T)_{it} + \alpha_{21}(T \times ex)_{it} + \alpha_{22}(T \times im)_{it} + \alpha_{23}(T \times bi)_{it} + \alpha_{30}(X)_{it} + \alpha_{31}(X \times ex)_{it} + \alpha_{32}(X \times im)_{it} + \alpha_{33}(X \times bi)_{it} + \alpha_4 G_{it} + v_{it}$$

- Here,  $TFP$  = total factor productivity,  $T$  = year

$ex$ ,  $im$ ,  $bi$  = dummy variables for export-driven,

import-competing, and intra-trade industries,

$X$  = dummy variable to indicate whether there is an exit

$G_{it}$  = industry characteristic vector, including industry dummy

$v_{it}$  = error term

- $\alpha_{21}$ ,  $\alpha_{22}$  and  $\alpha_{23}$  express the changes in the TFP of existing firms in the respective tradable sectors over time compared to those in the non-tradable sector.
- $\alpha_{30}$  is the average  $TFP$  gap between exiting firms ( $X = 1$ ) and existing firms ( $X = 0$ ) in the non-tradable sector while,  $\alpha_{31}$ ,  $\alpha_{32}$  and  $\alpha_{33}$  express additional  $TFP$  gaps (in addition to  $\alpha_{30}$ ) between exiting and existing firms in each tradable sector.
- For instance, the gap in the  $TFP$  between exiting firms ( $X = 1$ ) and existing firms ( $X = 0$ ) in the export-driven industry ( $ex = 1$ ) is  $\alpha_{30} + \alpha_{31}$ .

## A) Changes in the TFP of Existing Firms in the Tradable Sector

- During the third phase, in which the Korea-EU FTA (2011), Korea-US FTA (2012) and Korea-China FTA (2015) entered into force, there was no increase in the productivity of existing firms in the tradable sector compared to their non-tradable counterparts, with the exception of 2017.
  - Compared to the non-tradable sector, the TFP growth of existing firms in the tradable sector showed a statistically significant increase in the export-driven and intra-trade industries in 2017 of the third phase; in most tradable sectors in the second phase and; in just the intra-trade industry after 1995 during the first phase (Table 3).
- Despite entering FTAs with major trading partners such as the EU, US and China, the growth in Korea's imports and exports during the third phase was lackluster, which may be why FTAs did little to drive the active efforts of the firms in the tradable sector to bolster productivity regardless of the policy support (Table 4).
  - Because the TFP growth of existing firms is the result of other variables, such as exits, being controlled, it indicates that there were active efforts made within these firms to raise their TFP.
  - Expectations of an increase in imports and exports can affect the business outlook of the tradable sector, and thus, high growth could contribute to firms' efforts to raise productivity.
  - FTAs with major trading partners failed to resolve the stagnant growth in Korea's imports and exports in the third phase due to slowing world trade volume following the 2007 global financial crisis.
    - Despite the major FTAs, the average real effective tariff rate did not depreciate to any significant degree, and there was no meaningful growth in imports and exports.
  - In the second phase, the changing trade environment, represented by the exponential growth in imports and exports, seems to have propelled the active efforts made by existing firms in the tradable sector to enhance productivity.
    - The average real effective tariff rate fell only marginally but it was during a period of trade expansion in which the growth in imports and exports exceeded an annual average of 18% owed to China's accession to the WTO in December 2001, among others.

<Table 3> Changes in the TFP of Existing Tradable Firms Compared to Non-Tradable Firms (natural log)

	Year	Export-driven ( $\alpha_{21}$ )	Import-competing ( $\alpha_{22}$ )	Intra-trade ( $\alpha_{23}$ )
1 <sup>st</sup> phase	1992	0.022* (0.013)	-0.036** (0.016)	-0.005 (0.012)
	1993	0.027** (0.013)	-0.092*** (0.016)	0.002 (0.012)
	1994	-0.023* (0.013)	-0.088*** (0.016)	0.002 (0.012)
	1995	-0.064*** (0.013)	-0.039** (0.016)	0.042*** (0.012)
	1996	-0.051*** (0.013)	-0.004 (0.016)	0.062*** (0.012)
2 <sup>nd</sup> phase	1997	-0.115*** (0.013)	-0.028* (0.016)	0.038*** (0.012)
	2003	0.015 (0.013)	0.012 (0.019)	0.027*** (0.010)
	2004	0.014 (0.013)	0.059*** (0.019)	0.056*** (0.010)
	2005	0.030** (0.012)	0.078*** (0.019)	0.079*** (0.009)
	2006	0.027** (0.012)	0.044** (0.019)	0.051*** (0.009)
3 <sup>rd</sup> phase	2007	0.055*** (0.012)	0.070*** (0.019)	0.057*** (0.009)
	2013	-0.025* (0.013)	-0.014 (0.017)	-0.027** (0.012)
	2014	-0.003 (0.013)	-0.000 (0.017)	-0.011 (0.012)
	2016	0.017 (0.013)	0.017 (0.018)	-0.002 (0.012)
	2017	0.052*** (0.013)	-0.002 (0.018)	0.045*** (0.013)

Note: 1. Figures in the parentheses denote the standard deviation. Statistical significance level: \*\*\* p<0.01, \*\* p<0.05 and \*p<0.1.  
 2. The number of observations for each phase is 331,750, 317,936 and 294,997. R-squared is 0.382, 0.215 and 0.230.  
 3. The Mining and Manufacturing Survey for 2015 is not included as it was separated in 2015 with the start of the integrated economic statistics survey.

Source: By author using <Table 2-14-16> from Song (2019).

**<Table 4> Major Macroeconomic Conditions in Korea Since the 1990s**

(%)

	Year	GDP growth	Export growth	Import growth	Average tariff rate
1 <sup>st</sup> phase	1991	10.4	10.5	16.7	12.7
	1992	6.2	6.6	0.3	10.8
	1993	6.8	7.3	2.5	9.0
	1994	9.2	16.8	22.1	7.8
	1995	9.6	30.3	32.0	7.7
	1996	7.6	3.7	11.3	7.6
	1997	5.9	5.0	-3.8	7.7
	Annual average growth	7.5	11.2	10.0	-8.1
2 <sup>nd</sup> phase	2002	7.4	8.0	7.8	7.1
	2003	2.9	19.3	17.6	6.8
	2004	4.9	31.0	25.5	6.4
	2005	3.9	12.0	16.4	6.3
	2006	5.2	14.4	18.4	6.3
	2007	5.5	14.1	15.3	6.3
	Annual average growth	4.5	18.0	18.6	-2.3
	3 <sup>rd</sup> phase	2012	2.3	-1.3	-0.9
2013		2.9	2.1	-0.8	6.0
2014		3.3	2.3	1.9	6.0
2015		2.8	-8.0	-16.9	6.0
2016		2.9	-5.9	-6.9	6.0
2017		3.1	15.8	17.8	N/A
Annual average growth		3.0	0.9	-1.6	-0.3

Note: 1) GDP growth is real GDP growth.

2) The average tariff rate is the average real effective tariff rate of industries that fall within 17-37 of the 8<sup>th</sup> Korea Standard Industrial Classification (KSIC).

Source: By author using <Table 2-1, 2-4 and 2-7> from Song (2019).

## B) Effects of a Growth in TFP Resulting from Firm Exits by Industry

■ When the TFP of exiting and existing firms is compared, the TFP of the former is lower in all industries.

- The average TFP of exiting firms is estimated to be 12-26.2% lower than that of existing firms, confirming that low-productivity firms were driven out.
- The second phase has the largest gap with the average TFP of exiting firms in the import-competing industry 26.2% lower.
- On the other hand, the gap in the export-driven and import-competing industries is narrower than that in the non-tradable sector in the first and third phases.
  - For instance, in the first phase, the TFP gap in the export-driven and intra-trade industries is 12% and 13.8%, respectively; narrower than the non-tradable sector's 18.3%.

■ The fact that the TFP of exiting firms is lower in all industries verifies that firm exits have a positive impact on enhancing TFP. However, whether this is a result of trade liberalization is still unclear.

- This is consistent with the results from Han (2004)<sup>4)</sup> which, using data on Korean establishments in 1990-1998, finds that the withdrawal of firms greatly contributes to improving the efficiency of Korea's manufacturing industry.
- Generally, trade liberalization can increase firm exits in the import-competing industry as imports grow, and reduce it in the export-driven industry as exports grow. However, the regression analysis in <Table 5> does not support this hypothesis.

4 The entry factor had a negative impact on most industries during most periods, which is contradictory to the findings in Hahn (2004) which shows that, in 1990-1998, firm entries as well as firm exits played a significant role in enhancing the efficiency of Korea's manufacturing industry. Further research is needed on this matter.



# 4

## Conclusion and Policy Implications

<Table 5> Effects of an Increase in TFP Due to Firm Exits

(natural log)

	1 <sup>st</sup> phase (1991-1997)		2 <sup>nd</sup> phase (2002-2007)		3 <sup>rd</sup> phase (2012-2017)	
Exit ( $\alpha_{30}$ )	-0.183***	(0.007)	-0.207***	(0.006)	-0.253***	(0.012)
Export-driven ( $\alpha_{31}$ )	0.063***	(0.008)	-0.015	(0.010)	0.039***	(0.013)
Import-competing ( $\alpha_{32}$ )	-0.005	(0.011)	-0.097***	(0.015)	0.017	(0.017)
Intra-trade ( $\alpha_{33}$ )	0.045***	(0.008)	0.006	(0.008)	0.032**	(0.013)
Number of observation	331,750		317,936		294,997	
R-squared	0.382		0.215		0.230	

Note: Figures in the parentheses denote the standard deviation. Statistical significance level: \*\*\* p<0.01, \*\* p<0.05 and \* p<0.1.

Source: By author using <Table 2-14-16> from Song (2019).

- Bolstering the productivity of the overall economy through enhanced productivity in the tradable sector should be a main goal of trade policies including FTAs.
  - Trade liberalization serves to create an environment in which competitive firms can increase their economies of scale through exports. This is a double-edged sword, however, because the growth in imports will intensify market competition which will, in turn, exacerbate the competition in the import market and result in the exit of marginal firms.
  - The productivity in the tradable sector can be boosted by ① increasing the productivity of existing firms, and ② improving industrial productivity through the withdrawal of low-productivity firms.
  - For trade policies to strengthen overall economic productivity, they must be designed to drive the efforts of existing firms to enhance productivity, and also to encourage the exit of firms with low productivity.
  
- The results of this study, which evaluates the effects of Korea's trade policy in regards to improving the productivity of existing firms in the tradable sector, failed to provide any evidence that the FTAs with major trading partners such as the EU, US and China have served as a driver.
  - Positive contributions can be witnessed in 2017, indicating that the effects have not yet fully materialized. Still, it is concerning that they have not led the active efforts of tradable firms to improve productivity.
  
- This study was unable to verify the effects of Korea's trade policies in terms of improving industrial productivity via firm exits. It does, however, confirm that firm exits bolster TFP across all industries.
  - To increase the TFP of the manufacturing industry, the exit of firms with low TFP should be further promoted.
  
- In order to achieve the main policy goal of enhancing economic productivity, future policies on trade liberalization should be designed ① to enhance the productivity of existing firms, and ② eliminate those that have low productivity.

- The expansion in imports and exports through trade liberalization could brighten the outlook for the tradable industry, prompting further efforts to be made among firms to increase productivity.
    - There was significant growth in imports and exports during the second phase in which existing firms experienced an increase in TFP.
  - The exit of low-productivity firms resulting from trade liberalization could vitalize industrial productivity.
- To maximize the benefits from trade liberalization through firm exits, and minimize the negative impact on society, urgent efforts are needed to shift the focus of the current Trade Adjustment Assistance system towards supporting workers and not firms, and upgrading the efficacy of retraining and vocational programs for laid-off workers, etc.
- Pursuant to the Act on Trade Adjustment Assistance Following the Free Trade Agreements, Korea implemented the Trade Adjustment Assistance system which provides loans and consulting services to assist firms that experience or are likely to experience any loss or damages from FTAs.
  - The biggest problem to this system is that most of the subsidy is used to provide loans to affected firms. This would prevent low-productivity firms from withdrawing from the market and improving industrial productivity.
  - Firms who have lost their competitiveness should be removed and workers who have lost their jobs as a result should be provided with retraining and/or vocational training.

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