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**From Firm-Level Imports to
Aggregate Productivity:
Evidence from Korean Manufacturing Firms Data**

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THE BANK OF KOREA

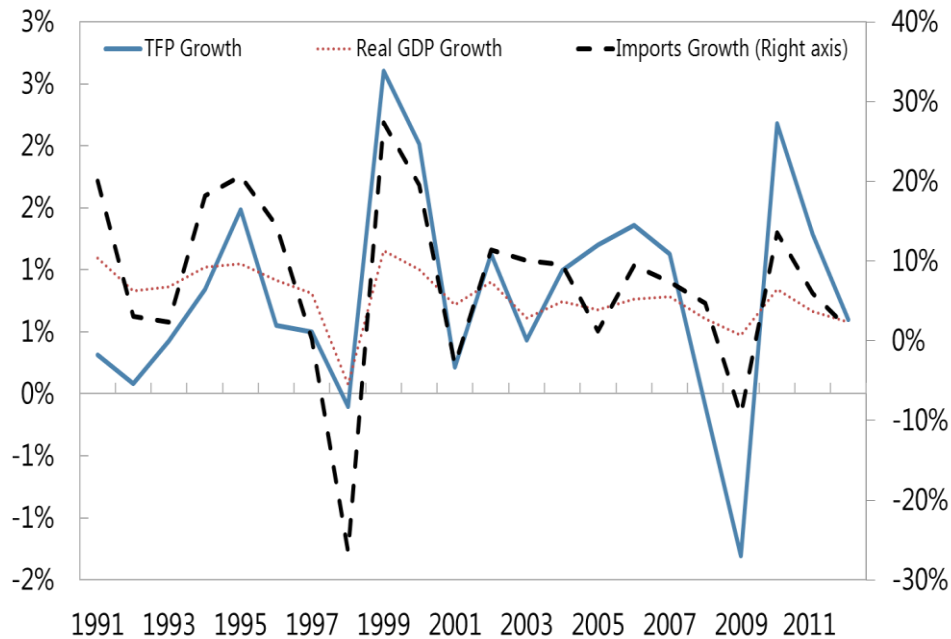
1. MOTIVATION

❖ Imports are pro-cyclical

- Imports demand depends on income and real exchange rate
- Expenditure-switching between home and foreign goods in raw and intermediate inputs - relevant to its implication on productivity

Figure 1. Pro-cyclical of TFP and Imports

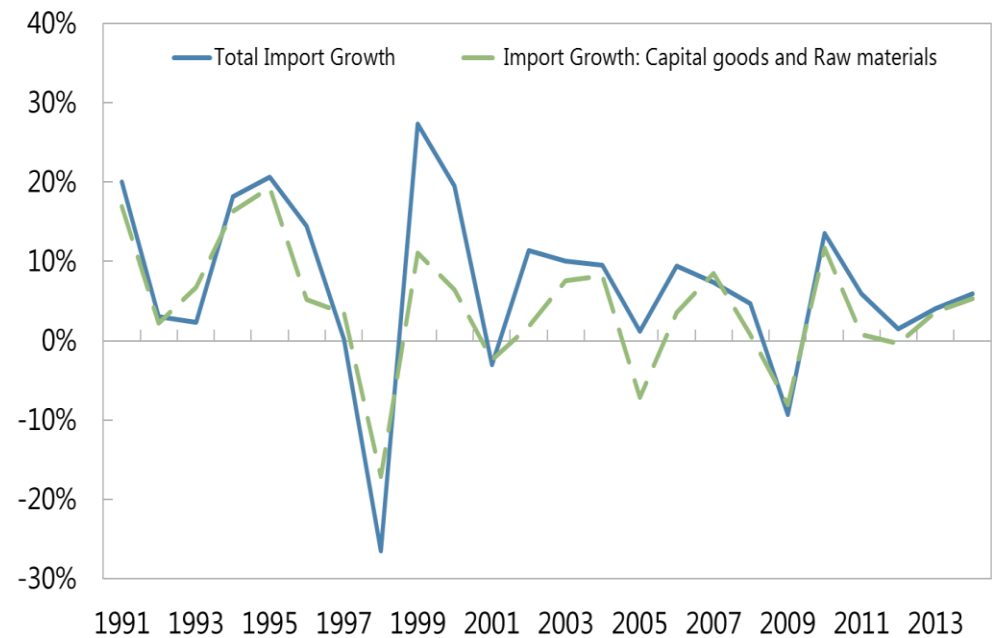
(In percent; Korea over the period 1991-2012)



Sources: Asia KLEMS; Bank of Korea

Figure 2. Import Growth by End-Use Category

(In percent; Korea over the period 1991-2014)



Sources: Bank of Korea; Korea International Trade Association

◆ Imports are productivity-enhancing

- Positive impact of imported inputs on productivity - micro data analysis in many countries (Amiti and Konings, 2007; Halpern, Koren, and Szeidl, 2015; Kasahara and Rodrigue, 2008; Topalova and Khandelwal, 2011)
- Channels:
 - Ⓜ Learning from the superior foreign technology embodied in the inputs
 - Ⓜ Quality-ladder effects from higher quality imports
 - Ⓜ Variety effects from an enlarged set of available inputs

➤ *Imports as one potential source of the pro-cyclical movement in productivity.*

→ *Question: how much can imports explain the cyclical behavior of productivity?*

◆ Imports are costly

- Only subset of producers use imported inputs
- Distribution of importers skewed toward larger firms
(e.g., Amiti, Itskhoki, and Konings, 2014; Bernard, Jensen, and Schott, 2009; Halpern et al., 2015; Manova and Zhang, 2009)

2. WHAT WE DO & CONTRIBUTION

- ◆ **Korean manufacturing firm-level data**

- : three patterns hold in Korea at the firm level**

- Ratio of imported inputs in total inputs tends to be pro-cyclical
- The use of imported inputs increases productivity
- Larger firms are more likely to use imported inputs

→ *firm-level import decisions explain a non-trivial fraction of aggregate productivity fluctuations in Korea over the period between 2006 and 2012*

- ◆ **Empirical evidence for the positive role of imported inputs in enhancing productivity in Korean manufacturing sector - aggregate- or industry-level data analysis**

(Kim, Lim, and Park, 2009; Lawrence and Weinstein, 1999; Feenstra, Markusen, and Zeile, 1992)

→ ***None of these studies covers the import-productivity nexus during the GFC using firm-level data.***

2. WHAT WE DO & CONTRIBUTION

◆ **Estimating TFP due to imported inputs**

(Kasahara and Rodrigue (2008) and Halpern et al. (2011, 2015))

- Estimating TFP due to imported inputs separately from TFP from all other sources
- O-P estimation to control for the simultaneity and sample selection biases in OLS approach. (Olley and Pakes (1996))

◆ **Accounting exercises using decomposition technique**

(McMillian, Rodrik, and Verduzco-Gallo (2013), Olley and Pakes (1996), and Pavcnik (2002))

- Aggregate firm-level TFP over firms with market shares as weights
- Decompose aggregate-level TFP growth to evaluate the contribution of imports to fluctuations in TFP
- Identify the sources of fluctuations in import-related TFP: intra-firm vs. inter-firm efficiency changes

- ◆ **Survey of Business Activities from the Statistics Korea (KOSTAT)**
 - Annual survey of all firms with 50 or more employees and 300 mil. Won or greater capital from 2006 to 2012
 - Manufacturing sector with KSIC 22 industry categories
 - Firm-level information on revenue, employment, inputs, capital, investment, imports, etc.
 - Each variable is deflated with relevant price indexes.
 - Revenue is deflated with the sector-level Producer Price Index (PPI) compiled by the Bank of Korea
 - Capital and investment are deflated with the domestic PPI for capital goods.
 - Domestic inputs and imported inputs are deflated by the sector-level effective PPI and Imported Inputs Price Index
 - Unbalanced panel, 36,310 observations, 8,232 firms

- ◆ **Importing firms tend to be larger in size and more productive than non-importing firms**

Figure 3. Distribution of TFP and Firm Size (Importer vs. Non-Importer)

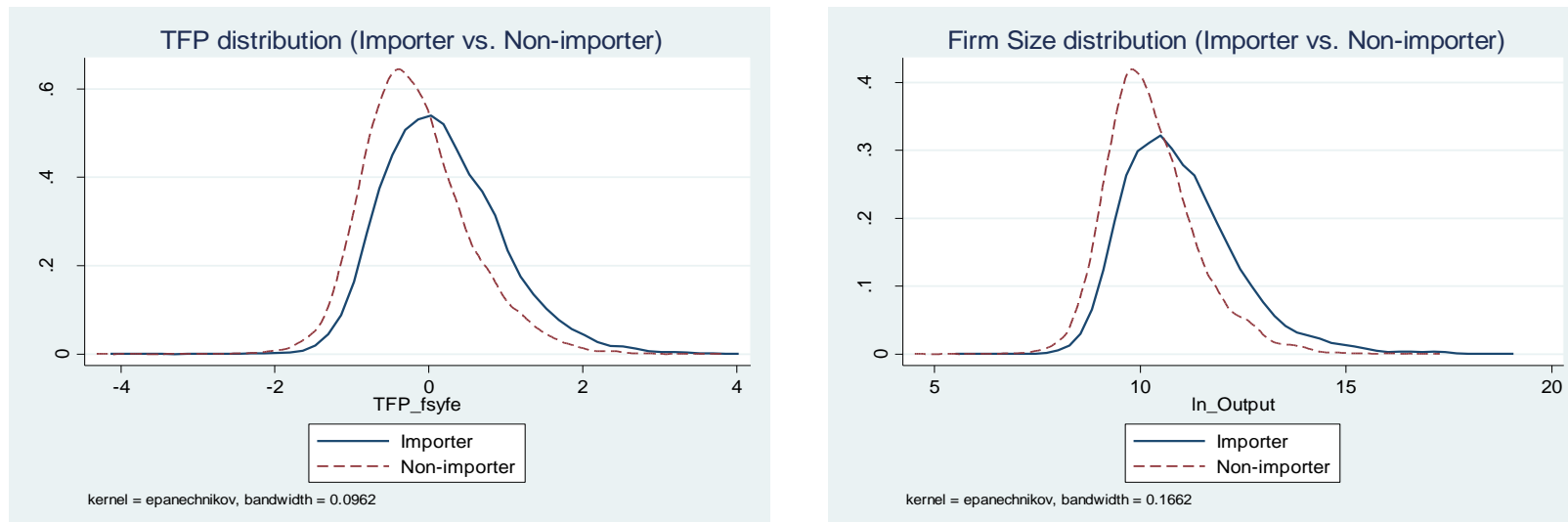


Table 3. Average TFP and Firm Size (Importer vs. Non-importer)

	Importer				Non-importer		
	Observations	TFP	Size	Import ratio	Observations	TFP	Size
2006	2,309	0.134	10.71	0.35	3,300	-0.175	10.11
2007	2,560	0.153	10.83	0.34	3,023	-0.191	10.15
2008	2,577	0.191	10.93	0.34	2,859	-0.187	10.20
2009	2,786	0.201	10.95	0.31	2,391	-0.186	10.19
2010	2,302	0.223	11.16	0.36	1,968	-0.141	10.41
2011	2,421	0.199	11.17	0.36	2,558	-0.150	10.47
2012	2,566	0.166	11.11	0.38	2,690	-0.141	10.49

Notes: This table reports the number of firms, average TFP, the size of importers and non-importers and the import ratio of importers for each year. TFP is obtained from firm and sector-year fixed effects estimation reported in column (4) in Table 1. The size indicates log value of total real revenue.

- ◆ **Cobb-Douglas production function of capital, labor, and intermediate inputs**

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \overbrace{\beta_{imp} f_{it}}^{\omega_{it}} + \tilde{\omega}_{it}$$

y_{it} : output measured as log of total real revenue

l_{it} : labor input measured as log of the number of employees

k_{it} : capital represented by log of total real tangible assets

m_{it} : log of real intermediate inputs

ω_{it} : TFP level in log

f_{it} : ratio of imported inputs to total input purchase

◆ **OLS estimation and endogeneity problems**

- simultaneity bias caused by the correlation between unobservable productivity shocks and the firm's input choices
- sample selection bias resulted from the relationship between the unobservable productivity shocks and the firm's liquidation decision

◆ **Olley-Pakes (O-P) methodology (by Olley and Pakes (1996))**

- investment demand as an increasing function of capital and productivity shocks
- inversed investment function as a proxy for unobservable productivity
- O-P estimation yields consistent estimates by semiparametric regression techniques

◆ **Import intensity as another state variable**

- Kasahara and Rodrigue (2008) and Halpern et al. (2011, 2015)
- A firm's import decision is made in one period ahead as the investment decision
- productivity as a function of investment, capital, and import ratio

- ◆ **log of measured TFP of firm i at time t**

$$\omega_{it} = \hat{\beta}_{imp} f_{it} + \tilde{\omega}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_m m_{it}$$

- ◆ **Accounting exercises using aggregate TFP in level value**

$$\omega_t = \sum_i (h_{it} \cdot \omega_{it}) = \underbrace{\overline{\omega_{it}}}_{\text{unweighted average TFP}} + \underbrace{\sum_i (h_{it})(\omega_{it} - \overline{\omega_{it}})}_{\text{covariance term (efficiency)}}$$

$$h_{it} = \frac{y_{it}}{\sum_i y_{it}}: \text{firm } i\text{'s output share,}$$

upper bar: average value across firms in a given year t .

- **The higher the covariance term is, the higher output share goes to a firm with higher TFP (e.g., Olley and Pakes, 1996; Pavcnik, 2002)**

- ◆ **Decomposition of aggregate TFP growth**

$$\begin{aligned}\Delta\omega_t &= \Delta\bar{\omega}_{it} + \Delta\sum_i(h_{it})(\omega_{it} - \bar{\omega}_{it}) \\ &= \underbrace{\Delta\bar{\omega}_{it}}_{\text{average TFP}} + \underbrace{\sum_i(h_{it-1}) \cdot \Delta(\omega_{it} - \bar{\omega}_{it})}_{\text{intra-firm efficiency}} + \underbrace{\sum_i\Delta(h_{it}) \cdot (\omega_{it} - \bar{\omega}_{it})}_{\text{inter-firm efficiency}}\end{aligned}$$

- *Intra-firm efficiency : the pure change in TFP level in each firm keeping its output share unchanged*
- *Inter-firm efficiency : resource reallocation across firms putting a larger weight on output share growth for firms with higher TFP*

5. RESULTS

Table 4. Estimation Results for Production Function with Import Ratio

	Dependent variable: log (total real revenue)				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	OLS	FE	FE	FE	O-P
Labor	0.459*** (0.006)	0.492*** (0.006)	0.411*** (0.021)	0.408*** (0.018)	0.092*** (0.013)
Capital	0.170*** (0.004)	0.155*** (0.004)	0.163*** (0.014)	0.095*** (0.008)	0.264*** (0.017)
Materials	0.429*** (0.005)	0.411*** (0.005)	0.150*** (0.012)	0.142*** (0.010)	0.389*** (0.009)
Imported inputs ratio	0.233*** (0.011)	0.217*** (0.011)	0.100*** (0.012)	0.075*** (0.010)	0.422*** (0.007)
Sector-Year FE	N	Y	N	Y	
Firm FE	N	N	Y	Y	
# of firms	8,232	8,232	8,232	8,232	8,232
Observations	36,310	36,310	36,310	36,310	36,310
R-squared	0.866	0.883	0.967	0.973	

5. RESULTS

Table 5. Estimation Results for Industry-level Production Function with Import Ratio

Industry code	Labor	Capital	Materials	Import ratio	# of obs.	# of firms
10	0.29*** (0.03)	0.19*** (0.07)	0.38*** (0.03)	0.22*** (0.06)	2330	548
13	0.50*** (0.04)	-0.01 (0.04)	0.43*** (0.03)	0.12 (0.08)	1508	368
14	0.37*** (0.04)	0.09** (0.04)	0.44*** (0.03)	0.15** (0.06)	1184	290
17	0.42*** (0.06)	0.19*** (0.06)	0.35*** (0.04)	0.15** (0.06)	831	183
20	0.31*** (0.04)	0.06 (0.07)	0.50*** (0.03)	0.27*** (0.06)	2218	510
21	0.71*** (0.05)	0.11** (0.05)	0.28*** (0.03)	0.26*** (0.06)	940	203
22	0.46*** (0.03)	0.20*** (0.03)	0.37*** (0.02)	0.36*** (0.08)	2491	634
23	0.35*** (0.04)	0.13* (0.07)	0.35*** (0.03)	0.33*** (0.11)	1217	292
24	0.28*** (0.03)	0.08 (0.06)	0.45*** (0.02)	0.24*** (0.07)	2151	507
25	0.40*** (0.03)	0.13* (0.08)	0.39*** (0.02)	0.28*** (0.08)	2229	645
26	0.47*** (0.02)	0.07*** (0.02)	0.43*** (0.01)	0.18*** (0.05)	5070	1387
27	0.48*** (0.05)	0.08 (0.05)	0.37*** (0.03)	0.14*** (0.05)	1232	328
28	0.43*** (0.03)	0.07 (0.06)	0.47*** (0.02)	0.40*** (0.08)	2269	611
29	0.56*** (0.02)	0.08*** (0.03)	0.33*** (0.01)	0.30*** (0.05)	4227	1096
30	0.43*** (0.03)	0.17*** (0.06)	0.39*** (0.02)	0.29*** (0.06)	4401	1047
31	0.43*** (0.06)	0.20*** (0.08)	0.33*** (0.03)	-0.01 (0.10)	709	213
33	0.33*** (0.07)	-0.05 (0.07)	0.41*** (0.04)	0.34** (0.13)	323	100

Table 6. Aggregate TFP Growth and Contribution of Imported Inputs (%)

Year	Growth of Aggregate TFP	Contribution of imported inputs	Excluding contribution of imported inputs
	(a) = (b)+(c)	(b)	(c)
2007	0.59	-2.02	2.60
2008	5.49	4.00	1.49
2009	-8.66	-2.87	-5.79
2010	12.28	0.26	12.01
2011	1.52	0.81	0.71
2012	6.13	0.22	5.91

Notes: Growth of aggregate TFP in column (a) is the sum of contributions from imported inputs in column (b) and all others in column (c). Specifically, each column is calculated as: (a) = $(\omega_t - \omega_{t-1}) / \omega_{t-1}$; (b) = $(\hat{\beta}_{imp} f_t - \hat{\beta}_{imp} f_{t-1}) / \omega_{t-1}$; (c) = $(\tilde{\omega}_t - \tilde{\omega}_{t-1}) / \omega_{t-1}$

- ◆ About one-third of the decline in aggregate TFP can be explained by the import collapse

5. RESULTS

Table 8. TFP Growth and Contribution of Imported Inputs by Industry (%)

TFP Growth (%)					TFP Growth (%)					TFP Growth (%)				
Industry	Year	Growth of sector-level TFP	Contribution of imported inputs	Excluding contribution of imported inputs	Industry	Year	Growth of sector-level TFP	Contribution of imported inputs	Excluding contribution of imported inputs	Industry	Year	Growth of sector-level TFP	Contribution of imported inputs	Excluding contribution of imported inputs
		(a)=(b)+(c)	(b)	(c)			(a) =(b)+(c)	(b)	(c)			(a) =(b)+(c)	(b)	(c)
10	2007	-2.39	0.02	-2.40	24	2007	3.25	-7.96	11.21	28	2007	0.31	0.38	-0.07
	2008	3.62	2.15	1.47		2008	1.47	8.25	-6.79		2008	38.03	20.20	17.83
	2009	3.14	-1.06	4.21		2009	-20.64	-5.68	-14.96		2009	2.41	-5.02	7.43
	2010	14.76	3.03	11.73		2010	31.79	0.02	31.77		2010	-15.86	-7.90	-7.95
	2011	-11.46	0.12	-11.58		2011	-1.34	-0.53	-0.82		2011	-0.59	2.42	-3.00
	2012	-2.20	0.15	-2.34		2012	2.20	0.63	1.57		2012	1.25	-0.22	1.47
20	2007	13.36	3.10	10.27	25	2007	9.20	1.58	7.61	29	2007	6.54	2.73	3.81
	2008	-9.92	-0.76	-9.16		2008	6.20	0.98	5.22		2008	8.19	-0.20	8.40
	2009	6.64	-1.62	8.26		2009	-8.42	-1.30	-7.11		2009	-1.66	-0.56	-1.10
	2010	1.83	1.95	-0.12		2010	7.05	-0.54	7.59		2010	16.24	2.67	13.57
	2011	1.41	-1.35	2.76		2011	0.26	-0.70	0.97		2011	-10.96	-1.88	-9.08
	2012	17.47	1.90	15.56		2012	-0.91	0.52	-1.43		2012	-3.70	1.16	-4.86
22	2007	10.05	1.31	8.74	26	2007	3.10	-2.23	5.34	30	2007	8.82	0.26	8.56
	2008	5.81	0.33	5.48		2008	16.46	2.07	14.39		2008	2.47	-0.10	2.57
	2009	-4.52	-1.12	-3.41		2009	12.72	1.04	11.68		2009	2.47	0.36	2.11
	2010	4.83	2.31	2.53		2010	16.37	1.25	15.12		2010	8.19	0.31	7.88
	2011	4.71	-1.23	5.93		2011	7.57	0.57	7.00		2011	10.43	0.56	9.86
	2012	-2.34	0.79	-3.13		2012	11.17	0.94	10.23		2012	4.24	-0.17	4.42

5. RESULTS

**Table 10. Regression Results:
Industry-level Decomposition of TFP Growth associated with Imported Inputs**

Dependent variable:	Contribution of imported inputs		Excluding contribution of imported inputs	
	(1)	(2)	(3)	(4)
(TFP growth) _{st}	0.195 *** (0.024)	0.199 *** (0.023)	0.805 *** (0.024)	0.801 *** (0.002)
(TFP growth) _{st} × (2009/2010 Dummy) _t		-0.021 (0.064)		0.021 (0.064)
Sector FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	132	132	132	132
Adj R squared	0.669	0.644	0.967	0.967

Note: The dependent variable is contribution of imported inputs to TFP growth (columns (1)-(2)) or TFP growth excluding contribution of imported inputs (columns (3)-(4)) in sector *s* in year *t*. Independent variable is TFP growth in sector *s* in year *t*. Columns (2) and (4) include additional independent variables, a dummy variable equal 1 for years 2009 and 2010 and 0 otherwise (not reported), and its interaction with TFP growth. Coefficients in columns (1) and (3) or columns (2) and (4) sum to 1. All columns include year and sector fixed effects. Robust standard errors are in parenthesis. Significance: * 10 percent; ** 5 percent; *** 1 percent.

- ◆ At industry level, 20% of variation in TFP growth is explained by the use of imported inputs

5. RESULTS

Table 7. Decomposition of Aggregate TFP Growth associated with Imported Inputs (%)

Year	TFP growth due to imported inputs	Contribution of unweighted average	Contribution of Covariance term	Intra-firm efficiency	Inter-firm efficiency
	(a)=(b)+(c)	(b)	(c)=(d)+(e)	(d)	(e)
2007	-25.97	3.92	-29.88	-30.97	1.09
2008	69.93	3.38	66.55	60.78	5.77
2009	-31.11	1.09	-32.20	-39.31	7.10
2010	3.78	14.03	-10.25	-12.28	2.55
2011	12.57	-6.72	19.29	10.28	9.01
2012	3.10	4.94	-1.84	-10.16	8.32

Notes: TFP growth due to imported input in column (a) is the sum of contributions from the unweighted average TFP due to imported inputs in column (b) and the covariance term in column (c), with the latter further decomposed into intra-firm efficiency improvement in column (d) and inter-firm efficiency improvement in column (e). Specifically, each column is calculated as:

$$(a) = (\hat{\beta}_{impf_t} - \hat{\beta}_{impf_{t-1}}) / \hat{\beta}_{impf_{t-1}}; (b) = (\hat{\beta}_{imp} \Delta \bar{f}_{it}) / \hat{\beta}_{impf_{t-1}}; (c) = \Delta \sum_i h_{it} \cdot (\hat{\beta}_{impf_{it}} - \hat{\beta}_{imp\bar{f}_{it}}) / \hat{\beta}_{impf_{t-1}};$$

$$(d) = \sum_i h_{it-1} \cdot \Delta (\hat{\beta}_{impf_{it}} - \hat{\beta}_{imp\bar{f}_{it}}) / \hat{\beta}_{impf_{t-1}}; (e) = \sum_i \Delta h_{it} \cdot (\hat{\beta}_{impf_{it}} - \hat{\beta}_{imp\bar{f}_{it}}) / \hat{\beta}_{impf_{t-1}}$$

5. RESULTS

Table 9. Industry-level Decomposition of TFP Growth associated with Imported Inputs (%)

Industry	Year	TFP growth due to imported inputs	Contribution of unweighted average	Contribution of covariance term	Intra-firm efficiency	Inter-firm efficiency	Industry	Year	TFP growth due to imported inputs	Contribution of unweighted average	Contribution of covariance term	Intra-firm efficiency	Inter-firm efficiency
		(a)=(b)+(c)	(b)	(c)=(d)+(e)	(d)	(e)			(a)=(b)+(c)	(b)	(c)=(d)+(e)	(d)	(e)
10	2007	0.36	6.42	-6.06	-10.36	4.30	25	2007	43.75	18.95	24.80	16.78	8.01
	2008	46.93	4.39	42.53	16.89	25.65		2008	20.56	10.45	10.11	-28.00	38.11
	2009	-16.38	-0.34	-16.04	-23.87	7.83		2009	-24.04	-5.12	-18.92	-16.19	-2.74
	2010	57.49	6.56	50.93	40.67	10.26		2010	-12.04	27.77	-39.81	-51.90	12.09
	2011	1.73	-2.90	4.63	-1.12	5.75		2011	-19.12	-34.70	15.58	15.40	0.18
	2012	1.76	2.78	-1.02	-19.87	18.85		2012	17.35	12.74	4.62	-22.00	26.62
20	2007	46.50	9.22	37.28	32.67	4.61	28	2007	7.59	10.77	-3.18	-10.96	7.78
	2008	-8.77	-2.99	-5.78	-8.46	2.68		2008	372.89	28.40	344.48	-14.12	358.60
	2009	-18.61	6.05	-24.67	-37.00	12.33		2009	-27.04	-0.93	-26.11	-26.95	0.84
	2010	29.29	21.70	7.59	-1.69	9.29		2010	-59.80	6.01	-65.81	-97.16	31.35
	2011	-15.93	-12.02	-3.91	-1.59	-2.32		2011	38.26	-10.61	48.88	6.91	41.97
	2012	27.15	6.38	20.76	31.67	-10.91		2012	-2.49	10.37	-12.86	-15.95	3.09
22	2007	16.57	11.18	5.39	2.08	3.31	29	2007	59.00	11.94	47.06	41.68	5.38
	2008	4.00	5.71	-1.71	-28.23	26.52		2008	-2.94	4.22	-7.17	-28.08	20.91
	2009	-13.59	-8.52	-5.07	-5.44	0.37		2009	-9.01	-0.07	-8.94	-12.35	3.41
	2010	31.03	12.94	18.08	-13.67	31.76		2010	46.64	7.20	39.43	-0.72	40.15
	2011	-13.22	4.38	-17.61	-22.14	4.54		2011	-26.02	0.70	-26.72	-46.59	19.87
	2012	10.31	1.21	9.10	-15.29	24.38		2012	19.40	2.43	16.98	15.08	1.90
24	2007	-57.43	-0.76	-56.67	-55.28	-1.39	30	2007	11.67	6.60	5.07	2.97	2.10
	2008	144.36	4.95	139.41	139.92	-0.51		2008	-4.32	20.82	-25.14	-31.14	6.00
	2009	-41.26	-1.96	-39.29	-57.09	17.80		2009	16.99	0.13	16.86	22.85	-5.99
	2010	0.16	9.97	-9.80	10.36	-20.16		2010	12.94	26.64	-13.70	-27.84	14.14
	2011	-6.81	-5.16	-1.65	-3.90	2.26		2011	22.17	-0.80	22.97	15.13	7.84
	2012	8.60	13.41	-4.81	-4.98	0.17		2012	-6.07	11.47	-17.54	-17.97	0.42

5. RESULTS

**Table 11. Regression Results:
Industry-level Decomposition of TFP Growth associated with Imported Inputs**

Dependent variable:	Contribution of unweighted average		Contribution of covariance term		Intra-firm efficiency		Inter-firm efficiency	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(TFP growth due to imported inputs) _{st}	0.134 *** (0.035)	0.118 ** (0.048)	0.866 *** (0.035)	0.882 *** (0.048)	0.455 *** (0.133)	0.319 ** (0.127)	0.411 *** (0.134)	0.563 *** (0.133)
(TFP growth due to imported inputs) _{st} × (2009/2010 Dummy) _t		0.053 (0.080)		-0.053 (0.080)		0.435 ** (0.183)		-0.488 *** (0.154)
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	132	132	132	132	132	132	132	132
Adj R squared	0.339	0.342	0.899	0.900	0.502	0.557	0.586	0.655

Note: The dependent variable is contribution of unweighted averages to TFP growth due to imported inputs (columns (1)-(2)), contribution of covariance term to TFP growth due to imported inputs (columns (3)-(4)), intra-firm efficiency improvement (columns (5) and (6)) or inter-firm efficiency improvement in sector *s* in year *t*. Independent variables is TFP growth due to imported inputs in sector *s* in year *t*. Columns (2), (4), (6), and (8) include additional independent variables, a dummy variable equal 1 for years 2009 and 2010 and 0 otherwise (not reported), and its interaction with TFP growth due to imported inputs. Coefficients in columns (1) and (3) or columns (2) and (4) sum to 1, while coefficients in columns (5) and (7) or columns (5) and (8) sum to coefficients in columns (3) or (4). All columns include year and sector fixed effects. Robust standard errors are in parenthesis. Significance: * 10 percent; ** 5 percent; *** 1 percent.

- ◆ During the GFC, larger importers with large market shares were mainly responsible for a decline in TFP due to imports

6. IMPLICATION & FUTURE WORK

- ◆ **Identified a role of imported inputs in aggregate TFP**
 - Firm-level estimates
 - Industry-, and aggregate-level accounting
 - Policy roles for supporting intermediate inputs imports over business cycles

- ◆ **A possible link between the global productivity slowdown** (Eichengreen, Park, and Shin, 2015) **and the global trade slowdown** (Constantinescu, Mattoo, and Ruta, 2015)
 - Two issues have been separately receiving great attention from recent policy discussions. A study that quantifies the potential effect of the latter on the former via the imported inputs channel would be particularly relevant in this context.

Thank you



Table A1. Industry Classification (Korean Standard Industry Classification (KSIC))

Industry Code	Description
10	Food Products
11	Beverages
12	Tobacco Products
13	Textiles, Except Apparel
14	Wearing apparel, Clothing Accessories and Fur Articles
15	Tanning and Dressing of Leather , Luggage and Footwear
16	Wood Products of Wood and Cork ; Except Furniture
17	Pulp, Paper and Paper Products
18	Printing and Reproduction of Recorded Media
19	Coke, hard-coal and lignite fuel briquettes and Refined Petroleum Products
20	Chemicals and chemical products except pharmaceuticals, medicinal chemicals
21	Pharmaceuticals, Medicinal Chemicals and Botanical Products
22	Rubber and Plastic Products
23	Other Non-metallic Mineral Products
24	Basic Metal Products
25	Fabricated Metal Products, Except Machinery and Furniture
26	Electronic Components, Computer, Radio, Television and Communication Equipment and Apparatuses
27	Medical, Precision and Optical Instruments, Watches and Clocks
28	Electrical equipment
29	Other Machinery and Equipment
30	Motor Vehicles, Trailers and Semitrailers
31	Other Transport Equipment
32	Furniture
33	Other manufacturing

