The TPP's Effect on Creating New Knowledge and Technology : Firm-level Evidence from Trade and FDI

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Estimating the TPP's effects

- Kawasaki (2013,RIETI)

→ Computable General Equilibrium (CGE) model of global trade

→ The income gains of the APEC economies as a whole would account for 1.2% of regional GDP from TPP.

- Li and Whalley (2012,NBER)

→ Numerical five-country (China, US, Japan, other TPP countries, and rest of world) global general equilibrium model

→ Japan's joining TPP would benefit both Japan and all other TPP countries, but negative effects on non-TPP countries; If China joins in TPP, it will increase all TPP countries' gain.

- Petri and Plummer (2012,PIIE)

→ CGE model and estimating FDI liberalization

→ If Japan and Korea take part in the TPP, Japan's GDP in 2020 would be about 2% larger.

- These estimates are based on macroeconomic models and focus on the direct effects of the TPP.

→ The TPP lowers barriers for trade and FDI

→ increasing export and investment→ increasing domestic production

- However, the TPP will not only temporarily increase GDP but also contribute to economic growth in the long run by sustainably promoting domestic innovation and technological improvement through globalization including trade and FDI.
- These growth effects of the TPP are not fully recognized (Todo,2013,RIETI).

→ The TPP's effect on creating new knowledge and technology is important.

The channels/mechanisms for creating new knowledge and technology

- Learning by exporting
- Knowledge spillovers from inward FDI
- Other channels:

Technology transfer through import etc.

Learning by Exporting
empirical evidence:

- Kimura and Kiyota (2006,RWE) for the case of Japan

→ a firm's TFP increases by 2.4% when it starts to export, by 1.8% when it starts to conduct FDI.

- Du, Lu, Tao, and Yu (2012,CER) for the case of China

→ domestic firms displayed significant productivity gains upon export entry.

→ the productivity gains were more pronounced in high- and medium-technology industries than in low-technology ones.

- Blalock and Gertler (2004,JIE) for the case of Indonesia
- De Loecker (2007,JIE) for the case of Slovenia.

Kimura and Kiyota (2006,RWE) for the case of Japan

Table 4: *Effects of Exports and FDI on TFP Growth*

	Dependent variable: Annual average TFP growth (percent) All firms					
	Without controlling for "convergence" effect			With controlling for "convergence" effect		
	(1)	(2)	(3)	(4)	(5)	(6)
Export dummy	−0.20			2.41***		
	(0.24)			(3.86)		
FDI dummy		−0.69			1.83**	
		(0.74)			(2.57)	
FDI & export dummy			−0.31			3.91***
			(0.25)			(4.14)
FDI only dummy			−2.19*			1.84*
			(1.74)			(1.91)
Export only dummy			−0.76			2.39***
			(0.86)			(3.52)
ln TFP (initial TFP level)				−87.87***	−87.86***	−87.88***
				(263.69)	(263.66)	(263.69)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Initial TFP level	No	No	No	Yes	Yes	Yes
N	121,825	121,825	121,825	121,825	121,825	121,825
R^2	0.02	0.02	0.02	0.43	0.43	0.43

***, **, and * indicate level of significance at 1, 5, and 10 percent, respectively. Figures in parentheses indicate z-statistics.
Note: Fixed-effect model is used for estimation. Estimated coefficients indicate the gaps of the growth rate between exporters/firms that engage in FDI and other firms.

Source: METI database.

Du, Lu, Tao and Yu (2012,CER) for the case of China

Table 9
Industry-level productivity gains of domestic exporters.

Two-digit industry	Tech level	Immediate TFP gains	Cumulative TFP gains	Maximum TFP gains
Pharmaceuticals	High	√-	√	7.2%
Electronic and communication equipment	High		√	4.9%
Chemical materials and products	Medium-high	√	√	5.7%
Chemical fiber	Medium-high		√	6.3%
General machinery manufacturing	Medium-high	√	√	5.0%
Special equipment manufacturing	Medium-high	√	√	7.1%
Transport equipment	Medium-high	√	√	6.2%
Electrical machinery and apparatus	Medium-high		√	3.4%
Instruments and meters and office machines	Medium-high	√	√	4.5%
Petroleum processing and coking	Medium-low			–
Rubber products	Medium-low		√-	4.9%
Plastics products	Medium-low	√		6.8%
Non-metallic mineral products	Medium-low		√-	2.2%
Black metal smelting and processing	Medium-low	√	√	4.5%
Non-ferrous metal smelting and processing	Medium-low		√	3.2%
Metal products	Medium-low		√	2.6%
Food processing	Low			–
Food production	Low			–
Beverage manufacturing	Low			–
Tobacco processing	Low			–
Textile	Low	√-	√	5.9%
Apparel and other textile products	Low			–
Leather, fur, and coat products	Low			–
Wood processing, and other wood products	Low		√-	6.7%
Furniture	Low			–
Paper making and paper products	Low			–
Printing and recording media reproducing	Low			–
Stationery and sporting goods	Low	√	√	5.2%
Other manufacturing	Low			–

Notes: The above manufacturing industries are at 2-digit industry level. Technology levels are classified according to OECD 2007 technology classification of manufacturing industries. "Immediate TFP gains" refer to receiving productivity gains in the first year of exporting ($s=0$). "Cumulative TFP gains" refer to receiving productivity gains in the second or subsequent years of exporting ($s=1, 2, 3, 4$). "√" and "√-" denote significance at 5% and 10% level, respectively.

Knowledge spillovers from inward FDI

empirical evidence:

- Todo (2006,JAE) for the case of Japan

→ R&D stocks of foreign firms increase productivity of Japanese firms through knowledge spillovers.

- Lin, Liu, and Zhang(2009,CER) for the case of China

→ FDI has generated beneficial vertical spillover effects to Chinese domestic firms.

- Javorcik (2004,AER) for the case of Lithuania
- Haskel, Pereira, and Slaughter (2007,RESts.) for the case of United Kingdom

Todo (2006,JAE) for the case of Japan

Table 4
Estimation of production function

Variable	Description	Dependent variable: log of value added			
		(1) OLS	(2) IV	(3) OLS	(4) IV
ln K	Log of capital stocks	0.240 (0.008)**	0.253 (0.017)**	0.239 (0.008)**	0.245 (0.008)**
ln L	Log of labor	0.767 (0.012)**	0.749 (0.020)**	0.764 (0.012)**	0.753 (0.014)**
ln R	Log of R&D stocks	0.042 (0.003)**	0.046 (0.004)**	0.043 (0.003)**	0.048 (0.003)**
SHARE	Market share	0.969 (0.138)**	2.079 (2.176)	1.817 (0.177)**	2.034 (0.314)**
ln K^F	Log of industry capital stocks of foreign firms	0.008 (0.006)	0.041 (0.039)		
ln K^D	Log of industry capital stocks of domestic firms	−0.077 (0.087)	0.945 (1.955)		
ln R^F	Log of industry R&D stocks of foreign firms			0.027 (0.009)**	0.058 (0.021)**
ln R^D	Log of industry R&D stocks of domestic firms			0.266 (0.061)**	0.343 (0.106)**
Length of the lag between the dependent and independent variables		1 year	None	1 year	None
Observations		21,404	18,151	21,404	18,151
R-squared		0.94	0.94	0.94	0.94

Note: Standard errors are in parentheses. ** and * signify statistical significance at the 1% and 5% levels, respectively. Industry and year dummies are included in all specifications. Industries are defined at the 3-digit level. The excluded instruments in the IV estimations are the first lags of the endogenous regressors.

Lin, Liu and Zhang(2009,CER) for the case of China

Table 5

Baseline regression II.

	Dependent variable: lnTFP			
	Fixed effect	Random effect	Fixed effect	Random effect
Horizontal	−0.086	−0.091	−0.106	−0.109
	(0.079)	(0.167)	(0.078)	(0.168)
Forward	4.560***	2.799***	4.563***	2.892***
	(0.305)	(0.484)	(0.300)	(0.482)
Backward	1.357***	1.329***	1.268***	1.305***
	(0.100)	(0.212)	(0.096)	(0.211)
CR8			−0.292***	−0.215***
			(0.027)	(0.064)

Notes: this table reports the estimation results of Eq. (7). Numbers in parentheses are standard errors corrected for sector/year clustering. Total number of observations is 1,048,386. *Denotes statistical significance at the 0.10 level. **Denotes statistical significance at the 0.05 level. ***Denotes statistical significance at the 0.01 level.

Conclusion

- The TPP has a large trade creation effect.
- The TPP's effect on creating new knowledge and technology is not negligible.
- From the point of view of firms, the TPP alone is not sufficient. To Japan, EPAs with China, Korea, and the European Union (EU) are equally important.

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