The exchange rate and the performance of Japanese firms: a preliminary analysis using firm-level panel data

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ESRI International Conference July 31, 2015

Introduction

* In order to pull the Japanese economy out of prolonged deflation and stagnation, the Prime Minister, Shinzo Abe, introduced a set of policies in December 2012 summarily referred to as ‘Abenomics.’

* Abenomics consists of three arrows: unconventional monetary policy (the first), expansionary fiscal policy (the second), and economic growth strategies to encourage private investment (the third arrow).

* The first two of the ‘three arrows’ were implemented quickly, while the third arrow (structural reforms) is in the process of implementation and expected to take time before effects appear.

* The stock and foreign exchange markets reacted very favorably to the new policy. The real economy (Japan’s macro fundamentals) is also showing some signs of improvement.

Introduction (cont.)

* While markets tend to react favorably when they expect a recovery in terms of macro fundamentals, the timing of events since the introduction of Abenomics suggests that the improvements in Japan's macro fundamentals likely are the result of the market response rather than the other way around.

* The purpose of our presentation today is to investigate the effects of exchange rate changes (one of the two market reactions mentioned above) on the performance of Japanese firms.

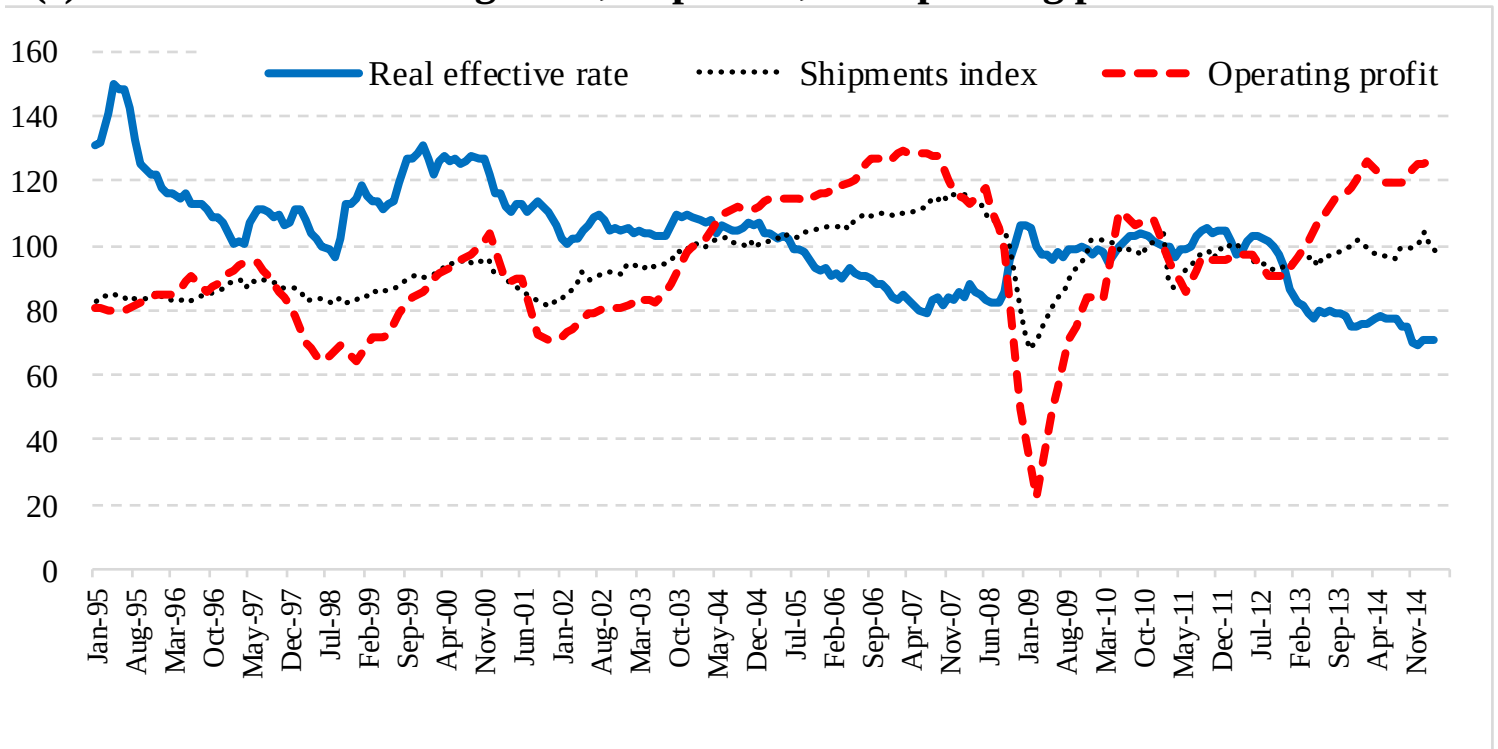
* In a zero interest rate environment, in which traditional ways to directly influence the course of the economy through monetary policy are not necessarily available, currency depreciation turns out to be the most tangible channel through which to stimulate private business activity.

Introduction (cont.)

- Despite the historical fact that developments in Japan's economy are closely linked with trends in the exchange rate of the yen, not everyone welcomes a weaker yen, with some arguing that it makes it difficult for smaller firms mainly serving the domestic market to pay for more expensive foreign goods.

Figure 1. Developments in macroeconomic indicators for Japan (2010=100)

1(c) Real effective exchange rate, shipments, and operating profit

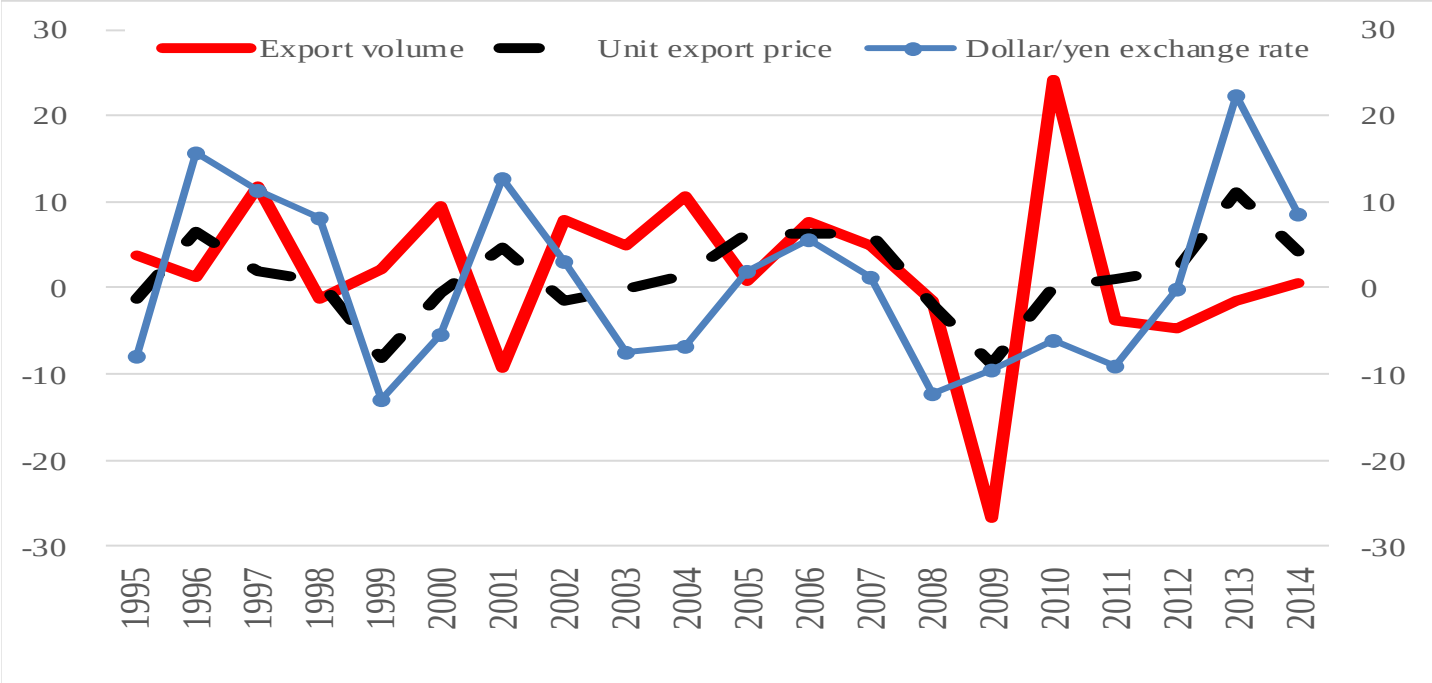


Introduction (cont.)

* Some argue that even export firms are not benefitting much, since many of them have shifted substantial parts of their production overseas.

* Although only time will tell, many economists expect that the volume of exports by Japanese firms will not increase very much, since they have not cut their export prices in dollar terms (raise them in yen terms) despite the falling value of yen.

Figure 2. Annual percent changes in the dollar/yen exchange rate and trade indicators



Introduction (cont.)

* Against this background, our presentation today presents the results of a fact finding study examining the effects of exchange rate changes on the performance of firms in Japan.

* Based on a large firm-level panel dataset of 359,000 non-financial firms (2.2 million total observations) in Japan from FY1994 to FY2013, we try to answer the following questions:

i) Is it correct to assume that the effects of a yen depreciation on Japanese firms are in general positive? Or is it only exporting firms that benefit?

ii) Do the effects differ depending on firms' characteristics? And if so, how?

iii) Does the observed pattern hold true even for firms in recent years?

iv) How are any changes in the effect of exchange rate changes related to the globalization (e.g. increasing overseas activities) of Japanese firms?

Datasets and summary statistics

* To examine the effects of exchange rate changes on the performance indicators (sales growth & ROA) of Japanese firms from the mid-1990s to FY2013, we used the following two firm-level panel datasets:

* *Basic Survey of Japanese Business Structure and Activities* (*BSBSA*)

  The Ministry of Economy, Trade and Industry (METI) conducts this survey once a year to acquire a quantitative understanding of the actual conditions and activities of Japanese enterprises, and to obtain basic data for the implementation of industrial policies. The survey each year covers about 30,000 enterprises with 50 or more employees and paid-in capital of over 30 million yen. We were able to obtain the *BSBSA* microdata from 1994 to 2012.

* *Orbis database*

  Orbis is a product of Bureau van Dijk Electronic Publishing, a world leading firm of private company information, and contains information on over 160 million companies worldwide. We were able to obtain the information on Japanese firms in *Orbis* (roughly about 200,000 firms every year) from 2004 to March 2014.

Datasets and summary statistics (cont.)

* While *Orbis* has the advantage that it provides a larger sample and more recent coverage, it goes back only to the mid-2000s and does not cover detailed information on firms' global activities such as their international trade, overseas operations, etc.

* To take advantage of the *BSBSA*'s long coverage (from the mid-1990s) and the rich information on firms' global activities, we basically use the *BSBSA* microdata to analyze the performance of large and medium-sized firms.

* We use the *Orbis* database simply to extend the sales and ROA data to FY2013 and to widen the coverage of our analysis to include small firms (with fewer than 50 employees), assuming that smaller firms' international trade and overseas operations were negligible.

* The number of observations examined is roughly 2.2 million, covering 359,000 firms in total, which consist of 46,000 (large and medium-sized) firms in the *BSBSA* and 314,000 (small) firms in *Orbis*. The basic statistics of the sample are reported in Table 1.

Datasets and summary statistics (cont.)

Table 1-1. Sample statistics (Levels)

		Total number of observations *BSBSA + Orbis*	(Total number of firms)	Sample of large and medium-sized firms from the *Basic Survey of Japanese Business Structure and Activities (BSBSA)* FY1994-FY2013 Obs.	Mean	Median	S.D.	Sample of small firms from *Orbis* (Bureau Van Dijk Database) FY2005-FY2013 Obs.	Mean	Median	S.D.
■ Number of regular employees											
Total Sample		2,202,265	(359,535)	508,301	338	127	1,334	1,693,964	12	8	11
By firm size:	Large (300 or more employees)	107,270	(8,324)	107,270	1,139	545	2,756				
	Medium (50 to 299 employees)	401,031	(37,556)	401,031	124	101	72				
	Small (fewer than 50 employees)	1,693,964	(313,655)	n.a.	n.a.	n.a.	n.a.	1,693,964	12	8	11
By industry:	Manufacturing	380,626	(42,718)	246,452	381	128	1,683	134,174	20	18	13
	Wholesale and retail	411,392	(54,250)	177,089	255	120	573	234,303	15	11	12
	Construction	1,118,086	(204,794)	8,263	278	121	654	1,109,823	9	6	9
	Other	292,161	(57,773)	76,497	401	140	1,367	215,664	14	10	13
■ Amount of sales (million yen)											
Total Sample		2,239,123	(359,641)	514,745	23,940	4,987	187,502	1,724,378	463	172	1,750
By firm size:	Large (300 or more employees)	108,303	(8,324)	108,303	88,043	24,429	401,316				
	Medium (50 to 299 employees)	406,442	(37,556)	406,442	6,858	3,677	14,945				
	Small (fewer than 50 employees)	1,724,378	(313,761)	n.a.	n.a.	n.a.	n.a.	1,724,378	463	172	1,750
By industry:	Manufacturing	384,783	(42,720)	249,877	21,462	3,817	148,750	134,906	651	399	1,225
	Wholesale and retail	414,733	(54,256)	179,064	30,453	7,972	252,695	235,669	1,263	556	3,814
	Construction	1,129,100	(204,844)	8,285	15,589	4,908	62,362	1,120,815	272	125	924
	Other	310,507	(57,821)	77,519	17,773	3,199	118,532	232,988	465	176	1,460
■ Operating profit (million yen)											
Total Sample		2,232,004	(359,571)	507,616	722	93	7,987	1,724,388	8	2	74
By firm size:	Large (300 or more employees)	107,163	(8,310)	107,163	2,811	585	17,122				
	Medium (50 to 299 employees)	400,453	(37,500)	400,453	163	67	964				
	Small (fewer than 50 employees)	1,724,388	(313,761)	n.a.	n.a.	n.a.	n.a.	1,724,388	8	2	74
By industry:	Manufacturing	381,338	(42,714)	246,430	837	90	9,389	134,908	17	5	134
	Wholesale and retail	412,976	(54,254)	177,307	426	96	2,527	235,669	18	4	108
	Construction	1,129,102	(204,844)	8,283	448	97	2,872	1,120,819	3	1	28
	Other	308,588	(57,759)	75,596	1,072	99	11,169	232,992	15	3	119

Datasets and summary statistics (cont.)

* To examine the situation in 2013 (i.e., after the start of Abenomics) with preceding years, Figure 3 presents kernel densities of the distributions of performance indicators by year (4th quarter).

* The estimated distributions indicate that in terms of firms' sales growth (from the previous year) and ROA, 2013 was among the best years in the past decade. On the other hand, the level of firms' sales has only just recovered from the slump in the wake of the global financial crisis.

* Comparing the performance of firms with different characteristics, i.e., large and medium-sized firms vs. small firms, and firms inside vs. firms outside large cities, we found that even small firms and firms outside large cities are doing well under Abenomics.

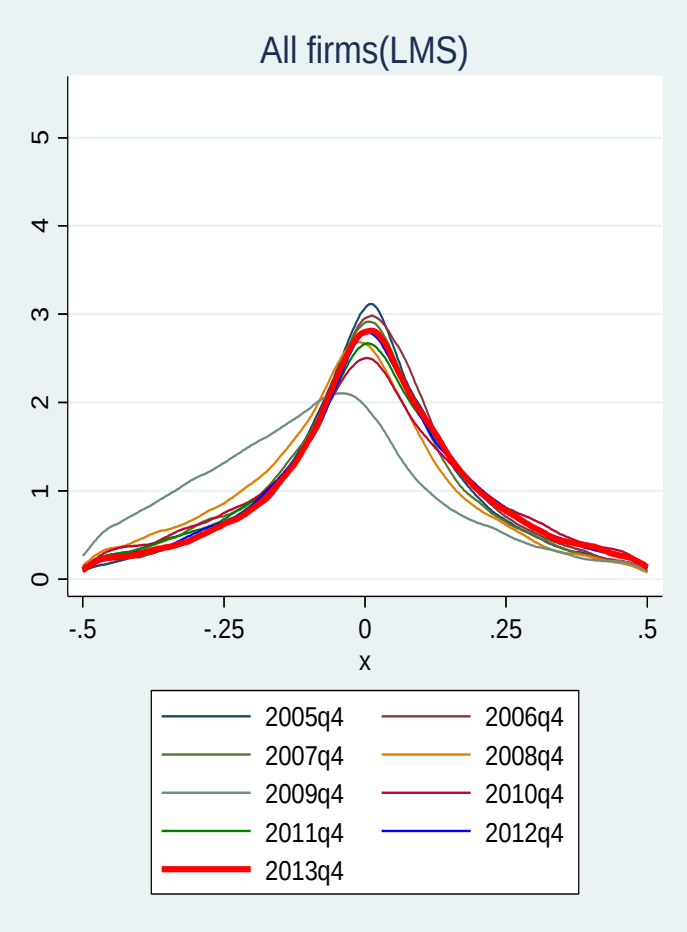
* In order to more formally investigate the causes of the observed favorable business conditions, we run microdata-based reduced-form regressions in the following sections.

Datasets and summary statistics (cont.)

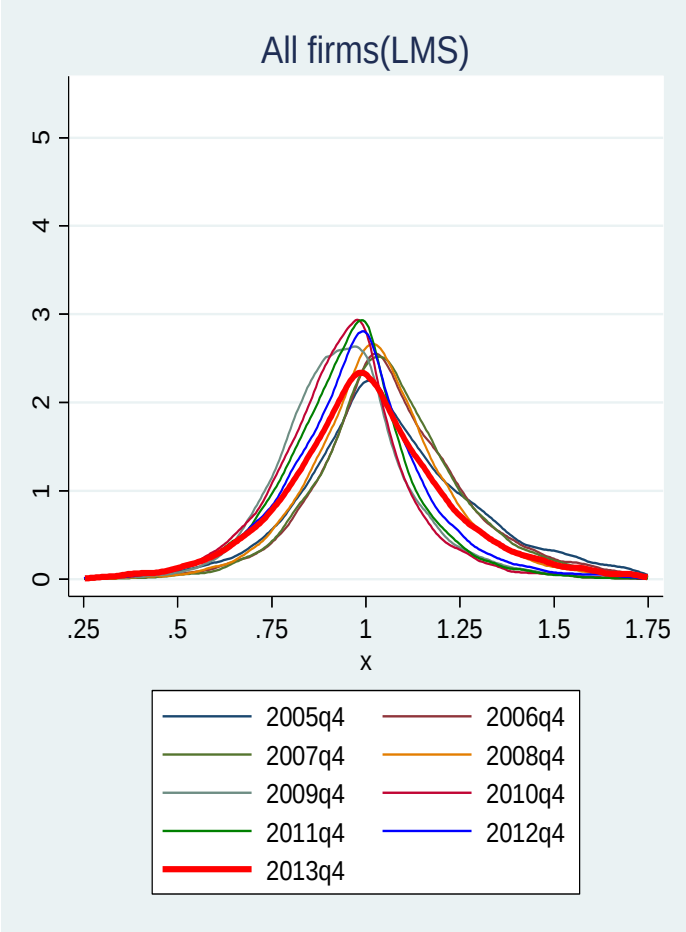
Figure 3. Kernel density of performance indicators by year (4th quarter)

3.1 All observations

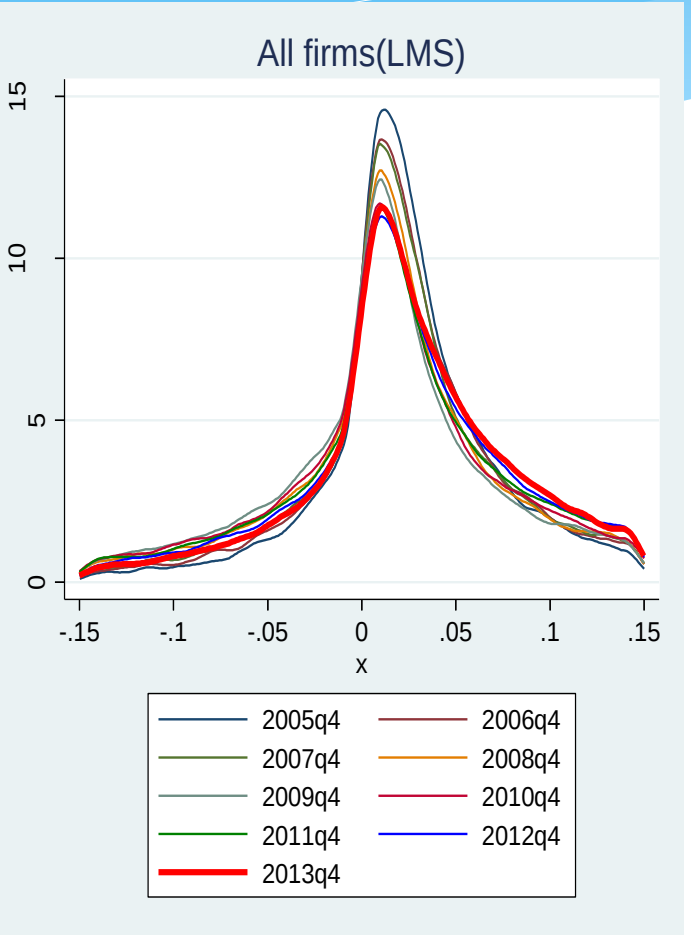
Sales growth



Sales (level)



ROA



Empirical specification

To empirically examine the impact of exchange rate changes on firms' performance, we run the following reduced-form regressions for firm performance variable *z*, where *z* is either the log of firms' sales or ROA:

$$\Delta z_{i,t} = \alpha + \sum_{k=0,12} \beta_{1,k} \Delta \ln EER_{t-k}$$
$$+ \sum_{k=0,12} \beta_{2,k} \Delta \ln EER_{t-k} * ((X_i - M_i)/S_i) * TSDum_i + \sum_{k=0,12} \beta_{3,k} \Delta \ln EER_{t-k} * ((X_i - M_i)/S_i) * (1 - TSDum_i)$$
$$+ \gamma_1 \Delta \ln DR_{t-12} + \gamma_2 \Delta \ln DU_{t-12}$$
$$+ \gamma_3 \Delta \ln DW_t + \gamma_4 \Delta \ln DW_t * XDum_i + \gamma_5 \Delta \ln DE_t + \gamma_6 \Delta \ln DE_t * XDum_i$$
$$+ \sum_{k=0,12} \rho_{1,k} \Delta \ln POIL_{t-k} + \sum_{k=0,12} \rho_{2,k} \Delta \ln POIL_{t-k} * MDum_i + \varepsilon_{i,t}$$

EER_t is the real effective exchange rate, expressed in terms of foreign currency units per yen, so that an increase in the rate amounts to a yen appreciation.

$(X_i\text{-}M_i)/S_i$ is the size of firm *i*'s trade surplus relative to its sales. We include $TSDum_i$, a dummy variable that takes 1 when firm $(X_i\text{-}M_i)>0$, to allow for asymmetric responses between firms with trade surplus and firms with trade deficit.

Empirical specification (cont.)

* As control variables, we include the annual growth rates of domestic private demand (DR_t), domestic public demand (DU_t), the US and European economies (DW_t), and Asian economies (DE_t), as well as rate of change of the oil price ($POIL_t$). $XDum_i$ and $MDum_i$ are dummy variables that take 1 if firm *i* exports or imports, respectively.

* Therefore, if yen depreciation has a positive effect (after controlling for other factors) on the performance of Japanese firms (regardless of whether they are exporters or importers, or both, or none), the coefficient $\beta_{1,k}$ is expected to be negative.

* If firms with a trade surplus (deficit) are affected positively (negatively) from yen depreciation $\beta_{2,k}$ ($\beta_{3,k}$) is also expected to be negative.

* As for the demand-related control variables, we generally expect that the coefficient γ_j should be positive. While changes in the oil price are expected to have a negative effect ($\rho<0$) on firms' ROA, the effects on sales growth are uncertain, since a higher oil price may cause some increases in sales prices.

Empirical specification (cont.)

* To see whether the effects of exchange rate changes on firms' performance differ across firms with different characteristics, we compare
  (1) Large vs. medium-sized vs. small firms,
  (2) Manufacturing vs. wholesale and retail vs. …

* We also tried the following expanded regressions to check whether the effects of yen depreciation in 2013, under Abenomics, were different from those observed in the past:

$$\Delta z_{i,t} = \alpha + \sum_{k=0,12} \beta_{1,k} \Delta \ln EER_{t-k}$$
$$+ \sum_{k=0,12} \beta_{2,k} \Delta \ln EER_{t-k} * ((X_i - M_i)/S_i) * TSDum_i + \sum_{k=0,12} \beta_{3,k} \Delta \ln EER_{t-k} * ((X_i - M_i)/S_i) * (1 - TSDum_i)$$
$$+ \beta_4 \Delta \ln EER_t * D2013_t$$
$$+ \beta_5 \Delta \ln EER_t * ((X_i - M_i)/S_i) * TSDum_i * D2013_t$$
$$+ \beta_6 \Delta \ln EER_t * ((X_i - M_i)/S_i) * (1 - TSDum_i) * D2013_t$$
$$+ \cdots + \varepsilon_{i,t}$$

β_4 , β_5 and β_6 will be significant if the patterns in 2013 were different.

Empirical specification (cont.)

We will further examine the relationship between the effects of exchange rate changes and the global activities of Japanese firms. More specifically, we will check

1) how the profits (in foreign currency terms) of firms' overseas business are reflected in the performance of Japanese firms;

2) how the accelerating shift to overseas production is changing the pattern of (exporting) Japanese firms' gains from yen depreciation.

Findings (1): General evaluation

* The results of our baseline regression are reported in Table 2.

We first run the regression using the sample of large and medium-sized firms from the *BSBSA*, about 450,000 observations (45,000 firms).

We also run regressions using an extended dataset with smaller firms from the *Orbis* database, about 1.7 million observations (350,000 firms).

* Despite the difference in sample size between the *BSBSA* dataset and the extended dataset, the obtained parameters generally look very similar for the two datasets.

Findings (1): General evaluation (cont.)

Table 2. Effects of exchange rate and control variables on the performance of Japanese firms

	Dep: Sales growth ($\Delta \ln S_{i,t}$)		Dep: $\Delta ROA_{i,t}$	
	BSBSA (FY1995-FY2013)	*BSBSA* (FY1995-FY2013) plus small firms in *Orbis* (FY2005-FY2013)	*BSBSA* (FY1995-FY2013)	*BSBSA* (FY1995-FY2013) plus small firms in *Orbis* (FY2005-FY2013)
Annual changes in real effective exchange rate (G_REER $_t$)	-0.121 ***	-0.129 ***	-0.010 ***	-0.006 ***
G_REER $_{t-12}$	-0.017 ***	0.037 ***	0.013 ***	0.022 ***
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.627 ***	-0.377 ***	-0.152 ***	-0.112 ***
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.520 ***	-0.840 ***	0.010	-0.017
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.396 ***	0.123	-0.192 ***	-0.231 ***
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	0.012	0.347 ***	0.058 ***	0.081 ***
Annual growth of private demand $_{t-12}$	0.126 ***	0.291 ***	-0.056 ***	0.040 ***
Annual growth of public demand $_{t-12}$	0.252 ***	0.508 ***	0.011 ***	0.032 ***
US and European GDP growth $_t$ (G_WEST $_t$)	0.397 ***	0.611 ***	0.051 ***	0.071 ***
G_WEST $_t$ × Exporting firm dummy $_i$	0.775 ***	0.526 ***	0.075 ***	0.046 ***
Asian GDP growth $_t$ (G_ASIA $_t$)	0.453 ***	0.118 ***	0.060 ***	0.018 ***
G_ASIA $_t$ × Exporting firm dummy $_i$	-0.143 ***	-0.099 ***	-0.008 ***	0.003
Annual changes in oil price (G_OILP $_t$)	0.045 ***	0.031 ***	0.001	-0.001
G_OILP $_{t-12}$	0.014 ***	0.022 ***	-0.004 ***	-0.003 ***
Importing firm dummy $_i$ × G_OILP $_t$	0.024 ***	0.042 ***	0.004 ***	0.006 ***
Importing firm dummy $_i$ × G_OILP $_{t-12}$	-0.011 ***	-0.021 ***	-0.004 ***	-0.009 ***
Number of observations	445,343	1,728,948	378,151	1,306,343
Pseudo R2	0.032	0.011	0.008	0.002

Notes: Coefficients are from median regressions. Regressions also include 1997 VAT dummy and a constant.
*** (** / *) indicates the coefficient is significantly different from zero at the 1 (5 / 10) % level.

Findings (1): General evaluation (cont.)

* The parameters obtained follow the expected patterns in general.
* As for the effects on "Sales growth,"

i) the sales of Japanese firms (regardless of whether they are exporters or importers, or both, or none)increase significantly when the yen depreciates ($\beta_{1,k} < 0$);

a 10% depreciation of the yen results in a 1.3% increase in firms' sales;

ii) the positive effects of a yen depreciation are significantly larger not only for firms with a trade surplus ($\beta_{2,k} < 0$) but also for firms with a trade deficit ($\beta_{3,k} > 0$);

iii) the demand-related control variables enter the sales regression as expected ($\gamma_j > 0$);

iv) an oil price increase leads to an increase in Japanese firms' sales ($\rho > 0$), probably due to some sales price increases.

Findings (1): General evaluation (cont.)

* As for the effects on "ROA,"

i) the ROA of Japanese firms increases in the year that the yen depreciates ($\beta_{1,0} < 0$);
a 10% depreciation of the yen results in a roughly 0.1% increase in firms' ROA;

ii) while the (positive) effect in the year of yen depreciation is significantly larger for firms with a trade surplus ($\beta_{2,k} < 0$) , that for firms with a trade deficit is significantly smaller or even turns to negative ($\beta_{3,k} < 0$);

iii) the demand variables enter the ROA regressions positively ($\gamma_j > 0$) ;

iv) an oil price increase leads to a lower ROA of Japanese firms ($\rho < 0$), as expected.

Findings (2): Comparison by size

* Table 3 reports the results of the regressions by firm size.

* While we see some minor differences between large and medium-sized firms, the estimated coefficients look generally the same as those reported in Table 2 (our baseline result).

* However, the coefficients for small firms are quite different from those for the larger firms.

  Among other things, 1) the positive effects of a yen depreciation look grossly negligible for small firms, and 2) the sales of small firms are negatively affected by an increase in the oil price.

Findings (2): Comparison by size (cont.)

Table 3. Effects of exchange rate and control variables on the performance of Japanese firms by firm size

	Dep: Sales growth ($\Delta \ln S_{i,t}$)			Dep: $\Delta ROA_{i,t}$		
	BSBSA (FY1995-FY2013)		*Orbis* (FY2005-FY2013)	*BSBSA* (FY1995-FY2013)		*Orbis* (FY2005-FY2013)
	Large firms	Medium-sized firms	Small firms	Large firms	Medium-sized firms	Small firms
Annual changes in real effective exchange rate (G_REER $_t$)	-0.110 ***	-0.122 ***	-0.009 †††	-0.021 ***	-0.007 *** †††	-0.001 †††
G_REER $_{t-12}$	-0.033 ***	-0.012 ***	0.011 ** †††	0.022 ***	0.010 *** †††	0.030 *** †††
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.739 ***	-0.544 ***		-0.187 ***	-0.112 *** ††	
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.546 ***	-0.411 ***		-0.010	0.023	
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.286 **	0.452 ***		-0.165 ***	-0.213 ***	
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.250 **	0.080		0.029	0.072 ***	
Annual growth of private demand $_{t-12}$	0.156 ***	0.131 ***	0.106 ***	-0.075 ***	-0.050 ***	0.051 *** †††
Annual growth of public demand $_{t-12}$	0.236 ***	0.260 ***	-0.053 ** †††	-0.017 ***	0.018 *** †††	-0.007
US and European GDP growth $_t$ (G_WEST $_t$)	0.656 ***	0.348 *** †††	2.391 *** †††	0.062 ***	0.048 ***	0.179 *** †††
G_WEST $_t$ × Exporting firm dummy $_i$	0.526 ***	0.820 *** †††	1.680 *** †††	0.063 ***	0.080 ***	0.174 *** †††
Asian GDP growth $_t$ (G_ASIA $_t$)	0.520 ***	0.432 ***	-1.338 *** †††	0.078 ***	0.054 ***	-0.081 *** †††
G_ASIA $_t$ × Exporting firm dummy $_i$	-0.173 ***	-0.141 ***	-0.174 ***	-0.002	-0.009 ***	-0.030 *** †††
Annual changes in oil price (G_OILP $_t$)	0.024 ***	0.050 *** †††	-0.036 *** †††	0.002	0.001	-0.004 *** †††
G_OILP $_{t-12}$	0.015 ***	0.014 ***	-0.014 *** †††	-0.004 ***	-0.003 ***	-0.003 ***
Importing firm dummy $_i$ × G_OILP $_t$	0.036 ***	0.021 *** ††	0.057 *** †††	0.005 ***	0.003 ***	0.004 ***
Importing firm dummy $_i$ × G_OILP $_{t-12}$	-0.008 ***	-0.013 ***	-0.003	-0.006 ***	-0.004 ***	-0.008 ***
Number of observations	95,764	349,579	1,283,605	83,424	294,727	928,192
Pseudo R2	0.039	0.030	0.010	0.015	0.007	0.001

Notes: Coefficients are from median regressions. Regressions also include a 1997 VAT dummy and a constant.

*** (** / *) indicates the coefficient is significantly different from zero at the 1 (5 / 10) % level. ††† (†† / †) indicates the coefficient is significantly different from that for large firms at the 1 (5 / 10) % level.

Findings (3): Comparison by industry

* Table 4 reports the results of the regressions by industry (and firm size).

* The positive sales effects of a weaker yen are most pronounced for large/medium-sized (exporting) manufacturing firms. However, positive sales effects can also be observed for large/medium-sized firms in other industries and small firms in non-manufacturing industries.

* While the ROA of exporting large/medium-sized firms are affected positively by yen depreciation, those of importing firms are sometimes affected negatively, and the ROA gains for small firms look largely negligible.

Findings (3): Comparison by industry (cont.)

Table 4. Effects of exchange rate on the performance of Japanese firms by industry

	BSBSA (FY1995-FY2013): Large firms & medium-sized firms				*Orbis* (FY2005-FY2013) Small firms			
	Manufacturing	Wholesale & retail	Construction	Others	Manufacturing	Wholesale & retail	Construction	Others
Dep: Sales growth ($\Delta \ln S_{i,t}$)								
Annual changes in real effective exchange rate (G_REER $_t$)	-0.150 ***	-0.122 *** ††	-0.186 ***	-0.085 *** †††	0.095 ***	-0.002 †††	-0.049 *** †††	-0.018 * †††
G_REER $_{t-12}$	-0.052 ***	0.033 *** †††	0.086 ** †††	-0.024 *** †	-0.117 ***	-0.098 ***	0.069 *** †††	-0.023 *** †††
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.673 ***	-0.481 ***						
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.264 ***	-0.887 *** †††						
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.391 ***	0.405 ***						
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.239 *	0.220 *** ††						
Annual growth of private demand $_{t-12}$	-0.103 ***	0.209 *** †††	0.859 *** ††	0.347 *** †††	0.069	-0.024	0.151 *** †††	-0.097 **
Annual growth of public demand $_{t-12}$	0.191 ***	0.252 ***	0.361 *** †††	0.337 *** ††	0.250 ***	0.225 ***	-0.086 ** †††	-0.374 *** †††
Number of observations	219,182	154,633	7,041	64,487	101,916	181,272	837,866	162,551
Pseudo R2	0.043	0.030	0.029	0.021	0.032	0.025	0.008	0.005
Dep: $\Delta ROA_{i,t}$								
Annual changes in real effective exchange rate (G_REER $_t$)	-0.023 ***	-0.003 *** †††	-0.016 **	-0.001 †††	-0.003	0.002	-0.002	-0.010 ***
G_REER $_{t-12}$	0.013 ***	0.011 ***	0.012 *	0.021 *** ††	0.040 ***	0.010 *** †††	0.037 ***	0.031 *** ††
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.187 ***	-0.072 *** †††						
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	0.028 *	-0.063 *** ††						
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	-0.249 ***	-0.175 *** †						
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	0.078 **	0.054 ***						
Annual growth of private demand $_{t-12}$	-0.147 ***	-0.017 *** †††	0.004 †††	0.034 *** †††	0.008	-0.002	0.084 *** †††	0.006
Annual growth of public demand $_{t-12}$	0.014 ***	0.011 ***	-0.052 *** ††	0.018 **	0.001	0.010	-0.014 **	-0.016
Number of observations	188,761	131,849	5,934	51,607	76,000	137,679	604,908	109,605
Pseudo R2	0.014	0.008	0.004	0.003	0.006	0.003	0.002	0.001

Notes: Coefficients are from median regressions. Regressions also include the same control variables as in the regressions reported in Tables 2.

*** (** / *) indicates the coefficient is significantly different from zero at the 1 (5 / 10) % level. ††† (†† / †) indicates the coefficient is significantly different from that for manufacturing firms at the 1 (5 / 10) % level.

Findings (4): Effects in 2013

* Table 5 reports the regression results examining whether the impact of yen depreciation in 2013 differed from that in the past.

* We find (in Table 5(*a*)) a negative and significant coefficient ($\beta_4 < 0$) on the cross-term, which potentially suggests that the positive impact of a yen depreciation was larger in 2013. However, it is also possible that Japanese firms performed well in 2013 for other reasons that are not controlled in our reduced-form regressions.

We tried various alternative regressions to exclude the effects of other factors such as the surge in demand before the consumption tax rate increase in April 2014 and increases in public spending under Abenomics (see Table 5(*b*)), but the estimated coefficient β_4 is not greatly affected.

Findings (4): Effects in 2013 (cont.)

Table 5. Effects of exchange rate on the performance of Japanese firms in 2013. (*BSBSA* sample only)

	Dep: Sales growth (⊿ln *Si,t*)					Dep: ⊿*ROAi,t*				
	All industries	Manufacturing	Wholesale & retail	Construction	Others	All industries	Manufacturing	Wholesale & retail	Construction	Others
5(*a*) Results based on the sample until the end of FY2013.										
Annual changes in real effective exchange rate (G_REER $_t$)	-0.069 ***	-0.098 ***	-0.072 *** †	-0.084 ** ††	-0.057 *** ††	-0.003 ***	-0.015 ***	0.001 †††	-0.008	0.006 ** †††
G_REER $_{t-12}$	-0.024 ***	-0.062 ***	0.027 *** †††	0.060 *	-0.023 *** ††	0.012 ***	0.012 ***	0.011 ***	0.008	0.020 *** ††
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.810 ***	-0.811 ***	-0.537 ***			-0.159 ***	-0.195 ***	-0.047 ** †††		
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.487 ***	-0.251 ***	-0.943 *** †††			0.010	0.031 **	-0.065 *** ††		
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.388 ***	0.197	0.456 ***			-0.188 ***	-0.243 ***	-0.169 *** †		
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	0.038	-0.188	0.233 *** †			0.061 ***	0.081 **	0.055 ***		
2013FY Dummy $_t$ × G_REER t	-0.143 ***	-0.150 ***	-0.146 ***	-0.286 *** †††	-0.067 *** †††	-0.021 ***	-0.025 ***	-0.014 *** †††	-0.037 ***	-0.017 ***
2013FY Dummy $_t$ × Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	0.594 ***	0.424 ***	0.248			0.037	0.071 **	-0.099 ** †		
2013FY Dummy $_t$ × (1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.100	0.435 *	-0.136			-0.010	-0.038	0.002		
Number of observations	445,343	219,182	154,633	7,041	64,487	378,151	188,761	131,849	5,934	51,607
Pseudo R2	0.033	0.044	0.031	0.031	0.021	0.009	0.015	0.009	0.005	0.003
5(*b*) Results based on the sample excluding the 4th quarter of FY2013.										
Annual changes in real effective exchange rate (G_REER $_t$)	-0.068 ***	-0.1 ***	-0.070 *** †	-0.085 **	-0.056 *** †	-0.003 ***	-0.015 ***	0.002 * †††	-0.008	0.006 ** †††
G_REER $_{t-12}$	-0.016 ***	-0.05 ***	0.034 *** †††	0.063 * ††	-0.020 ** †	0.013 ***	0.012 ***	0.012 ***	0.009	0.020 *** ††
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	-0.809 ***	-0.81 ***	-0.54 ***			-0.159 ***	-0.195 ***	-0.046 ** †††		
Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_{t-12}$	-0.483 ***	-0.25 ***	-0.9 *** †††			0.011	0.032 **	-0.065 *** ††		
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.396 ***	0.187	0.454 ***			-0.187 ***	-0.239 ***	-0.170 ***		
(1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_{t-12}$	0.038	-0.184	0.234 *** †			0.060 ***	0.078 **	0.054 ***		
2013FY Dummy $_t$ × G_REER $_t$	-0.055 ***	-0.07 ***	-0.04 ***	-0.258 *** †	-0.031	-0.015 ***	-0.022 ***	-0.004 ††	-0.036 ***	-0.012 **
2013FY Dummy $_t$ × Trade surplus firm dummy $_i$ × Trade surplus ratio $_i$ × G_REER $_t$	0.846 ***	0.596 ***	0.694 *			0.107 **	0.165 **	-0.090		
2013FY Dummy $_t$ × (1 -Trade surplus firm dummy $_i$) × Trade surplus ratio $_i$ × G_REER $_t$	0.092	0.510	-0.239			-0.083	-0.055	-0.052		
Number of observations	433,696	213,929	150,609	6,816	62,342	370,596	185,492	129,124	5,781	50,199
Pseudo R2	0.032	0.044	0.029	0.028	0.020	0.009	0.015	0.009	0.004	0.003

Notes: Coefficients are from median regressions. Regressions also include the same control variables as in the regressions reported in Tables 2.

*** (** / *) indicates the coefficient is significantly different from zero at the 1 (5 / 10) % level.

††† (†† / †) indicates the coefficient is significantly different from that for manufacturing firm at the 1 (5 / 10) % level.

Findings (4): Effects in 2013 (cont.)

* Another finding is that the positive effects of yen deprecation on the performance (sales growth, ROA) of firms with a trade surplus in 2013 were significantly smaller ($\beta_5 > 0$) than in previous years.

* The smaller gain from yen depreciation for exporting firms is consistent with our macro-based finding that the export volume overall has not increased much in 2013 despite yen depreciation.

* In sum, while Japanese firms appear to have been favorably affected by the depreciation of the yen in 2013, the channel through which they did so seems to have shifted away from the classical boost to export.

Findings (5): Exchange rate effects and globalization

* Finally, Table 6 reports the results examining the relationship between the effects of exchange rate changes and the globalization of Japanese firms.

* We first extended our regression specification to include cross-terms to see whether the positive effect of yen depreciation is larger for firms with overseas business establishments.

* Yen depreciation is expected to have a positive effect on the sales and profits of Japanese firms with overseas business, since the yen value of their overseas sales and profits increases with a depreciation of the yen.

* The results reported in Table 6(*a*) support this conjecture; at the same time, the effect of yen depreciation remains positive even after controlling for this factors (and even for firms without exports).

Findings (5): Exchange rate effect and globalization (cont.)

Table 6. Firms' global activities and the effects of exchange rate changes (*BSBSA* sample only)

	Dep: Sales growth (⊿ln *Si,t*)			Dep: ⊿*ROAi,t*		
	All industries	Manufacturing	Wholesale & retail	All industries	Manufacturing	Wholesale & retail
6(*a*) Is the positive effects of yen depreciation larger for firms with overseas business establishments?						
Annual changes in real effective exchange rate (G_REER *t*)	-0.115 ***	-0.141 ***	-0.118 *** †	-0.009 ***	-0.020 ***	-0.002 ** †††
G_REER *t-12*	-0.011 ***	-0.048 ***	0.040 *** †††	0.013 ***	0.013 ***	0.012 ***
Trade surplus firm dummy *i* × Trade surplus ratio *i* × G_REER *t*	-0.518 ***	-0.569 ***	-0.473 ***	-0.134 ***	-0.168 ***	-0.048 ** †††
Trade surplus firm dummy *i* × Trade surplus ratio *i* × G_REER *t-12*	-0.558 ***	-0.383 ***	-0.748 ***	-0.019	-0.008	-0.043 *
(1 -Trade surplus firm dummy *i*) × Trade surplus ratio *i* × G_REER *t*	0.378 ***	0.284 **	0.419 ***	-0.192 ***	-0.245 ***	-0.178 ***
(1 -Trade surplus firm dummy *i*) × Trade surplus ratio *i* × G_REER *t-12*	0.009	-0.188	0.202 ***	0.063 ***	0.082 **	0.042 ***
Overseas business establishments dummy *t* × G_REER *t*	-0.042 ***	-0.044	-0.034 **	-0.003	-0.009 ***	-0.004
Overseas business establishments dummy *t* × G_REER *t-12*	-0.024 **	0.021	-0.066 *** ††	-0.001	0.012 ***	-0.014 *** †††
Overseas business establishments dummy *t*	-0.002 ***	0.002	-0.006 *** †††	-0.000	-0.000	-0.001 **
Number of observations	414,146	200,368	145,618	349,766	171,484	123,614
Pseudo R2	0.030	0.040	0.029	0.008	0.014	0.008
6(*b*) Does the acceralation of overseas transfer lead to the smaller gains through the export channel in 2013?						
2013FY Dummy *t* × G_REER *t*	-0.145 ***	-0.147 ***	-0.149 ***	-0.022 ***	-0.029 ***	-0.014 *** †††
2013FY Dummy *t* × Trade surplus firm dummy *i* × Trade surplus ratio *i* × G_REER *t*	0.719 ***	0.608 ***	0.304	0.006	0.059	-0.122 **
2013FY Dummy *t* × (1 -Trade surplus firm dummy *i*) × Trade surplus ratio *i* × G_REER *t*	-0.048	0.244	-0.255	0.017	-0.007	0.003
Overseas transfer enhancement dummy *i* × 2013FY Dummy *t* × G_REER *t*	0.007	-0.009	-0.005	0.002	-0.001	0.000
Overseas transfer enhancement dummy *i* ×2013FY Dummy *t* × Trade surplus firm dummy *i* × Trade surplus ratio *i* × G_REER *t*	-0.438	-0.303	-0.395	0.027	0.070	0.063
Number of observations	359,621	171,265	129,365	303,332	146,483	109,686
Pseudo R2	0.031	0.041	0.030	0.008	0.014	0.008

Notes: Coefficients are from median regressions. Regressions in Table 6(*a*) include the same controlling variables as those reported in Table 2.
Regressions in Table 6(*b*) also include the same explanatory variables as those included in Table 6(*a*).
*** (** / *) indicates the coefficient is significantly different from zero at the 1 (5 / 10) % level. ††† (†† / †) indicates the coefficient is significantly different from that of manufacturing firm at the 1 (5 / 10) % level.

Findings (5): Exchange rate effects and globalization (cont.)

- We also examined whether the smaller gains for exporting firms in 2013 (reported in Table 5) result from Japanese firms' globalization (i.e., from the transfer of production overseas).

- If the smaller gains for exporting firms in 2013 are due to changes in the behavior of firms that transferred production overseas, the inclusion of a cross-term with a dummy for firms that transferred production should reduce the significant positive coefficient ($\beta_5 > 0$) in Table 5.

- Although the hypothesis that the transfer of production is reducing the gains from yen depreciation has gained wide currency and sounds plausible, our result (the coefficient on the cross-term with the overseas transfer enhancement dummy in Table 6(*b*)) appears not to support it.

- As firm-level export data for 2013 is not yet available, we unfortunately need to wait another year to settle this issue.

Concluding remarks

* The purpose of our presentation today was to examine the effects of exchange rate changes on the performance of Japanese firms, especially in recent years.

* While our results are very preliminary, the findings can be summarized as follows:

(1) The sales growth and ROA of Japanese firms in FY2013 were among the best in the past decade, irrespective of firm size or location of the firm.

(2) Yen depreciation appears to have a positive effect on the performances of Japanese firms through the sales channel in general, and it is large exporting firms that benefit the most as expected.

(3) In contrast, yen depreciation affects ROA of importing firms negatively through the cost channel.

Concluding remarks (cont.)

(4) The firm performance in 2013 is grossly in line with or an extension of the estimated relationship between the yen rate and the performance of Japanese firms in the past 20 years, though our findings on their own cannot substantiate the view that the yen depreciation caused the strong performance.

(5) The positive effect of yen depreciation in recent years probably reflects the increases in the yen value of the sales and profits of overseas business.

(6) The positive effect of yen depreciation on the exporting firms appears to be smaller, for some reason, in 2013, though our analysis do not produce evidence supporting the hypothesis that firms' overseas transfer of production is reducing their gains from yen depreciation

Concluding remarks (cont.)

* The findings reported in our presentation are very preliminary, so further analyses are necessary to arrive at firmer conclusions.

* We first would like to note that our analysis lacks a strong theoretical foundation. Theoretical considerations are necessary to provide a firmer basis for our analysis.

One promising direction would be to examine the relationship between firms' participation in global supply chains and exchange rate effects.

(For this purpose it would be more fruitful to focus on a sample of firms with certain characteristics, while the current study cast its net wider, covering all firms.)

Concluding remarks (cont.)

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* Secondly, our observation period is too short to evaluate the impact of Abenomics. As time goes by, extending our observation period to cover one more year will help to obtain firmer and richer conclusions.

* Finally, it would also be fruitful to conduct similar studies on firms in other countries to draw more general conclusions that apply not only to Japan, but more broadly.