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"Do All Exporters Benefit from Export Boom?
–Evidence from Japan"

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Do All Exporters Benefit from Export Boom?
– Evidence from Japan

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Abstract

We use a large dataset of Japanese manufacturing firms to investigate the effect of the late export boom to the productivity growth and various productivity enhancing investments by exporting firms. We find that large exporters enjoyed significantly higher productivity growth over non-exporters while it was not the case for the small exporters which constitute a large mass of Japanese exporters. We also find striking evidence that only the exporters serving worldwide actually enjoyed significant advantage in productivity growth, and not those that exported only to Asia which corresponds to about 50% of small exporters. On the other hand, we find that both large and small exporters engaged in more intensive innovation activities and capital investments. Therefore, although the late export boom did not reward all exporters in an even way, it did encourage wide range of exporter investments that should enhance their productivity. Export boom is thus the case where exporters build up productivity advantage over non-exporters long after their entry, offering additional explanation on the formation of universally observed exporters' "premium" on productivity level.

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1. Introduction

From the early 2000s to until the end of 2007, the world economy enjoyed a long and steady expansion. Many developing countries such as China enjoyed buoying exports, as well as some advanced countries such as Japan. Japan was in a sense special, for its economic growth has been heavily dependent on exports while its domestic demand such as private consumption and public expenditure remained modest.[1] Such export-led economic growth is considered to have brought substantial advantage to the exporting firms compared to domestic firms. In this paper, we use a large firm level data of Japanese manufacturing firms to evaluate whether the late export boom contributed universally to the development of exporting firms, and if so, through what kind of channel.

Two important issues prompt us to address these questions: first is the fact that, while the exporting itself is a highly selective activity, the major part of export is concentrated to a small group of largest exporters: Bernard et al. (2007) report that 96% of U.S. exports value is concentrated on the top 10% exporters with largest value. For Japan, this value is 92% (Wakasugi et al., 2008). This implies that there exists a large mass of small exporters with each negligible share on total exports, an important fact that has not been granted much attention. One aim of this paper is to clarify whether the export boom rewards those smallest exporters in a same way as it does the large exporters. To our knowledge there are no studies that compared the effect of export boom across exporters with different export size.[2]

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[1] While the average annual growth of Japan's real GDP during the latest economic expansion from 2002 to 2007 was 2.1%, the contribution of net export was 0.8% points, exceeding that of private consumption which was 0.7% points.(Author's calculation from the System of National Account, Cabinet Office)

[2] As it will be shown, those small exporters are mostly also small in firm size. Our analysis is related to Hsu and Chen (2000) who compared the effect of export intensity on the labor productivity between Taiwanese SMEs and large firms, or Salomon and Shaver (2005) testing the contribution of export volume on Spanish firms' innovation. There are also quite a few studies on the effect of exporting on SME's performance, but those studies often limit their scope to SMEs.

Secondly, it is widely recognized that exporting firms have on average higher productivity compared to non-exporting firms. Numerous works have explored this "exporters' premium". Works such as Roberts and Tybout (1997) Melitz (2003), Helpman, Melitz and Yeaple (2004) emphasized the mechanism where most productive firms self-select into exporting and foreign investment. Other branch of research such as Clerides, Lach and Tybout (1998), Aw, Chung and Roberts (2000), De Loecker (2007) assessed the effect of exports in promoting firms' development right after the entry, often described as "learning-from-exporting". However, those studies have mostly focused their attention on the entrants to export market, despite the fact that the majority of actual exporters are firms with long export experience.[3] While the extensive margin is no doubt an important source of export dynamics, it is unlikely that the apparent difference in productivity level between exporters and non-exporters is solely formed by a handful of entrants. However, previous studies reported surprisingly little evidence of established (or "continuous") exporters growing faster than non-exporters. For example, Bernard and Jensen (1999) and Silvente (2005) reported that while entering firms often experience higher productivity growth, such advantage tends to die out rather quickly. Damijan and Kostevc (2006) attributed such short life of post-entry advantage on the increase in capacity utilization due to the acquisition of export demand. Export boom, on the other hand is most likely a period where those continuous exporters experience higher productivity growth against non-exporters, and thus further exporters' premium is formed. To confirm this point, we specifically observe the productivity growth of continuous exporters -not the entrant, during the late export boom.

In case the faster productivity growth by established exporters during the export boom is solely due to the stronger external demand, exporters' premium should fade once the boom is gone. If on the other hand, export boom also promotes essential efforts that raise their productivity, the

[3] For example, in 2005, more than 70% of Japanese manufacturing exporters had 3 or more years of export experience.(Authors' Calculation)

premium that is formed during the boom may be lasting. For example, learning-from-exporting, whether it is a transfer of advanced technology from foreign buyer (Grossman and Helpman, 1991) or a feedback from foreign consumer that contributes to new product development (Salomon, 2006), is likely to require longer term to realize than temporary rise of capacity utilization. For example, Salomon and Shaver (2005) found that exporting promote the patent application of Spanish firms the most with a lag of three years. Also, recent studies such as Ederington and McCalman(2008), Lileeva and Trefler (2007) assert that exporters are more likely to make investments that improve their productivity than non-exporters because of the larger demand captured through cost reduction. The steady export expansion during the boom allows sustained contact with foreign market thus provides favorable environment for learning. Also better prospect of export demand is likely to promote various kinds of forward-looking investments. In order to identify such possible effect by the export boom, we observe several productivity enhancing investments and efforts made by the continuous exporters with comparison to non-exporters.

We estimate the relative advantage of continuous exporters in the productivity growth and expansion of various investments during the period 2002-2005, the first two-third of the export boom. We use difference-and-difference (DID) method where we regard the continuous export participation within this period as the treatment. Our analysis is based on different perspective as previous studies that tested the effect of exporting on firm's growth, in a sense that we are interested in identifying the effect of export boom and not of entering exporting activity.

We find that the late export boom did reward the continuous exporters with significantly higher productivity growth than non-exporters. The export boom also promoted exporters to invest more zealously in skill up-grade, capital investment and R&D activities. However, when we separate the sample of continuous exporters between large exporters and small exporters, we only observe such advantage on productivity growth for large exporters with weaker significance. On the other

hand we still observe for both large and small exporters significantly higher innovation efforts than non-exporters. In order to understand the lack of significant premium on productivity growth by small exporters, we refine our analysis by observing such premium by the markets exporters serve. We find striking evidence that only the continuous exporters that served worldwide (Asian, Western and other regions) enjoyed significantly higher productivity growth. Other exporters, such as those serving only Asian region- comprising 46% of all small exporters- were not rewarded significant advantage. The effect of the export boom in promoting R&D activities had been more general, although its magnitude is markedly larger for exporters serving wider destinations and it was not significant for those serving only Asian region. We therefore conclude that the late export boom did benefit the established exporters in Japanese manufacturing sector, but such benefits were fairly concentrated to those processing highly globalized supply chain. Our results provide new explanation on the formation of the widely observed exporters' advantage on productivity level and important policy implication for internationalization of firms and their development strategy.

In the next section, we conduct a simple statistical observation on the distribution of Japanese exporters and some of their characteristics in the late export boom. The empirical framework is presented in Section4 and its result in Section 5. Section 6 concludes.

2. Statistical Observation of Japanese Exporters

This section describes the structure of Japan's exports and characteristics of exporters during the late export boom. The data used in this analysis and in our empirical analysis as well is *The Basic Survey of Japanese Business Structure and Activities (Kigyo Katsudo Kihon Chosa)* conducted annually by the Ministry of Economy, Trade and Industry (METI). This dataset covering enterprises with more than 50 employees or capital amount larger than 10 million yen has been used for numerous works studying the effect of internationalization on Japanese firms. We use firm level information between 2002 and 2005, a period roughly equivalent to the two third of the export boom.

Wakasugi et al.(2008) show using the same dataset that top 10% of largest exporters export about 92% of Japan's manufacturing exports. It is also reported that such concentration of export value into very few largest exporters is a quite common phenomenon, thus crowned the name of "the Happy Few" by Mayer and Ottaviano (2008). On the other hand, this implies that there exists a large mass of exporters each with very small export value. For example in 2005, while 344 firms (8.2% of all manufacturing exporters) with largest export values exported 90% of total manufacturing exports, 2532 firms (60.5% of all exporters) with smallest export value comprised only 1% of total exports. Whether or not this mass of small exporters benefit in a same way as the "Happy Few" through exporting has important policy implication, but has not been clarified so far.

Table 1 compares the characteristics of the largest 344 exporters comprising 90% of exports versus the smallest 2532 exporters comprising 1% of total exports. It can be seen that smallest exporters are on average smaller in firm size, its sales and employment markedly smaller than average exporters. For this reason, we infer the performance of those smallest exporters by observing the subsample of small and medium firms (SMEs) often defined as firms with less than

300 employees by the *Small and Medium Enterprises Basic Law (Chusho Kigyo Kihon Hou)*. We admit this is fairly arbitrary as often is the definition of small firms in many literatures. In 2002, this definition covers more than 75 % of the smallest exporters comprising 1% of total manufacturing exports.

Table 1. Comparison of Largest 344 exporters and Smallest 2532 exporters

Let us now look at the characteristics of exporters during the late export boom as comparison to the non-exporters. Those exporters are again continuing exporters who have exported all though this period and do not include entrants and exiting firms.

We start by constructing several variables of interest which we will be observing the effect of export boom. Beside the real sales that we obtain by deflating the nominal sales with the industry level output deflator from JIP 2006 Database developed by the Research Institute of Economy, Trade and Industry (RIETI),[4] we construct two measures of productivity: the total factor productivity (TFP) and labor productivity. Whereas the latter is obtained by dividing the real value added by total employment, TFP is calculated using the method of Olly and Pakes (1996) which corrects the bias estimates of input coefficients that are endogenous of firm's unobserved productivity.

As for firms' various investments, we observe the skill intensity defined as the weight of headquarter workers on total employment with respect to the claim by Bustos (2005), that exporters should have higher skill-intensity associated with adoption of advanced technology.[5] We also observe capital investment and per capita real Capital stock. Previous studies such as Aw, Roberts and Winston (2007) report dynamic interaction between exporting and R&D investment and their

[4] For explanations regarding JIP 2006 Database, see http://www.rieti.go.jp/en/database/d05.html.
[5] Headquarter workers are those engaged in administrative matters and can be regarded as non-production workers often used in indices that capture skill intensity (Bernard and Jensen,1999) .

complementary role in productivity growth. We observe real R&D investments and R&D intensity defined as ratio of R&D investment to real sales in order to infer exporters' innovation efforts.[6]

Table2. Mean Value Comparison between exporters and non-exporters (2002-2005)

Table 2 lists the mean value of those variables for exporters and non-exporters during the late exports boom. We can see from the top panel that exporters have been on average larger in sales and employment, have higher productivity, and more skill and capital intensive, consistent to the empirical regularity reported by many previous studies. Exporters are also more intensive in R&D activity. When we compare the change of those characteristics during the export boom, exporters achieved on average 5.6% higher growth of sales and 12.2% higher growth of TFP or 7.4% higher growth of labor productivity. Exporters have remarkably higher growth in capital investment. Their skill and capital intensity also saw higher raise, although not as conspicuous. On the other hand, exporters' R&D investment growth turns out to be lower than that of that of non-exporters as well as their rise in intensity.

The middle and lowest panel of Table 2 display the mean value for large and medium firms with 300 or more employees and small exporters with less than 300 employees. While exporter's advantage in productivity growth is more pronounced for small exporters, their advantage on the efforts that are likely to contribute to higher productivity is more obvious for large and medium firms especially for capital investment which records 65% higher growth! Although exporters' growth of R&D investments and raise of R&D intensity are lower than those of non-exporters, we also note that their absolute level is distinctively larger than non-exporters for any firm sizes. It may be necessary to control for initial value when conducting this kind of comparative evaluation, if

[6] Capital investment, Capital stock and R&D investments are all deflated using industry wise input deflator by JIP2006 Database.

R&D intensity has tendency to converge around optimal level.

The problem with this preliminary comparison of mean value is that it is not comparing apple with apple: it is not taking into account the fact that exporters are fundamentally different from general non-exporters in many way such as their innovative ability. The next section thus conducts more formal analysis to identify exporters' advantage that can be attributed to the late export boom.

3. Empirical Framework and Issues

We estimate the effect of continuous export participation during the late export boom to the productivity and investments using the framework of Difference-in-Difference (DID). An often raised issue in this kind of analysis is that the self-selection of firms with higher productivity into exporting. Such self-selection implies that exporters are fundamentally different from general non-exporters, and it is necessary to control such difference by including adequate covariates to obtain an unbiased effect of continuous export participation. Growing number of studies such as Girma, Greenaway and Kneller (2004) or De Loecker (2007) instead employs Propensity Score Matching (PSM) which replaces such control variables with a probability of exporting. However, as Angrist and Pischke (2008) explain clearly, PSM and regressions with adequate covariates are essentially non-different as a method to match exporters and non-exporters sharing similar characteristics. Based on the comparison of the estimated treatment effect by PSM and regression with control variables, they recommend the regression method as nearly effective as PSM and more standardized approach.

One major merit of PSM is that we can explicitly model the probability of firm entering export. However, such merit is small if we do not have good variables that explain such entry. Unfortunately, this is likely to be the case at least for Japan, for Todo (2009) found that the role of

ex-ante productivity level or employment size-both considered as important determinant of self-selection into export- is decimal in determining the export entry by Japanese firms: even a 50% higher TFP level today will only result in 0.05% higher probability of becoming an exporter next period. On the other hand, entry to export market is heavily determined by firm's unobserved heterogeneity. The attractiveness of PSM is thus fairly limited, not to mention the fact that PSM may not be able to form an adequate control group based on the poorly estimated score. For those reasons, we choose to include factors that are likely to shape the status of continuous exporter and to contribute to productivity growth, directly into our DID regression. This method also proves useful to infer the indirect effect of export boom to productivity growth.

We now model firm level TFP as a function of export participation during the boom and the vector of control variables X_i and unobserved firm heterogeneity η_i . An often mentioned example of such heterogeneity is manager's ability or know-how in oversea business.

$$TFP_{it} = f(EX_i, X_{it}, \eta_i). \quad (1)$$

i and *t* are a firm index and time period index (t=2002, 2005), respectively. $EX_{i,}$ is a dummy variable which is 1 if the firm continued to export from 2002 to 2005, and 0 if the firm never exported during that period, i.e. it remained non-exporter. Vector of controls X_{it} includes the log of number of employee as proxy of firm size, the ratio of non-production workers on total employment as proxy of skill intensity, and per capita knowledge stock. Scale effect, skill intensity and knowledge stock are considered as fundamental factors contributing to the TFP. They are also factors on which significant ex-ante advantage of future exporters over general non-exporters is observed[7]. Knowledge stock is computed from the flow of real R&D investments using the perpetual inventory method

[7] See for example Bernard and Jensen (1999). R&D investments and export participation are shown to go hand-in-hand by Aw, Robert and Winston (2007).

recommended by Grilliches (1979).[8] We construct the initial knowledge stock at 1997 by assuming a constant R&D growth rate identical to the average growth rate between 1997 and 2005, which is 37%. Depreciation rate is assumed to be 15% per year following Todo (2006). All control variables are lagged one year in order to avoid the reverse causality. We make a fairly common assumption that $f(.)$ is an exponential function so that log TFP can be expressed as linear function such as:

$$\ln(TFP_{it}) = \alpha_0 + \alpha_t T + \alpha_{EX} EX_i + \alpha_{EXT} EX_i * T + \alpha_X^{'} X_{it} + \eta_i + u_{it} \quad (2)$$

where *T* is a dummy variable taking 1 in year 2005 and 0 in year 2002. Note that the third term on the right hand side is the exporter's premium on productivity level, which corresponds to the self-selection of firms with higher productivity level into exporters. The fourth term is the subject of our interest, i.e. the effect of being a continuous exporter over time. u_{it} is an error term such that : $E(u_{it}|X_{it}, \eta_i) = 0$. We take the difference of equation (2) between 2005 and 2002 to eliminate the time invariant unobserved firm heterogeneity η_i, we end up with following equation. [9]

$$\Delta TFP = \ln(TFP_{2005}) - \ln(TFP_{2002}) = \alpha_{2005} + \alpha_{EXT} EX_i + \alpha_X^{'} \Delta X_i + \varepsilon_i, \quad (3)$$

where the left hand side is now the growth rate of TFP between 2002 and 2005. The coefficient α_{EXT} on the export continuation dummy measures the premium of TFP growth by continuous exporters during 2002-2005. The third term on the right hand side is the inter-temporal change of control variables $\Delta X_i = X_{i2005} - X_{i2002}$ which partly explains the TFP growth. The last term is an

[8] The contribution of R&D to TFP is often inferred using this method so that the time lag between the past R&D investments and manifesting of their effect to productivity can be taken into account. For example, Hu, Jefferson and Qian (2005) use this method to assess the contribution of buoying R&D investments by Chinese firms to their TFP level.

[9] The self-selection term also disappears when we take difference, since by construction there is no moving sample between non-exporters and exporters.

i.i.d. error term $\varepsilon_i = u_{i2005} - u_{i2002}$. We estimate α_{EXT} by regressing the equation (3) with ordinary least squares (OLS).

Such estimate of α_{EXT} is equivalent to the Difference-in-Differences (DID) estimator defined as follow:

$$\widehat{\alpha_{EXT}} = \mathrm{E}(\ln(TFP_{i2005}) - \ln(TFP_{i2002}) \,|EX_i = 1,\, X_i\,) - \mathrm{E}(\ln(TFP_{i2005}) - \ln(TFP_{i2002}) \,|EX_i = 0, X_i\,) \quad (4)$$

When we actually run regression on equation (3) we include following additional variables to improve our estimations: two digits industry dummy which control industry specific demand or supply-side shock, and the initial productivity level. Inclusion of initial value assumes a productivity convergence across firms, analogous to the convergence across countries and industries explored by Bernard and Jones (1996). Such convergence model is characterized by the reduced form with a negative relationship between productivity growth and initial productivity level. [10] Nishimura, Nakajima and Kiyota (2005), Kimura and Kiyota (2006) find that there is indeed significant convergence effect in productivity growth within Japanese firms.

For estimation of the effect of export boom on firms' various investments, we rum OLS on equations similar to equation 3 this time with firm size (employment level) as control. Initial value and industry dummy are also added. We restrict the samples to those used in the estimation of advantage in productivity growth in order to make the inference consistent. Table 3 provides the Summary Statistics of relevant variables used in estimations.

Table 3. Summary Statistics

[10] See Bernard and Jones (1996) for the complete structure of productivity convergence model.

4. Results and Discussion

We start by reporting the estimated consequence of the late export boom on exporters' productivity. Table 4 presents the estimation result of equation (3). The export boom rewarded exporters with about 5% higher growth of TFP compared to non-exporters once we control for the contribution from firm size, skill intensity and knowledge capital. When we divide the sample between firm sizes, we still observe about 4.5% higher growth for large and medium exporters but with weaker significance. Significant premium on productivity growth is however absent for small exporters, contrary to what we would expect from the previous analysis using mean value. The highly significant exporters' premium is therefore partly due to the larger average firm size by exporters which is allowing them to grow faster. We also note that change in firm size and per capita knowledge stock contribute significantly to TFP growth during this period but not that of skill intensity. The initial TFP level is negatively significant indicating the existence of strong convergence effect. The late export boom does not seem to have rewarded the mass of small exporters like it did the larger exporters.

Table 4. The effect of Export Boom on exporters' TFP growth (Large and Small exporters)

We next test whether the late export boom induced established exporters to engage in various types of investments that are likely to contribute to their long run competitiveness. From Table 5 we see that exporters in fact realized1.5% higher employment growth, 3% points higher rise in skill intensity, 8.5% higher growth of per capita capital stock, and about 40% higher growth of capital investment. While those results are consistent with the previous analysis using mean comparison, we also find that exporters' R&D investment growth in fact was 22% higher than that of

non-exporters once we take into account the effect of firm size and initial level of such investment. In a same token, exporters also realized 0.4% higher rise in R&D intensity. Those results suggest that export boom rewarded something more than increased capacity utilization to exporters, possibly seeds for innovation. From the significant contribution by knowledge stock to productivity growth, we can also conjecture that export boom also contributed indirectly to exporters' productivity growth through promoting R&D. Unlike the case of productivity growth, we more or less observe advantage on those efforts for both large and medium exporters and small exporters.[11]

Table 5. The effect of Export Boom on exporters' efforts (Large and Small exporters)

The weak advantage in productivity growth by the exporters once their firm size is accounted for calls for a finer evaluation of export activity. One useful perspective is the direction of exports. De Loecker (2007), Park et al. (2009) claim that exports directed to countries with high income is associated with higher productivity growth than those directed to developing countries. Exporting to high income countries may induce exporters to upgrade product quality (Verhoogen, 2008). Also, De Loecker and Warzynski (2009) find that exporters supplying high income countries tend to have higher mark-up, which suggests that exports to high income regions have higher value added.

Table 6. Share of Exporters serving Specific Destination

Table 6 dissects the year 2002 exports by large and medium exporters and small exporters by direction. It is apparent that large and medium exporters supply more to Western region (North

[11] Curiously exporters' advantage in skill intensity becomes insignificant once samples are segregated across firms size.

America and Europe) than small exporters, with 43% of them supplying worldwide. Small exporters on the other hand supply mainly to Asia, with 46% of them supplying only to Asia. The fact that almost half of small exporters serve only Asian region where markets are unlikely to require higher quality update compared to Japan's domestic market, may partly explain why they do not enjoy higher productivity growth against domestic firms. It is also likely that exporters supplying only to Asia are mostly providing intermediate goods to Japanese firms' production sites in Asia, thus have small room for learning through interaction with local market.[12]

To evaluate the effect of late export boom by the type of markets exporters were serving, we estimate exporters' advantage on productivity growth over non-exporters separately according to the export destinations classified in Table 6. Specifically, for each of destinations, we construct group of exporters that kept exporting to that destination during the export boom, and compare their productivity growth with that of non-exporters. We however carry out this exercise only for those exporting only to Asia, those exporting only to Western countries, those exporting to both Asian and Western countries, and those exporting worldwide (to all destinations), due to the extreme minority in numbers of exporters exporting mostly to region others than Asian and Western countries. We also consider a group of continuous exporters that switched destinations during this period, which we call "switchers".

Table 7-1. The effect of Export Boom on exporters' TFP growth (by Regions)

Table 7-1 reports the striking finding that only those who supplied worldwide enjoyed significantly higher productivity growth of 9.6% points. Similar results are obtained for both large

[12] Japanese firms are known to have fragmented production network in South East Asian region especially in electronics and general machinery industry. While the share of firms belonging to those two industries in 2002 was 26% for all small exporters, it was 43% for small exporters serving only Asian region.

and medium exporters and small exporters. From Table 7-2 we see that only the small exporters that supplied worldwide enjoyed significant premium of 8.5% higher productivity growth against small non-exporters. Those that switched destinations also marked a premium of 6% but with weaker significance. This concentration of significant advantage on productivity growth to the worldwide supplier regardless of their size indicates that, the difference of performance between large and medium exporters and small exporters can be mainly explained by the fact that 43% of large and medium exporters served all regions in 2002 while only 17 % of small exporters did.

Table 7-2. The effect of Export Boom on exporters' TFP growth (Small firms, by Regions)

On the other hand, we see from Table 8 that exporters serving both Asian and Western region realized 0.4% point higher rise in R&D intensity. The size of such premium is 0.5% point for exporters serving all regions, and less than 0.3% for those that switched export destinations during this period. Exporters supplying only in Asia constituting about half of small exporters, did not experience such effect. Therefore, while the effect of the late export boom to promote exporters' innovation was more general than in case of TFP, it was still limited to those exporting to wider destinations and seems to be stronger for as the destinations increases. To our knowledge, this is the first study that reports this effect of diversified export destinations on the intensity of innovation activity. Note also from Table 7-1 and Table 7-2 that the contribution of knowledge stock to productivity growth is significant for all cases. This implies that the indirect channel through which export boom enhance productivity growth is rather a general phenomenon.

Table 8. The effect of Export Boom on exporters' R&D intensity (by Regions)

To infer the robustness of our result, we apply the same estimation as equation (3) for labor productivity, computed as the real value added divided by total employment, thus not subject to any specific estimation method.[13] We assume similar model as equation (1) for labor productivity except that we add in our control variables per capita capital stock, a primary determinant of labor productivity. As we see from Table 9, we obtain similar result for all sample and two subsamples separated by firm size, and also for sample of small exporters excluding those serving only Asia. The exporters' advantage on labor productivity growth is estimated to be about 1% point lower than that on TFP growth, possibly reflecting exporters' higher increase in employment size. When we estimate exporters' advantage on labor productivity growth by the regions they serve, we find same results as in Table 7 where only those supplying worldwide recorded significant premium (Table 10). Those qualitatively identical results regardless of construction of productivity measure confirm our earlier discussion.

Table 9. The effect of Export Boom on exporters' Labor Productivity growth

(Large and Small exporters)

Table 10. The effect of Export Boom on exporters' Labor Productivity growth

(by Regions)

[13] We have also rerun the estimations with the TFP estimated by the method proposed by Levinsohn & Petrin(2003) and ended up with almost same results.

5. Conclusion

We have used a large dataset of Japanese manufacturing firms to assess whether the late export boom significantly accelerated the productivity growth of established exporters. We find that while large exporters did realize significant advantage in productivity growth, it was not the case for the mass of small exporters. We were also interested in finding out whether the benefit rewarded by the export boom was mainly about the buoying export demand, or something more essential to firms' long run development. Drawing on recent literature on exporting and innovation, we tested whether export boom had promoted higher intensity of innovation efforts as well as faster skill up-grade and capital investment growth. It was indeed found that exporters of all sizes more or less engaged in those efforts more zealously than non-exporters.

In order to understand the lack of significant premium on productivity growth by the small exporters, we also estimated such premium for different exports destinations. We find a striking fact that only those exporting to largest set of destinations (Asia, Western and other regions) were rewarded significant premium in productivity growth regardless of firm size. The disparity in performance between large and small exporters is thus mostly due to the fact that there are more large and medium exporters that supply worldwide than small exporters. On the other hand, we observed that export boom raised the R&D intensity of not only the exporters supplying worldwide but also those supplying in Asia and Western region, as well as those that may have increased serving destinations. However, such effect seems to be stronger for exporters serving wider destinations, and exporters supplying only in Asia which actually constitute about half of small exporters, did not get to experience such effect. This provides a rather grim perspective on the mass of small exporters supplying mainly the vertical production network of highly globalized Japanese firms in Asia.

If we interpret the observed exporters' premium on productivity growth as the temporary demand effect of export boom that increases capacity utilization, and the premium on innovation activity as manifestation of "learning-from-exporting", our result suggests that the late export boom fostered for wide range of exporters including those with small export size, a chance to innovate and strengthen their competitiveness. However, it is also found that it is important to diversify export destinations and possibly include sophisticated markets, in order to capture such benefit of the export boom.

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Table 1. Comparison of Largest 344 exporters and Smallest 2532 exporters (year 2005)

	Largest Exporters Comprising 90% of Total exports	Smallest Exporters Comprising 1% of Total Exports	Exporter Average
Number of firms	344	2532	4186*
Export Value (Million Yen)	125,545	190	11,466
Export/Total Sales (%)	39.2	5.0	13.6
Real Sales (Million Yen)	419,383	9,349	50,853
Number of Employee	4,231	244	685
Capital (Million Yen)	37,137	693	4,561

Source: Authors' calculations based on The Basic Survey of Japanese Business Structure and

*Total numbers of Exporters with more than 50 employees

Table2. Mean Value Comparison between exporters and non-exporters (2002-2005)

All Sample

	Continuous Exporters between 2002 and 2005			Continuous Non-Exporters between 2002 and 2005			(A)-(B)
	2002	2005	Growth (A)	2002	2005	Growth (B)	
Real Sales (Million Yen)	54,718	66,326	17.5	9,928	11,109	11.9	5.6
Log TFP	2.0	2.2	21.4	1.8	1.9	9.2	12.2
Labor Productivity (Million Yen)	9.8	13.6	28.1	7.4	9.0	20.7	7.4
Employment Size (Person)	834	849	1.8	241	243	0.7	1.1
Skill Intensity (%)	43.6	44.0	0.3	28.7	28.6	-0.1	0.4
Real Investment (Million Yen)	2,088	3,241	35.6	532	532	-0.1	35.7
Per capita Capital Stock (Million Yen)	14.7	15.1	2.6	11	11	2.1	0.5
R&D Investment (Million Yen)	3,319	3,657	9.2	219	273	24.3	-15.0
R&D intensity (%)	3.1	2.7	-0.4	1.2	1.1	-0.1	-0.3

Large and Medium Firms

	Continuous Exporters between 2002 and 2005			Continuous Non-Exporters between 2002 and 2005			(A)-(B)
	2002	2005	Growth (A)	2002	2005	Growth (B)	
Real Sales (Million Yen)	116,694	141,141	21.0	43,484	48,526	11.6	9.4
Log TFP	2.2	2.4	21.8	2.0	2.1	14.3	7.5
Labor Productivity (Million Yen)	11.6	16.3	40.7	9.4	12.8	36.3	4.4
Employment Size (Person)	1,687	1,716	1.7	883	878	-0.5	2.2
Skill Intensity (%)	50.8	51.6	0.8	37.5	37.2	-0.3	1.1
Real Investment (Million Yen)	4,476	6,986	56.1	2,748	2,506	-8.8	64.9
Per capita Capital Stock (Million Yen)	20.2	20.9	3.6	18.1	18.3	1.0	2.5
R&D Investment (Million Yen)	6,416	7,097	10.6	788	972	23.4	-12.8
R&D intensity (%)	3.6	3.2	-0.4	1.2	1.1	-0.1	-0.3

Small Firms

	Continuous Exporters between 2002 and 2005			Continuous Non-Exporters between 2002 and 2005			(A)-(B)
	2002	2005	Growth (A)	2002	2005	Growth (B)	
Real Sales (Million Yen)	4,835	6,108	26.3	3,792	4,267	12.5	13.8
Log TFP	1.9	2.1	21.1	1.8	1.9	8.3	12.8
Labor Productivity (Million Yen)	8.3	11.4	37.2	7.1	8.3	17.0	20.2
Employment Size (Person)	147	152	3.1	124	127	2.3	0.8
Skill Intensity (%)	37.8	37.8	0.0	27.1	27.1	-0.1	0.1
Real Investment (Million Yen)	166	226	35.7	127	170	34.2	1.5
Per capita Capital Stock (Million Yen)	10.3	10.5	1.4	9.9	10.2	2.5	-1.1
R&D Investment (Million Yen)	120	134	11.5	48	54	12.6	-1.1
R&D intensity (%)	2.5	2.2	-0.3	1.2	1.1	-0.1	-0.2

Source: Authors' calculations based on The Basic Survey of Japanese Business Structure and Activities

Note: Large and medium firms are firms with 300 or more employees.

Small firms are those with less than 300 employees.

Table 3. Summary Statistics

Variables	*N*	Mean	SD	Min	Max
TFP	3546	1.966	0.470	-1.955	4.802
Employment Size	3546	0.006	0.187	-1.515	1.617
Skill intensity	3546	0.255	17.42	-100	100
Per capita Knowledge stock	3546	0.090	0.474	-1.260	4.993
Investment	3194	0.310	1.232	-5.879	6.430
R&D investment	3257	-0.030	0.910	-6.441	6.289
R&D intensity	3257	-0.275	1.772	-19.28	22.37
Per capita Capital Stock	3546	0.912	2.642	-17.56	29.64
Labor Productivity	3532	0.158	0.430	-2.941	2.525

Note: Except of Skill intensity and R&D intensity, all variables are in log
All variables are difference between 2005 and 2002 value.

Table 4. The effect of Export Boom on exporters' TFP growth (Large and Small exporters)

	All firms	Large and medium firms	Small firms
Dependent Variable: TFP			
Exporter Dummy	0.0565 ***	0.0480 *	0.0286
	(0.0188)	(0.0264)	(0.0260)
Employment Size	0.1145 ***	0.0840	0.1340 **
	(0.0442)	(0.0624)	(0.0589)
Skill intensity	-0.0007	-0.0011 *	-0.0002
	(0.0006)	(0.0007)	(0.0010)
Per capita Knowledge stoc	0.0156 ***	0.0111 *	0.0266 ***
	(0.0054)	(0.0058)	(0.0070)
Initial value TFP_{2002}	-0.2741 ***	-0.2335 ***	-0.3310 ***
	(0.0313)	(0.0438)	(0.0418)
Industry dummy	yes	yes	yes
Intercept	0.5336 ***	0.5504 ***	0.5649 ***
	(0.0590)	(0.0830)	(0.0793)
Ajusted-R^2	0.1649	0.1960	0.1539
N	3546	1429	2117

Note: TFP and Employment Size are in log value.
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%, respectively.
Small exporters corresponds to exporters with less than 300
Large and medium exporters are those with 300 or more employees.

Table 5. The effect of Export Boom on exporters' efforts

	All firms	Large and medium firms	Small firms
Employment Size	0.0187 **	0.0296 **	0.0130
	(0.0074)	(0.0140)	(0.0085)
Skill intensity	2.1898 ***	1.6320	1.2669
	(0.6200)	(1.0833)	(0.7779)
per capita Capital stock	0.0741 ***	0.0455 **	0.0524 **
	(0.0147)	(0.0206)	(0.0211)
Investment	0.3378 ***	0.3945 ***	0.1274 **
	(0.0455)	(0.0620)	(0.0616)
R&D investment	0.1619 ***	0.1176 *	0.1628 ***
	(0.0384)	(0.0663)	(0.0461)
R&D intensity	0.2737 ***	0.2995 ***	0.1933 **
	(0.0645)	(0.0970)	(0.0777)

Note: All values are coefficient on the export dummy where the growth of dependent varables are regressed on export dummy, change in employment Size (except when dep. Var is Employment Size), industry dummy and initial Employment Size, Per capita Knowledge stock, Investment and R&D investment

Numbers in the parentheses are robust standard errors.

***, **, * represent statistical significance at the level of 1%, 5%, 10%, Small exporters corresponds to exporters with less than 300 employees. Large and medium exporters are those with 300 or more employees.

Table 6. The share of exporters serving specific destinatio

	Large and medium	Small
Asia region only	21%	46%
Western region only	5%	9%
Other region only	0%	1%
Asia and Western regions	28%	24%
Western and Other regions	1%	1%
Asia and Other regions	1%	2%
All regions	43%	17%

Source: Authors' calculations based on The Basic Survey of Japanese Business Structure and Activities

Note: Western region consists of European and North American countries.

Table 7-1. The effect of Export Boom on exporters' TFP growth (by Regions)

	(1)	(2)	(3)	(4)	(5)	(6)
	All firms	Asia only	Western only	Asia and Western	All regions	Switched
Dependent Variable: TFP						
Exporter Dummy	0.0565 ***	-0.0094	-0.0643	0.0290	0.0963 ***	0.0402
	(0.0188)	(0.0333)	(0.0570)	(0.0311)	(0.0263)	(0.0282)
Employment Size	0.1145 ***	0.0493	0.0722	0.0760	0.1033 *	0.1094 **
	(0.0442)	(0.0618)	(0.0619)	(0.0577)	(0.0542)	(0.0535)
Skill intensity	-0.0007	-0.0005	-0.0008	-0.0010	-0.0007	-0.0006
	(0.0006)	(0.0006)	(0.0007)	(0.0006)	(0.0005)	(0.0009)
Per capita Knowledge stoc	0.0156 ***	0.0308 ***	0.0327 ***	0.0191 *	0.0190 **	0.0256 ***
	(0.0054)	(0.0078)	(0.0071)	(0.0108)	(0.0081)	(0.0052)
Initial value						
TFP_{2002}	-0.2741 ***	-0.2313 ***	-0.2030 ***	-0.2242 ***	-0.2068 ***	-0.2670 ***
	(0.0313)	(0.0330)	(0.0341)	(0.0353)	(0.0321)	(0.0393)
Industry dummy	yes	yes	yes	yes	yes	yes
Intercept	0.5336 ***	0.4326 ***	0.3951 ***	0.4378 ***	0.4099 ***	0.5227 ***
	(0.0590)	(0.0622)	(0.0615)	(0.0631)	(0.0581)	(0.0706)
Ajusted-R^2	0.1649	0.1331	0.1456	0.1569	0.1587	0.1631
N	3546	2105	1791	2023	2244	2327

Note: TFP and Employment Size are in log value.
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%, respectively.
Small exporters corresponds to exporters with less than 300 employees.
Large and medium exporters are those with 300 or more employees.
In equations (1)-(5), continuous exporters to the indicated destination are compared with non-exporters.
In equation (6), continuous exporters that switched destinations are compared with non-exporters.

Table7-2 . The effect of Export Boom on exporters' TFP growth (Small firms, by Regions)

	(1)	(2)	(3)	(4)	(5)	(6)
	All firms	Asia only	Western only	Asia and Western	All regions	Switched
Dependent Variable: TFP						
Exporter Dummy	0.0286	-0.0392	-0.1057	-0.0298	0.0847 **	0.0612 *
	(0.0260)	(0.0451)	(0.0761)	(0.0499)	(0.0385)	(0.0357)
Employment Size	0.1340 **	0.1515 **	0.1992 ***	0.2127 ***	0.1973 ***	0.1548 **
	(0.0589)	(0.0724)	(0.0671)	(0.0652)	(0.0654)	(0.0617)
Skill intensity	-0.0002	-0.0009	-0.0013	-0.0016 *	-0.0012	-0.0003
	(0.0010)	(0.0008)	(0.0009)	(0.0009)	(0.0008)	(0.0013)
Per capita Knowledge stock	0.0266 ***	0.0328 ***	0.0471 ***	0.0471 ***	0.0438 ***	0.0336 ***
	(0.0070)	(0.0119)	(0.0094)	(0.0094)	(0.0090)	(0.0081)
Initial value						
TFP_{2002}	-0.3310 ***	-0.2791 ***	-0.2567 ***	-0.2912 ***	-0.2442 ***	-0.3080 ***
	(0.0418)	(0.0378)	(0.0376)	(0.0389)	(0.0368)	(0.0498)
Industry dummy	yes					
Intercept	0.5649 ***	0.4669 ***	0.4561 ***	0.5150 ***	0.4352 ***	0.5494 ***
	(0.0793)	(0.0744)	(0.0684)	(0.0703)	(0.0672)	(0.0883)
Ajusted-R^2	0.1539	0.1222	0.1430	0.1531	0.1444	0.1622
N	2117	1521	1302	1394	1411	1560

Note: TFP and Employment Size are in log value.
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%, respectively.
Small exporters corresponds to exporters with less than 300 employees.
Large and medium exporters are those with 300 or more employees.
In equations (1)-(5), continuous exporters to the indicated destination are compared with non-exporters.
In equation (6), continuous exporters that switched destinations are compared with non-exporters.

Table 8. The effect of Export Boom on exporters' R&D intensity (by Regions)

	(1) All firms	(2) Asia only	(3) Western only	(4) Asia and Western	(5) All regions	(6) Switched
Dependent Variable: R&D intensity						
Exporter Dummy	0.2737 ***	0.1058	-0.0198	0.4263 ***	0.5119 ***	0.2756 ***
	(0.0645)	(0.0737)	(0.1724)	(0.1385)	(0.1091)	(0.0989)
Employment Size	0.1257	0.3566 *	0.3396	0.2233	0.1337	0.3240
	(0.1912)	(0.1911)	(0.2088)	(0.2505)	(0.1923)	(0.2109)
Initial value						
R&D intensiy$_{2002}$	-0.2724 ***	-0.3734 ***	-0.4036 ***	-0.3900 ***	-0.2900 ***	-0.2708 ***
	(0.0325)	(0.0398)	(0.0424)	(0.0469)	(0.0372)	(0.0481)
Industry dummy	yes	yes	yes	yes	yes	yes
Intercept	0.2359 ***	0.2625 ***	0.2682 ***	0.2567 ***	0.1906 ***	0.2170 ***
	(0.0584)	(0.0424)	(0.0411)	(0.0437)	(0.0429)	(0.0639)
Ajusted-R^2	0.1938	0.2897	0.3367	0.2936	0.2154	0.1721
N	3257	1892	1589	1814	2029	2085

Note: Employment Size is in log value.
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%, respectively.
In equations (1)-(5), continuous exporters to the indicated destination are compared with non-exporters.
In equation (6), continuous exporters that switched destinations are compared with non-exporters.

Table 9. The effect of Export Boom on exporters' Labor Productivity growth (Large and Small exporters)

	(1) All firms	(2) Large and medium firms	(3) Small firms
Dependent Variable: Labor Productivity			
Exporter Dummy	0.0468 ***	0.0435 *	0.0281
	(0.0152)	(0.0237)	(0.0203)
Employment Size	0.0591	0.0200	0.0989 *
	(0.0424)	(0.0603)	(0.0548)
Skill intensity	-0.0006	-0.0010 *	-0.0002
	(0.0004)	(0.0006)	(0.0006)
Per capita Capital Stock	0.0056	0.0357	-0.0022
	(0.0127)	(0.0223)	(0.0152)
Per capita Knowledge stock	0.0144 ***	0.0092 *	0.0283 ***
	(0.0051)	(0.0054)	(0.0056)
Initial value			
Labor productivity$_{2002}$	-0.1875 ***	-0.1552 ***	-0.2405 ***
	(0.0250)	(0.0369)	(0.0333)
Industry dummy	yes	yes	yes
Intercept	0.4471 ***	0.4372 ***	0.5089 ***
	(0.0522)	(0.0780)	(0.0695)
Ajusted-R^2	0.1642	0.2003	0.1477
N	3532	1428	2104

Note: Labor Productivity, Employment Size and Per capita Capital Stock are in lo
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%,
Small exporters corresponds to exporters with less than 300 employees.
Large and medium exporters are those with 300 or more employees.

Table 10. The effect of Export Boom on exporters' Labor Productivity growth (by Regions)

	(1)	(2)	(3)	(4)	(5)	(6)
	All firms	Asia only	Western only	Asia and Western	All regions	Switcher
Dependent Variable: Labor Productivity						
Exporter Dummy	0.0468 ***	-0.0029	-0.0577	0.0200	0.0707 ***	0.0371 *
	(0.0152)	(0.0256)	(0.0504)	(0.0271)	(0.0240)	(0.0225)
Employment Size	0.0591	0.0072	0.0100	0.0079	0.0486	0.0465
	(0.0424)	(0.0565)	(0.0581)	(0.0542)	(0.0512)	(0.0528)
Skill intensity	-0.0006	-0.0003	-0.0006	-0.0007	-0.0005	-0.0008
	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0006)
Per capita Capital Stock	0.0056	0.0061	0.0138	0.0117	0.0250	0.0070
	(0.0127)	(0.0160)	(0.0163)	(0.0154)	(0.0155)	(0.0148)
Per capita Knowledge stock	0.0144 ***	0.0315 ***	0.0294 ***	0.0167	0.0168 **	0.0228 ***
	(0.0051)	(0.0062)	(0.0062)	(0.0102)	(0.0075)	(0.0043)
Initial value						
Labor Productivity$_{2002}$	-0.1875 ***	-0.1664 ***	-0.1256 ***	-0.1366 ***	-0.1325 ***	-0.1725 ***
	(0.0250)	(0.0297)	(0.0288)	(0.0306)	(0.0278)	(0.0282)
Industry dummy	yes	yes	yes	yes	yes	yes
Intercept	0.4471 ***	0.3809 ***	0.3021 ***	0.3286 ***	0.3228 ***	0.4101 ***
	(0.0522)	(0.0606)	(0.0580)	(0.0612)	(0.0565)	(0.0576)
Ajusted-R^2	0.1642	0.1426	0.1490	0.1544	0.1554	0.1644
N	3532	2094	1786	2017	2238	2321

Note: Labor Productivity, Employment Size and Per capita Capital Stock are in log value.
Numbers in the parentheses are robust standard errors.
***, **, * represent statistical significance at the level of 1%, 5%, 10%, respectively.
Small exporters corresponds to exporters with less than 300 employees.
Large and medium exporters are those with 300 or more employees.
In equations (1)-(5), continuous exporters to the indicated destination are compared with non-exporters.
In equation (6), continuous exporters that switched destinations are compared with non-exporters.