Abenomics’ Trade Spillover

The paper assesses the impact on Japan’s competitors from a marked fall in the value of yen. Competing exporters are likely hurt by a cheaper yen, except those relying heavily on Japanese parts and components for their exports. This paper formalizes this intuition and tests it against a data set covering more than 90% of world trade at the product level, between 2000 and 2011. Panel regression analysis shows that, for countries and products facing Japan’s strongest competition, a 10% appreciation of the yen lowers average exports by more than 3%, which is a sizeable pass through. Elsewhere, the impact is negligible, particularly when parts and components trade is accounted for.

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Abenomics’ Trade Spillover

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ABSTRACT

There is no escaping Japan’s competition in the world markets for goods, particularly in the automotive and electronics industries. Countries exporting to these markets are bound to feel the competitive pressure from a marked fall in the value of the yen. However, while some exporters will be hurt by a cheaper yen, others will benefit from lower input costs, to the extent that they source parts and components from Japan for processing, assembly, and reexport. This paper formalizes these intuitions and tests them against a data set covering more than 90% of world trade at the product level, between 2000 and 2011. Panel regression analysis shows that for countries and products facing Japan’s strongest competition, a 10% appreciation of the yen lowers average exports by more than 3%, which is a sizeable pass through. Elsewhere, the impact is negligible, particularly when vertical trade is accounted for.

Keywords: export competition, exchange rate spillover, Abenomics, Japan, Republic of Korea

JEL classification: F12, F13, F14
I. INTRODUCTION

The Japanese yen depreciated sharply in late 2012 and the first half of 2013, as markets reckoned with the country’s new policy stance promoted by Prime Minister Shinzo Abe. In an all-out effort pulling the economy out of its long slump, “Abenomics” entails a combination of government fiscal stimulus and Bank of Japan (BOJ) expansionary monetary policy, combined with labor market and other structural reforms that would seek to further Japan’s economic performance in the long run.

The real economic outcome of Japan’s ambitious reform plan has yet to crystallize. So far, its effects have been felt mostly in the stock and money markets, which reacted sharply to BOJ’s policy turnaround and newly found vigor. Currency markets followed suit: between July 2012 and April 2013, the yen lost about a quarter of its value against currencies such as the United States (US) dollar, the euro, and the Korean won (Figure 1).

These sudden adjustments have dismayed several of Japan’s competitors in the foreign goods markets, fearing an Abenomics spillover in terms of stiffer competition or foregone market shares. Making matters worse is that this threat comes at a time of sluggish and uncertain global demand. The Republic of Korea’s finance minister has given such sentiments expressed at the margins of the April 2013 meeting of the G20, pointing out that “[...]a sliding yen is having considerable impact on the real economy of the Republic of Korea.”

Japan’s monetary stance in the face of persistent deflation not necessarily qualifies as competitive devaluation, rather than legitimate intervention in support of an ailing economy. Nor is there much evidence to suggest that recent depreciation is undervaluing the yen against other key currencies, rather than reversing a sustained period of appreciation that started between 2007 and 2008 and lasted until 2012 (Figure 1). In addition, recent trade data fail to portray a drop in exports that could be ascribed to the yen depreciation without a counterfactual at hand; actually, the Republic of Korea’s exports have been roughly at level since mid-2012, the usual ups and downs of monthly data notwithstanding (Figures 2 and 3).

Be that as it may, there is no denying that the Republic of Korea and other exporters must have been experiencing sharper competition and a squeeze of margins from the yen’s sharp depreciation, and some even a loss of market shares to Japanese exporters. Anecdotal evidence has been fueling stakeholder’s concern during the past few months. For an assessment of the matter on grounds less elusive and selective than the anecdotal, a systematic empirical analysis of Japan’s competition in the international goods markets and of the yen’s impact on global trade appears both timely and relevant.

This paper uses a finely detailed global trade matrix and a suitably defined index to identify and rank the key products, destinations, and exporters facing Japan’s competition in global merchandise trade. For example, competition is assessed in terms of the Republic of Korea’s contention of Japan’s exports share in the People’s Republic of China (PRC) market for imported photographic paper and related chemicals. Similarly assessed are each of the 1,215 product categories, 117 exporters, and 53 importing countries included in the analysis, covering more than 90% of world trade.

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1 www.bloomberg.com/news/2013-04-18/south-korea-says-yen-bigger-issue-than-north-korea.html, accessed 19 April 2013.
The competitiveness index by exporter–importer country pairs and products is then merged with data on yearly average exchange rates of the yen against the currencies of the economies or Japan and its competitors export to. The ensuing data set spans nearly over 10 million observations. It is suitable to the application of panel estimation techniques involving more than one million indicator variables, in an attempt to circumvent the bias from the likely presence of endogeneity, or indeterminacy as regards the causal relationship between exports and exchange rates.

Regression analysis yields robust evidence of the yen exchange rates impacting global trade flows. This finding is consistent and statistically significant across various model specifications. However, the estimated magnitude of the yen’s impact on trade suggests that while this matters for countries and market segments facing Japan’s strongest competition, it does less so for the bulk of world trade. That is, for the top 5% competing products and destinations serviced by both Japan and other exporters, a 10% depreciation (appreciation) of the yen against the local currency at destination lowers (raises) competing export flows by about 3.2% on average. For the remaining 95% of observations in the data set, the relationship is statistically irrefutable but practically irrelevant.

**Figures 1-3: The Yen and Competing Exports**

- **Figure 1: Exchange Rates Index**
  - EUR = euro, JPY = Japanese yen, KRW = Korean won.
  - USD = United States dollars.
  - Note: Indexed to 2012m6=100.
  - Source: Author’s calculations

- **Figure 2: Total Exports Index**
  - Note: Indexed to 2012m6=100.
  - Source: Author’s calculations

- **Figure 3: Republic of Korea’s Exports and Exchange Rate**
  - JPY = Japanese yen, KRW = Korean won.
  - Note: Derived from IMF International Financial Statistics (2012m6=100).
  - Source: Author’s calculations

**EUR = euro, JPY = Japanese yen, KRW = Korean won, USD = United States dollars.**
Note: Indexed to 2012m6=100.
Source: Author’s calculations
The regressions also suggest that, in the presence of vertical trade between Japan and its competitors, a depreciation of the yen may constitute an advantage rather than an adversity, by reducing the import price of Japanese parts and components for processing, assembly and reexport. Indeed, when vertical trade is accounted for in the regressions, the net effect of change in the value of the yen turns out to be negligible, because competition in the final goods markets and complementarity through trade in intermediates roughly cancel each other out.

The remainder of this paper is structured to sketch out in Section II, the empirical framework underlying the analysis. Section III then discusses the data, and Section IV illustrates Japan’s position as an exporter competing in the world markets. Section V discusses the regression results, and Section VI concludes.

II. EMPIRICAL FRAMEWORK

The empirical framework relies on the model in Mattoo, Mishra, and Subramanian (2012). In our flavor of the model, changes in the exchange rate are transmitted to exports through the price Japanese exporters charge to the importing countries, which in turn depends on product prices in Japan, importers’ exchange rates to the yen, and the degree of exchange rate pass-through.

Specifically, the spillover effect of the Japanese exchange rate, $E^j$, on exports of Harmonized System (HS) 6-digits product $h$ from exporter $i$ to importer $j$, $X^j_h$, is derived as a function of an index of competition with Japan of product $h$ exported from $i$ to $j$, $C^j_h$, and a composite parameter, $\varphi^j_h$ of consumption elasticities and pass-through:

$$\frac{\partial \ln X^j_h}{\partial \ln E^j} = C^j_h \varphi^j_h$$  \hspace{1cm} (1)

where

$$C^j_h = \sum_h \left[ \frac{X^j_h}{\sum_i X^j_i} \frac{M^j_h}{\sum_i M^j_i} \right]$$  \hspace{1cm} (2)

and

$$\varphi^j_h = \mu^j_h (\omega_h - \sigma_h)$$  \hspace{1cm} (3)

$\sigma_h$ denotes the elasticity of substitution between imported varieties of $h$, $\omega_h$ the elasticity of substitution between domestic and imported varieties of $h$, $\mu^j_h$ the product-specific exchange rate pass-through from prices in Japan to the importing country $j$.

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2 In turn, Mattoo, Mishra, and Subramanian (2012) rest their model on Feenstra, Obstfeld, and Russ (2012). Its partial exposition in this section does not do justice to the model. For a more comprehensive discussion, the reader is referred to the source.
\( \frac{X^h_i}{\sum^h_i X^h_i} \) is the ratio of any HS 6-digit export item \( h \) to the sum of 6-digit exports pertaining to the same 4-digit category of the HS classification, and \( \frac{M^h_j}{\sum^h_j M^h_j} \) is the share of Japan in country \( j \)'s total imports of that 6-digit item.

To take equations (1) to (3) to the data, they can be reduced to the following estimating equation:

\[
\ln X^h_{it} = \beta C^h_i \ln E^\¥_{it} + d^h_{it} + \varepsilon^\¥_{it} \tag{4}
\]

Reflecting the longitudinal time series dimension of the data, \( X^h_{it} \) now carries the time subscript \( t \). Exports are aggregated at the level of 4 digits of the HS goods classification. The product-level competition index \( C^h_i \) is interacted with \( E^\¥_{it} \), which is defined as the exchange rate of the Japanese yen to the importing countries’ currency, for example \( ¥$/$. To minimize endogeneity issues, the index is computed at the start of the assessment period (\( t=1 \)).

The coefficient \( \beta \) represents the elasticity of exports other than Japan’s to changes in the exchange rate of the yen against importers’ currencies. We expect its estimate to have a negative sign, because a depreciating yen is postulated lowering competing exporters’ sales in the contested market. This is because the adopted exchange rate notation implies that a depreciation of the yen, say against the US dollar, raises the ratio \( E = ¥$/ $\), while the competition index is always positive and its size merely determines the intensity of the exchange rate effect.

\( d^h_{it} \) is a vector of exporter, importer, product and time fixed effects, combined as three-way permutations of \( (i,j,h,t) \) to control for a wide range of potential bias from endogeneity between the regressor and the regressands. This specification of fixed effects encompasses idiosyncratic shocks affecting the export capacity of any one supplying or buying nation, or of a particular industry at any given time. Examples are floods hampering Thailand’s export capacity; subsidies to Japanese rice farmers; the global financial crisis triggering a temporary slump in world trade.

Mattoo, Mishra, and Subramanian (2012) note that, by combining the indicator variables among any three of the four dimensions included this empirical strategy is suitable to control \( (i,j,h,t) \) also for bilateral specificities that may change over time. For example, a variation in the preferential market access \( j \) grants to \( i \) for any specific product \( h \). Technically impossible to control for are, of course, changes that would involve all four the dimensions simultaneously, such as for example changes over \( t \) across \( j \)'s market access provisions that vary across \( i \) and \( h \).

Mattoo, Mishra, and Subramanian (2012) point out that simultaneity is less of a concern regarding the interaction of exchange rates and exports, because the two measures are in reference to different countries in any given observation.
We extend the empirical framework to reflect also international production sharing and vertical trade among competing exporters. This appears relevant in view of Japan’s prominent role as a supplier of parts and components to the Asian and global production networks (Cheng and Kierzkowski 2001, Ando and Kimura 2003, Elms and Low 2013). To the extent that the other exporters in our sample rely on Japanese parts and components for their exports, a depreciation of the yen against their currencies is expected to increase their exports if lower input costs translate into lower prices of the processed or final goods they supply to the world markets. For example, a drop in the value of the yen will lower the price of Japanese microcircuits used in the production of US consumer electronics, as well as the price of Japanese auto parts, thereby increasing US exporters’ ability to price their products competitively.

Trading partners’ dependence on Japan’s parts and components is best gauged by the network trade index or NTI \( N_{ih}^{ij} \) introduced in Ferrarini (2013). For the purpose of the analysis here, \( N_{ih}^{ij} \) is best defined as the share of Japan’s components \( o_{ih}^{j} \) in country \( i \)’s total imports of parts and components \( \left( \sum o_{ih}^{j} \right) \), weighted by the share of (2-digit) sector \( h \) in \( i \)’s total final goods exports, \( \left( \sum f_{ih}^{j} \right) \). \(^5\) Sector-specific \( N_{ih}^{ij} \) measures are the weighted sum across countries \( i \), and the country-specific \( N_{ih}^{ij} \) is derived as the weighted sum across sectors \( h \):

\[
N_{ih}^{ij} = \sum_{h} \sum_{i=1}^{c_{ih}^{j}} \frac{p_{ih}^{j}}{c_{ih}^{j}} \sum_{h} \frac{p_{ih}^{j}}{c_{ih}^{j}}
\]

The index augments the estimating regression in equation (4) through the addition of the term \( \gamma N_{ih}^{ij} \ln E_{i}^{ij} \), which interacts the network trade index with the exchange rate of the yen vis-a-vis the currency of the importer of parts and components. The ensuing expression is:

\[
\ln X_{ih}^{ij} = \beta c_{ih}^{j} \ln E_{i}^{ij} + \gamma N_{ih}^{ij} \ln E_{i}^{ij} + d_{ih}^{j} + \varepsilon_{ih}^{ij}
\]

Contrary to \( \beta \) which we expect to be negative, the \( \gamma \) coefficient should be estimated positive, reflecting opposite impacts in relation to horizontal and vertical trade relationships between competing exporters.

III. DATA

Equations (4) and (6) are estimated against yearly panels that combine bilateral trade with exchange rate data. For a matrix of bilateral trade data disaggregated at six digits of the HS-1996 product classification, we draw on the latest Banque analytique de commerce internationale BACI data set. BACI itself is based on the COMTRADE database maintained by

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\(^4\) The opposite will hold true for an appreciation of the yen.

\(^5\) To the NTI, the larger the share of parts imports from a given partner country within a given industry, the greater is that partner’s importance to the importing country’s network of industrial relations. By the same token, the larger the share of that industry in the country’s total exports of final goods, the more relevant a network partner is deemed as a supplier of inputs to that industry.
the United Nations Statistics Division (UNSD).\(^6\) Product disaggregation at six digits of HS distinguishes more than 5,000 different products traded by more than 200 countries, with yearly data spanning from 1998 to 2011.

Observations for 1998 and 1999 are dropped, to avoid the trade distortions from the Asian financial crisis and its aftermath. Trade in fuels (HS category 27) is excluded, for a sharper competitiveness index in view of Japan’s lack of significant exports in this category.

To avoid clutter, we drop exports by the smallest countries, except Asian and Pacific countries.\(^7\) We also drop imports by all but the largest countries. This leaves us with data on 117 exporters and 53 importers, trading in 5,111 categories at HS six digits and 1,215 categories at four digits, and which combined account for more than 90% of average global trade flows during the 2000–2011 period of analysis (Annex Table A1.) Taipei, China is not part of the analysis because it is not explicitly coded in the United Nations database underlying BACI.

The trade data is deflated by the US consumer price index and merged with (period-average) yearly bilateral exchange rate data of importing countries’ currencies vis-a-vis the yen. To reflect the transmission of Japanese domestic prices, bilateral exchange rates are deflated by Japan’s consumer price index.

**IV. COMPETING WITH JAPAN IN THE GLOBAL GOODS MARKETS**

Figure 4 profiles Japan’s competition in the world markets, measured by the index \(C^i_h\) in equation 2. The markets contested are lined up on the vertical axis. Competing exporters are placed along the horizontal axis. The ordering along both the axes is by ascending United Nations numerical country codes, but the particular order is inconsequential for analysis.

Visible are the contours of the \(C^i_h\) index at the top quartile of its distribution. That is, the plot highlights but the strongest instances of competition associated with the exporter-importer-product combinations in the sample, notwithstanding Japan’s presence in most of them. The key competitors and importers are marked with corresponding country ISO codes, which are spelled out in Table A1.

The relative intensity of competition across product categories emerges also from Figures 5 and 6, ranking exporters and destinations above the median of the \(C^i_h\) distribution. Further detail is provided in Annex Tables A2 to A4, which break down the index by exporters, importers and products. Besides the US and several countries in Europe, the PRC, the Republic of Korea, and Thailand stand out as the most hotly contested markets by Japan and the other exporters. They themselves compete with Japan in markets such as Malaysia, the Philippines and Indonesia (Table A3).

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\(^6\) The BACI data set is compiled by the French Centre d’Etudes Prospectives et d’Informations Internationales (CEPII). Compared to the underlying UNSD data, BACI offers the advantage of reconciled importer and exporter records, for a more consistent and balanced world trade matrix of bilateral flows. For a description of the data set, see Gaulier and Zignago (2010).

\(^7\) Asian and Pacific countries are kept in the data set for a comprehensive account of developing Asia, although smaller countries’ narrow trade baskets are not expected to display a great deal of competition with Japan.
Figure 4: Japan’s Exports Competition Profile

Note: International Standards Organization (ISO) 3-digit alphabetic codes, please refer to Appendix Table A1 for the list of countries.
Source: Author’s calculations

Figures 5–6: Japan’s Top Competitors and Markets

Notes:
1. Includes countries with a competitiveness index above median.
2. International Standards Organization (ISO) 3-digit alphabetic codes, please refer to Appendix Table A1 for the list of countries.
Source: Author’s calculations
Germany ranks as the single strongest competitor with Japan across product markets and importers, and is associated with a cumulative competitiveness index equal to 100, its normalized maximum. The top row in Table A2 also shows that, among all the destinations of exports from Germany and Japan, competition is strongest in the product markets from the Republic of Korea (94.6). The Republic of Korea is also the top destination of exports from the PRC, Italy, and the US competing with Japan.

In the full set of exporter–importer combinations, competition is fiercest between the Republic of Korea and Japan for exports to the PRC product markets (Table A3). The two countries compete in a broad range of markets, such as textiles, chemicals, metal foils and tubes, musical instruments, sewing and weaving machines (Table A5).

Motor vehicles and related parts and accessories are products with the strongest competition between Japan and the other exporters, followed by instruments, machinery, electrical and electronic components (Table A4). Japan’s main competitors are thus countries with a strong foothold in the automotive or electronic industries, such as Germany, the Republic of Korea, and the United States.

In sum, all evidence points to the Republic of Korea as a country that it is indeed heavily exposed to Japanese exports, be it as a competing exporter or as an importer of goods from countries that are in competition with imports from Japan.

Table 1: Panel Regression

| Regressor:   | lnX_{jt} | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------|----------|-----|-----|-----|-----|-----|-----|
| $C_{t} \times \ln E_{jt}^{i}$ | -0.113*** | -0.0840*** | -0.0753*** | -0.0758*** | -0.0676*** | -0.0644 |
| (0.00630) | (0.00640) | (0.00664) | (0.00666) | (0.003) | (0.00318) | (0.000318) |
| $S_{t} \times \ln E_{jt}^{i}$ | -0.0756*** | -0.0756*** | 0.0461*** | -0.0756*** | -0.0756*** | -0.0756*** |
| (0.000318) | (0.003) | (0.193) | (0.114) | (0.115) | (0.180) | (0.01501) |
| $N_{t} \times \ln E_{jt}^{i}$ | 0.567*** | 2.056*** | 1.488*** | 5.104*** | 1.774*** | 1.431*** |
| (0.003) | (0.193) | (0.114) | (0.115) | (0.180) | (0.01501) |
| Constant | 0.567*** | 2.056*** | 1.488*** | 5.104*** | 1.774*** | 1.431*** |
| (0.003) | (0.193) | (0.114) | (0.115) | (0.180) | (0.01501) |
| Fixed effects excluded | None | ijt | iht | jht | None | None |
| Observations | 9,671,927 | 9,671,927 | 9,671,927 | 9,671,927 | 9,671,927 | 9,099,610 |
| Clusters | 1,115,735 | 1,115,735 | 1,115,735 | 1,115,735 | 1,115,735 | 1,013,465 |
| R-squared | 0.309 | 0.152 | 0.169 | 0.147 | 0.363 | 0.359 |

Notes:
1. Robust standard errors in parentheses (** p<0.01, * p<0.05, * p<0.1).
2. Fixed effects include all combinations of ijt,jjt,iht,jht.
Source: Author’s estimates

The net effect of the Republic of Korea’s exposure to a depreciating yen will be either positive or negative, depending on the intensity of competition in each consumer market, the corresponding price elasticities of the Republic of Korea’s exports and imports, and the degree of vertical integration of the countries’ production and trade. Whatever the net effect, which is difficult to gauge, the degree of exposure of Korean exporters to Japan’s competition arguably justifies the Korean government’s sensitivity toward sharp movements in the won exchange rate to the yen.
V. ESTIMATES OF YEN’S TRADE SPILLOVER

Table 1 lists the regression results from the estimation of equations 4 and 6. Shown are the core specification (equation 4), in column 1; robustness tests involving different combinations of fixed effects or a differently defined competition index, in columns 2 to 5; and the specification controlling for vertical trade (equation 6), in column 6.

The top coefficient in column 1 corresponds to $\beta$ in equation 4. As expected, the sign of the coefficient is negative ($-0.113$). The estimate is statistically significant, and the cluster-robust standard errors are very small. The $R^2$ statistic is relatively large, at 0.31, mainly on account of the broad set of fixed-effects indicators included in the regression.8

Table 2: Impact of a 10% Appreciation of the Japanese Yen

| Percentile | $C^g_h$ | Impact (%) |
|------------|---------|------------|
| 5th        | 0.000   | -0.001     |
| 25th       | 0.002   | -0.017     |
| 50th       | 0.011   | -0.123     |
| 75th       | 0.055   | -0.624     |
| 95th       | 0.288   | -3.243     |

Based on Table 1, column 1.

Table 2 shows that the magnitude of the spillover is small for all combinations of exporters, importers, and products, except those associated with the highest competition index, that is, where Japan’s competition is strongest. At the upper fifth percentile of the distribution of $C^g_h$, a 10% appreciation of the yen lowers average exports by more than 3.2%, which is a sizeable pass through. But at the median of the competition index, or below, the impact is negligible.

This finding suggests that the bulk of international trade is largely unaffected by the yen, simply because competition with Japanese exports facing most of the exporters in most of the product categories is insufficiently strong to cause a substantial shift in importers’ demand. Of course, weak transmission on average does not imply an equally mild impact at the level of specific products, many of which rank within the upper percentiles of the competition index. For example, in the sector "mounted lenses, prisms, mirrors and optical elements" (HS 9002), the Republic of Korea competes with Japan in 30 markets that are associated with a competition index within the top five percentiles (Table A6.)

To test the robustness of these findings, alternative specifications in columns 2 to 4 of Table 1 progressively exclude from the regression certain fixed-effects combinations. As a result, the estimates of $\beta$ as well as the coefficient of determination are somewhat lower compared to the core regression, but the sign and level of significance appear highly robust.

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8 From the vast literature on gravity regression, we know of course that exchange rates by themselves do not explain a large share of the bilateral trade flows observed, compared to the core gravity variables, such as trading nation’s economic size and their physical and cultural proximity.
Robustness is further tested in the fifth column of Table 1, through the adoption of the Finger and Kreinin (1979) indicator of export similarity instead of the Mattoo, Mishra, and Subramanian (2012) competitiveness index used in the other regressions. Denoting Japan's exports of good \( h \) to country \( j \) by \( X^j_{ht} \), we compute the similarity index as the difference of product market shares in Japan and those in other countries, summed across the entire set of products:

\[
S^j_h = 1 - 0.5 \left( \frac{\sum_h X^j_{ht}}{\sum_h X^g_{ht}} - \frac{\sum_h X^g_{ht}}{\sum_h X^j_{ht}} \right).
\] (7)

The similarity index takes value one for the case of perfect similarity of any country's export pattern with that of Japan, and value zero when there is no overlap at all. Like the competition measure, it enters the regression as an interaction with the exchange rates vis-a-vis the yen. Column 5 shows that the estimated \( \beta \) coefficient on the similarity index closely matches that in column 1, in terms of magnitude, sign and statistical significance.\(^9\)

As an additional robustness test and model extension, described in Section II, the sixth column of Table 1 adds to the regression the network trade index, \( N^\gamma_{ij} \), as a control variable capturing the intensity of vertical trade between the \( ij \) country pairs \( N^\gamma_{ij} \). The additional regressand enters the analysis as a multiplicative term, interacted with exporters’ exchange rates as compared with the yen.\(^10\)

As expected, the estimate of coefficient \( \gamma \) is positive: on average, countries’ dependence on Japan as a supplier of parts and components translates into higher (lower) exports as the yen depreciates (appreciates) against their currencies. At \(-0.0676\) and \(0.0461\), \( \beta \) and \( \gamma \) are roughly of the same order of magnitude, operating in different directions. As a result, the yen’s impact on competing countries’ exports is very limited when vertical trade is accounted for. Exceptions are countries that export to destinations Japan is highly competitive in (high \( C^j_{hi} \)) and which at the same time do not benefit from vertical integration with Japan (low \( N^\gamma_{ij} \)).

In this regard, Annex Table A7 suggests that Asian countries, including the Republic of Korea, tend to rely heavily on Japan as a supplier of parts and components. As \( C^j_{hi} \) and \( N^\gamma_{ij} \) are both high for these countries, the yen’s depreciation is likely to cut both ways, toughening competition in some product lines, but improving their own competitiveness in the vertically integrated industries benefiting from lower input prices.\(^11\) The same is true for the US and Europe, and for the key emerging markets, such as Mexico and Brazil. All these countries' reliance on Japanese inputs cushions the competitive impact from changes to the value of the yen.

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\(^9\) Both the competition and similarity indices range from zero to one, which allows for a rough comparison between the estimated coefficients.

\(^10\) Note that this differs from the case of horizontal competition, where interaction is between \( N^j_{hi} \) and \( S^j_{hi} \) and importers’ exchange rates.

\(^11\) The opposite applies when the yen appreciates.
VI. CONCLUSIONS

There is no escaping Japan’s competition in the world markets for goods, particularly in the automotive and electronics industries. Countries exporting to these markets are bound to feel the competitive pressure from a marked fall in the value of the yen. However, while some exporters may be hurt by a cheaper yen, others will benefit from lower input costs to the extent that they source parts and components from Japan for processing, assembly and reexport.

This paper has formalized these intuitions and put them to test in a rigorous empirical framework. Based on a data set covering more than 90% of world trade at the product level between 2000 and 2011, panel regression analysis confirms the hypotheses of the yen’s impact via competition and vertical integration. These findings are both robust and highly statistically significant.

However, the estimated magnitude of the yen spillover is relatively small, which suggests that it only matters for those countries and products facing Japan’s competition at its toughest. There, at the upper fifth percentile of the distribution of $C_{ij}$, a 10% appreciation of the yen lowers average exports by more than 3%, which is a sizeable pass through. Elsewhere, the impact is negligible, particularly when vertical trade is accounted for.

Competition analysis has revealed that several countries in Asia face Japan’s competition in the world markets, particularly the PRC, the Republic of Korea, and Thailand. While it is inevitable that their exporters’ competitiveness will feel the impact from sharp movements in the yen, their strong vertical integration with Japan is likely to cushion the effects.

All in all, the findings in this paper suggest that the recent depreciation of the yen should not be of particular concern to the economies in the region. Of greater importance for the rest of Asia will be Japan’s success or failure to revitalize its economy, in the context of which the yen’s depreciation ought to be considered a temporary symptom, not a cure.
## APPENDIX

### Table A1: List of Countries Included in the Regression Analysis

| ISO  | Exporter/Importer | ISO  | Exporter/Importer | ISO  | Exporter/Importer |
|------|------------------|------|------------------|------|------------------|
| AFG  | Afghanistan      | GHA  | Ghana            | PAK  | Pakistan*        |
| ARE  | United Arab Emirates* | GRC  | Greece*          | PER  | Peru*            |
| ARG  | Argentina*       | GTM  | Guatemala        | PHL  | Philippines*     |
| ARM  | Armenia          | HKG  | Hong Kong, China* | PNG  | Papua New Guinea |
| AUS  | Australia*       | HRV  | Croatia          | POL  | Poland*          |
| AUT  | Austria*         | HUN  | Hungary*         | PRT  | Portugal*        |
| AZE  | Azerbaijan       | IDN  | Indonesia*       | PRY  | Paraguay         |
| BGD  | Bangladesh*      | IND  | India*           | QAT  | Qatar            |
| BGR  | Bulgaria         | IRL  | Ireland*         | ROM  | Romania*         |
| BHR  | Bahrain          | ISL  | Iceland          | RUS  | Russian Federation* |
| BLR  | Belarus          | ISR  | Israel*          | SAU  | Saudi Arabia*    |
| BOL  | Bolivia          | ITA  | Italy*           | SGP  | Singapore*       |
| BRA  | Brazil*          | JAM  | Jamaica          | SLB  | Solomon Islands  |
| BRN  | Brunei Darussalam | JOR  | Jordan           | SLV  | El Salvador      |
| BTN  | Bhutan           | KAZ  | Kazakhstan       | SVK  | Slovakia*        |
| CAN  | Canada*          | KEN  | Kenya            | SVN  | Slovenia         |
| CHE  | Switzerland*     | KGZ  | Kyrgyz Republic  | SWE  | Sweden*          |
| CHL  | Chile*           | KHM  | Cambodia         | SYR  | Syria            |
| CHN  | China, People’s Republic of* | KIR  | Kiribati         | THA  | Thailand*        |
| CIV  | Cote d’Ivoire    | KOR  | Korea, Rep. of*  | TJK  | Tajikistan       |
| CMR  | Cameroon         | KWT  | Kuwait           | TKM  | Turkmenistan     |
| COL  | Colombia*        | LAO  | Lao People’s Democratic Republic | TMP  | Timor-Leste     |
| CRI  | Costa Rica       | LBN  | Lebanon          | TON  | Tonga            |
| CYP  | Cyprus           | LBY  | Libya            | TUN  | Tunisia          |
| CZE  | Czech Republic*  | LKA  | Sri Lanka        | TUR  | Turkey*          |
| DEU  | Germany*         | LTU  | Lithuania        | TUV  | Tuvalu           |
| DNK  | Denmark*         | LVA  | Latvia           | TZA  | Tanzania         |
| DOM  | Dominican Republic | MAR  | Morocco*         | UGA  | Uganda           |
| DZA  | Algeria*         | MDV  | Maldives         | UKR  | Ukraine*         |
| ECU  | Ecuador          | MEX  | Mexico*          | URY  | Uruguay          |
| EGY  | Egypt*           | MHL  | Marshall Islands | USA  | United States*   |
| ESP  | Spain*           | MMR  | Myanmar          | UZB  | Uzbekistan       |
| ETH  | Ethiopia         | MNG  | Mongolia         | VEN  | Venezuela*       |
| FIN  | Finland*         | MYS  | Malaysia*        | VNM  | Viet Nam         |
| FIJ  | Fiji             | NGA  | Nigeria*         | VUT  | Vanuatu          |
| FRA  | France*          | NLD  | Netherlands, The* | WSM  | Samoa            |
| FSM  | Micronesia, Federated States of | NOR  | Norway*          | YEM  | Yemen            |
| GBR  | United Kingdom*  | NZL  | New Zealand*     | ZAF  | South Africa*    |
| GEO  | Georgia          | OMN  | Oman             | ZWE  | Zimbabwe         |

**Notes:**
1. International Standards Organization (ISO) 3-digit alphabetic codes.
2. Exports by all the 117 countries are included, as well as imports by the 53 starred countries.

Source: Author’s listing
Table A2: Top 50% of Exports Competing with Japan

| Exporter                      | Top Importer/Market | $\sum_i \sum_h C_{ih}$ | $\sum_h C_{ih}$ |
|-------------------------------|---------------------|-------------------------|-----------------|
| Germany                       | Korea, Rep. of      | 100.0                   | 94.6            |
| United Kingdom                | Thailand            | 95.2                    | 86.7            |
| People’s Republic of China    | Korea, Rep. of      | 91.2                    | 91.7            |
| (PRC)                         | Korea, Rep. of      | 89.2                    | 93.2            |
| United States                 | Korea, Rep. of      | 88.6                    | 87.5            |
| Italy                         | Korea, Rep. of      | 82.8                    | 100.0           |
| Korea, Rep. of                | PRC                 | 77.6                    | 75.9            |
| France                        | PRC                 | 72.7                    | 68.6            |
| Netherlands, The              | PRC                 | 67.2                    | 64.7            |
| Switzerland                   | PRC                 | 65.5                    | 68.7            |
| India                         | Thailand            | 63.0                    | 63.9            |
| Spain                         | PRC                 | 58.4                    | 66.5            |
| Hong Kong, China              | PRC                 | 57.7                    | 65.9            |
| Thailand                      | PRC                 | 55.9                    | 70.9            |
| Singapore                     | Thailand            | 49.4                    | 53.8            |
| Malaysia                      | PRC                 | 48.6                    | 64.4            |
| Austria                       | PRC                 | 46.4                    | 52.7            |
| Indonesia                     | PRC                 | 46.3                    | 52.4            |
| Australia                     | PRC                 | 43.9                    | 47.7            |
| Sweden                        | PRC                 | 43.0                    | 49.7            |

Source: Author’s calculations
| Importer/Market               | Top Competing Exporter | $\sum_{i} \sum_{h} c_{ij}^i$ | $\sum_{h} c_{ij}^i$ |
|------------------------------|------------------------|------------------------------|---------------------|
| People’s Republic of China   | Korea, Rep. of         | 100.0                        | 100.0               |
| Korea, Rep. of               | Germany                | 88.1                         | 94.6                |
| Thailand                     | Germany                | 87.1                         | 89.4                |
| Hong Kong, China             | United Kingdom         | 51.9                         | 58.5                |
| United States                | United Kingdom         | 51.7                         | 40.4                |
| Malaysia                     | PRC                    | 48.9                         | 52.6                |
| Philippines                  | Korea, Rep. of         | 47.4                         | 66.2                |
| Indonesia                    | PRC                    | 45.2                         | 55.9                |
| Singapore                    | United Kingdom         | 38.5                         | 41.6                |
| Saudi Arabia                 | Germany                | 24.7                         | 23.1                |
| India                        | United Kingdom         | 23.9                         | 24.4                |
| Germany                      | United Kingdom         | 22.2                         | 16.7                |
| United Kingdom               | Germany                | 21.0                         | 16.1                |
| United Arab Emirates         | Germany                | 20.7                         | 20.4                |
| Australia                    | United Kingdom         | 18.4                         | 23.0                |
| Netherlands, The             | Germany                | 18.4                         | 16.8                |
| New Zealand                  | PRC                    | 17.1                         | 22.9                |
| Pakistan                     | PRC                    | 13.7                         | 18.9                |
| Mexico                       | Germany                | 13.7                         | 15.3                |
| South Africa                 | Germany                | 13.3                         | 16.3                |

Source: Author’s calculations
### Table A4: Top 5% Products by Competition across Exporters and Importers

| HS Code | HS Description                                           | $\sum_i C_{ij}$ |
|---------|----------------------------------------------------------|-----------------|
| 8708    | Parts and accessories for motor vehicles                 | 100.0           |
| 8703    | Motor vehicles for transport of persons (except buses)   | 87.0            |
| 8511    | Ignition/starter equipment, internal combustion engine    | 68.2            |
| 8711    | Motorcycles, bicycles, etc with auxiliary motor          | 66.7            |
| 8482    | Ball or roller bearings                                  | 61.1            |
| 8483    | Shafts, cranks, gears, clutches, flywheel, pulleys, etc. | 56.4            |
| 7318    | Screws, bolts, nuts, rivets, washers, etc., iron, steel  | 55.4            |
| 8413    | Pumps for liquids                                        | 54.6            |
| 8429    | Self-propelled earth moving, road making, etc. machines | 54.6            |
| 8479    | Machines nes having individual functions                | 53.9            |
| 9018    | Instruments, etc. for medical, surgical, dental, etc. use| 52.7            |
| 8536    | Electrical switches, connectors, etc.                    | 52.3            |
| 3702    | Photograph film, rolls, unexposed, not paper             | 50.8            |
| 8532    | Electrical capacitors, fixed, variable or adjustable     | 48.7            |
| 8407    | Spark-ignition internal combustion engines               | 48.2            |
| 4011    | New pneumatic tyres of rubber                           | 47.8            |
| 7304    | Tube or hollow profile, seamless iron/steel not cast     | 47.2            |
| 8414    | Air, vacuum pumps, compressors, ventilating fans, etc.  | 46.2            |
| 8541    | Diodes, transistors, semi-conductors, etc.               | 45.8            |
| 8443    | Printing and ancillary machinery                         | 45.3            |
| 9010    | Equipment for photographic laboratories nes              | 44.7            |
| 3920    | Plastic plate, sheet, film not cellular, reinforced      | 44.5            |

*nes = not elsewhere specified*

*Source: Author’s calculations*
### Table A5: The Top 30 PRC Markets the Republic of Korea and Japan Compete In

| Rank | HS Code | HS Description                                                                 | $C_h$ |
|------|---------|--------------------------------------------------------------------------------|-------|
| 1    | 5513    | Woven fabric, synthetic and cotton[...]                                      | 0.86  |
| 2    | 8103    | Tantalum and articles thereof, including waste, scrap                         | 0.82  |
| 3    | 2822    | Cobalt oxides and hydroxides                                                   | 0.82  |
| 4    | 2809    | Diphosphorus pentaoxide, phosphoric acids                                     | 0.79  |
| 5    | 2846    | Compounds, mixtures of rare-earths, yttrium, scandium nes                      | 0.79  |
| 6    | 8904    | Tugs and pusher craft                                                          | 0.78  |
| 7    | 5803    | Gauze                                                                          | 0.76  |
| 8    | 3703    | Photographic paper, board, etc sensitised, unexposed                           | 0.76  |
| 9    | 9201    | Pianos, harpsichords, keyboard string instruments nes                          | 0.74  |
| 10   | 5408    | Woven fabric of artificial filament, monofilament yarn                         | 0.73  |
| 11   | 2808    | Nitric acid, sulphonitric acids                                                | 0.71  |
| 12   | 8452    | Sewing machines (not book sewing), related furniture                          | 0.71  |
| 13   | 3707    | Chemical preparations for photographic use                                     | 0.71  |
| 14   | 7607    | Aluminium foil of a thickness<0.2 mm                                           | 0.70  |
| 15   | 8005    | Tin foil (thickness<0.2 mm), tin powder, flakes                               | 0.69  |
| 16   | 9607    | Slide fasteners and parts thereof                                              | 0.69  |
| 17   | 9612    | Typewriter and similar ribbons, ink pads, etc                                  | 0.69  |
| 18   | 8446    | Weaving machines (looms)                                                       | 0.66  |
| 19   | 5308    | Yarn of other vegetable textile fibers, paper yarn                             | 0.66  |
| 20   | 7804    | Lead plates, sheets, strip, foil, powders and flakes                           | 0.65  |
| 21   | 2928    | Organic derivatives of hydrazine or of hydroxylamine                           | 0.64  |
| 22   | 7004    | Drawn or blown glass, in sheets                                                | 0.63  |
| 23   | 7014    | Signalling glassware, unworked optical elements                                | 0.62  |
| 24   | 7411    | Copper pipes, tubes                                                            | 0.62  |
| 25   | 5606    | Chenille, loop whale, gimped (except metallised) yarn                         | 0.62  |
| 26   | 5208    | Woven cotton fabric, >85% cotton, <200g/m2                                     | 0.61  |
| 27   | 7109    | Base metals, silver, clad with gold, semi-manufactured                         | 0.61  |
| 28   | 0713    | Vegetables, leguminous dried, shelled                                          | 0.61  |
| 29   | 5403    | Artificial filament yarn (except sewing), not retail                           | 0.61  |
| 30   | 7115    | Articles of, or clad with, precious metal nes                                  | 0.61  |

nes = not elsewhere specified
Source: Author’s calculations
Table A6: Korean Exports of Mounted Lenses, Prisms, Mirrors, Optical Elements  
(HS 9002)

| Importer                              | $C_l$  |
|--------------------------------------|-------|
| Pakistan                             | 0.98  |
| Thailand                             | 0.85  |
| Norway                               | 0.72  |
| Australia                            | 0.72  |
| Colombia                             | 0.72  |
| Algeria                              | 0.62  |
| New Zealand                          | 0.59  |
| Canada                               | 0.58  |
| United Kingdom                       | 0.58  |
| Philippines                          | 0.58  |
| China, People’s Republic of China    | 0.54  |
| Turkey                               | 0.51  |
| Singapore                            | 0.49  |
| United States                        | 0.48  |
| Chile                                | 0.47  |
| Austria                              | 0.45  |
| Spain                                | 0.45  |
| United Arab Emirates                 | 0.43  |
| Czech Republic                       | 0.41  |
| South Africa                         | 0.39  |
| Finland                              | 0.39  |
| Israel                               | 0.38  |
| Germany                              | 0.37  |
| Peru                                 | 0.36  |
| Saudi Arabia                         | 0.36  |
| Hong Kong, China                     | 0.34  |
| France                               | 0.31  |
| Morocco                              | 0.31  |
| Malaysia                             | 0.31  |
| Denmark                              | 0.31  |

Source: Author’s calculations
Table A7: Network Trade Index—Top and Bottom 30 P&C Importers from Japan

| Country                          | Top 30 2000 | Top 30 2007 | Bottom 30 2000 | Bottom 30 2007 |
|----------------------------------|-------------|-------------|----------------|----------------|
| Thailand                         | 0.357       | 0.636       | 0.007          | 0.018          |
| China, People’s Republic of      | 0.366       | 0.537       | 0.006          | 0.017          |
| Korea, Republic of               | 0.414       | 0.526       | 0.006          | 0.016          |
| Philippines                      | 0.261       | 0.324       | 0.003          | 0.016          |
| United States                    | 0.255       | 0.275       | 0.012          | 0.015          |
| Malaysia                         | 0.261       | 0.233       | 0.008          | 0.013          |
| Viet Nam                         | 0.267       | 0.225       | 0.017          | 0.012          |
| Hong Kong, China                 | 0.178       | 0.198       | 0.009          | 0.012          |
| Indonesia                        | 0.195       | 0.191       | 0.007          | 0.008          |
| Mexico                           | 0.055       | 0.187       | 0.004          | 0.007          |
| Sri Lanka                        | 0.137       | 0.178       | 0.001          | 0.006          |
| Singapore                        | 0.163       | 0.134       | 0.005          | 0.006          |
| Hungary                          | 0.071       | 0.094       | 0.022          | 0.006          |
| Brazil                           | 0.054       | 0.092       | 0.003          | 0.005          |
| Germany                          | 0.079       | 0.090       | 0.001          | 0.005          |
| United Kingdom                   | 0.085       | 0.085       | 0.003          | 0.005          |
| New Zealand                      | 0.068       | 0.082       | 0.020          | 0.005          |
| Czech Republic                   | 0.018       | 0.076       | 0.003          | 0.004          |
| Turkey                           | 0.029       | 0.069       | 0.006          | 0.004          |
| Netherlands, The                 | 0.055       | 0.062       | 0.005          | 0.004          |
| France                           | 0.043       | 0.061       | 0.002          | 0.003          |
| Canada                           | 0.043       | 0.058       | 0.006          | 0.002          |
| Spain                            | 0.044       | 0.058       | 0.001          | 0.002          |
| India                            | 0.056       | 0.053       | 0.002          | 0.001          |
| Israel                           | 0.021       | 0.053       | 0.000          | 0.001          |
| Italy                            | 0.040       | 0.047       | 0.000          | 0.001          |
| Slovak Republic                  | 0.016       | 0.046       | 0.001          | 0.000          |
| Ireland                          | 0.019       | 0.045       | 0.000          | 0.000          |
| Belgium                          | 0.039       | 0.045       | 0.000          | 0.000          |
| Portugal                         | 0.039       | 0.043       | 0.000          | 0.000          |

P&C = parts and components
Source: Ferrarini (2013)
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Abenomics’ Trade Spillover
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