Japanese Exports: The (Ever More) Disconnected Exchange Rate?

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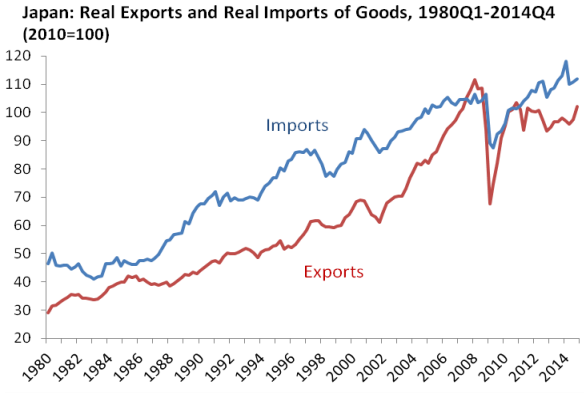
Summary: *The 30 % depreciation of the yen against the dollar, from late 2012 to mid 2013, has not been followed by significant improvement in Japan's exports, which have been flat until just recently. Two observations help to understand the lackluster response of exports:*

1) *Pass-through rate of exchange rate to export prices seems somewhat lower recently than in previous large depreciation episodes. This is related to Japan's being increasingly involved in global value chains (GVCs) in which it maintains an upstream position;*
2) *The ongoing shift of production by Japanese firms overseas has "substituted" for domestic production of export goods, obscuring the positive impact of the depreciation on exports.*

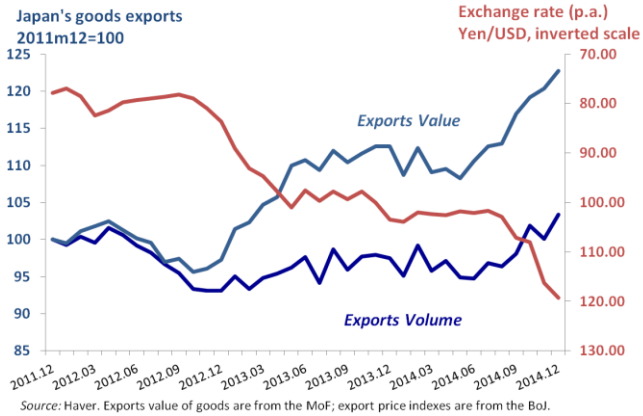
This note presents preliminary evidence for the above and identifies potential areas for future work. It points out that in the context of constantly evolving GVCs, better understanding of firm behavior and sectoral evidence would help to shed light on important policy issues such as the role of the exchange rate in external adjustment.

Background

Growth in Japanese exports was strong and stable before the GFC. After trade plummeted during the crisis, imports bounced back and resumed growing.[2] But exports stagnated.



Zeroing in on the post-crisis period, the introduction of "Abeconomics" in late 2012 led yen to depreciate from about 80 per USD in October 2012 to about 100 in May 2013. Both CPI-based and ULC-based real exchange rates depreciated by almost 30% during the period. More recently QQE2 brought another round of yen depreciation. But export volume has been flat and only started to increase in the last 4 months of 2014.

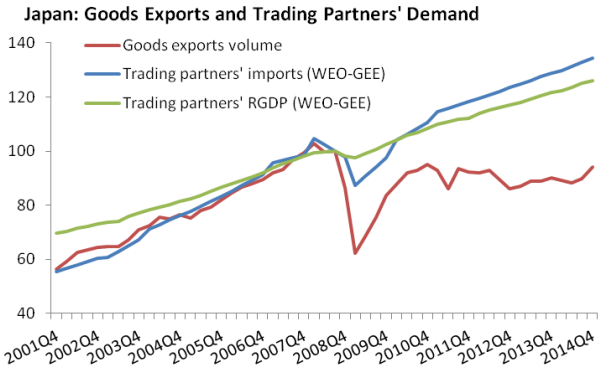


Source: Haver. Exports value of goods are from the MoF; export price indexes are from the BoJ.

[1] I have benefitted greatly from conversations with the Japan desk, Joong Shik Kang.

[2] Imports growth has been boosted by an increase in fuel imports following the shutdown of nuclear power plants after the 2011 earthquake and heightened domestic demand in anticipation of a tax increase.

Meanwhile, external demand for Japanese exports—proxied either by trading partners' real imports or their real GDP—has grown steadily.



So the outstanding question is why exports seemingly have not responded to depreciation. First, we assess whether this low level of sensitivity is "typical" in Japan or whether it is a new phenomenon. As an initial diagnostic, we estimate a standard export demand equation, on pre-crisis quarterly data (1980Q1-2008Q3), with an ECM specification:

$$\Delta lnEX_t = \underset{(-0.15)}{-0.01}\Delta lnEX_{t-1} + \underset{(1.01)}{0.04}\Delta lnREER_t \underset{(-2.65)}{-0.12}\Delta lnREER_{t-1} + \underset{(2.88)}{0.97}\Delta lnD_t + \underset{(4.17)}{1.61}\Delta lnD_{t-1}$$
$$\underset{(-4.13)}{-0.14}(lnEX_{t-1} + \underset{(4.64)}{0.50}lnREER_{t-1} - \underset{(27.53)}{0.86}lnD_{t-1}) + 0.36$$

with $R^2 = 0.46$ and t-statistics in brackets. Foreign demand D is measured by the (weighted) average of trading partners' real GDP (from WEO-GEE).

The result suggests that 10% depreciation of REER is associated with less than 1% increase in export volume in a year and 5% increase in the long-run. An out-of-sample forecast for post-crisis period (2009Q1-2014Q3) based on above equation shows that export growth would have been stronger if exports responded to REER and foreign demand in a similar fashion as it did pre-crisis. In particular, after the depreciation, from 2012Q3 to 2014Q3 exports would have grown by more than 20%, compared to the 2% observed.

In this note, we highlight three facts about Japan which contribute to understanding the seeming lack of response of exports to weakened yen. The three interconnected facts are (i) lower exchange rate pass-through to export prices recently; (ii) increased participation in global supply chain and the upstream position of Japan's exports; and (iii) a shifting of export production overseas by Japanese manufacturing firms. Facts (ii) and (iii) contribute to explaining (i). Fact (iii) itself implies that exports likely did respond positively to the depreciation: if the yen had not depreciated, exports likely would have fallen further with the ongoing shift of domestic production of goods for export to Japanese overseas subsidiaries.

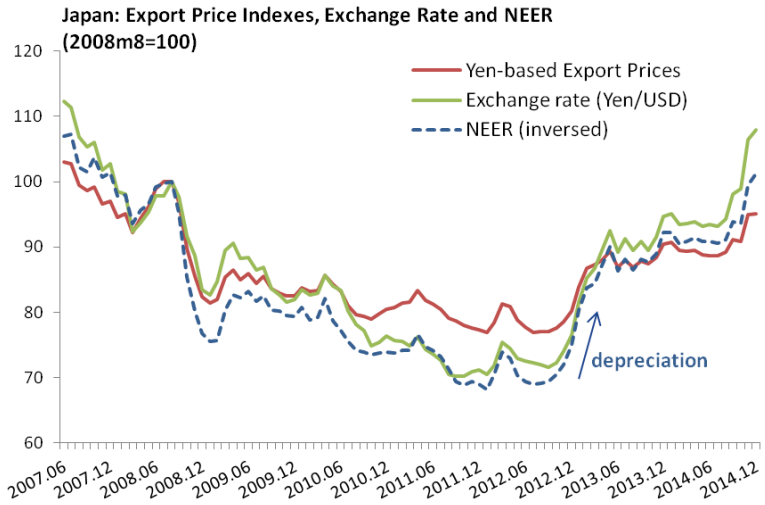
Japan's export structure. It's helpful to first look at the structure of Japanese exports. A few sectors account for a large share of exports. At the HS2-digit level, the top 10 exporting sectors (out of 93 sectors) are responsible for more than 80% of total export value, with the top 3 counting for more than 60%. In general, Japanese exports are dominated by high value-added products: electrical machinery and transportation equipment, which are specialized and not easily substitutable. This allows the producer to charge a sizable profit margin.

What is also special about electrical machinery and transportation equipment industries is their linkage to GVCs. For both industries, the Asian hub is largely built around Japan as the lead manufacturer of products and components.

Fact 1: Low exchange rate pass-through in general, and lower recently.

The price of Japanese exports, expressed in terms of yen, rose sharply following the yen depreciation, implying limited pass-through of the depreciation to the prices faced by foreign buyers; i.e., demonstrating significant "pricing to market" behavior. The 30% depreciation of yen against the dollar from Oct. 2012 through May 2013 led yen-based export prices to rise by more than 15%, suggesting an increase in profit margins.

Also notable, the chart below shows that a prolonged period of yen appreciation took place earlier between 2007 and 2012, and export prices in yen terms then fell greatly, suggesting profit margin compression.



There is evidence suggesting that the passthrough rate has been even lower in recent years. The table below presents the percentage change of (the inverse of) NEER together with that of the yen-based export prices during 5 large depreciation episodes since the 1980s. All else equal, the passthrough rate can be roughly expressed as 1 - % change in yen-based export prices/NEER depreciation. The table shows that passthrough in the recent episodes has been somewhat smaller than previous episodes.

Large depreciation episode	%change of yen-based export price	NEER depreciation rate	Passthrough
	(1)	(2)	1-(1)/(2)
1988M10-1990M04	9%	23%	58%
1995M06-1997M04	18%	42%	57%
2000M01-2002M02	7%	20%	64%
2005M01-2007M06	12%	24%	50%
2012M10-2013M05	15%	28%	46%
2014M09-2014M12	7%	11%	35%

So, what has changed?[3]

Fact 2: deeper involvement in global supply chains. *Japan's increased participation in global supply chains---manifested in increased import content of exports and higher share of exports used in other countries' export production---implies lower elasticity of exports to REER than before.*

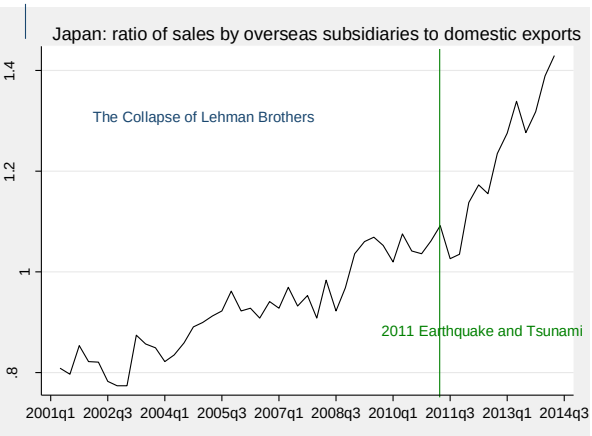
Japan is *increasingly* involved in the global production chain (GVCs), especially with other Asian countries. According to the OECD GVCs data, the foreign value added as percentage of Japan's gross exports (backward participation) doubled from 1995 to 2009, from 8% to 16%. Meanwhile, Japan has also become a more important intermediate input supplier for other countries' exports: domestically produced inputs used in third countries' exports (forward participation) jumped from 22% to 32% during the same period.

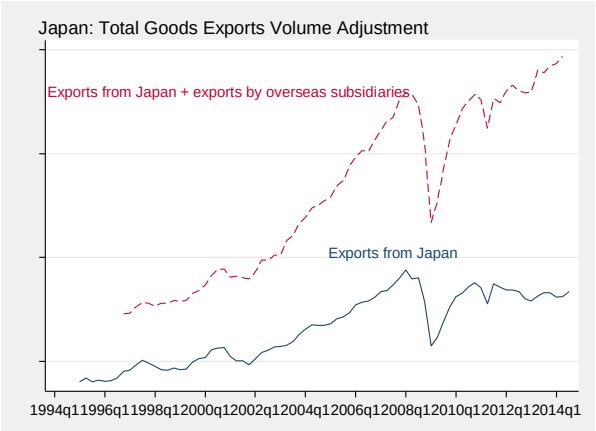
In addition, compared to other non-commodity exporting countries, Japan is more specialized in upstream sectors (i.e. sectors at the beginning of the value chain which are more intensive in research and design). An upstream position in GVCs means that many production stages are left before the goods reach final consumers. More intermediate inputs from other countries are being added along the way, and hence the consumer price of the final product is less tied to export prices set by Japanese suppliers. Therefore, there is less incentive for the producers to adjust their producer-price to exchange rate fluctuations. As Japan became more heavily involved in GVCs and as GVCs become ever more complicated, goods produced and exported by Japan become more specialized and more difficult to be replaced with other countries' products. These two observations together help explain why exchange rate pass-through to producer prices is low and why it seems to be even lower in recent years.

[3] Lower exchange rate passthrough is not due to changes in invoicing currencies. If prices are "sticky" in the short-run and firms invoice their exports in foreign currency terms, then yen depreciation mechanically translates into higher yen-based export prices. However, the share of exports invoiced in foreign currency (mostly in USD) in fact has decreased from 75% in the 1990s to 60% after 2010. Therefore, the larger increase in yen-based export prices (as a ratio of NEER depreciation) in recent two episodes is not an outcome of the change in invoicing currency choice.

Fact 3: Shift of production/sales overseas. *The sharp appreciation of the yen following the collapse of Lehman and the 2011 earthquake prompted many Japanese firms to expand their production network abroad. This implies (i) a higher ratio of intra-firm trade and less response of exports to the exchange rate (as above), and (ii) any positive impact of the weaker yen on export volumes was offset by the ongoing shift of production of previously exported goods to overseas.*

The process of production reallocation overseas has been going on long before the crisis. However, the appreciation of the yen during GFC and the destructive 2011 earthquake further propelled the overseas expansion. Overseas sales by Japanese subsidiaries have risen by more 40% since 2011, a much faster pace than "domestic" exports growth (8%), and now count for 58% of total sales. The chart on the right below shows that adding overseas "exports" (i.e. overseas sales by Japanese subsidiaries excluding sales back to Japan) to domestic exports greatly increases the export level and changes the post-crisis trend to be more in line with the pre-crisis trend.





Notes: Lack of direct information on the local currency pricing, exports (imports) value by Japanese overseas subsidiaries are deflated using the export (import) deflator for domestic exports (imports). Data source: Quarterly survey of overseas subsidiaries

The increased production and sales overseas suggests that intra-firm trade has become much more important. This would help to explain lower exchange rate pass-through, as within-firm transactions are less subject to the impact of exchange rate fluctuations.[4]

More importantly, though we lack direct data on intra-firm trade, there is evidence that Japanese intra-firm trade is largely concentrated in the exporting industries—such as transportation equipment and electrical machinery. This type of intra-firm trade involves exports of parts and components from Japanese parent firms to their foreign affiliates. The products produced/assembled by foreign affiliates in these industries are either sold in local

[4] This increase in exports from Japanese parent firms to their foreign affiliates is consistent with the observed change in invoice currency choices. In 2002, only 28% of exports are contracted in yen, while its now 38%.

markets or shipped to unrelated buyers in third-country markets. Therefore, the offshoring production/sales by Japanese subsidiaries has increasingly become "substitutes" (replacements) for domestic production/exports. In fact, preliminary work by Joong Shik Kang (APD) shows that when controlling also for the degree of offshoring—measured by the relative size of overseas investment out of total investment by Japanese manufacturing sector—a standard export demand equation can replicate the observed flattening of exports after the trade collapse relatively well. Thus, increases in offshore sales decreased domestic exports, offsetting any positive impact of the yen depreciation on exports.

Conclusion. The evidence suggests that the response of exports to the yen depreciation may have been small, in line with structural characteristics of Japan, and that any such response was obscured by ongoing shift to overseas of the production of goods previously exported. Deeper understanding of trade structure, such as firm-level evidence on firms' involvement in GVCs and offshoring and their implications for exchange rate pass-through, would be informative about the role of exchange rate (and monetary policy) on the external sector.