

Estimation of imported car inventory in Japan

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1. Introduction

Inventories of imported goods have recently become the focus of a number of studies by academic economists. Alessandria et al. (2011), for example, studied large fluctuations in international trade relative to production and sales and found that inventory adjustment plays an important role in the dynamics of international trade. Data on import inventory are usually not readily available, and, to the best of the author's knowledge, imported automobiles are no exception. By making use of import and sales data, however, it is possible to estimate inventory, that is, the number of cars imported but not sold and held by importers.

This research note is an attempt to estimate the inventory of imported cars in Japan. The estimate is based on the idea that gaps between imports and their sales during a certain period can be considered as inventory investment: When imports exceed sales in a given period, this can be treated as a positive inventory investment during the period. On the other hand, when sales exceed imports, this implies a negative inventory investment, as the inventory level has been reduced.

The note is organized as follows: An overview of the import and sales of imported cars is provided in the next section; Section 3 presents the estimated inventory of imported cars in Japan using the data described in Section 2; Section 4 summarizes and discusses findings.

2. Japan's auto imports and sales

Two statistical sources are used here: Trade Statistics of Japan, issued by the Ministry of Finance (MOF), and New Registrations of Imported Vehicles, compiled by the Japan Automobile Importers Association (JAIA). The former provides import data; the latter tracks sales of automobile imports. This note focuses on car imports and the sales of imported cars in Japan (hereinafter, “imports” and “sales,” respectively).ⁱ

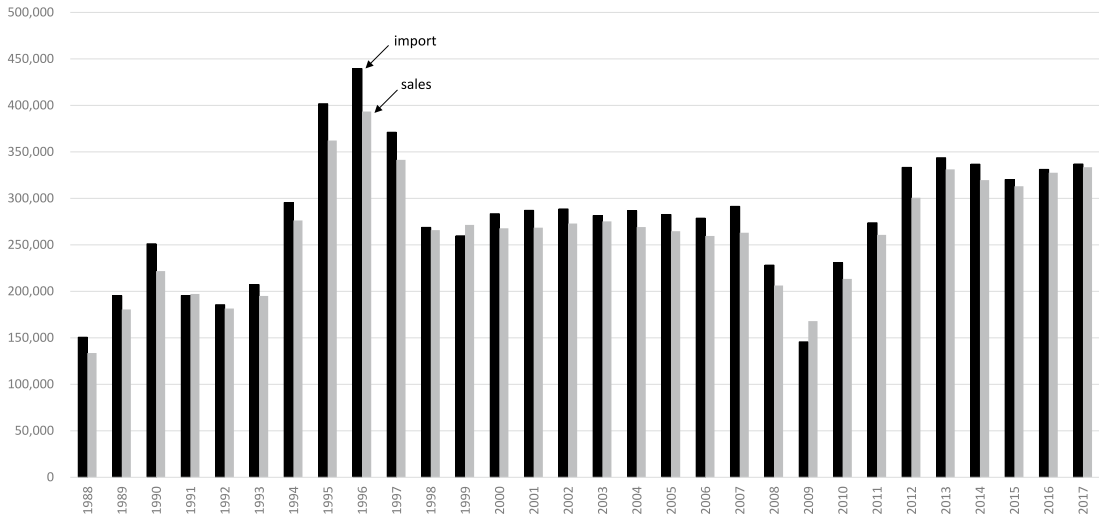
Figure 1 shows Japanese imports and sales over the past thirty years. As the figure indicates, the general trend in auto imports is positive, with distinct peaks and valleys. In recent years, approximately 300,000 cars have been imported and sold annually. From the late 1980s to the early 1990s, annual volume was roughly 200,000. The economic boom in the mid-1990s expanded the market substantially, briefly elevating sales to nearly 400,000 cars. The market remained relatively stable from 2000 to 2007, with annual imports and sales between 250,000 and 300,000 cars. When the global economic crisis hit the Japanese imported car market in 2008, the market shrank dramatically, with imports falling below 150,000 units in 2009.

As can be seen in the figure, the heights of the import and sales bars each year roughly match each other. However, there is some gap. For example, in 1996, imports exceeded sales, which means inventory increased. In contrast, in 2009, sales exceeded imports, indicating that importers reduced inventory. Such import-sales gaps suggest that car importers hold and adjust inventories, a phenomenon that will be addressed in the next section.

Figure 2 takes a closer look at the relation between car imports and their sales by showing quarterly data. To control for seasonal effects, the rates of change of imports and sales relative to the same period the previous year are used. As in Figure 1, both imports and sales show similar movement. However, imports appear to fluctuate more than sales. Figure 2 shows three apparent slumps during the targeted three decades, the first of which was in 1991. Notably, while both imports and sales recorded negative year-on-year growth in 1991, the rate of decrease in imports was larger than that of sales. Similarly, during the slump from 1997 to 1998, imports recorded larger negative growth compared to sales. The most recent slump, which occurred during the 2008–2009 economic crisis, led to decreases both in imports and sales, but again, the rate of decline in imports was larger. This magnified movement of imports relative to sales can also be seen during the recovery periods following the slumps. Specifically, the rate of recovery of imports was greater than that of sales during the recovery period from 1992 to 1994; an even more substantial recovery of imports was seen in 2010 after the economic crisis.

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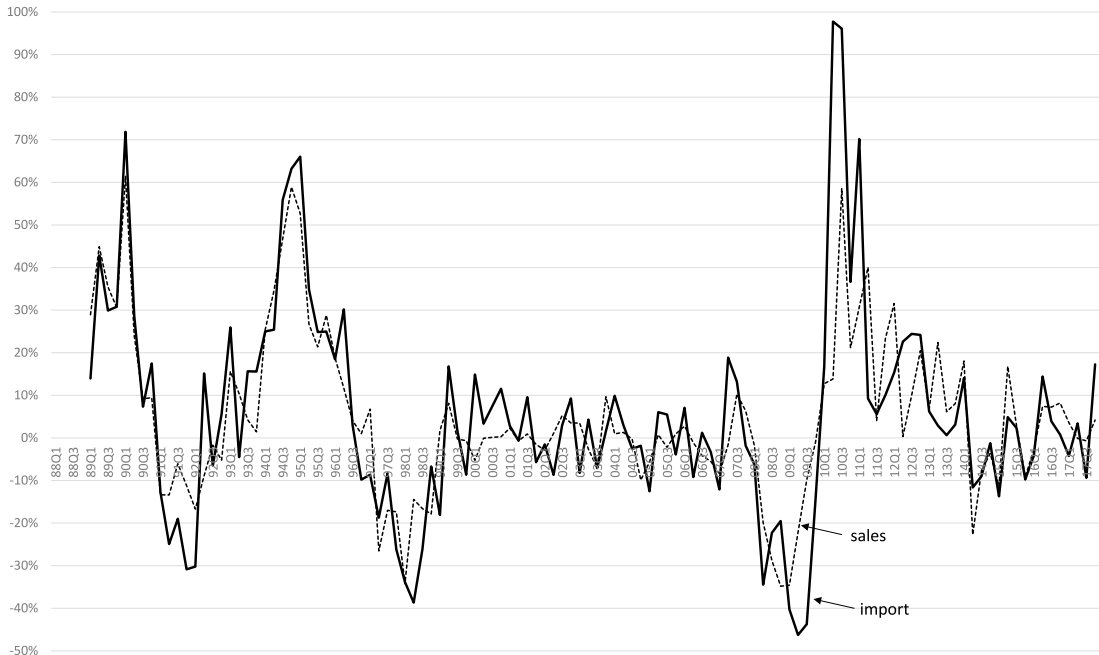
Figure 1: Car imports and sales in Japan, 1988-2017



Unit: Number of cars.

Source: Graph created by author using MOF trade statistics and JAIA sales figures.

Figure 2: Growth rates of car imports and sales (ratio to the same period in the previous year)



Unit: Number of cars.

Source: Graph created by author using MOF trade statistics and JAIA sales figures.

3. Estimating the inventory of imported automobiles in Japan

The following method was used to estimate inventory investment over the period observed. Imports, sales, and inventory levels are represented by m , s , and v , respectively. Because inventory investment is the gap between imports and sales in each period, inventory investment in period t (Δv_t) can be defined as

$$\Delta v_t \equiv m_t - s_t.$$

Inventory level at the end of period t (v_t) is

$$v_t = v_{87Q4} + \sum_{i=88Q1}^t \Delta v_i,$$

where v_{87Q4} is the initial level of inventory at the end of the fourth quarter of 1987 (an unknown value).

Figure 3 shows the resulting estimates of the inventory of imported cars—that is, inventory investment (Δv_t)—and the corresponding sum of inventory investment since 1988 ($\sum_{i=88Q1}^t \Delta v_i$). The bars in the figure show Δv_t ; the line indicates $\sum_{i=88Q1}^t \Delta v_i$. Quarterly inventory investment ranges from approximately plus 25,000 cars to more than minus 15,000 cars. As indicated in the two previous figures, there is occasional negative inventory investment, that is, reduced inventory, during slumps. In particular, inventory reductions occurred for three consecutive quarters in 2009 amidst the global economic crisis. According to the estimates, negative inventory investment for three consecutive quarters occurred previously only in 1991. Second, overall, the level of inventory appears to be increasing. The most recent estimated inventory level of imported cars in Japan is at least 448,488 cars:

$$v_{17Q4} = v_{87Q4} + \sum_{i=88Q1}^{17Q4} \Delta v_i = v_{87Q4} + 448,488.$$

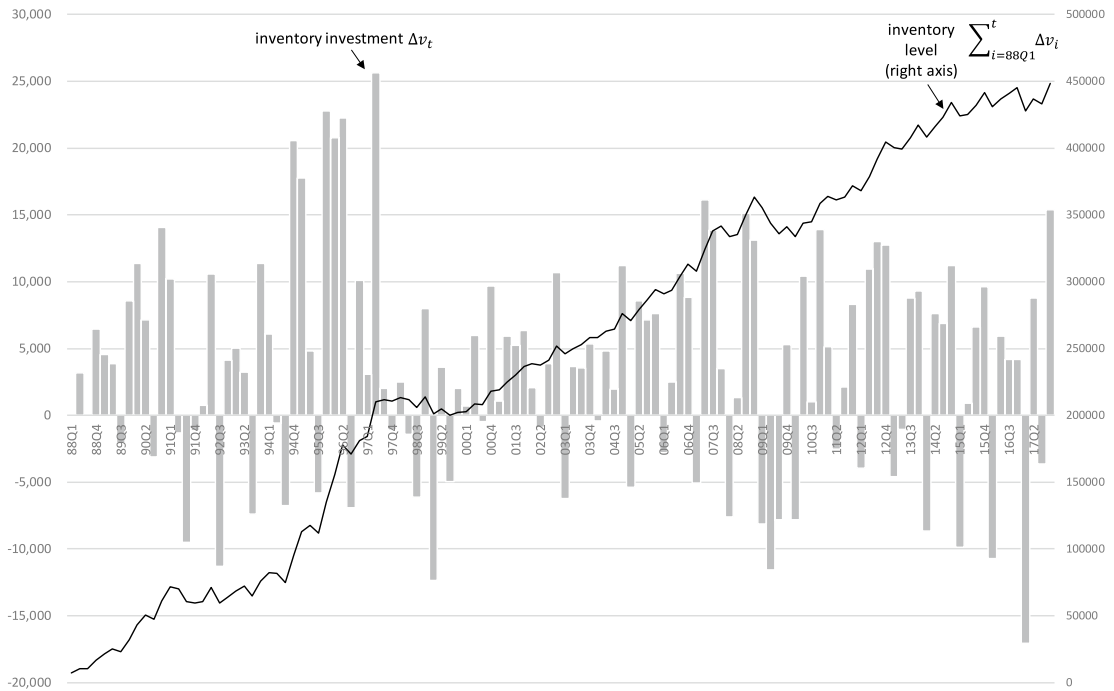
Using this estimate, inventory turnover in 2017, defined as the ratio of sales to average inventory level in 2017, is calculated to be, at most, 0.75.

4. Tentative summary of findings and discussion

Findings on inventory of imported cars

- The inventory of imported cars in Japan—the number of imported cars in stock—appears to have been increasing overall during the past three decades.
- The estimated level of inventory in the late 1990s is at least 200,000 units (approximately); in recent years, it has exceeded 400,000 cars. The most recent data suggest that there are at least

Figure 3: Estimated inventory investment and inventory level of imported cars



Unit: Number of cars.

Source: Author's estimate based on MOF trade statistics and JAIA sales figures.

448,000 units in stock.

- Given that annual imported car sales in Japan have been around 300,000 units in recent years, the estimated inventory figures would mean that today, importers as a whole hold inventory that exceeds their usual annual sales; the estimated inventory turnover in 2017 is, at most, 0.75.
- Although the level of inventory has been on the rise, fluctuations can be found by inspecting quarterly inventory investment data. In particular, during the most recent economic crisis, inventory investment decreased for three consecutive quarters, from the first to the third quarter of 2009. Previously, such a continuous decrease in inventory investment had only happened in 1991, according to the present data set and the estimation method used here.

Findings in relation to the trade dynamics literature

- A substantial drop and rebound in imports relative to sales was seen in Japan's imported cars. Trade is more volatile than demand in this sector.
- Consistent with the argument by Alessandria et al. (2011), trade (import) fluctuates more than demand (sales), and the gaps between the two can be interpreted as inventory adjustment. It appears that importers in Japan respond to demand shocks by reducing imports more and cutting

their inventory.

- Such large inventory adjustments occurred at least three times in the present data set: in 1991, 1999 and 2009.

Discussion

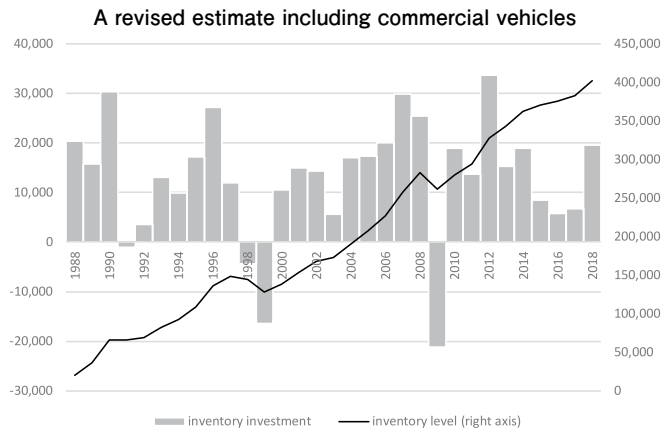
- It must be stressed that the inventory of imported cars presented in this note is an “estimate” based on trade statistics and sales data. Therefore, it is possible that the inventory figures here are biased. In fact, the estimated inventory of over 400,000 cars appears too large.
- Factors leading to this likely overestimation include the fact that used cars may be included in the import data; unlike exports, new and used cars cannot be distinguished in the MOF import statistics. In contrast, the JAIA data cover the registration of newly imported cars. Since Japan has become a major car manufacturing and exporting country, it is unlikely that so many Japanese customers today need to purchase used cars from abroad. Therefore, the inclusion of imported used cars may not be a major source of bias.
- The Ministry of Economy, Trade and Industry, METI (2001, 2002) has conducted surveys on the business practices of used car dealers. It was found that these dealers do import used cars, although only 0.21 to 0.50 percent of the cars they handle come directly from abroad.
- Another explanation for the apparent overestimation of inventory may arise from the way the vehicles are classified. The estimates presented here focus on the import and sales of passenger cars. However, the MOF import data and the sales data used by JAIA may differ in their classification of vehicles as either passenger cars or commercial vehicles (trucks and buses). It is possible that some imported vehicles are identified as passenger cars in the import statistics, while the same vehicles are classified as commercial vehicles in the JAIA sales data. With the estimation method described here, this would lead to an overestimation of inventory. To deal with this problem, a recalculated estimate that includes all types of vehicles—the aggregate total of passenger cars, trucks and buses—is presented in the Appendix. The revised estimate somewhat reduces the level of inventory. However, it still shows that the present inventory level is at least around 400,000 units.
- A minor factor that may be related to the apparent overestimation is that some cars, when shipped to Japan, may be damaged and some of the damaged cars may not be sold. However, it might also be the case that importers return the unsold cars to the country of origin or re-export them to a third country. The puzzle of the seemingly excessive level of estimated imported car inventory remains unsolved. In any case, because of these factors, the estimate of 448,000-plus imported cars in stock should be taken as an upper bound estimate.
- Why is the level of inventory increasing? There are a number of plausible explanations. It seems natural that a larger market will require a larger inventory. The growth in the imported car mar-

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ket in Japan has been accompanied by a rapid increase in the number of imported car dealerships over the past several decades. For example, Volkswagen Japan, the largest auto importer, increased its dealership network from just over 100 outlets in 1993 to over 200 in 1996; currently, there are 250 outlets. Such an increase in the number of sales outlets suggests that a larger stock of cars will be held in dealer warehouses and displayed in showrooms, in addition to the cars that are available for test drives by customers. Another factor is the increase in the variety of the imported cars entering Japan. Increases in the variety of cars, other things being equal, would imply that more inventory is needed, as a certain level of inventory is required for each model.

Appendix

A revised estimate adding commercial vehicles—trucks and buses under HS codes 8704, 8705 and 8702—to passenger cars is shown below.



Unit: Number of cars.

Source: Author's estimate based on MOF trade statistics and JAIA sales figures.

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- i The classification of automobiles can be quite confusing. This note focuses on passenger cars unless otherwise mentioned. A majority of imported cars in Japan today are German brands. Imported cars, however, include those produced by Japanese manufacturers in their overseas plants. Toyota and Honda, among others, do import some of their foreign manufactured cars and, in fact, are members of JAIA. The term “sales” is somewhat vague. JAIA’s new car registration data is interpreted as sales data, although, in practice, there will be some time gap between sales and registration. For further information on the nature of the two statistics, see Atsumi (2015).