Firms as Risk Absorbers: A Source of Resilience in Japan's Labor Market*

Yuta Takahashi
University of Osaka

Naoki Takayama
Hitotsubashi University

Lianming Zhu
University of Osaka

Abstract

This report studies how Japanese manufacturing establishments adjust to exchange rate shocks. The results show that yen appreciation reduces profits, wages, and labor productivity, while total employment responds only modestly. This pattern suggests that Japanese firms absorb external shocks internally, cushioning employment through adjustments in profits, compensation, and labor composition.

*This is a preliminary report. Please do not circulate or distribute without permission.

Introduction

This report examines how Japanese manufacturing firms adjust labor and other margins after exchange rate shocks. Exchange rate movements can reduce export competitiveness and weaken firm performance, especially for industries that rely heavily on destination markets where the yen appreciates. A central question is whether firms respond to these shocks by reducing employment or by adjusting other margins, such as profits, wages, labor productivity, and the composition of employment.

We begin with a description of the data sources and variable construction. Our primary data source is Japan's Census of Manufacturing, which provides annual establishment-level information. The Census covers manufacturing establishments with more than four employees and reports employment, wages, sales, costs, and value added. A useful feature of the Census is that it separately reports regular and part-time employment, which allows us to examine both changes in total employment and adjustments in the composition of labor. Total wage payments are available for all establishments, while wage payments by worker type are available only for establishments with more than 30 employees.

We measure profits as operating surplus, defined as sales net of total wage payments and intermediate input costs. The average wage rate is measured as total wage payments divided by total employment, and labor productivity is measured as value added per worker.

To address revisions to the Japanese Industry Classification (JIC) codes in 1984, 1993, 2001, 2007, and 2013, we construct a consistent industry classification over the full sample period. Specifically, we harmonize establishments into a stable set of Japanese manufacturing industries and use this classification throughout the analysis.

We measure industries' exposure to exchange rate movements using bilateral industry-level trade data from the NBER–UN Trade Database and exchange rate data from Penn World Table 10.0. The trade data provide Japanese exports by destination country and product category, while the exchange rate data measure bilateral currency movements against the yen. We use these data to construct the export-weighted exchange rate exposure measure described below.

Industry-Level Exchange Rate Exposure

For each industry, we measure exposure to nominal exchange rate shocks as the export-share-weighted average of bilateral exchange rate changes across destination countries:

$$\Delta \ln q_{jt} = \sum_{c} \left(\frac{X_{jc,1980}}{\sum_{c'} X_{jc',1980}} \right) \Delta \ln e_{ct},$$

where j indexes Japanese manufacturing industries and c indexes destination countries.

$X_{jc,1980}$ denotes exports from Japanese industry j to destination country c in 1980, constructed by linking Japanese industry codes to the trade classification used in the NBER–UN data.[1] $\Delta \ln e_{ct}$ denotes the log change in the nominal value of the yen relative to country c's currency, with positive values indicating a yen appreciation.

The measure $\Delta \ln q_{jt}$ has a shift-share structure: initial export shares across destinations are the shares, and bilateral exchange rate movements are the shocks. Industries exporting mainly to countries against which the yen appreciates more experience larger appreciation shocks, while industries exporting mainly to countries with relatively stable bilateral exchange rates experience smaller shocks. The measure captures each industry's exposure to yen appreciation based on its initial export-destination structure.

Empirical Specification

The objective of the empirical analysis is to estimate how Japanese manufacturing establishments respond to exchange rate shocks. Our baseline specification examines whether establishments in industries with greater exposure to yen appreciation experience differential changes in outcomes following exchange rate movements. We estimate the following local-projection specification:

$$Y_{ij,t+h} - Y_{ij,t-1} = \alpha_h \Delta \ln q_{jt} + \gamma_h X_{jt} + \lambda_{p,t+h} + \varepsilon_{ij,t+h}. \tag{1}$$

Here, i indexes establishments, j indexes industries, p indexes prefectures, and t indexes years. The dependent variable is the change in establishment outcome Y from $t-1$ to $t+h$. The coefficient of interest is α_h, which captures the dynamic response of establishment outcomes to exchange rate appreciation at horizon h. The specification includes prefecture-year fixed effects, $\lambda_{p,t+h}$, which absorb shocks common to establishments located in the same prefecture and year. These fixed effects control flexibly for local economic conditions as well as aggregate year-specific shocks. Standard errors are clustered at the industry level.

The identifying assumption is that exchange rate movements across destination countries are not systematically related to unobserved shocks affecting the Japanese industries exporting to those destinations. For example, industries that initially export heavily to the U.S. market experience larger shocks when the yen appreciates strongly against the dollar. The assumption requires that yen-dollar movements are not driven by unobserved shocks specific to Japanese industries with greater initial exposure to the U.S. market.

[1] Because the Census of Manufacturing and the trade data use different classification systems, we construct a concordance between JIC industries and the product classifications used in the trade data. The concordance proceeds in two steps. We first map JIC industries to HS product codes and then map HS product codes to SITC categories, the classification used in the NBER–UN data. We then aggregate the resulting trade flows to the harmonized JIC industry–destination–year level.

Our baseline specification includes a set of industry-level controls, $X_{j,t}$, designed to address two potential threats to identification. The first is a share-side concern. Initial export shares are not randomly assigned: they reflect persistent industry characteristics, such as productivity, technology, skill intensity, and export orientation. If these characteristics are correlated both with subsequent establishment outcomes and with exchange rate movements in industries' export destinations, the exposure measure may capture systematic industry differences rather than exchange rate shocks. To address this concern, we include industry-specific linear trends and control for initial industry characteristics—including import penetration, export share, and labor productivity—interacted with year fixed effects. These controls allow industries with different initial characteristics to follow different time paths over the sample period.

The second concern is a shift-side concern. Exchange rate movements may reflect macroeconomic shocks in destination countries. For example, a recession in a destination country may both cause exchange rate movements and reduce demand for Japanese exports. In that case, $\Delta \ln q_{j,t}$ would partly capture foreign demand shocks rather than changes in export competitiveness induced by exchange rate movements. To address this concern, we control for export-share-weighted foreign GDP and GDP per capita, which capture demand conditions in the destination markets to which each industry is initially exposed.

We also control for domestic industry conditions that may affect establishment outcomes independently of exchange rate movements. Changes in domestic demand or supply conditions, for example, may generate differential trends across industries. We therefore control for initial domestic industry characteristics, including domestic absorption and industry output, interacted with year fixed effects. These controls allow industries with different initial domestic conditions to evolve flexibly over time.

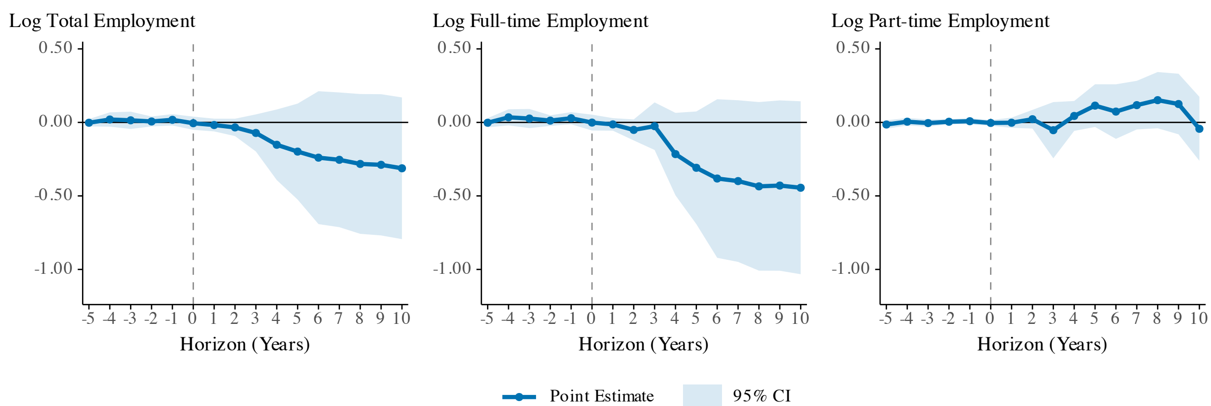
Taken together, the empirical strategy compares establishments in industries with different predetermined exposure to exchange rate movements, while flexibly controlling for local shocks, industry characteristics, foreign demand conditions, domestic industry conditions, and differential industry trends.

Empirical Results

We begin by estimating baseline impulse responses of establishment outcomes to exchange rate shocks. The figures report responses from five years before to ten years after the shock, with 95 percent confidence intervals. Pre-shock coefficients provide a check on differential pre-trends across industries with different exchange rate exposure.

Employment. Figure 1 reports the response of employment to yen appreciation. The three panels show total employment, full-time employment, and part-time employment. Total employment responds little to exchange rate shocks. Full-time employment declines gradually in the medium run, while part-time employment increases modestly. Both responses are small in magnitude, and the aggregate employment response remains limited. The pre-shock coefficients are close to zero, suggesting no sharp differential pre-trends across industries with different subsequent exposure. These results indicate that employment is not the main margin of adjustment.

Figure 1: Dynamic Employment Responses to Yen Appreciation

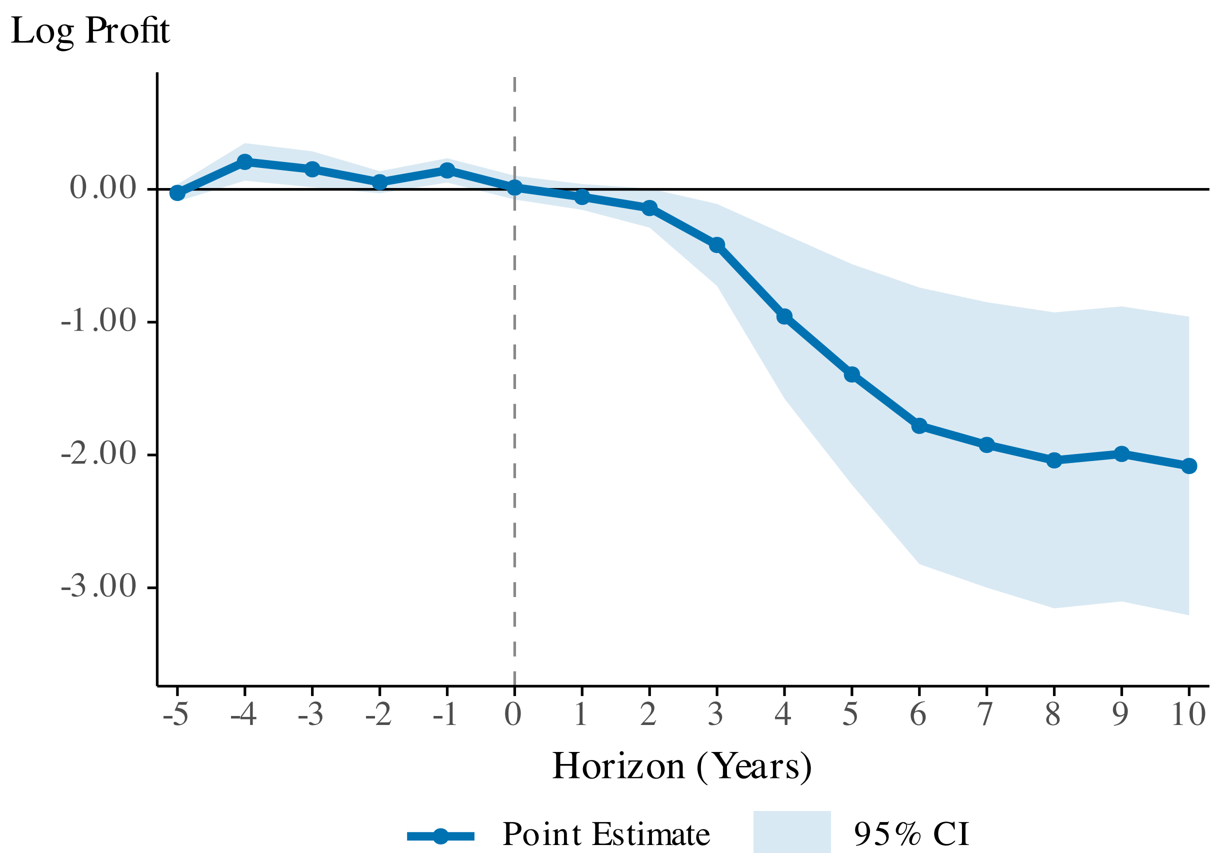


Notes: This figure reports impulse responses of establishment employment to exchange rate shocks. The left panel shows log total employment, the middle panel shows log full-time employment, and the right panel shows log part-time employment. Each point plots the estimated impulse response at horizon h from the baseline local-projection specification in equation (1). The shaded areas denote 95 percent confidence intervals. The vertical dashed line marks the year of the shock.

Profits. In contrast, Figure 2 shows that profits respond strongly to yen appreciation. Following yen appreciation, profits decline gradually and persistently over time, and the effect becomes economically meaningful in the medium run. This contrast between profits and employment suggests that exchange rate shocks weaken firm performance but do not translate into large employment reductions.

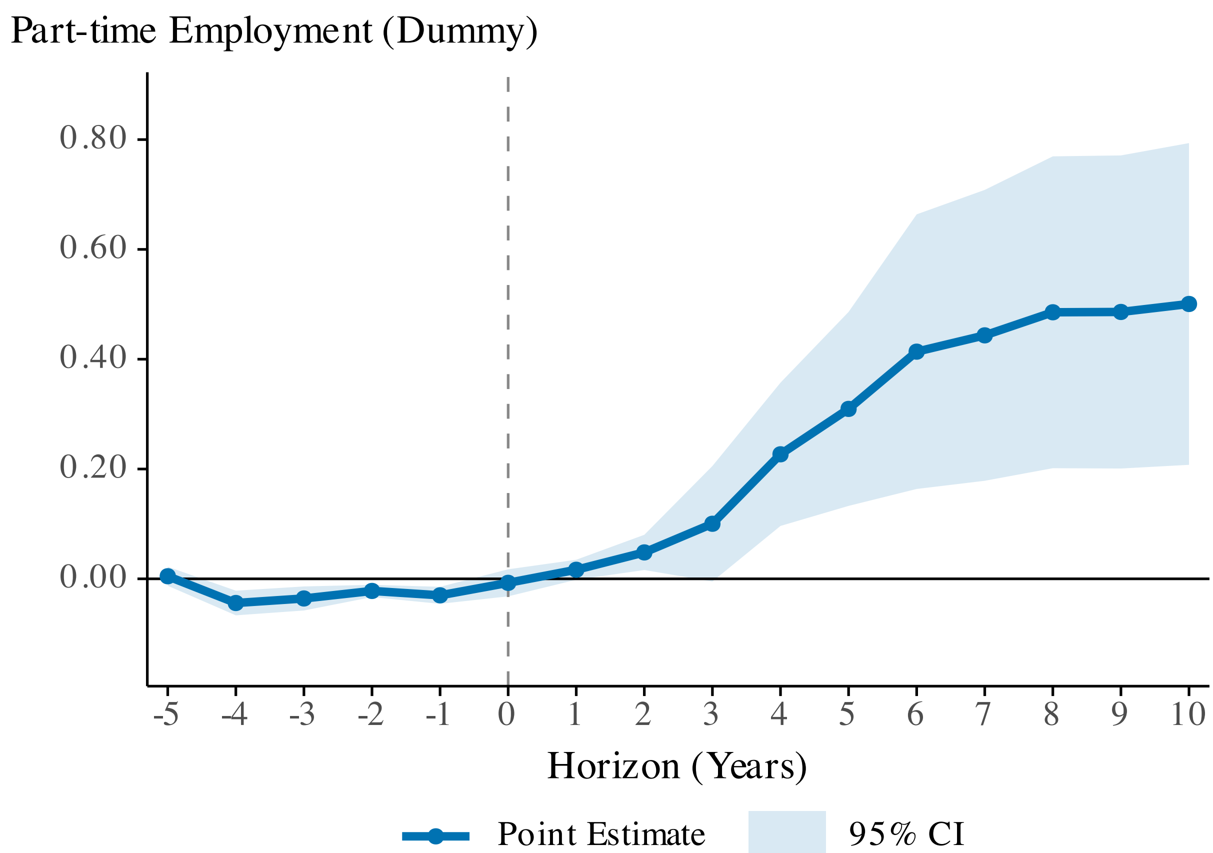
Part-Time Employment. Figure 3 examines whether establishments adjust the composition of employment. The probability of employing part-time workers rises after yen appreciation and increases over the post-shock horizon. This pattern suggests that establishments adjust by shifting toward more flexible labor arrangements rather than reducing employment levels.

Figure 2: Dynamic Profit Responses to Yen Appreciation



Notes: This figure reports impulse responses of establishment profits to exchange rate shocks. Each point plots the estimated impulse response at horizon h from the baseline local-projection specification in equation (1). The shaded areas denote 95 percent confidence intervals. The vertical dashed line marks the year of the shock.

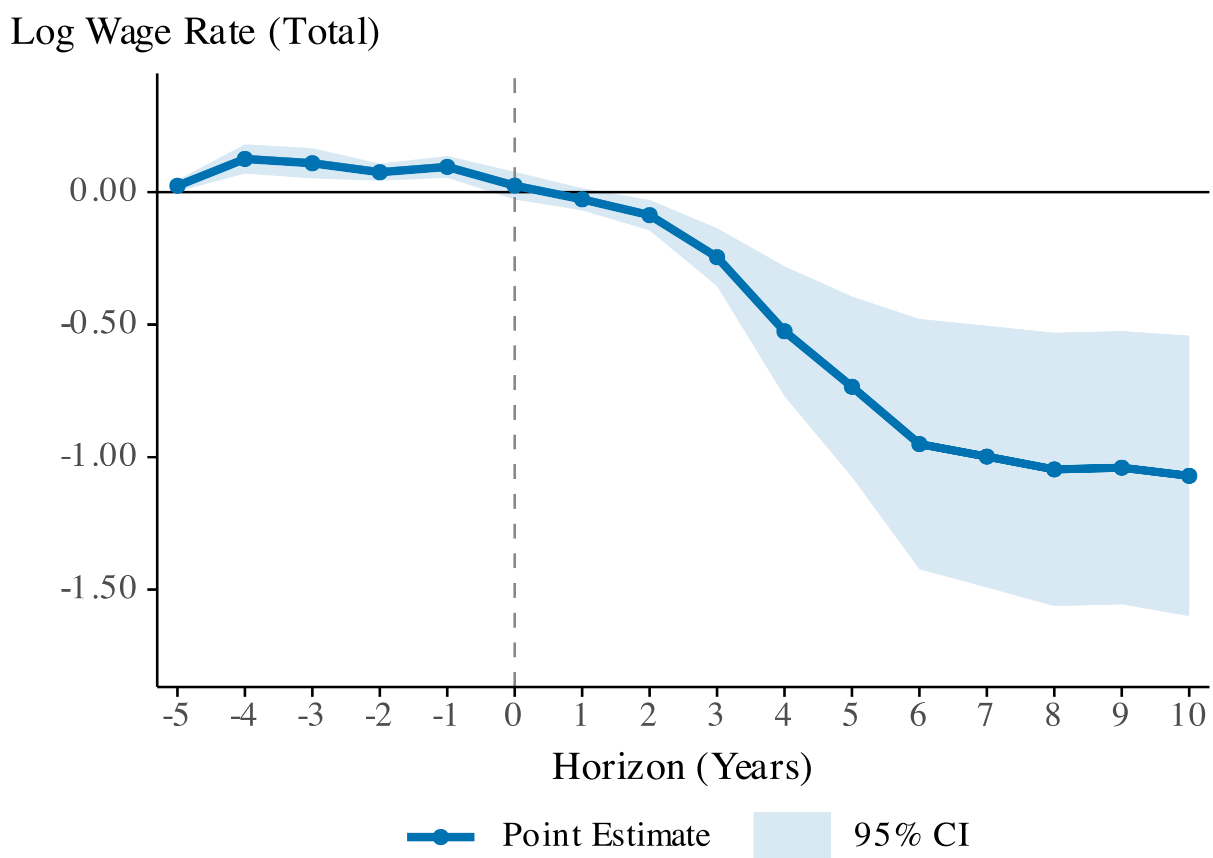
Figure 3: Dynamic Response of Part-Time Employment Use to Yen Appreciation



Notes: This figure reports impulse responses of the probability of employing part-time workers to exchange rate shocks. Each point plots the estimated impulse response at horizon h from the baseline local-projection specification in equation (1). The shaded areas denote 95 percent confidence intervals. The vertical dashed line marks the year of the shock.

Wages. Figure 4 reports the response of the average wage rate. Wages decline gradually after yen appreciation, with the response becoming more pronounced several years after the shock. Wage adjustment therefore appears to be another margin through which establishments respond to exchange rate shocks.

Figure 4: Dynamic Wage Responses to Yen Appreciation

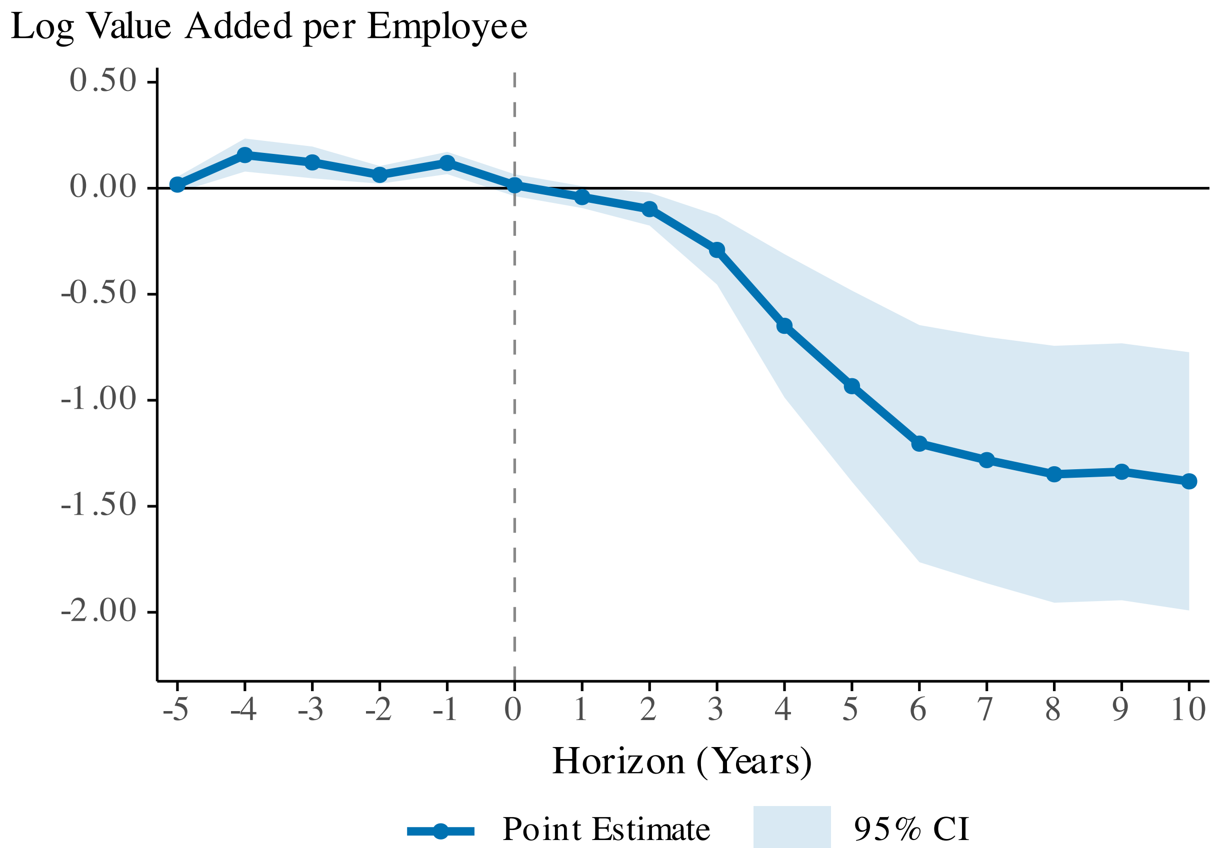


Notes: This figure reports impulse responses of establishment wage rate to exchange rate shocks. Each point plots the estimated impulse response at horizon h from the baseline local-projection specification in equation (1). The shaded areas denote 95 percent confidence intervals. The vertical dashed line marks the year of the shock.

Labor Productivity. Finally, Figure 5 reports labor productivity, measured as value added per employee. Labor productivity declines after yen appreciation, with the decline becoming larger in the medium run and remaining negative over longer horizons.

Overall, the baseline results support the view that Japanese firms act as risk absorbers in response to exchange rate shocks. Yen appreciation significantly reduces profits and labor productivity, and firms adjust partly through wages and the use of part-time labor. Total employment, however, responds little. This pattern suggests that firms shield employment

Figure 5: Dynamic Labor Productivity Responses to Yen Appreciation



Notes: This figure reports impulse responses of establishment labor productivity to exchange rate shocks. Each point plots the estimated impulse response at horizon h from the baseline local-projection specification in equation (1). The shaded areas denote 95 percent confidence intervals. The vertical dashed line marks the year of the shock.

from adverse shocks by adjusting through profits, compensation, and labor composition rather than through large employment reductions.