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JOB SECURITY AND WORK FORCE ADJUSTMENT: HOW DIFFERENT ARE U.S. AND JAPANESE PRACTICES?

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ABSTRACT

This paper compares employment and hours adjustment in Japanese and U.S. manufacturing. In contrast to some previous work, we find that adjustment of total labor input to demand changes is significantly greater in the United States than in Japan; adjustment of employment is significantly greater in the United States, while that of average hours is about the same in the two countries. Although workers in Japan enjoy greater employment stability than do U.S. workers, we find considerable variability in the adjustment patterns across groups within each country. In the United States, most of the adjustment is borne by production workers. In Japan, female workers, in particular, bear a disproportionate share of adjustment.

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I. Introduction

Severe macroeconomic recessions, trade pressures and industrial restructuring have created tensions between American management, which wants to reduce work force levels and increase productivity, and American labor, which wants greater job security. Many in the United States have pointed to Japan, with its success in trade, its high labor productivity, and its relatively strong job security, as a model to follow in reforming U.S. labor relations.

While Japanese workers generally are perceived as having greater job security than U.S. workers, job security can be achieved in different ways. Firms may simply keep excess workers on the payroll during a downturn, even though doing so reduces their short term profits, if they believe that there are long run advantages to such a strategy. Such advantages might include the retention of highly skilled workers or better labor relations. Alternatively, a firm may provide employment security for its work force without sacrificing short term profits if workers as a group are willing to accept flexible hours and/or flexible compensation. Finally, a company may offer employment security for a core group of employees without giving up labor cost flexibility by using subcontractors or temporary workers as a buffer. In this case, greater stability of employment for some translates into less stability for others. All three approaches have been seen as an integral part of Japanese industrial relations. The relative importance of each of these strategies has clear implications for how the costs of adjustment are distributed in society.

This paper focuses on the dynamics of employment and hours adjustment in U.S. and Japanese manufacturing industries. Our empirical work addresses two sets of issues. We look first at the overall elasticities of employment, average hours and total hours with respect to changes in demand in the two countries. A key question in this part of the analysis is whether, in Japan, total labor input adjusts less than in the United States or whether greater flexibility in hours compensates for lower employment elasticities.

The second set of questions that we address concerns differences in adjustment patterns across groups of workers within countries. To the extent that labor input is adjusted to changes in demand, are some groups within each country disproportionately affected? If so, are these groups the same in the United States as in Japan? And is the degree to which the employment of particular groups responds to changes in demand similar in the two countries?

A number of Japanese and American researchers have studied employment and hours adjustment in the two countries using both aggregate and industry data.[1] While, to our knowledge, all have found slower adjustment of overall employment levels in Japan than in the United States, there is conflicting evidence concerning the adjustment of total hours. The prevailing wisdom seems to have been that, in Japan, hours worked are sufficiently responsive to changes in output that hours adjustment largely compensates for the lack of employment adjustment. Shinozuka and Ishihara

[1] Studies comparing employment and hours adjustment in the United States and Japan include Shinozuka and Ishihara (1976), Shimada, Seike, and Hosokawa (1982), Shimada et. al. (1982-82), Sterling (1984), United States Department of Labor (1985), Tachibanaki (1987) and Hashimoto and Raisian (1988).

(1976), for example, find that, while the adjustment of employment is slower in Japan, the adjustment of total labor input in the two countries is about the same. Shimada, et. al. (1982-83) also suggest that employment adjustment in Japan is slower than in the United States, but that the adjustment of total hours in the two countries is roughly comparable. The basis for this claim is unclear. Tachibanaki (1987), comparing standard deviations of employment and hours measures for Japan, the United States, and European countries, concludes that while Japan has the lowest adjustment of employment, it has the greatest adjustment of average hours. In constrast, Hashimoto and Raisian (1988), who relate changes in labor input to changes in output using annual data for manufacturing, find slower adjustment of total hours in Japan. Using a more flexible functional form and somewhat different data to estimate labor elasticities than has been adopted in previous work, we present evidence that both employment and total hours adjustment is significantly greater in U.S. manufacturing than in Japanese manufacturing and that adjustment of average production worker hours is about the same in the two countries.

In analyzing the distribution of the burden of adjustment across groups of workers within each country, we make three comparisons. For both the United States and Japan, we compare adjustment patterns by broad occupational category (production versus nonproduction workers) and by sex. In addition, for Japan only, we look at differences in adjustment by establishment size.[2]

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[2] Unfortunately, available data do not permit parallel by-establishment-size comparisons for the United States.

We would expect greater adjustment of employment among workers whose duties are tied more directly to the level of production or who possess less firm-specific human capital. The greater responsiveness of production than of nonproduction employment in the United States is a well established fact that has been explained on the basis of these economic factors. Our results indicate that production employment elasticities also exceed nonproduction employment elasticities in Japan, but that the difference between the two groups is much smaller than that in the United States.

Because turnover rates are typically higher for women than for men, we would expect greater employment elasticities for women in both countries. In addition, female employment may adjust more than male employment if women as a group have weaker job rights and are more vulnerable to layoff or contract termination than men. In studies of the adjustment of employment levels by sex, Shinozuka (1980) and Nakamura (1983, 1984) find greater adjustment of female than of male employment in Japan. Our estimates support these results. Interestingly, we also find evidence of higher employment elasticities for women than for men in the United States, although the differences between the two groups are much less pronounced than those in Japan.

Finally, it is widely believed that small Japanese enterprises function as a buffer for larger firms. By subcontracting work during expansions and terminating contracts during recessions, large firms may shift cyclical risk onto smaller companies. Others argue, however, that the linkages between large and small Japanese firms are more complex than this simple characterization would suggest.[3] Shinozuka (1980), using aggregate data by

[3] See, for example, Aoki (1984).

establishment size, does find greater adjustment of small than of large establishment employment, but Sterling (1984) finds no correlation between the proportion of industry employment in small establishments and the magnitude of industry employment adjustment. Our results reveal only a weak relationship between employment adjustment and establishment size.

The remainder of the paper is organized into four sections. Sections II and III discuss the model and the data underlying our analysis. Our empirical results are presented in Section IV. Section V summarizes the conclusions that can be drawn from our analysis concerning the overall dynamics of employment and hours adjustment and the relative job security of various groups in each country.

II. The Estimating Framework

The objective of the empirical work described in this paper is to characterize the process whereby U.S. and Japanese employers adjust employment and hours in response to short-run changes in the level of production. Given our comparative focus, it is important that our estimating equations be sufficiently flexible to capture any differences in the pattern of adjustment that might exist between the two countries.

Much previous work on employment adjustment, including almost all previous studies using Japanese data, has used the Koyck specification.[4] Although the Koyck specification is appealingly parsimonious and the Koyck parameters are amenable to precise structural interpretation, this approach requires very strong assumptions that are unlikely to be satisfied in

[4]The one exception among studies using Japanese data that we know of is Sterling (1984).

practice. In particular, it assumes that adjustment costs are quadratic, so that adjustment to a given shock declines geometrically over time, and that the current level of labor demand is expected to persist indefinitely into the future. We have chosen to estimate employment elasticities using a distributed lag model that is flexible enough to capture employment dynamics and demand environments that are different from those presupposed by the Koyck model.

Our basic estimating equation is of the following form:

$$(1)\quad \Delta \ln E_t = \alpha + \sum_{i=0}^{13} \beta_i \Delta \ln P_{t+1-i} + \theta\, t + \mu_t$$

where E represents employment, P represents production, t is a time trend, μ is the error term (assumed to follow a first-order autoregressive process), and α, the β's and the θ's are parameters to be estimated.[5] The β's in this equation capture the response of employment to changes in output. For example, the sum of β_0 through β_4 (i.e., the coefficients on the lead, the current and the first three lagged production terms) captures the cumulative effect on employment over three months of a one-time decline in production. Our specification allows production to affect employment with a lag of up to one year. We assume that other factors affecting employment, such as productivity trends and changes in relative factor prices over the estimating period, are adequately captured by the constant term and the time

[5] We could have estimated an equation containing levels, rather than differences, of the employment and production terms. We did begin by fitting levels equations, but the estimated errors in these equations were such as to suggest that the underlying process generating them was very close to a random walk. We therefore adopted the differenced specification shown in equation (1).

trend.[6] Equations with hours per worker or total hours in place of employment on the left-hand side can be interpreted similarly.

In addition, rather than estimating the β_i's freely, we constrain them to lie along a third-order polynomial in i. That is, we assume that the β_i's can be written in terms of four underlying parameters:

(2) $\beta_i = \phi_0 + \phi_1 i + \phi_2 i^2 + \phi_3 i^3$

where the ϕ's are the parameters we actually estimate. We impose no end-point constraints on the ϕ's.[7]

It should be recognized that the parameters we estimate may be influenced not only by the institutional constraints that are operative in a particular setting but also by the production structure (the industry composition of output, the engineering technologies in use, and so on) and by expectations concerning future demand. In comparing U.S. and Japanese adjustment patterns, we implicitly assume that the structure of production and the structure of the demand for output are reasonably similar between the two countries. This is an issue that we return to below when we discuss our empirical results.[8]

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[6]Including a constant plus a time trend in a difference equation is equivalent to including a time trend plus its square in a levels equation. If, for example, productivity growth over a given time period were to reduce the labor input required to produce any given output, that would reduce the constant term in our estimating equation; a slowing in the rate of productivity growth would raise the coefficient on our time trend.

[7] The point estimates of the cumulative effects of changes in output derived from the Almon lag models are almost identical to those derived from the corresponding unconstrained models.

[8] For more detailed discussions of the assumptions underlying alternative specifications and of the interpretation of the finite lag model we have chosen to estimate, see Sims (1974), Nickell (1986) and Abraham and Houseman (1989).

Note that information on the net accession rate derived from labor turnover statistics can also be used to estimate the employment version of equation (1). Given a change in the level of production, employers alter the level of employment through some combination of changes in accessions and changes in separations. For example, if output declines, an employer may curtail hiring (reduce the accession rate) and also lay off workers (increase the separation rate). The net change in employment will reflect both actions. Using the approximation that the change in ln(employment) equals the net accession rate, equation (1) can be rewritten as:

$$(3)\quad ACCRATE_t - SEPRATE_t = \alpha + \sum_{i=0}^{13} \beta_i \Delta \ln P_{t+1-i} + \theta t + \mu_t$$

where ACCRATE represents the gross accession rate, SEPRATE represents the gross separation rate, and the other terms are as previously defined. If there are problems with the available employment data, as turns out to be the case for Japan, this equation may actually perform better than the corresponding equation based on employment data.

III. Data

In the analysis that follows we make use of monthly data on employment, hours, and production for the U.S. manufacturing sector and on employment, gross accessions, gross separations, hours and production for the Japanese manufacturing sector. The analyses reported in the paper are for the manufacturing sector as a whole. We also carried out similar analyses for each of fifteen disaggregated industries within the manufacturing sector; the results of these disaggregated analyses are reported in an appendix available from the authors.[9] Because we were only able to obtain seasonally adjusted production series for Japan, we used seasonally adjusted series throughout.[10] Except as otherwise noted, all of our analyses cover the 1970:1 through 1985:12 time period.

The employment and hours data for the United States come from the employer payroll survey sent to a stratified random sample of establishments each month. The data from this survey permit us to construct not only an overall employment series, but also separate employment series for production versus nonproduction workers and for male versus female workers. The survey also yields information on average paid weekly hours for production workers. The published data from this survey are not broken down by establishment size.

The labor input data for Japan are derived from a similar employer survey, the Monthly Labour Survey, sent to a random sample of establishments with 5 or more employees. This survey covers all workers who are employed on an employment contract of at least one month's duration or who have worked at least 18 days during each of the previous two months.[11] It yields

[9] The fifteen disaggregated industries are: food; textiles; apparel; lumber; pulp and paper; chemicals; rubber; stone, clay and glass; iron and steel; nonferrous metals; fabricated metals; nonelectrical machinery; electrical machinery; transportation equipment; and precision machinery.

[10] Where no seasonally adjusted series was published, we performed the seasonal adjustment ourselves using the X-11 procedure in SAS.

[11] In the Japanese Labour Force Survey, a monthly household survey, "temporary employees" are defined as "employees employed for a period of not less than a month but not longer than a year" and "day labourers" are defined as "employees employed daily or for a period of less than a month." Thus, the employer-provided data we use include temporary employees, but may not include day laborers. In 1984, day laborers accounted for about two percent of employment in Japanese manufacturing. See Japan Ministry of Labour (1984).

information on employment, gross accessions and gross separations for the covered work force as a whole. For establishments with 30 or more employees, the same information is also collected separately for production and nonproduction workers and for male and female workers. Similarly disaggregated data on average monthly hours are also available for these establishments. For establishments with 5-29 employees, data are not collected separately for production and nonproduction workers. Except when we look explicitly at patterns of adjustment by size of establishment, the results we report for Japan are based on data for establishments with 30 or more employees.[12]

While the U.S. and the Japanese surveys are otherwise quite similar in concept, there is an important difference in the quality of the employment data derived from them. In the United States, month to month movements in all of the employment series we have used are generated using the "link relative" method, which exploits information on the percentage change in employment in establishments that report their employment in both months, and the series are rebenchmarked to population totals annually. The Japanese employment data just described are simply published each month as they become available and never revised subsequently. Because there are significant month to month changes in the sample of reporting establishments, the Japanese employment series are far noisier than the corresponding U.S. series.[13] Each month, however, in addition to reporting

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[12] Models fit using data for establishments with 5 or more employees, rather than 30 or more employees, in cases in which this was possible, yielded findings that were very similar to those we report.

[13] Eiji Shiraishi of the Japan Ministry of Labor brought this problem to our attention. The Ministry of Labor does publish an index of employment in establishments with 30 or more employees that it considers suitable for

their end-of-month employment, establishments responding to the Japnese Monthly Labour Survey are asked to report their accessions and separations. We use this information to calculate the gross monthly accession rate and the gross monthly separation rate at the responding firms. The Japanese employment models are then estimated using equation (3) rather than equation (1) above, with the net accession rate rather than the change in ln(employment) as the dependent variable. This approach avoids the problems associated with using employment data based on different samples in different months.[14]

Another difference between the U.S. and Japanese surveys is that the U.S. survey asks for information on paid hours, while the Japanese survey asks for information on actual hours. We discuss the implications of this difference in definition when we report our results.

Finally, the estimation carried out for this paper required monthly data on production. For the United States, we use the monthly industrial production index constructed by the Federal Reserve Board. Where available, information on physical output serves as the basis for this index. Information on energy usage is generally the preferred proxy for the level of production activity where actual output data are unavailable. In some cases, however, manhours are used to gauge the level of production activity. For manufacturing as a whole, movements in manhours proxy for movements in about 19 percent of total output. This feature of the underlying data

use in time series analysis, but no similar indices are constructed for employment by occupational category, sex or establishment size.

[14] The use of the net accession rate, rather than the change in ln(employment), to fit our Japanese employment equations had very little effect on the estimated coefficients, but the standard errors in the models using the net accession rate were much smaller.

should be kept in mind as we discuss the results in the next section of the paper. We do not, however, believe it poses a serious problem for our estimates. For a number of disaggregated manufacturing industries the weight given to manhours in the construction of the production index is negligible. In the equations that we fit for disaggregated manufacturing industries, the findings concerning cross-country differences in adjustment are not sensitive to the degree to which manhours were used in constructing the Federal Reserve Board production index.

The corresponding Japanese series, the Industrial Production Index, is constructed by MITI based on reports from random samples of firms in a variety of market segments concerning their production of several thousand commodities.

IV. Empirical Results

The first part of our empirical work contrasts the overall pattern of employment and hours adjustment in U.S. and Japanese manufacturing. The second part focuses on differences in employment and hours adjustment across groups within each country, and addresses the question of whether a disproportionate share of the burden of adjustment is borne by certain groups in society.

Production Structure and Demand in U.S. and Japanese Manufacturing

Our central objective in this study is to learn about the effects of the U.S. and Japanese industrial relations systems on employment and hours adjustment. This effort is complicated by the fact that, as noted above, different production structures and different expectations concerning future demand across the two countries might also lead to differences in the pattern of employment and hours adjustment. Thus, an important question that we must consider before proceeding further is whether U.S. and Japanese employers have been operating in a sufficiently similar environment that observed differences in the responsiveness of employment and hours to changes in demand can be interpreted as telling us something about the operation of the two countries' labor market institutions rather than about differences in the structure of production or differences in expectations concerning future demand.

Our major concern with respect to the structure of production was whether differences in the adjustment of aggregate manufacturing labor input to changes in aggregate manufacturing output between the United States and Japan might reflect differences in the composition of the manufacturing base in the two countries. Although in this paper we report only estimated employment and hours elasticities for manufacturing as a whole, as noted earlier, we have also estimated similar equations for fifteen disaggregated manufacturing industries. The fact that these estimates display patterns very similar to those for manufacturing as a whole suggests that differences in the structure of production between the United States and Japan do not explain our findings for manufacturing as a whole.

We were also concerned that differences in the demand conditions prevailing in U.S. and Japanese manufacturing might influence our results. In particular, we feared that stronger long term demand prospects might have lead Japanese employers to adjust labor input less in response to short term perturbations in sales. Table 1 presents measures of growth and cyclicality in the two countries' manufacturing output during the full 1970-85 period and during the two subperiods 1970-77 and 1978-85.[15] From 1970 to 1977, trend growth in manufacturing production was quite similar in Japan and the United States and the variability of production was actually somewhat greater in Japan. However, during the 1978-85 period, manufacturing output grew much more rapidly in Japan than in the United States, and the variability of manufacturing production around its trend was substantially smaller in Japan. These differences are also apparent, though in muted form, in the data for the full 1970-85 period. Thus, looking at data for the 1970-77 period, when demand conditions in the two countries were relatively comparable, is one way of checking any conclusions concerning the effects of differences in the two countries' industrial relations systems drawn from analyses for periods that include the late 1970's and early 1980's, when demand conditions were less comparable. The fact that our results are very similar for all three time periods we examine gives us confidence that the qualitative U.S./Japanese differences we observe reflect differences in the two countries' industrial relations systems, not differences in prevailing demand conditions.

Employment and Hours Adjustment: An Overview

Table 2 and Table 3 provide an overview of labor adjustment in U.S. and Japanese manufacturing. In light of the possible sensitivity of our results to the time period selected, we present separate estimates for the full 1970-85 period, reported in Table 2, and for the subperiods 1970-77 and

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[15] At the end of 1977, both countries were experiencing strong growth following the 1974-75 recession, so that our cutoff represents a similar point in the business cycle for the two countries. Given that our estimating strategy requires a substantial number of observations, it also seemed sensible to break the data at the midpoint of the full period so that neither subperiod was too short.

1978-85, reported in Table 3. Estimates of one, three, six, and twelve month elasticities are presented for total employment, production employment, average production worker hours, and total production worker hours.

The pattern of both total employment and production employment adjustment is strikingly different in the two countries. In the estimates for all three time periods, U.S. manufacturing employment responds quickly and substantially to changes in production, whereas in Japan there is little adjustment until six to twelve months after the change. Moreover, the magnitude of both total employment adjustment and production employment adjustment is significantly greater in the United States than in Japan over all time horizons.[16]

The adjustment of average production worker hours is, in contrast, quite similar in the two countries. In both the United States and Japan, there is a large and immediate response of average hours to changes in production, and none of the estimated average hours elasticities are significantly different across the two countries. As noted above, however, the hours data for the United States measure paid hours, while the hours data for Japan measure actual hours worked. One might expect the adjustment of actual hours to changes in production to be greater than that of paid hours. For example, employers may be able to schedule vacation time during slack periods, in which case actual hours worked would adjust, but paid

[16] Statements concerning the significance of U.S.-Japanese differences are based on Wald tests, with the test statistic computed as the difference between the estimated elasticities for the two countries, divided by the square root of the sum of the variances of these elasticities. Implicitly, we are assuming that the error terms in the U.S. and Japanese equations are uncorrelated. We use the same test for cross-time-period comparisons.

hours would not. Although we do not know the empirical importance of the difference in definition, we can conclude that average hours in Japanese manufacturing adjust no more, and possibly less, than in American manufacturing.

Total production worker hours elasticities are without exception significantly larger in the United States than in Japan. Again, these differences are, if anything, understated.

As already noted, demand conditions in U.S. and Japanese manufacturing were most similar during the 1970-77 subperiod. During the 1978-85 subperiod, Japanese manufacturing output grew more rapidly and was less cyclically volatile than in the earlier subperiod, while U.S. manufacturing output grew less rapidly and was no less cyclically volatile. The point estimates of the relevant Table 3 coefficients imply that, during the later subperiod, U.S. employment and hours generally adjusted somewhat more to changes in production than during the first part of the 1970's, while Japanese employment and hours generally adjusted less.[17] Thus, the magnitude of the divergence between the U.S. and the Japanese adjustment pattern is somewhat sensitive to the period considered. Importantly, however, our qualitative findings are not.

The characterization that Japanese industry relies relatively more on adjustment of average hours while U.S. industry relies relatively more on employment adjustment is certainly accurate. For example, from Table 2, the

[17] For the United States, only the twelve month production employment elasticity difference is statistically significant at the 0.05 level. For Japan, both of the three and six month employment elasticity differences are significant. Our results for Japan are consistent with those reported by Muramatsu (1983). On the basis of Koyck models fit for various subperiods, he concludes that employment adjustment was greatest following the first oil shock than during either earlier or later subperiods.

adjustment of production employment levels accounts for about two-thirds of the total production labor input adjustment over a one month time horizon in the United States; in Japan, the adjustment of production employment levels accounts for only about 10 percent of the total production labor input adjustment over the same time horizon.

Our estimates do not indicate, however, as some researchers have concluded, that average hours adjustment in Japan compensates for the lack of employment adjustment. In both the short and medium run, the adjustment of total production labor input in Japanese manufacturing is substantially less than that in American manufacturing.

Who Adjusts: Within Country Differences in Employment Stability

The results of the preceding section may mask significant variation in employment and hours adjustment, and corresponding differences in the stability of employment, across groups within each country. In the final part of the analysis, we compare labor adjustment by broad occupational category and by sex for both the United States and Japan. In addition, for Japan we look at differences in employment adjustment by establishment size. In this section we present only estimates using data for the entire 1970-85 period. However, we have also estimated equations using data for the 1970-77 subperiod and the 1978-85 subperiod. None of our qualitative conclusions are sensitive to the time period selected. Qualitatively similar results were obtained in our analyses for disaggregated industries as well.

Production versus Nonproduction Worker Adjustment

For technological reasons, production workers are likely to be a more variable input in the production process than nonproduction workers. Furthermore, the average production worker is likely to possess less firm-specific human capital than the average nonproduction worker. For both of these reasons, production employment may adjust more to changes in output than nonproduction employment.

Table 4 compares estimates of one, three, six and twelve month elasticities of production and nonproduction employment within both U.S. and Japanese manufacturing. It also presents estimates of average hours elasticities for Japanese production and nonproduction workers. As expected, U.S. production employment elasticities are uniformly significantly larger than those for nonproduction employment.[18]

Quite different patterns are evident in Japan. The one month elasticity estimates for production and nonproduction employment are insignificantly different both from zero and from each other. The labor input of production workers is somewhat more responsive than that of nonproduction workers in the very short run, but this largely reflects the adjustment of average hours rather than of employment. The production employment elasticity does increase steadily over longer time horizons, but the nonproduction employment elasticity remains insignificantly different from zero. By three months out, the production employment elasticity is significantly larger than the nonproduction employment elasticity.

Still, the differentials in employment adjustment between production and nonproduction workers are much smaller in Japan than those in the United

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[18] To determine the statistical significance of these differences, we used seemingly unrelated regression techniques to estimate unconstrained and constrained versions of the production and nonproduction worker equations. In the constrained versions, we required that the one, three, six or twelve month elasticities, as appropriate, be the same for the two groups. This approach permitted us to construct chi-squared statististics for hypothesis testing. The same approach was used to test the statistical significance of the other within-country differences reported below.

States. Interestingly, the elasticity point estimates for production workers in Japan are insignificantly different from those of nonproduction workers in the United States. Stated somewhat differently, production workers in Japan enjoy a degree of employment stability that is similar to that enjoyed by nonproduction workers in the United States.

Male versus Female Adjustment

Given the fact that turnover rates are higher for women than for men, we would expect to observe greater adjustment of female than of male employment in response to changes in demand. In addition, weaker job rights for women might translate into greater volatility in female employment.

In the United States, last-in-first-out layoff rules are common even in nonunion settings. Because women's job tenure is, on average, shorter than men's, women may be more vulnerable to being laid off in the event of a reduction in force.[19]

In Japan, the so-called lifetime employment system applies primarily to regular employees in large and medium sized establishments.[20] In 1984, only 80 percent of women employed in manufacturing held regular positions, while 20 percent were employed as "temporary workers" or "day laborers".[21] In contrast, 97 percent of men employed in manufacturing held regular positions, with only 3 percent employed as temporary workers or day laborers. Women are also underrepresented in large establishments and

[19] For evidence on these points, see Abraham and Medoff (1984) and Hall (1982).

[20] For discussions of work force reductions in Japanese industry, see United States Department of Labor (1985) and Shimada (1986).

[21] As noted earlier, the term "temporary worker" applies to those employed for one month to one year and the term "day laborer" applies to those employed on a daily basis or for a period of less than one month.

overrepresented in small establishments. In 1984, only 20.6 percent of female employees in manufacturing worked in establishments with 500 or more employees; 34.0 percent were employed in establishments with fewer than 30 employees. The corresponding figures for men were 40.5 percent and 23.6 percent.[22] The fact that Japanese women are less likely than Japanese men to be employed in regular positions with large employers may mean that they are more vulnerable to contract termination.

Table 5 reports one, three, six and twelve month employment elasticity estimates for men and for women in U.S. and Japanese manufacturing. Average hours elasticities by sex for Japan are also reported. In the United States the female employment elasticities are uniformly greater than the male employment elasticities, significantly so for the one, three and six month time horizons.

In the Japanese manufacturing sector, female employment adjustment is much larger than male employment adjustment, especially beginning with the three month elasticity. All male/female differences in the Japanese employment elasticities are statistically significant. From three months onwards, however, the adjustment of male average hours is somewhat larger than that of female average hours; the six and twelve month differences are statistically significant. Therefore, it appears that the lower adjustment of male employment is partly compensated for by greater adjustment of average male hours. The fact that average female hours respond less to

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[22] The data we use to estimate employment and hours elasticities exclude day laborers and employees of establishments with fewer than 30 employees. Among manufacturing employees who are either regular or temporary employees, only 83 percent of women but 98 percent of men are regular employees. Among manufacturing employees in establishments with 30 or more employees, only 31 percent of women but 53 percent of men are employed in establishments of 500 or more employees.

changes in demand may in part reflect the fact that, until 1986, tight legal restrictions limited overtime work by women.[23]

Because production and nonproduction worker employment elasticities are so different in the United States, estimated male/female differentials are likely to be sensitive to the representation of men and women by occupation. Unfortunately, the establishment data source we are using does not provide data on male and female employment separately by occupation. Information from other sources, however, suggests that differences in the distribution of men and women between production and nonproduction jobs are unlikely to explain our finding of higher employment elasticities for women than for men.[24] The same problem in disentangling the effects of occupation and sex on labor adjustment exists for Japan, though the fact that production and nonproduction employment elasticities are more similar makes it less worrisome.[25]

Although in Japan female employment adjusts more than male employment, the employment elasticities reported in Table 5 nonetheless imply that

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[23] Specifically, women were prohibited from working more than 2 hours of overtime in any day, 6 hours in any week or 150 hours in any year. We thank Eiko Shinozuka and Machiko Osawa for bringing this to our attention.

[24] Tabulations of the May 1979 Current Population Survey indicate that a slightly higher proportion of male than of female employees in manufacturing were employed in production jobs (69.8 percent versus 62.6 percent), where production jobs were defined to include craft, operative, laborër and service positions. On the basis of broad occupation alone, then, one would expect male employment elasticities to be higher than female employment elasticities.

[25] During 1979, about 76 percent of women in manufacturing were production workers, compared to 63 percent of men. This difference alone would have lead one to expect only a .003 difference between the one month female and male employment elasticities; over twelve months, the predicted difference would be only .029. The actual differences reported in Table 5 are much larger than the differences one would expect based simply on differences in production versus nonproduction status.

employment elasticities for Japanese women are significantly less than employment elasticities for either American men or American women. This suggests that Japanese women enjoy greater employment stability than either American men or American women as a group. An important caveat to this conclusion, however, is the fact that day laborers, who are disproportionately female, are excluded from our employment data. Day laborers account for only a small fraction of employment in manufacturing (2.1 percent of total employment, 4.5 percent of female employment and 0.8 percent of male employment) but may well provide an important margin for adjustment.

Adjustment by Establishment Size

In this final comparison we look at adjustment of employment levels by establishment size for Japan. Many have noted that the lifetime employment system is primarily a phenomenon of large and medium sized companies. Employment in smaller companies may be less stable due to differences in personnel practices from larger companies. In addition, larger companies may subcontract to smaller companies, essentially using them to cushion demand shocks. In this case, greater fluctuations in production also would contribute to less employment security in smaller companies.

To directly examine the relation between establishment size and employment adjustment, we estimated separate employment elasticities for establishments with 500 or more employees, 100-499 employees, 30-99 employees, and 5-29 employees. The production variables on the right-hand side measure percentage changes in production for the entire industry, not for the individual size class. Consequently, differences in employment adjustment by establishment size may result from differences in the variablility of production by establishment size as well as differences in personnel practices.

The results in Table 6 do reveal some differences in employment adjustment by establishment size. The distinction appears primarily between establishments in the largest size class -- those with 500 or more employees -- versus all other size classes. Employment adjustment is generally greater in the three smaller establishment size classes than in the largest, although many of the differences between the top size class and the others are not statistically significnat and the 12 month employment elasticity for establishments with 5-29 employees is actually less than that for establishments 500 or more employees. A comparison of the three smaller size classes shows that employment elasticities generally decline with establishment size. It is interesting to note that the relatively slower adjustment in the largest establishment size category coincides with the fact that women are particularly underrepresented in establishments with 500 or more employees.

V. Conclusion

Japanese workers appear to enjoy, on average, considerably greater job security than American workers. Consistent with previous work, we find that employment levels in Japanese manufacturing adjust much less to changes in production than do U.S. employment levels. Contrary to some previous work, however, we find that the adjustment of average hours is about the same in the two countries. Consequently, the adjustment of total labor input in the Japanese manufacturing sector is also significantly less than that in U.S. manufacturing. Thus, Japanese hours are not sufficiently flexible to offset any short run costs of providing employment security borne by Japanese employers.

Weitzman (1984) and Freeman and Weitzman (1987) have suggested that the bonus system renders compensation considerably more flexible in Japan than in the United States. The relative responsiveness of total labor costs to changes in production in the United States and Japan is something that we plan to examine in future work. At this point, it would be premature to conclude that the strong job security characterizing Japanese labor markets imposes costs on employers even in the short run. In addition, Japanese internal labor markets are often characterized as more flexible than American internal labor markets, in the sense that Japanese employers have more freedom to reassign workers within the firm.[26] Such flexibility is likely to enhance productivity and may be viewed as a substitute for managerial flexibility in hiring and firing.

Although the stability of employment is, on average, greater in Japan than in the United States, the variation in employment and hours adjustment across groups of workers within each country is considerable. In the United States, the burden of work force adjustment falls primarily on production workers. In Japan, differences between production and nonproduction employment adjustment are relatively small. Both production and nonproduction workers enjoy strong employment security compared to production workers in the United States. This may be a result of the changes in industrial relations in Japan after World War II that equalized

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26 For a recent discussion, see Koike (1984).

social relations between blue and white collar workers. Such equalization has never occurred in the United States.[27]

In Japan, the burden of adjustment to demand shocks is widely believed to be borne disproportionately by workers in small establishments and by casual workers, who are predominantly women. We find only limited support for the contention that employment adjustment is greater in smaller establishments. The differences between the adjustment patterns of male and female employees appear to be more important. Female employment adjusts much more than male employment, particularly over horizons of three months or more. This finding is consistent with the fact that women comprise the bulk of temporary workers in manufacturing and, secondarily, are concentrated in the smaller establishments.

In sum, in both the United States and Japan, the degree of employment security varies widely across groups, resulting in some overlap between the two countries. In the United States, the employment of nonproduction workers is, in practice, roughly as stable as that of overall employment in Japan.

Yet, in Japan, among the groups we examined, there is no group whose employment adjusts as much to changes in demand as that of production workers in the United States. Although, in Japan, female workers, and, to some extent, workers in small establishments, do bear a disproportionate share of the burden of employment adjustment, employment of these groups is still less responsive to changes in demand than that of U.S. production workers.

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[27] We owe this observation to Konosuke Odaka.

A caveat to this last conclusion is that we could not independently examine adjustment patterns for temporary employees and day laborers, who are predominantly women. The pattern of adjustment for temporary employees is likely to be considerably different from that for regular workers, and the fact that a disproportionate number of women are temporary workers may well underlie the male/female differentials we report for Japan. Moreover, our data exclude day laborers, though it should be remembered that they comprise under five percent of the women employed in the manufacturing sector. Nevertheless, one can conclude that Japanese women not employed as day laborers -- the great majority of female Japanese employees -- enjoy, on average, much greater stability of employment than does the average American worker.

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TABLE 1: GROWTH AND CYCLICALITY OF MANUFACTURING PRODUCTION IN THE UNITED STATES AND JAPAN [a]

	Growth	Cyclicality
United States		
1970-1977	.0025	.056
1978-1985	.0016	.055
1970-1985	.0024	.058
Japan		
1970-1977	.0023	.066
1978-1985	.0034	.032
1970-1985	.0031	.054

[a] The numbers reported in this table were derived from regressions of seasonally adjusted monthly ln(production) on a time trend. "Growth" is the time trend coefficient from this regression; "cyclicality" is the standard deviation of the regression residuals.

TABLE 2: EMPLOYMENT AND HOURS ADJUSTMENT
IN U.S. AND JAPANESE MANUFACTURING, 1970-1985 [a]

	One Month	Three Months	Six Months	Twelve Months
Employment				
U.S.	.314 *	.580 *	.664 *	.758 *
	(.023)	(.028)	(.032)	(.045)
Japan	.015	.074	.141	.207
	(.011)	(.024)	(.032)	(.045)
Production Employment				
U.S.	.430 *	.763 *	.845 *	.920 *
	(.029)	(.035)	(.040)	(.075)
Japan	.025	.118	.211	.277
	(.013)	(.026)	(.033)	(.020)
Average Production Hours				
U.S.	.224	.270	.202	.115
	(.043)	(.051)	(.057)	(.044)
Japan	.188	.282	.251	.104
	(.068)	(.082)	(.085)	(.094)
Total Production Hours				
U.S.	.661 *	1.036 *	1.046 *	1.037 *
	(.052)	(.061)	(.069)	(.078)
Japan	.210	.371	.409	.374
	(.073)	(.090)	(.094)	(.128)

* Difference between U.S. and Japanese adjustment significant at the 0.05 level or better

[a] The numbers in parentheses are standard errors.

TABLE 3A: EMPLOYMENT AND HOURS ADJUSTMENT IN U.S. AND JAPANESE MANUFACTURING, 1970-1977 [a]

	One Month	Three Months	Six Months	Twelve Months
Employment				
U.S.	.323 *	.598 *	.663 *	.717 *
	(.032)	(.037)	(.043)	(.084)
Japan	.026	.100	.170	.241
	(.016)	(.028)	(.035)	(.071)
Production Employment				
U.S.	.426 *	.764 *	.822 *	.847 *
	(.039)	(.046)	(.052)	(.055)
Japan	.041	.154	.252	.322
	(.018)	(.031)	(.036)	(.030)
Average Production Hours				
U.S.	.154	.219	.174	.095
	(.050)	(.056)	(.064)	(.078)
Japan	.211	.290	.294	.100
	(.100)	(.117)	(.116)	(.146)
Total Production Hours				
U.S.	.574 *	.981 *	.995 *	.939 *
	(.063)	(.071)	(.081)	(.115)
Japan	.204	.400	.478	.380
	(.105)	(.123)	(.123)	(.160)

* - difference between U.S. and Japanese adjustment significant at the 0.05 level or better

[a] The numbers in parentheses are standard errors.

TABLE 3B: EMPLOYMENT AND HOURS ADJUSTMENT
IN U.S. AND JAPANESE MANUFACTURING, 1978-1985 [a]

	One Month	Three Months	Six Months	Twelve Months
Employment				
U.S.	.325 *	.583 *	.692 *	.842 *
	(.031)	(.040)	(.045)	(.045)
Japan	-.005	.014	.057	.079
	(.014)	(.025)	(.033)	(.060)
Production Employment				
U.S.[b]	.452 *	.798 *	.858 *	1.009 *
	(.042)	(.048)	(.054)	(.061)
Japan[b]	.005	.056	.097	.125
	(.021)	(.032)	(.040)	(.047)
Average Production Hours				
U.S.	.272	.302	.213	.119
	(.080)	(.100)	(.110)	(.154)
Japan	.149	.249	.205	.146
	(.103)	(.145)	(.168)	(.210)
Total Production Hours				
U.S.	.741 *	1.094 *	1.108 *	1.162 *
	(.097)	(.121)	(.134)	(.168)
Japan	.203	.250	.197	.292
	(.113)	(.160)	(.185)	(.225)

* - difference between U.S. and Japanese adjustment significant at the 0.05 level or better

[a] The numbers in parentheses are standard errors.

[b] Due to difficulties in computing standard errors for the Almon lag model, the numbers in this row are derived from an unconstrained finite lag model.

TABLE 4: PRODUCTION VERSUS NONPRODUCTION EMPLOYMENT AND AVERAGE HOURS ADJUSTMENT IN U.S. AND JAPANESE MANUFACTURING, 1970-1985 [a]

	One Month	Three Months	Six Months	Twelve Months
United States				
Production employment	.430 * (.029)	.763 * (.035)	.845 * (.040)	.920 * (.075)
Nonproduction employment	.031 (.017)	.140 (.025)	.231 (.031)	.370 (.050)
Japan				
Production employment	.025 (.013)	.118 * (.026)	.211 * (.033)	.277 * (.020)
Nonproduction employment	.001 (.012)	-.020 (.024)	-.018 (.031)	.059 (.062)
Production average hours	.188 * (.068)	.282 * (.082)	.251 * (.085)	.104 (.094)
Nonproduction average hours	.059 (.076)	.144 (.093)	.172 (.097)	.072 (.111)

* Difference between production and nonproduction adjustment significant at the 0.05 level or better

[a] The numbers in parenthese are standard errors.

TABLE 5: MALE VERSUS FEMALE EMPLOYMENT AND AVERAGE HOURS ADJUSTMENT IN U.S. AND JAPANESE MANUFACTURING, 1970-1985 [a]

	One Month	Three Months	Six Months	Twelve Months
United States				
Male employment	.296 *	.541 *	.626 *	.743
	(.022)	(.027)	(.031)	(.028)
Female employment	.347	.667	.754	.786
	(.031)	(.041)	(.049)	(.079)
Japan				
Male employment	.004 *	.023 *	.059 *	.133 *
	(.010)	(.022)	(.029)	(.040)
Female employment	.050	.193	.323	.381
	(.019)	(.035)	(.043)	(.076)
Male average hours	.143	.261	.279 *	.152 *
	(.069)	(.085)	(.088)	(.113)
Female average hours	.164	.187	.111	-.035
	(.079)	(.096)	(.099)	(.114)

* Difference between male and female adjustment significant at the 0.05 level or better

[a] The numbers in parentheses are standard errors.

TABLE 6: EMPLOYMENT ADJUSTMENT BY SIZE OF ESTABLISHMENT IN JAPANESE MANUFACTURING, 1970-1985 [a]

	Current	Three Months	Six Months	Twelve Months
Establishments with 500 or more employees	-.005 (.014)	.023 (.032)	.072 (.042)	.168 (.050)
Establishments with 100-499 employees	.023 (.014)	.115 * (.031)	.197 * (.040)	.294 * (.048)
Establishments with 30-99 employees	.027 (.016)	.084 (.022)	.149 (.025)	.180 (.029)
Establishments with 5-29 employees	.019 (.013)	.066 (.018)	.107 (.020)	.127 (.023)

* Difference between adjustment for this size class and the largest size class significant at the 0.05 level or better

[a] The numbers in parentheses are standard errors.