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Sectoral shifts and unemployment in Japan

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SECTORAL SHIFTS

AND UNEMPLOYMENT IN JAPAN

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BY

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Abstract

The unemployment rate in Japan has increased after the first oil crisis. Though its level is still low compared to other industrialized countries, the upward trend is significant. It is widely held that changes in labor supply, especially extensive female labor force participation are primarily responsible for this trend.

This study uses sectoral shift theory to investigate the effects of rapid changes in labor demand across sectors on the Japanese unemployment rate. Sectoral shifts such as large relative price changes, rapid technological changes and shifts in output demand require reallocation of labor across sectors. If labor is specific to a sector, sectoral shift disturbances could increase the unemployment rate.

The sectoral shift view differs much from conventional view of the business cycle. They explain aggregate fluctuations by aggregate demand movements. The sectoral shift argument attributes aggregate fluctuation primarily to allocative disturbances across sectors. In this study, the distinction between these two disturbances is essential. Previous methods developed in macroeconomics and the sectoral shift literature are employed.

The two oil crisis and volatile exchange rate movements generated large variations among industrial sectors. Firms are now quicker to adjust their employment level. Regional imbalances of labor markets are observed. However, statistical

tests using unemployment rate equations do not support the sectoral shift hypothesis.

Japanese-specific aspects of labor markets are posited as reasons for this rejection. Japanese firms tend to avoid dismissals by utilizing various measures such as changes in hours worked, personnel transposition within a firm, loaning workers to related or new businesses, and hiring newly graduates in expanding sectors. They do not dismiss workers until other alternatives are exhausted and a demand decline is found to be persistent. In general, the flexibility of Japanese labor markets mitigates the effect of sectoral shifts.

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Chapter I

Introduction

This dissertation is an empirical study that applies sectoral shift theory to unemployment in Japan. The sectoral shift theory is part of the theory of real business cycles. A recent review briefly summarized the sectoral shift theory (Katz 1988 509). Sectoral shift theory is at odds with the major conventional macroeconomic view that aggregate fluctuations arise from aggregate demand shocks. Shifts in the sectoral composition of demand can have adverse aggregate consequences in an economy in which resources are not instantaneously mobile across sectors. The basic idea is that rapid technological change, shifts in product demand, or major changes in relative prices, such as one generated from an oil price shock, require unusually large movements of labor across firms and possibly also across regions. If labor is slow to adjust to these shifts of labor demand, unemployment is likely to increase.

The pattern of unemployment in Japan has two distinguishing characteristics compared with Western countries: it is low and has a small variation. These characteristics have been examined from such views as statistical definition, demographic or occupational distribution, female labor supply behavior, flexible wages, and slow employment adjustment.

The Japanese unemployment rate has been on an upward trend since 1973. Previous studies examined this trend primarily from the labor supply side. The female labor force increased due to an increase in employment in service industries. The aging of the Japanese population accelerated. Unemployment is a complicated adjustment phenomenon produced by both labor demand and supply. Mismatching among workers has become a large concern recently. The importance of job information transmission in labor markets has increased.

This dissertation takes a sectoral shift view of Japanese unemployment. The sectoral shift theory appears to be directly relevant to Japanese unemployment if exogenous and endogenous changes are examined. The period of rising unemployment includes large relative price changes resulting form the two oil crises of 1973 and 1979, extremely volatile exchange rates, and large fluctuations in the real interest rate. The industrial structure shifted toward service industries. New industries with highly sophisticated technology also boomed despite a decline in aggregate demand growth, while heavy industrial and chemical industries required much employment reduction.

Japanese-specific institutional arrangements may reduce the impact of sectoral shifts on unemployment. The labor reallocation mechanism affects relationships between sectoral disturbances and dismissals. Internal labor markets as well

as external labor markets play an important role in adjusting to sectoral shift disturbances.

The following chapters consist of three major parts. The second chapter surveys the sectoral shift theory, including theoretical models of general equilibrium as well as empirical studies of U.S. and Canadian unemployment. The third chapter reviews the Japanese labor markets with respect to unemployment characteristics and movements. Some previous analyses of the causes of the upward trend are also introduced. The fourth chapter tests the sectoral shift hypothesis. Developments in the U.S. and Canadian literature in measuring sectoral shift shocks as distinguished from aggregate demand shocks are employed. A conclusion and an appendix follow.

Chapter II

Sectoral Shift Theory of Unemployment

A. Sectoral Shift Theory

It is not a new argument that sectoral disturbances could be a source of business cycles. An early expression of the sectoral shift's fluctuation can be found in Ricardo's discussion of the sudden changes in the channels of trade (1821, Chapter 19, 175). Even in the United Kingdom after the World War I, one study attributed high unemployment mainly to "maldistribution of labor" (Clay 1928, 14) in opposition to Pigou's argument based on high real wages.

However, most modern business cycle theories strive to explain economic fluctuations by aggregate demand disturbances such as in Keynesian accelerator-multiplier models or monetarist real balance hypothesis models. Recent developments in macroeconomic theory have emphasized micro-foundations such as neoclassical theories with misperceptions on nominal variables and Neo-Keynesian theories with price and wage rigidities. Yet, their common emphasis is still to explain cyclical fluctuation in labor markets by aggregate demand changes rather than sectoral shift.

The oil price shocks in the 1970's and subsequent experience gave much credibility to the view that exogenous real disturbances can cause fluctuations in aggregate economic activity (Davis 1987a, 326). Some empirical studies focused directly on the causal relationship between oil price shocks

and macroeconomic activity (Hamilton 1983; Loungani 1986; Mork 1989). In the theoretical literature, the above observation stimulated two major streams in business cycle theory. One is a real business cycle theory that incorporates exogenous shocks and a propagation mechanism (Long and Plosser 1983; Kydland and Prescott 1982). However, they were not successful in explaining the magnitude of the response to the oil price shocks (Davis 1987a, 329). The other major stream is a real business cycle theory that gave sectoral shift among sectors a large role in business cycle when human and physical capital are sector-specific.[1]

Recent developments strive to explain how aggregate fluctuations can be the consequence of sectoral shift among sectors in an optimized model with specialization of human and physical capital. The first rigorous analysis in this direction (Lucas and Prescott, 1974) derived equilibrium unemployment with constant demand and stochastic fluctuations in sectoral demand, assuming spatially and informationally distinct labor markets and time-consuming labor mobility. In such an economy, there exists a positive opportunity cost to search that is equal to an expected return in each market receiving workers in equilibrium. Equilibrium employment is less than a given work force. The Lucas and Prescott model was

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[1] Earlier theoretical development on unemployment due to sectoral shift and labor reallocation can be found in the job search theory in the 1960's (Phelps et al. 1970).

deepened in order to envisage a tractable equilibrium time path following permanent shocks (Rogerson 1987). This two-sector, two-period model demonstrated that equilibrium paths of variables are easily characterized as responses to shocks of different magnitude and labor mobility of various degrees.

A simple general equilibrium model with two sectors (Black 1982) shows that shocks to both tastes on the demand side and technology on the supply side will cause unemployment to wander around its average level via the shifts of resources. Assuming costly shifts of human and physical capital from one sector to another, shocks generate changes in productivity and a mismatch between jobs and workers. Relative price changes motivate resource reallocation. Thus, shocks combined with the shifts of resources will cause unemployment fluctuations around an average level. Though this is a general equilibrium model with maximizing behavior and costless information, it assumes a positive amount of cost in shifting resources across sectors via a contracting production frontier.

A later study (Hamilton 1988) presents a fully articulated general equilibrium model with rigidities "in terms of specification of technology rather than through assumptions on about suboptimal pricing arrangements" (ibid, 594). This model has two sectors with one unproduced good. This unproduced good is exogenously endowed with households and introduced to evaluate an effect of seemingly small

disruptions in the supplies of primary commodities such as oils. Workers in each sector are affected differently by the total endowment of the unproduced good. Frictions in the model are only the one-period time cost of labor reallocation across sectors and the choice for workers between full-time employment in one of two sectors or unemployment. An individual worker knows how his utility depends on the product combination and endowment of unproduced good in each period. He knows also the probability distribution of potential endowments of this unproduced good in each period. Optimal state-dependent policy of a representative worker generates four kinds of equilibria depending on what kind of Markov process the endowments of the unproduced good follow in successive periods: unemployment of workers in a depressed sector waiting for conditions to improve; unemployment due to switching labor towards the more prosperous sector; permanent full employment; and a mixture of both waiting-time and sector-switching unemployment. The period of the second kind of unemployment is limited by the amount of time needed to reallocate labor. The nature of second kind of unemployment is the same as in the Lucas and Prescott (1974) because of the necessary consequence of better allocation of resources. The essential innovation of this model lies in the first kind of unemployment, waiting type unemployment. If a sector is adversely affected, its marginal labor productivity falls below the marginal utility of leisure. A worker rationally

chooses leisure rather than relocation if there is some possibility of improvement in this sector in future and if there are reallocation costs. Unemployment is voluntary in the sense that it is the best strategy yielding the highest utility assuming rational expectations. Hence, ex post regret, which does not exist in the classical analysis of unemployment, may occur. Those who have rejected in past periods to be trained for relocation to a sector yielding the current highest marginal productivity of labor may regret later. This depends on the outcome in the current period which depends on the endowment of the unproduced good.

A small disruption in the unproduced good could generate fairly large fluctuation in the aggregate output. If the unproduced goods is indispensable to consume one good, a small disruption, for example 10 percent, can generate drop in demand for labor in this sector by 10 percent times labor demand elasticity. This associated displaced workers become unemployed over a certain period due to the cost or delay in reallocation of labor to the sector consuming less of the unproduced good. Then, the effect of disruption of the unproduced good is limited by the dollar share of a product, whose use depends critically on energy, in total outputs rather than by the dollar share of energy in consuming this good.

The sectoral shift theory leaves out some important aspects of business cycles: short run fluctuation in the pace

of labor reallocation; and the concomitant movements in unemployment (Davis 1987a, 330). Propagation mechanisms that reinforce or impede the past direction of reallocation have been suggested as important factors in explaining the first point. The second point suggests an analysis of the interaction between allocative and aggregate demand disturbances. An integration of the sectoral shift theory into the other main stream of real business cycle theory, i.e., propagation mechanism models, has been proposed as a high priority research item (ibid, 331).

So far, the sectoral shifts argument has focused on labor market movements. It has not yet explained how sectoral shifts translate into serially correlated aggregate output movements. A distinct characteristic of the business cycle is the simultaneous expansion and then contraction of most kinds of economic activity (Mitchell 1951, 75). Putting emphasis on expansion of some sectors and contraction of others makes it difficult to explain this basic observation. However, the sectoral shift theory matches the second feature of the business cycle which conventional thoughts are tend to overlook: "business cycles consist not only of roughly synchronous expansions in many activities, followed by roughly synchronous contractions in a slightly smaller number; they consist also of numerous contractions while expansion is dominant, and numerous expansions while contraction is dominant" (ibid, 79).

B. Empirical Findings

Sectoral shift theory first attracted attention in an empirical study by Lilien (1982a).[2] He introduced the varying variance of individual market demand shocks into a Lucas-Prescott type economy, though he did not develop this model formally. This introduction implied moving market-equilibrium unemployment. He argued that "in the real world there is little reason to believe that the variance of firm-specific or market-specific demand is time-invariant" (ibid, 778). Examples in the U.S. economy were listed. The possible causes of the large sectoral shifts in the 1970's were the end of the Vietnam war, oil boycotts and price increases, and changing import competition in manufacturing sectors.

Casual evidence was developed to explain the increase in unemployment rate from the sixties' 3.6 percent to the seventies' 4.5 percent. Though the shifts in industry employment shares themselves were large, Lilien pressed its understatement by not accounting for the shifts of employment within a broad industrial category.[3] Other evidence explaining the cyclical pattern of unemployment over the decade included discontinuity in employment changes. The share of employment

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[2] Earlier empirical works as Kalachek (1967, 235-36) admitted a displacement version of structural unemployment as one category of unemployment. However, they did not argue the sectoral shifts is a primary cause of aggregate unemployment movements.

[3] This disaggregation problem is important if one employs a sectoral shift argument.

in durable manufacturing showed three declines in 1970-71, 1975 and 1980 relative to the secular trend in other periods.[4]

Lilien's empirical model derived the layoff function first. Accessions minus layoffs are equal to net hiring. The net hiring rate of a typical firm is postulated as:

$h_t = H_t + \mu_t$, where H_t is aggregate hiring rate. μ_t is assumed to be distributed with mean zero and variance σ^2_t, which measures the dispersion of employment demand conditions throughout the labor market. The net hiring rate was assumed to be the difference between accessions and layoffs. With the further assumption that a firm does not hire and layoff workers at the same time, the aggregate layoff function was derived as a function of σ_t and H_t. If dispersion increases i.e., with larger σ_t, both layoffs and accessions increase. The increase in the aggregate hiring rate, i.e., larger H_t, leads to decreases in layoffs and increases in accessions.

The dispersion of the net hiring rate across sectors, which is not observable, was proxied by the standard deviation of industry employment growth rates, i.e., by a weighted average of employment growth rate's deviation from mean:

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[4] One may reasonably argue that the entrance of baby boom cohorts could explain the increase in the base unemployment rate, and that fluctuation in aggregate demand itself could explain the deviations in durable manufacturing employment trend.

$\sigma^r_t = \{ \Sigma_{i=1,N} (l_{it}/L_t) (\log(l_{it}/l_{it-1}) - \log(L_t/L_{t-1}))^2 \}^{1/2}$.

l: employment number in a industry ,i.

L: total employment number.

N: number of industries.

This may be called the "raw dispersion measure" since it was found to be a contaminated measurement of aggregate demand shocks and sectoral shifts (Lilien 1982b, Abraham and Katz 1984, 1986). Other measurements such as a purged measure (Lilien 1982b) or a decomposed index by Neelin (1985, 1987) will be discussed.

Several linearized versions of layoff functions were estimated with σ_t and H_t, which was decomposed into the rate of change in employment and the quit rate. The estimation result supported the relationships predicted by the hypothesized model.

The model was enlarged to include other movements into and out of the unemployment pool. The flow identity was the starting point. The change in unemployment rates is equal to the flow into the unemployment pool in period t, θ_{1t}, minus the flow out of the pool in period t, θ_{2t}: $dU_t = \theta_{1t} - \theta_{2t}$. The entrance rate θ_{1t} consists of three parts: the layoff rate, which is a function of the aggregate hiring rate and dispersion in labor demand as described: the quitting rate Q_t, which is assumed to be negatively related to the unemployment rate; and the entrance rate from non-labor force, a_0, which is

presumed to be constant. Therefore, $\theta_{1t} = L_t + a_0 + a_1Q_t$.[5] The exit from the unemployment pool is assumed to be determined by a stationary probability to exit, p, with aggregate demand disturbances caused by unanticipated monetary policy, DMR_t . Therefore, $\theta_{2t} = pU_{t-1} + \Sigma_{i=0,k}\ \alpha_i DMR_{t-i}$. The essence of this empirical sectoral shift model lies on the assumption of constant and positive "p". A sectoral shift increases not only the layoffs but also new opportunities of hiring as presented in the hypothesized model. There would be no unemployment due to sectoral shifts if labor were infinitely mobile.

As a whole, the following model was tested:

$U_t = B_0 + B_1\sigma_t - \Sigma_{i=0,k}\ \Gamma_i DMR_{t-i} + B_2U_{t-1}$ + stochastic term.

This resulted in a familiar neoclassical unemployment equation like that of Sargent (1974) or Barro (1977), though the natural unemployment rate varied with the dispersion of employment demand in the labor market. The estimation was done with yearly data from 1948 to 1980 using a dispersion measure disaggregated into 11 industries. The classification was not reported.

Lilien's empirical conclusion was striking. He showed that more than one half of cyclical unemployment fluctuations in the U.S. after the World War II is attributable to sectoral shifts. The estimated natural unemployment rate in the

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[5] A person who quitted a job goes into unemployment pool by possibility of a_1 or non-labor force by the possibility of $1-a_1$.

seventies was very close to the actual one, as expected from the casual evidence of more and larger supply side shocks. The conclusion was provocative since it rejected previous models of economic fluctuations embodied in single factor business cycle theories.

However, this conclusion was refuted by Abraham and Katz (1984, 1986) who examined the correlation between the measurement of sectoral shifts and aggregate demand disturbances. Though Lilien's study was influential on studies in labor fluctuations, close examination of the measure of sectoral demand dispersion by Abraham and Katz revealed Lilien's conclusion was consistent with both the sectoral demand shifts theory and the aggregate demand change theory.

Abraham and Katz argued that the sectoral shift hypothesis is consistent with a positive correlation between the dispersion index and the unemployment rate. The pure sectoral shift hypothesis presumes a shock that necessitates more labor in one sector and equally less in another sector which keeps aggregate demand on its trend path. Such a shock increases the dispersion of desired employment growth rate, σ^*_t. This kind of shock is called a "mean preserving spread" in the growth rates of labor demand across sectors. The increase in σ^* can be traced by the movements in the actual σ^r_t. Since a mean preserving spread increases unemployment with

time-consuming reallocation,[6] the σ^r_t should be positively correlated with unemployment. Mean preserving spread with friction generates wider variation of wage offers among sectors. In terms of job search theory, the larger variance of expected wage offer distribution leads to higher possibility of being offered higher wage than the same level of reservation wage, and hence longer duration of unemployment.

The aggregate demand fluctuation hypothesis is also consistent with this positive correlation. This occurs in two cases, both of which appear to have been satisfied empirically in the post-war U.S. economy. The first case was the negative correlation between the trend growth rate of industries and sensitivities to economic fluctuations. This is illustrated with an economy consisting of two sectors: manufacturing, with a low trend and high sensitivity; and services, with a high trend and low sensitivity. In the upturn, the growth rate in manufacturing increases relative to services, and the difference in trend growth becomes an offset; smaller dispersion results. In the downturn, the opposite occurs. Therefore, aggregate demand fluctuation is positively related with σ^r_t. By assuming Okun's law, the higher the aggregate demand, the lower the unemployment is with smaller actual

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[6] In the frictionless world, the change in unemployment rate depends only on the difference between the mean of employment growth rate and growth rate in labor force.

dispersion of employment growth. The second case is the different sensitivities to a common aggregate demand shock.

Abraham and Katz recommend the use of information on job vacancy rates[7] in order to distinguish these two interpretations of the positive correlation of dispersion measure and unemployment. The vacancy rate, V_t, has positive correlation with the employment growth dispersion σ^r_t if the pure sectoral shift hypothesis stands. Conversely, if the aggregate demand scenario is correct, the σ^r_t is negatively correlated with V_t. Then, the two hypotheses that are consistent with Lilien's estimated result can be differentiated through the test of replacing U_t by V_t. The finding that σ^r_t is negatively correlated with the vacancy rate supported the aggregate demand fluctuation hypothesis.

Only the unanticipated money growth is not enough to capture the aggregate demand disturbances, though Lilien (1982a, 1982b), Abraham and Katz (1984, 1986) employed it. There is considerable evidence that the hypothesis only unanticipated money growth affect aggregate demand is not correct (Okun 1980; Mishkin 1982a, 1982b; Gordon 1982b). A later study (Neelin 1987) employed both unanticipated and anticipated money growth.

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[7] The information on the job vacancy rate was acquired from the Conference Board's help wanted index. The index was essentially an employment-weighted average of the number of help wanted advertisements in 51 metropolitan newspapers. There are many objections to this Job Help Wanted Index as a correct information source [e.g. see general discussion on Medoff's report (1983, 127-28)].

C. Variations in Sectoral Shift Measurement

Neelin (1985, 1987) developed Lilien's model in two directions by improving its applicability to the Canadian economy (Samson 1985). One is the expansion of the concept of sector. First, she argued that "ideally, economic sectors should be defined using data about actual barriers to mobility between industries and regions" (ibid, 720). Originally the importance of regional imbalance to aggregate changes in the U.S. labor market was pointed out by Medoff (1983). Though he admitted that cross regional labor market developments were not a major cause of aggregate changes, he found that the more difficult it is to find a new worker in one region, the less difficult it is in another. His contribution was showing that cross regional analysis provides meaningful insights into macroeconomic analysis. Since the ideal data were not available, Neelin defined sectors in three different ways: across industries, across regions, and across both industries and regions.

The second improvement is the decomposition of the sectoral shift measure. It was divided into one component that was attributed to aggregate activity and another that was not. The raw dispersion measure by Lilien (1982a) can be rewritten:

$$\sigma^r_t = \{ \quad \Sigma_{i=1,N} \quad (l_{it}/L_t)(l^*_{it}-L^*_t)^2 + \Sigma_{i=1,N} \quad 2*(l_{it}/L_t)(l^*_{it}-L^*_t)(z_{it}-Z_t) + \Sigma_{i=1,N} \quad (l_{it}/L_t)(z_{it}-Z_t)^2 \quad \}^{1/2}$$

l^*_{it}: a part of $\log(l_{it}/l_{it-1})$ explained by the aggregate demand shocks.

z_{it}: a part of $\log(l_{it}/l_{it-1})$ unexplained by aggregate demand shocks.

L^*_t: a part of $\log(L_t/L_{t-1})$ explained by aggregate demand shocks.

Z_t: a part of $\log(L_t/L_{t-1})$ unexplained by aggregate demand shocks.

The employment growth rates of each sector and the total were decomposed into two parts, l^*_{it} and z_{it}, and L^*_t and Z_t, respectively through two steps. In the first step, individual industry employment growth rates were regressed on aggregate demand disturbances:

$$\log(l_{it}/l_{it-1}) = c^{ols}_0 + \Sigma_{i=0,n}\, C^{ols}_i DMR_{t-i} + c^{ols}_1 TIME + e^{ols}_{it}$$

where the DMR is unanticipated money growth as an aggregate demand disturbance and TIME is a time trend.

In the second step, the growth rates were regressed on aggregate demand disturbances as well as employment weighted average of residuals of the ordinary least squares equations of the first step. This weighted average of the first step's residuals was introduced so as to capture the aggregate demand shocks which could not be observed as DMR. It purges each sector's employment growth equation residuals of a component

that moves together with the average residual (Abraham and Katz 1984, 18; Neelin 1987, 719).[8]

$$\log(l_{it}/l_{it-1}) = c_0 + \Sigma_{i=0,n}\, C_i DMR_{t-i} + c_1 TIME + c_2 AVGRES + e_{it}$$

$$(e_{it} = rho_i * e_{it-1} + z_{it})$$

$$\log(L_t/L_{t-1}) = d_0 + \Sigma_{i=0,n}\, D_i DMR_{t-i} + d_1 TIME + d_2 AVGRES + E_t$$

$$(E_t = RHO * E_{t-1} + Z_t)$$

where AVGRES is an employment weighted average of the residuals of employment growth equations.

The z_{it}'s represent current sectoral shifts in each sector. The random components of a first order serial correlation of a residual of these second step's employment growth rate equations, z_{it}s, were expected to capture the employment dispersion undisturbed by aggregate demand disturbances (Lilien 1982b 24-25; Neelin 1987, 719). Using z_{it} rather than e_{it} is useful in order to isolate industry-specific innovations. The past shifts affect unemployment rate through the lagged decomposed index unexplained by the aggregate demand disturbances.

However, the right hand side of $\sigma^r{}_t$ in the decomposing equation cannot be linearly approximated using only the first and third terms since the second term in the expression,

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[8] Lilien (1982b, 23-24) also concerned that there would be other aggregate demand disturbance's variables which are unobservable. Introduction of the AVGRES is a response to such a concern.

$\Sigma_{i=1,N}\ 2*(l_{it}/L_t)(l^*_{it}-L^*_t)(z_{it}-Z_t)$, is usually not zero. Neelin constructed two indexes to measure sectoral shifts by dropping this covariance. A component of the sectoral shift index explained with aggregate demand disturbances was defined:

$$\sigma^p_t = \{ \Sigma_{i=1,n} (l_{it}/L_t)(l^*_{it}-L^*_t)^2 \}^{1/2}$$

where $l^*_{it} = \log(l_{it}/l_{it-1}) - z_{it}$ and $L^*_t = \log(L_t/L_{t-1}) - Z_t$. This measures the weighted standard deviation of the industries' employment growth rates predicted by the aggregate demand disturbances. A component of sectoral shift index exogenous to aggregate demand disturbances was defined:

$$\sigma^u_t = \{ \Sigma_{i=1,n} (l_{it}/L_t)(z_{it}-Z_t)^2 \}^{1/2}$$

This measures the weighted standard deviation of the industries' employment growth rate unpredicted by aggregate activity.

Neelin estimated models with the sectoral shift index/indexes defined in two ways: the raw index of Lilien (1982a), σ^r_t, and a set of decomposed indexes described above, σ^p_t and σ^u_t. Quarterly data from 1961 to 1983 were used with nine industrial sectors, six regional sectors, and fifty four regional and industrial sectors. Finally, the test proposed by Abraham and Katz (1986) was done for the non-decomposed version. Samson's conclusion (1985) was that the sectoral shift in employment demand play a significant role in explaining fluctuations in the aggregate level of unemployment in Canada. The study by Neelin found that only the sectoral shift measure attributable to the aggregate activity, $\sigma^p t$,

correlated with unemployment. The Abraham and Katz test was inconclusive because of the insignificant coefficients of the shifts index.

Lilien (1982b) used a very similar method to extract pure sectoral shift effects out of his original raw dispersion measure because the original raw dispersion proxy, σ^r_t, was found to be influenced by aggregate demand shocks through different sensitivities of employment growth across sectors. He constructed purged dispersion measures by using the portions of employment growth unexplained by the aggregate demand and time trend, which Lilien (and later Neelin) defined to be the random components of estimated residuals that follow a first order auto regressive process.

Abraham and Katz (1985) criticized this purged dispersion measure as not a good proxy for the sector-specific developments in a sector's employment. First, they found that purged measure is negatively related with the help wanted index whereas it should be positively correlated. Secondly, they observed that Lilien's purged dispersion measure is positively correlated with the predicted dispersion measure associated with the aggregate demand fluctuation. This positive correlation between the predicted and unpredicted parts of employment growth rates suggests that decomposing the raw dispersion measure clearly into two parts is difficult.

Decomposition may not work empirically. If there are large correlations between these two decomposed indexes,

unemployment movements could be attributable to either sectoral or aggregate demand disturbances. Though the interaction between allocative and aggregate demand disturbances in the determination of aggregate fluctuations has great potential (Davis 1987a, 331), there may exist a general obstacle to this direction of empirical study. Haltiwanger (1987) points out that the covariance between the natural and cyclical rates of unemployment is so substantial that it becomes a serious hindrance to the natural rate of unemployment as an operative concept.

The past pattern of labor reallocation was also incorporated into the sectoral shift indexes. The current response of unemployment to sectoral shift partly depends on past patterns of labor reallocation (Davis 1987a, 331). A sectoral shift "that reinforces past patterns of labor reallocation exacerbates skill, location, informational mismatches between workers and firms" (ibid). By contrast, a sectoral shift that reverses past patterns of labor reallocation mitigates such mismatches. This argument is called the "reallocation timing hypothesis." This hypothesis was confirmed with a modified sectoral shift index in the U.S. (Davis 1987b, 353-367), which incorporated past pattern of labor reallocations and cross-sectoral covariance measures:

$$\sigma^{h}_{t,j} = \Sigma_{i=1,N} (l_{it}/L_t) * (\log(l_{it}/l_{it-1}) - \log(L_t/L_{t-1})) * (\log(l_{it-1}/l_{it-1-j}) - \log(L_{t-1}/L_{t-1-j}))$$

$\sigma^{h}_{t,j}$ indexes the direction of labor reallocation at time t over a one-period horizon relative to the direction at time t-1 over a j-period horizon. A relatively high value of $\sigma^{h}_{t,j}$ implies that the direction of labor reallocation at time t reinforces the past pattern and vice versa. This measure is called as a "horizontal index." Davis found that horizontal indexes over the one and half to three years horizons explained unemployment rate in U.S. significantly.

Oil price changes are directly related to unemployment rate. One of the seemingly largest sources of sectoral shift has been the change in relative oil prices. An empirical study on real exogenous disturbances (Hamilton 1983) found statistically significant and non-spurious correlation between oil price increases and recessions over the period from 1948 through 1978. Together with statistically little support that some third set of influences caused oil price increases and the recessions, oil shocks were suggested as a contributing factor in some of the post war U.S. recessions. A recent study incorporating a period of declining oil prices and corrections on the price controls in the 1970's (Mork 1989) confirmed the negative correlation in Hamilton's study.

Loungani (1986) decomposed the raw sectoral shift index into two parts by a method similar to Neelin's, inspired by Hamilton's findings. The dispersion index explained by the

differential impact of oil price changes explained a significant fraction of the raw dispersion index. Moreover, the unexplained part had no explanatory power on unemployment. Further tests put the changes in the relative price of crude oil directly into the unemployment equation so as to determine if the labor reallocation process in response to the oil shocks had been a source of unemployment fluctuations. This directly incorporated relative oil price change was more significant than the dispersion index explained by the differential impact of oil price changes.

What distinguishes the sectoral shift hypothesis from conventional macro theories is that only the magnitude of oil price changes matter. "Both positive and negative changes increases the amount of labor reallocation required" (Loungani 1986, 539). However, relative oil price changes in the observation period are almost zero, with exceptions of some positive blips. For this reason, the symmetric effect could not be confirmed.

These arguments depend on price flexibility. If energy and labor are substitutes, as they seem to be in Japan, an energy price increase creates more input demand for labor. If prices are flexible and labor is mobile, no unemployment occurs. If prices are flexible and labor is immobile, sectoral shift-type unemployment occurs. If prices are inflexible and labor is mobile, unemployment also occurs. Some industries decrease demand for labor and others increase their demand for

labor in response to relative price changes which they actually face. The magnitude of excess labor supply depends on the rapidity and magnitude of relative price changes, the degree of substitutability and complementarity across factors, and initial factor proportions among sectors. Unless prices adjust correctly, this excess labor supply persists. If prices change correctly in the long run, the unemployment vanishes. In particular, if the labor is a substitute for energy, increased demand for labor could mask sectoral shift-type unemployment.

Beginning with next chapter, the sectoral shift theory is applied to the Japanese case. Previous studies concentrated on U.S. and Canadian labor markets. The magnitude of sectoral shifts in Japan seems large: the Japanese economy has been hit severely by many external shocks. At the same time, the unemployment rate has increased. The next two chapters investigates the relationship between these two observations, with much attention to Japanese labor market mechanisms.

Chapter III

Japanese Labor Markets and Unemployment

The purpose of this chapter is to introduce Japanese labor markets with emphasis on unemployment movements and sectoral shift. The first half of the chapter surveys the characteristics of Japanese unemployment and the aspects of Japanese labor markets that generated such characteristics. The second half of this chapter examines how previous studies have explained upward movements in the Japanese unemployment rate and applicability of the sectoral shift theory on it.

A. Characteristics of Japanese Unemployment

The characteristics of Japanese unemployment compared to Western countries are its low level and small variation. The Japanese unemployment rate fluctuated within a small band from 1.1 percent to 2.8 percent. But, at the same time, it has suffered from a steadfast upward trend. Examining factors which generate such low overall unemployment and small variations would be helpful in analyzing the upward trend. These two characteristics are often attributed to the following: differences in the statistical definition, the high portion of self-employed or family workers, the high rate of growth in aggregate demand, the high percentage of female workers in the labor force, flexible real wage rates, female labor supply behavior (strong discouraged-worker effect), and practice of labor hoarding in a company or group (slow

employment adjustment).[9] The flexible wage, discouraged-worker effect and employment adjustment will be discussed in later sections. The upward trend is decomposed by sex and age. A short preview of factors raising unemployment rate is introduced.

The first concern is to determine if Japanese unemployment rate statistics use the same definition as the one employed in the U.S. or not. The characteristics of low level and small variation in the Japanese unemployment rate is invariant to the difference in definitions (Ohashi 1983, 105). Some estimates of the Japanese unemployment rate using U.S. definitions (Sorrentino 1984) could not result in a significant upward revision. Sorrentino found that Japanese unemployment rates are only slightly understated in relation to the U.S. concept, though the Japanese unemployment rate concept is some what more restrictive than the U.S. concept. The estimation by Eguchi (1987) confirmed Sorrentino's conclusion. The discussions mainly between the U.S. and Japanese authorities and the affirmative answer to the concern were briefly reviewed by Hamada and Kurosaka (1986, S283-85).

Yashiro (1983, 108) pointed out three reasons for the low unemployment rate. The first is the high share of self-employed or family workers. This factor affects mainly the

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[9] Compared to the U.S. economy, one may add two factors lowering unemployment rate in Japan: the lack of a significant immigrant population and the relative lack of non-competing groups based on racial and ethnic considerations.

female unemployment rate since only 62 percent of the Japanese female workers are employees, compared with around 90 percent in the other industrialized countries. These female self-employed or family workers are unlikely to withdraw from labor markets, rather they are likely to remain partially working independent of the state of the economy since most of them are employed in the informal sector. They are not included as unemployed. The conventional method in economic analysis of eliminating this effect is to use the employees' unemployment rate, which is the ratio of the unemployed to the sum of employees and the unemployed rather than to the total labor force. Not counted in the denominator are self-employed and family workers. This rate is higher by around one percentage point than the usual concept of unemployment rates (ibid, 109).[10]

Yashiro attributes the low unemployment rate mainly to the small imbalance between demand and supply in labor markets. This small imbalance was due to the high growth rate of labor demand reflecting the difference between GDP growth and labor force growth. If this factor is the major cause of the low rate before 1974, the decline in the GDP growth rate from around 10 percent in 1965-73 to 5 percent in 1975-85 together with the small drop in the labor force growth rate

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[10] This employees' unemployment rate has been used for many studies (e.g. Shimada 1986, 206). The fourth chapter follows this conventional technique.

from 1.3 percent to 1.1 percent for the same periods should have generated a once and for all jump to a higher level of unemployment rate. This may explain the small jump in unemployment rate in 1975. But the unemployment rate has still increased since then.

Yashiro's third explanation for the low unemployment rate was the low labor force participation rate by household females. The total female labor force participation rate in Japan was high. On the other hand, wives of salaried men (defined in the Labor Force Survey as married women whose head of household is not a self-employed but an employee) did not participate in the labor force. Their participation rate was 42 percent in 1979. Traditionally, Japanese women, whose households are neither farmers nor small owner-occupied companies such as retailers, are part of the non-labor force. Wives of salaried men are expected to keep house and raise children. He suggested that the low labor force participation rate of this group had been one reason of the low unemployment rate because such housewives have inherently high job accession and separation rates.

The labor force participation rate of this group has increased to 46 percent in 1987 as a result of the job opportunities created by shifts to the service sector in industrial restructuring. This trend could be reflected in the upward trend in a flow incidence from non-labor force status to the unemployment status (Ministry of Labor 1988a, 163) and

declining trend of discouraged-worker effect. These two changes in female labor supply are postulated to be pushing up the whole unemployment rate. These supply side changes are discussed further.

The upward trend in the unemployment rate from 1972 through 1987 can be decomposed by sex and ages (see table 1). Two groups which have experienced large increases in their unemployment rates or shares in labor force, and which have significantly contributed to the whole unemployment rate attract attention. They are the middle age females and the aged male groups.[11] Though the contribution of male middle age group is large, it is attributable not to its significant change but its large share in the labor force. The male youth unemployment rate has greatly increased. But because of the drop in its share of the labor force till 1981, it was not a major factor in raising the total unemployment rate. This is one reason for the still low unemployment rate in Japan compared to Western countries. The male middle age group raised the total unemployment rate especially with its increasing share in the labor force in the early 1970's; However, this group's unemployment rate increased by less than average. The aged male group was one of the major contributing groups to the whole trend since its increments in both

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[11] At a matter of convenience, persons who are 15 to 24, 25 to 54 and over 55 years old are called as youth, middle age and aged, respectively.

Table 1

Contribution to Unemployment Rate Increments by Age and Sex Between 1972-1987

Sex and Age Group	Change in Share of Labor Force	Change in Unemployment Rate	Contribution to Total Unemployment Rate Change
Total	-	1.40	1.40
Male			
Total	-1.8	1.3	0.75
15-24	-4.5	2.7	0.05
25-54	0.5	1.0	0.37
55-	2.2	2.3	0.33
Female			
Total	1.8	1.5	0.62
15-24	-3.2	2.9	0.11
25-54	2.9	1.3	0.39
55-	1.9	1.1	0.12

Sources: Ministry of Labor (1988a; S96, S132-39) and Statistics Bureau (Annual Report on the Labor Force Survey 1978, 78-79; 1987, 90-93).

Note: Units are percentage points.

unemployment rate and share of the labor force were so large. Though the female youth unemployment rate has been increasing rapidly, its contribution is not large. The middle aged female showed an increase in labor force participation. This affected the total unemployment rate trend.

The question here is what kind of aspects in labor markets generated these unemployment rate increases. Shimada et al. (1981, 33-67) briefly reviewed aspects in the 1970's. For youths, they insisted that trial and error type friction in the job-entry process was responsible for the upward trend. It was accommodated by the shifts to service industries in industrial structure and occupational distribution. Service industries are expected to inherently have higher unemployment rates because job accession and separation rates in service industries are generally higher than in manufacturing. For example, the job separation ratio in wholesale, retail and restaurant industries was 21 percent in 1987 compared to 17 percent in manufacturing according to the Monthly Labor Survey. Cross sectional research using the Population Census (Mizuno 1983) found that the more the region leans on service industries, the higher the unemployment rate is. For the middle age female group, labor force participation was affected by the increasing part-time employment system resulting from shifts to service industries. This increase in part-time employment is suitable for wives of salaried men because they are still engaged in housekeeping even after

being released from raising children. The part-time jobs markets inspire a variety of job information sources such as private job vacancy magazines. For the aged male workers, aging as a whole and the mandatory retirement system produce more and more unemployment in aged groups. Well-developed internal labor markets with entrenched seniority-based wage systems hinder the hiring of the retired.

The above comments by Shimada et al. seem to be still valid: the shifts to service industries has continued; the unemployment duration and job separation rates of youths are still rising (Ministry of Labor 1988a, 171-174); the number of female part-time workers has increased (Ministry of Labor 1989a, 226); aging is accelerating (ibid, 127); diversified informational channels for job transfers are developing.

B. Wage Flexibility

The next four sections review the unemployment characteristics via five aspects of labor markets: price flexibility, supply side, labor reallocation, mobility of labor and information routes. It has been suggested that the low level and small variation in the Japanese unemployment rate can be explained by the flexibility of real wage. There is a widespread view that Japanese companies are able to ride through hardships without dismissals by holding down bonuses (Sinclair 1987, 238-39). Yet, the empirical grounds for this assertion are not so clear. Work hours adjustment and monthly base pay determined in the annual wage revision are more

important for wage flexibility than the bonus payments. Pattern-setting in the annual wage revision may hinder the change in relative wage changes among industries.

Wage flexibility in Japan has been regarded as being considerably high, though there are a number of objections to this conclusion. Many studies support a view that Japanese real wages are more flexible than the other industrialized nations. Various reasons are provided (Tachibanaki 1987, 657). Statistical tests on the variation of wages, not using Phillips curve, supported flexibility hypothesis. A representative study is the one by Gordon (1982a). He examined the standard deviations of wages and responses of wages to the nominal GNP changes. His study concluded that Japan has the highest flexibility in real wages as well as nominal wages.

Studies using the Phillips curve can be divided into support and objection to the real wage flexibility proposition depending on the definition of the real wage flexibility (Yoshikawa and Ueda 1984, 68-69). Grubb, Jackman and Layard (1983) is an example which supported flexibility. They estimate that wages adjust rapidly to small changes in labor markets conditions. This type of analysis tends to overestimate the wage flexibility in Japan because the Japanese unemployment rate does not show much variation due to the discouraged-worker effect (Tachibanaki 1987, 658; 664-45). The other studies such as Sachs (1983) contradicted the hypothesis of real wage flexibility in Japan. These studies

conclude that real wages can be rigid if nominal wages adjust rapidly to changes in price. A recent study (Ohtake 1988b), which measured the adjustment speed towards an equilibrium real wage determined by labor demand and supply functions, rejected the flexibility hypothesis.

The bonus payment system does play a role in flexibility, though this role is not so large as is believed. Bonus payments were indicated as a primary reason for wage flexibility in Gordon's study. However, bonus payments are neither so flexible nor a big portion of total payments. A bonus in Japan is paid twice a year in June and December. The winter bonus is larger than the summer by 0.2 month base pay (Shimada 1986, 178). The average bonus pay is equal to around four months' base pay for small companies and five for companies with more than 1000 employees (Sasajima 1988, 31): it is 20 to 30 percent of total payments (Shimada ibid). In addition, the bonus pay does not fluctuate much as expected. Bonus payments are quasi-fixed payments (Tachibanaki ibid). At the peak of the boom in the winter of 1973, it was 3.3 months base pay, while it was 2.6 months at the trough in the summer in 1975 (Shimada ibid): this is equal to 3.4 percent of total wage.[12]

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[12] With respect to sectoral shift argument, the variation of bonus payment among sectors along business cycle is important. Bonus payment in Japan varies widely across sectors. Average movement of bonus payment may hinder its role against sector-specific shocks.

Monthly payments are more important for real wage flexibility. A study (Mizuno 1985, 67) showed that bonus payments explain only 10 to 16 percent of variations in Japanese total payments variations. Much of this fluctuation in monthly payments is attributable to overtime working variations (Tachibanaki 1987, 657). At the same time, yearly revision of monthly wages contributes to this flexibility (Shimada 1986, 177; Tachibanaki 1987, 658). Monthly base payments are revised once every spring, in contrast to the average revision of only once every three years in the U.S. Both employers and unions consider various factors such as past performance of productivity movement, inflation rate, macroeconomic conditions. Trade unions also support flexible wage (Shimada ibid): union members want an assurance of current employment; they are well informed about company's situation; and they tend to be supportive of their company as a community. A decrease in the terms of trade, which is close to a ratio of output products prices to material prices, slows the rate of wage increases (Komiya and Yasui 1984, 85).

What is important with respect to the effects of sectoral shift is not the flexibility of macro-wages but the flexibility of wage relationships among sectors. In this sense, the wage determination in Japan may be rather rigid. The yearly revision of wages has been done in a concentrated period of April and May. This revision begins in a few industries. Their results of wage revision extends over other

industries and public sectors, though wage revision in each industry may deviate from the pattern-setter's result depending on the its own conditions. These pattern-setters had been steel or private railroad industries. After 1978, this role has been occupied by steel or metal related industries (Shimada, 1986, 181). Sano (1981, 76-80) confirmed that such a pattern-setter was well represented by the steel industry from 1961 to 1979. Since the steel industry has not been a boom industry after the first oil crisis, it may have generated the modest macro wage increase. Such pattern-setting in the annual wage revision might hide the effects of sectoral shift to some extent. While a sectoral shift alters the marginal value product of labor across industries, these changes will not appear as a actual wage variation if levelling of wages across industries exists.

C. Labor Supply

Recently the most significant changes in the labor supply have been the increases in female labor supply and the rapid aging of the labor force. This coincides with the facts that both the middle aged female and the aged male group have shown much contribution to the total unemployment rate increase. The more active female labor force participation or less discouraged-worker effect was generated by both labor supply and demand side changes. Higher unemployment incidence and longer unemployment duration were observed among the aged.

The female labor force participation rate has been increasing. It was 47.4 percent in the late 1960's according to the Labor Force Survey. It moved up to 48.9 percent in 1988 from a bottom of 45.7 percent in 1975 (Ministry of Labor 1988a, 146-52). These increases were generated by the active labor force participation by the females from 25 to 54 years old. Females residing in an employee's household raised their participation rate by 7.9 percentage points since the early 1970's. Married women helped to push up the total female labor force participation rate until 1983. After that, an increase in birth rates for women from 25 to 39 caused not only their participation rate to drop but also a slowdown in the rate of increase of the total participation rate. The female labor force participation rate increased by 2.9 percentage points from 1975 until 1987. This was decomposed into a drop in the labor force entrance incidence and a lengthened duration of participation. The latter explains over half of the change.

The small variation in the Japanese unemployment rate was often ascribed to the discouraged-worker effect. The flexible behavior in labor force participation in a certain business cycle phases is known as a discouraged-worker effect. During recession periods, there is a low wage and small probability finding a new job, contrary to the stable opportunity cost of household work. In these circumstances, female workers will be discouraged from participating in the labor force and encouraged to stay at home (Ehrenberg and Smith 1988, 231-33).

The labor force subject to these effects were traditionally called the "marginal labor force ('enpen rodoryoku' in Japanese)" (Umemura 1971). Ono (1971, 44-50) measured the number of discouraged-workers in 1978 who were in non-labor force and had abandoned the search for a job because of little possibility in finding one. He found that there were 2.87 million in Japan and 0.84 million in the U.S. Unemployed persons in 1978 were 1.41 million and 6.04 millions in the respective countries. An econometric study (Shimada and Higuchi 1985, S366) confirmed a significant discouraged-worker effect using female labor force participation functions for the period from 1967-1981.

It was pointed out that the discouraged-worker effect was decreasing from about 1975. An early explanation of the decreasing discouraged-worker effect was Furugoori (1981, 30) and Yashiro (1983, 114). Furugoori found less tendency in female unemployed persons to leave labor markets. It dropped from 76 percent in 1974 to 54 percent in 1979. Yashiro predicted that an increase in married women employees would push up the unemployment rate in the long run through weakened absorption into the female non-labor force during a recession (ibid, 118): wives of salaried men as employees have a smaller discouraged-worker effect; they are not discouraged as much as the female self-employed whose majority is homeworkers and female youth employees who relies much on other family members income. Such a trend was confirmed by a recent study (Higuchi,

Seike and Hayami 1986): in a flow incidence analysis, female exit incidence from unemployment to the non-labor force is apparently decreasing. This trend is steeper for Japan than for the U.S. (ibid, 269); another analysis estimated the female consecutive job engagement ratio by cross sectional data in 1977 and 1982. Female workers from 25 to 34 years old increased their consecutive job engagement ratio in proportion with age. Moreover, the negative effect of the number of children on the consecutive job engagement ratio dropped (ibid, 274).

Behavioral change as increasing participation or decreasing discouraged-worker effect may be attributable to both labor supply and demand side changes. Higuchi (1982) analyzed the labor supply function derived from utility function of leisure and income with pooled data. This analysis found that a tendency to maintain the level of income when husband's income declined encouraged wives to work more. Other factors such as declining trend in the number of children, higher education and productivity increase in household production were suggested as a reason for more rigorous female labor force participation (Sasajima 1988, 11-12).

Changes in the labor demand side also encourages married female labor force participation. Shifts to more service industries or service related occupations in industrial restructuring generates more jobs suitable to married women. These are part-time or flexible-time jobs such as in

wholesale, retail, and insurance industries.[13] Because married women have to assign some hours for housework, these jobs are acceptable to them. Increased variation in working hours has been confirmed (Ministry of Labor 1989a, 233-40).

In the labor demand side, generalization of required skills made firms easy to accept female married workers (Osawa 1988). Firstly, some jobs come to require less specific skills: the introduction of personal computers made customer management quite easy. Secondly, jobs which require less specific skill compose a larger portion of all jobs. These labor markets developments induced increased labor force participation among married women who do not stay in the same job for a long period.

The rise in labor force participation by the married women into part-time or flexible jobs increases unemployment. The job turnover ratio among workers who work less than 35 hours a week is around 30 percent while among general workers it is less than 15 percent (Ministry of Labor 1989a, S102). More part-time workers in the total labor force generate more unemployment.

Another important aspect in the labor supply is the rapid aging of the labor force in Japan. In the future it will

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[13] Examples are cashiers in supermarkets, saleswomen in department stores, waitress or cook in chain restaurants, and door-to-door sellers of insurance. Even in manufacturing industries, there are manualized part-time jobs such as operation of simple automatic machines.

accelerate even more. Aging has caused several problems in firms. It generates an increase in the labor cost under the seniority-based wage system and a shortage of the senior positions under life time employment system. These two problems are compounded with the extension of retirement age to 60. Some companies have already revised the seniority-based wage system.

The aged male unemployment rate is high and rising due to both a high entrance incidence and a long unemployment duration (Ministry of Labor 1983, 195). In 1977, the unemployment duration of workers from 55 to 64 years old was 6.50 months, while it was 5.43 months for persons from 25 to 54 years old. The entrance incidence to the unemployment pool was 0.58 for the former and 0.28 for the latter. The difference in the unemployment incidence explains the difference in the unemployment rate level more than the unemployment duration.

The reasons for the remarkable increase is more complicated. The aging of society as a whole with the retirement age-limit system and the limited number of posts for seniors generates more persons who lose jobs. This pushes up the unemployment rate directly via higher entrance incidence to the unemployment pool. But this is only one source of higher unemployment rate of the aged male.

Declining exit incidence is another source of increasing unemployment rate of the aged male. The long unemployment

duration of aged persons lengthened further: A portion of those in the unemployment pool more than 6 months was 41.7 percent in 1972. It rose to 62.2 percent in 1988.

The mismatching hypothesis that suitable jobs for the aged are scarce does not seem sufficient to explain the upward trend. Newly created part-time jobs require generalized skills and are not necessarily physically hard tasks. The aged could choose some sort of job. Rather, the high salary before retirement and the pension payment may keep their reservation wages high and generate the higher unemployment.

The extension of the retirement age may have affected unemployment trends of the aged male (ibid, 176). Many companies raised the uniform limit on retirement age from 55 to 60 years old after 1975. The peak unemployment rate at age 60 as well as the unemployment rate after age 60 is getting higher by the Population Census in 1975, 1980 and 1985. The peak of the unemployment rate among aged persons occurs at age 60. This peak rate in 1975 was 6.5 percent. It moved up to 12.0 percent in 1985. The unemployment rate at age 65 was 5.0 percent in 1975 and 7.8 percent in 1985. The extension of retirement age may have made reemployment harder. However, this may have been the effect of the better pension pay. The pension pay for the aged deflated by consumer price increased by 35 percent from 1975 till 1982 (Seike 1986, 189).

Labor force participation rate for age 60 or older people has been dropping for the last 20 years (Ministry of Labor

1988a, 143-46). Discouraged-workers among the aged are increasing. A 35.1 percent of the aged male non-labor force in 1987 wished to engage jobs. This suggests a scarcity of acceptable jobs relative to their high reservation wages. A recent study (Seike 1986) supports a negative effect of pension pay on the labor force participation rate of the aged.

D. Labor Reallocation

Third, the labor reallocation mechanism will be introduced. There are several characteristics in the employment adjustment in Japan. These characteristics correspond to the mechanism of internal labor markets.

The well-developed internal labor markets conceal labor demand fluctuations caused by either aggregate demand change or sectoral shift. The unemployment adjustment speed is so slow that hours of work adjustment is the major response to cyclical fluctuations for firms' products and services. This is the one reason for small variation in the unemployment rate. Labor reallocation within a company or business group, which do not accompany employment interruption, is effective to cope with demand changes which alter the value of human capital significantly. For persistent sectoral shifts, personal transposition and transfer play roles to avoid dismissals. This may be the one reason why the Japanese unemployment rate remains at a low level despite larger sectoral shifts. With a life-time employment system, the allocation of new school-leavers is a method to reallocate

labor among sectors in the long run. It is suggested that dismissals occur when demand change is generated by persistent sectoral shifts. Recent more rapid employment adjustment may have generated by more frequent sectoral shifts. Government's role is limited.

There are several ways to adjust to changes in desired labor allocation. Employment adjustment measures in order of priority are (Tachibanaki 1987, 28): hours of working, cuts or increases in new hires, and finally dismissals of workers. Dismissals consist of three detailed measures: sending older workers to subsidiary companies or companies in the same group, voluntary quits with incentive programs and, last, dismissals from the company. Temporary, seasonal or part-time workers may be dismissed or their contract may be allowed to expire before the dismissals of regular workers (Sasajima 1988, 28). The slow speed of adjustment does not mean that there are no dismissals.

Japanese employment adjustment achieved through such measures has several characteristics: slow speed of adjustment, asymmetry between the increasing and decreasing phase, speeds defined by technical aspects of industries, recent faster adjustment, and differences based on the size of firms. Several of these characteristics are reviewed in Shimada et al. (1981, 83-92) or Tachibanaki (1987, 650-656).

The most distinguishing characteristic of the Japanese employment adjustment compared to the U.S. is its slow speed.

However, many studies suggests that rather the U.S. is particularly fast in employment adjustment. Shimada et al. (1981, 84-85) examined the elasticity of the number of employed and labor input to output changes from November 1973 through December 1975 for manufacturing industries in Japan, the U.S., the United Kingdom, West Germany and France. The elasticities suggested that the employment number adjustment is quite large for the U.S. compared to the other four countries. The labor input elasticity of the U.S. is again larger than the others. The Japanese labor input elasticity is larger than the three European countries. Shinotsuka and Ishihara (1977) used a model of partial adjustment toward the optimal labor demand derived from a Cobb-Douglas production function for the period from November 1973 through March 1976. The employment adjustment speed by labor inputs, i.e., number of employees times average hours worked, is close among the four countries. However, the U.S. employment adjustment speed by the employment number is four times faster than the other three countries. Shimada et al. (1982, 102) calculated adjustment speed coefficients for many manufacturing industries in Japan and the U.S. They are estimated not by using a specific production function but by observing actual excess labor when an industry is not at its full capacity (Fair 1969). They were two times faster than Japanese firms for the 1970's. Muramatsu (1985, 17) surveyed eight Japanese studies between 1976 and 1985 with data from 1960 through

1981: the elasticity of the employment number to output changes after four quarters is 0.24 for all sectors and 0.45 for the manufacturing industry. This elasticity in the U.S. is 0.75 with strong agreement among studies surveyed by Hammermesh (1976, 518).

One possible explanation for the difference between Japanese and U.S. employment adjustment speeds is the payment system (Nishikawa 1980, 158-59). Because of a high 50 percent premium on overtime work and a complete five-day work week system, U.S. companies have to use layoffs to reduce labor. The Japanese overtime premium is only 25 percent. With a minimum bonus pay of three months base pay, overtime cost is less than hiring a new worker, even neglecting any fixed cost for hiring. However, if a demand decrease is perceived as persistent, the working hours adjustment is not enough even in Japan.

The employment adjustment speed is asymmetric between the increasing and decreasing phase. Shimada et al. (1982, 92-96) compared the employment adjustment speeds for 15 manufacturing industries before and after the first oil crisis. All 15 industries' coefficients got larger, though in only four cases were the differences statistically significant. Increasing employment thorough hiring new graduates and mid-career entrants is easier than decreasing employment through voluntary quits with an incentive program and age limits system.

Each industry's employment adjustment speed is governed by technological or organizational characteristics. An industry which adjusts employment fast relative to other industries in Japan tends to be fast also in the U.S. (Muramatsu 1983 166-67). Regularity in the order of employment adjustment speeds among industries was observed in the comparison of U.S. and Japan (ibid) and between Japanese cases before and after the oil crisis (Shimada et al. 1982, 92-96). Both studies found that, in Japan, industries such as textile, lumber, precision instruments, and machinery have fast adjustment speeds, while industries such as steel, nonferrous metal, and paper and allied products have slow adjustment speeds. They suggested that such regularity is attributable to the technological or organizational characteristics of each industry such as age and sex distribution, and specific human capital.

The actual employment adjustment speed has increased. Many studies have suggested that employment adjustment has been increasing since the two oil crises (Tachibanaki 1987, 654). The latest study (Economic Planning Agency 1988b, 268-270) confirms this tendency using either partial adjustment model or the ratio of overtime cost to the job turnover cost. The employment adjustment speed in manufacturing increased by around one third from the mid 1970's to the late 1980's. Some portion of this increase can be attributed directly to the shifts to service industries since service industries produced

more part-time jobs. Larger sectoral shifts might be another direct source of the increase.

Employment adjustment in small-scale companies is quick. A study (Shinotsuka 1980) of a manufacturing industry from 1970 to 1977 suggested that small-scale companies adjust employment more rapidly than large scale companies.[14] However, no significant difference can be found by total man-hours. This finding is consistent with the decreasing fixed-cost of workers as the scale decreases (Tachibanaki 1987, 655): the cost to a firm for an additional new hire can be inferred from the premium rate for overtime hours payment to a currently employed person. This premium rate is 74.4 percent for large firms with more than 500 employees, 61.0 percent for medium-size firms with 100-499 employees and 47.4 percent for small firms with 30-99 employees (Ministry of Labor 1986, 171). Such a divergence in the fixed cost in labor coincides with more flexible employment patterns among small firms. From such findings, it is believed that the frictional unemployment will increase as the employment in small scale companies weighs more in total employment (Ministry of Labor 1988a, 180).

These characteristics of employment adjustment in external markets have corresponding characteristics in the

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[14] Her conclusion might need to be modified partially: small scale companies increased the number of their employees just after the first oil crisis; the asymmetry between the increasing and decreasing phase might make the small-scale companies employment adjustment look faster.

internal or quasi-internal labor markets. This is related to one of the three Japanese employment practices, the lifetime employment system. "A company hiring a worker accepts an obligation to do everything in its power to keep that worker in its employ, even during recessions, and to provide continuous employment up to retirement age, except under the most extraordinary circumstances" (Sasajima 1988, 2).[15]

The lifetime employment system uses methods of labor reallocation such as personnel transposition across sections but within a company ("Haichitenkan" in Japanese), and transfer to related affiliates or subsidiaries in the same business group ("Syukko" in Japanese). The Survey of Employment Trends (Policy Planning and Research Department, Ministry of Labor, every year) collects information on the accession to and separation from establishments[16] as well as information on the previous career of new entrants. According to the Survey on the Employment Trends in 1987, 894 thousand

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[15] It is controversial whether "long-term employment is more prevalent in Japan than in the United States" (Hashimoto and Raisian 1985, 721) or not. The purpose of the following discussion is not to contrast the peculiarities of the Japanese employment practices with the U.S., but to present evidence for employment adjustment practices which are widely considered to consist of the Japanese lifetime employment system.

[16] An "establishment" is defined by the Census of Establishments as "a single physical location where either goods are produced or services are rendered on business. For example, mine, office, factory, store or shop, cinema house, hospital, school and so on" (Statistics Bureau 1978, Vol.1, x).

workers experienced personnel transposition across establishments but within a firm during this year. Over 80 percent of them were male workers. The Survey on Employment Management by Policy Planning and Research Department in Ministry of Labor focused on transfers in 1986. This Survey reported: that firms generated 149 thousand temporary transfers which kept employment relationships with a former company, and 25 thousand retirement transfer which terminated employment relationships with a former company (Ministry of Labor 1988b, 53). According to the Survey on Employment Management in 1986 (ibid, 52), both personnel transposition and transfer are more widely used among large-scale than small-scale companies.

Personnel transposition or reassignments of workers to other positions within a company has been done not only to avoid dismissals but also for regular rotation for the purpose of skill formation and promotion. Promotion of Japanese workers is done not by staying in the same job but by experiences in various related jobs so that they can acquire wider skills and knowledge (Koike 1980, 106). However, personnel transposition for the avoidance of dismissals is limited to six months since it is a disadvantage to the worker to stay in a position which has little relation with the original post (ibid, 107). It is difficult to distinguish these two personnel transposition types: one, a variation of

periodical personal rotation and the other, an emergency evacuation measure.

Personnel transposition plays a large role in better labor allocation. This role is becoming more important. Personnel transposition across occupations is regarded as an effective measure to cope with technological progress such as office and factory automation (Higuchi 1988, 47): According to the Survey on the Employment Trends in 1973, 22 percent of male workers new to an establishment had been working in other establishments within the same company. This share increased to 39 percent in 1985. An analysis (Ministry of Labor 1988a, 201-202) confirms this increasing importance of personnel transposition in terms of the number of transferred workers, net contribution to inflows of workers to a industry, and relative contributions compared to job turnover across companies. A quantitative analysis with cross section data between 1985 and 1987 (Ohtake 1989) focused on the relationships between dismissal rate and such factors which affect dismissal rate as: personnel transposition rate to and from a existing or new establishment, transfer rate, wage increase rate, degree of product diversification, scale of company and growth of company. An increase in the personnel transposition to existing establishments by 1 percentage point led to decrease in dismissal rate by from 0.48 to 0.85 percentage point significantly.

Transfers to subsidiaries or related companies within a same business group is another way to achieve labor reallocation without reliance on external labor markets. This may be thought of as a loaning of workers. Its role for employment adjustment is becoming important, too. Though there are few comprehensive studies on transfers, a study (Ministry of Labor 1988a, 229-233) briefly summarize its characteristics. Workers on loan can be divided into two categories: one is temporary transfer which keeps the employer-employee relationship with the original company. The other is retirement transfer which disconnects the relationship during the loan period. The former accounts for 3.3 percent of workers in companies with more than 30 workers. The latter accounts for 0.2 percent. Some of the former have turned into the later, especially among the aged workers. The transfer period is not usually designated beforehand. Aged workers, or management, clerical and technical workers account for most of workers that are loaned. Working rules and pay often differs between the original company and the subsidiary. Many temporary transferred workers are subject to the original company's rules for pay, bonus, overtime premium and paid holidays. However, the subsidiary's rules apply for business trip allowances, holidays, and work hours. This implies relatively small deterioration in working conditions for temporary transferred workers, especially for the aged who would have to face a large drop in pay with job if they

switched companies. Several recent surveys of personnel management in large business groups suggest more reliance on loaning workers as a way of utilizing entire labor force within a group systematically.

However, transfer is not always used for a positive labor reallocation. There are problems such as lack of prior training (ibid, 232) and the tendency to see loaning as relegation (Uenishi 1989, 20). Sending older worker to the subsidiaries has often been a substitute for dismissal.[17] Transfer as a substitute for a dismissal, often without a time limit and with termination of employer-employee relationships, sometimes turned out to be a job turnover as a result (Sugi 1987, 201-202). It is not a worker himself but a company who must find a new job. It may require aged workers to occupy a job strange to him. Large-scale companies have had a service section for such a worker-outplacement operations.

The enterprise union system, which is another characteristic of the Japanese employment practice, reinforces the above peculiar employment adjustment system. The

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[17] Some aged workers are given the title as "deputy manager" and come to the office to sit beside windows, where seniors can sit, but only to read newspapers everyday. Such unfortunate workers are called "Madogiwa-zoku" (literally, tribe sitting beside windows). Firms are reluctant to dismiss them because the negotiation is costly and dismissals hurt the image of lifetime employment. However, letting them read newspapers beside windows deteriorates other workers' morale. "Madogiwa-zoku" is often either waiting for an offer of "Syukko" or suffering from torture of reading newspaper because of his rejection of the kind offer from the company.

enterprise unions in Japan are far more cooperative with companies than unions in the U.S. (Koike 1980, 107). Since job protection is the goal of the enterprise unions, they cooperate with management to minimize dismissals through various measures (Sasajima 1988, 28).

Because of these employment adjustment measures, diversification by companies has worked to mitigate the expulsion of workers to the external labor markets. In 1986 to 1987, Shin-Nipponseitetsu, which is the largest steel company in Japan, diversified its production to include computers, electronics, education, leisure services, and biotechnology (ibid). The major sources of labor in new businesses are personnel transposition and loaning. According to a survey on a manufacturing companies with more than 100 workers in 1987 (Uenishi 1989, 18), companies that established a new subsidiary by dividing an existing section of the parent company satisfied 55.5 percent of their workers requirement in the new subsidiary by transferring workers from the parent company. Even if they established a new subsidiary in a business field foreign to the parent company, 49.8 percent of the workers requirement in the new subsidiary were transferred from the parent company.

These methods are most effective when a company faces sectoral shifts. This coincides with the usage of transfer when a company diversifies its businesses. Meanwhile, the working hours adjustment is suitable to cope with short run

fluctuation, such as cyclical disturbance or aggregate fluctuations. This is confirmed by the fact that varying working hours is the first method to implement labor adjustment. Such an assignment of employment adjustment methods depends on the changes in the value of specific human capital.

Beside these two methods which are effective during medium- to long-run fluctuations (plausibly to persistent sectoral shifts), the life-time employment system has one channel for reallocation of labor in the long run. Labor reallocation among sectors is also achieved through acquisition of new graduate from schools (Higuchi 1988, 45). The age distribution of workers in an industry at one period depends not on the characteristic of its technology or aptitude by age but the period when the industry was in boom. For example, the textile industry employs more older workers relative to younger workers over time: this industry hired many new school-leavers in the 1950's when it was in boom. In the U.S. this phenomena is less prevalent.

The role of job turnover for labor reallocation is limited compared to other countries. The job turnover ratio across companies in Japan is so low that such turnovers do not play much role in labor reallocation as in other countries (Ministry of Labor 1988a, 221-224). The comparison of the job turnover ratio among Japan, the U.S., West Germany and France reveals that the Japanese ratio is less than one fourth of the

U.S. and much lower than other two countries. Such a low ratio was attributed to longer continuous employment in a same company among youths and male middle aged workers. This corresponds with the utilization of personnel transposition and loans in the internal labor markets.

Finally, we come to see how dismissals have been conducted. Contrary to the wide belief of the lifetime employment, recent literature has emphasized that Japanese companies do in fact dismiss workers. One study (Koike 1983) surveyed dismissals from 1973 till 1980 in large scale companies in the cement, and electrical machinery, equipment and supplies industries using profit and loss statement. This survey found that it is not unusual even for a large company to dismiss workers if it had been losing money for one or two consecutive years. Another study (Muramatsu 1986) which surveyed large-scale companies in the metal working machines and machine tools industries from 1973 till 1984 confirmed this result.

This finding of the two consecutive year's deficit is important with respect to sectoral shifts. The average length of the four recessionary periods defined by the business cycle index after 1973 was 20 months (Business Cycle Statistics Division 1988, 140). This suggests that dismissals occurred when there were not cyclical aggregate fluctuations but rather persistent sectoral shifts.

Dismissals and requesting voluntary retirement are becoming more popular methods to deal with economic hardships (Koike ibid, 116-117). As expected, small-scale companies dismiss workers more frequently as expected (ibid).

As sectoral shifts have become more frequent recently, they may have generated increases in employment adjustment speed, especially in firing and hence unemployment. Sectoral shifts require more dismissals or new hiring (more employment number adjustment) and less changes in the number of hours worked than the aggregate demand fluctuations with the same decline of output.

Pure aggregate demand changes should lead to small changes in the number of employees. The pure aggregate demand disturbances alter the discounted value of earnings from specific human capital very little. As a result, firms tend to hoard this capital. This is an application of the prominent explanation by Becker (1962, 121) and Oi (1962, 549) of a smaller variation of skilled worker employment. However, in a pure sectoral shift, the return to specific human capital varies substantially.

Thus, a firm will have a strong incentive to alter the employment of specific human capital in the face of a sectoral shift. If changes in demand for a firm's output is generated more by sectoral shifts and less by aggregate demand shocks, the employment adjustment speed increases. A variation of this hypothesis is that a Japanese firm relies more on personnel

transposition and transfer than working hours adjustment when it faces output demand changes caused more by sectoral shifts than by aggregate demand shocks.

Government policies might have a role in mitigating unemployment by improving labor reallocation efficiency when the economy faces sectoral shift disturbances. After World War II, there were three kinds of government policies which accommodated the "rapid economic growth and successful performance in the face of external shocks" (Blumenthal and Lee 1985, 221): planning, change in relative prices and administrative guidance (ibid, 223). These policies are intended to shift private actions in the long-run to directions prescribed by the government. They appreciated these government interventions since they reinforce a "future-oriented development strategy" (ibid, 222). The "future-oriented development strategy" is understood to mean a coherent strategy in which "short-term costs caused by inefficient allocation of resources are tolerated if needed for capturing long-term benefits." This is in contrast to the principal of static comparative advantage. If this is true, government policies would have mitigated unemployment.

This is most plausible if future sectoral shifts are serially correlated and predictable. Though they appreciated that economic plans in Japan "were somewhere between indicative and command planning (closer to the former)" (ibid, 227), the government seems to have neither acted as an

exclusive source of decisions nor commanded the private sector. The main function of economic planning was to establish a consistent future perspective of the Japanese economic society as a consensus among various sectors (Komine 1985, 258-268). This consensus building process has worked to induce participants to share the same perspective and make actions by private and government sectors implementable. However, if the consensus was wrong, sectoral shifts might have caused more disturbances than without economic planning. For example, an economic plan approved by the Cabinet in August 1979 was criticized for lacking sufficient contingencies for another oil crisis: it had to be revised significantly within one and a half years.

E. Labor Mobility

The fourth aspect, which may explain unemployment rate movements is labor mobility. Labor immobility across regions together with larger sectoral shifts may be one of the reasons for the increasing unemployment rate.[18] There is evidence of larger mismatching across regions, which could push up the whole unemployment rate.[19] The job turnover ratio was higher

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[18] The lack of large-scale of immigrants is a difference with U.S. and other countries. International labor mobility is one important aspect of labor market, though it lacks so far in Japan.

[19] A comparative analysis in a general equilibrium model (Rogerson 1987, 832) concluded that the larger the cost to switch jobs, the smaller the change in labor supply across sectors, facing a sectoral shift.

in the rapid economic growth period in the 1960's. Meanwhile, there are new kinds of mobile workers across companies.

First, the unemployment rates in all but one of 8 regions got larger between 1980 and 1985 (Mizuno 1987, 12), while the economic growth rate was higher in 1985. The rise of the unemployment rate in the overall market was accompanied by a rise in each of the markets. The difference in unemployment rates across regions had not been eliminated. Imbalances across regions remain.

Second, mismatching across regions has increased. The U-V curves[20] using cross sectional data of 48 prefectures shifted upward from 1970 through 1980 (Kosiro 1983, 72-74; Ministry of Labor 1988a, 274). The majority of the prefectures suffered from more excess labor supply for the same vacancy.[21]

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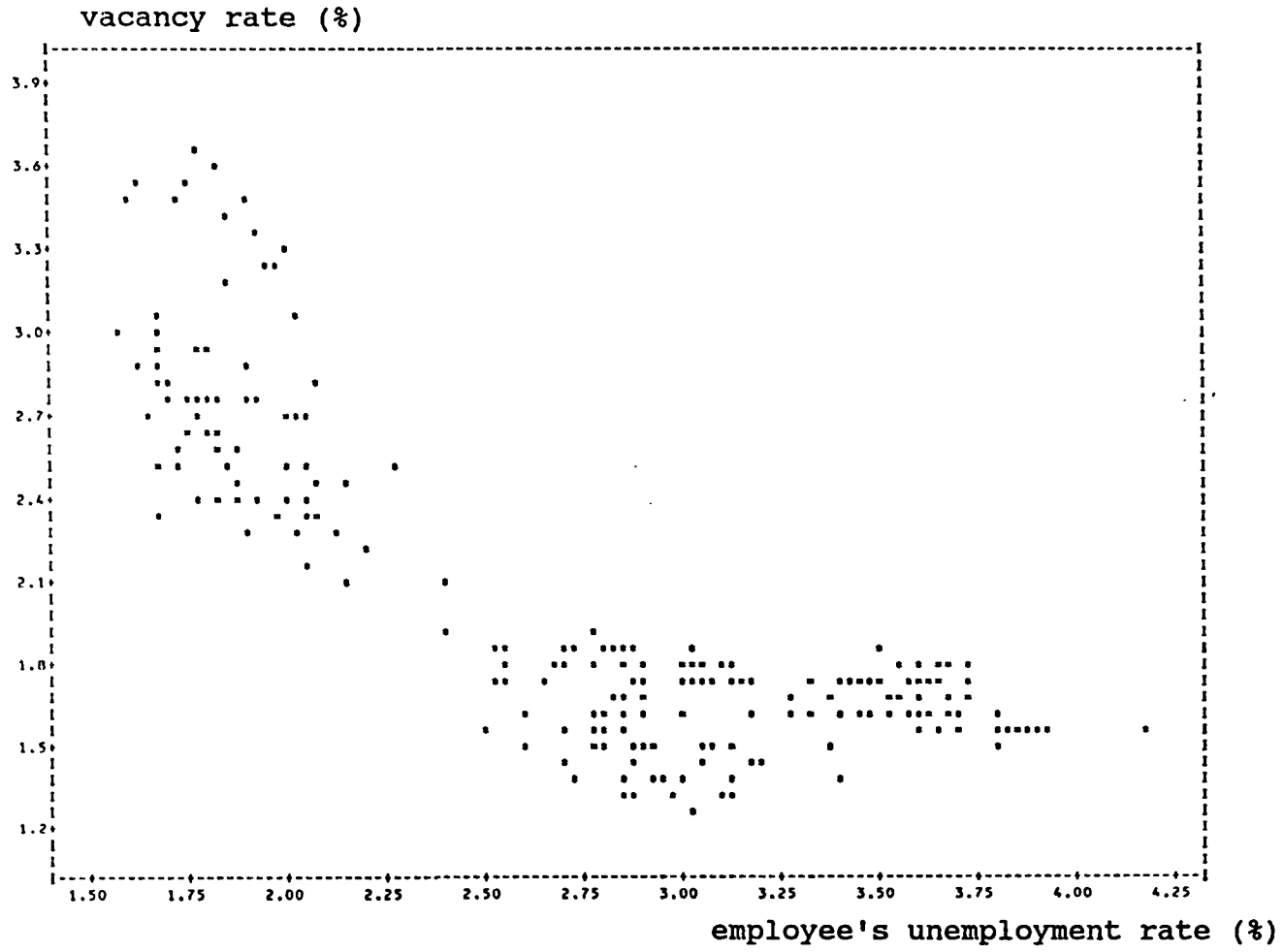
[20] A U-V curve, which plotted the unemployment rate against the vacancy rate, is a hyperbola for the same degree of mismatching (Jackman and Roper 1987, 10-13). An economy experiencing only pure aggregate disturbances goes along on a certain U-V curve. The long run equilibrium of such an economy lies on the cross point of the hyperbola and the 45 degrees' ray from the origin. The unemployment stock is equal to the vacancy stock at this point. If a mismatching increased by sectoral shift disturbances, an U-V curve shifts outward since more vacancy will resulted with the same amount of unemployment.

U-V curves are usually drawn using the vacancy rate in the Employment Security Statistic and the unemployment rate in the Labor Force Survey. Figure 1 is the scattered graph.

[21] These U-V curves used the JOJA ratio because unemployment rate are unavailable by prefectures.

Figure 1 U-V Relationship



Notes: Referred period is February 1968 to December 1987. Seasonally adjusted basis. The vacancy rate is at the end of the month. "=" denotes more than two observations.

Third, the improvement of the overall labor market widened the mismatching across regions. The JOJA ratio[22] for all of Japan increases as the weighted variation among prefectures' JOJA ratios increases (Economic Planning Agency 1988b, 241-242). The tightness in the overall market generated more differentiated effects on the regional labor markets.

Yoshikawa (1988) stressed that labor was more mobile in the high growth period before than after the first oil crisis. According to the Monthly Labor Survey (Policy Planning and Research Department, 85), the annual job accession and separation rate during the former period was around 30 percent, while during the later period it was about 20 percent.[23] The labor force moved from rural agricultural regions to metropolitan areas, trading jobs in agriculture for jobs in manufacturing and tertiary sectors. The high economic growth could not have been accomplished without such a large-scale transfer of labor. During the low growth rate period after 1970, employment growth was almost exclusively the result of the tertiary sector. However, the labor mobility after 1970 was slow. The shifts in labor during this period

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[22] The JOJA ratio is the number of job offerings divided by the number of job applications in the public employment security offices. The JOJA ratio is calculated from the Employment Security Statistic. It has been a representative index of labor market conditions as well as the unemployment rate and is one of the most familiar business cycle indexes.

[23] This smaller job turnover ratios can be confirmed also by the Survey on Employment Trends (Policy Planning and Research Department, every year).

were achieved mainly through job accessions by the newly graduates from schools. This study insisted labor shifts over industrial and regional sectors are achievable with high economic growth.

Meanwhile, some kinds of mobile workers across companies are increasing. Such mobile workers possesses high job turnover ratio. This may be one source of more rapid employment adjustment. They are part-time workers, dispatched workers, youth workers in certain occupations, and mid-career workers. The largest group of flexible workers is part-time workers. By defining part-time workers as employees who work less than 35 hours a week, part-time workers accounts for 23.6 percent of female non-agriculture employees in 1988, while it was 13.4 percent in 1972 (Ministry of Labor 1989a, S100).

A new kind of mobile worker group is the dispatched (temporary) workers. They were officially admitted by the Worker Dispatching Law enforced in 1986 with a revision of the Employment Security Law. According to the Ministry of Labor, the number of dispatched workers is 195,000 (Sasajima 1988, 22).

Surveys of the plans of workers and companies show increasing mobility among professional and technical workers (Ministry of Labor 1988a, 219-221). Workers younger than 30 years in software programing, system engineering and design industries are a major portion of this trend.

Headhunting companies and private job introduction services are more widely used as a method of hiring mid-career workers (Industry and Labor Research Division 1989, 26). Companies will hire more mid-career workers to cope with restructuring (Economic Planning Agency 1988b, 229).

F. Information Routes in Labor Markets

This section examines the job information routes in the Japanese labor markets. The external labor market is represented by the public employment security offices. The variation of job vacancy and application information through public employment security office is examined. The role of private job vacancy magazines seems to have enlarged. Job introduction services in Japan are principally monopolized by the Government. The Law of Employment Security obligates the Government to provide free job introduction services and prohibits private job introduction businesses (Law of Employment Security 1948, Article four and thirty two). Private for-fee job introduction services are confined to 28 kinds of occupations which require much specific skills.[24] The Ministry of Labor has been providing the job introduction services since 1948 through its 481 public employment security offices, which serve to introduce jobs offered and wanted to firms and unemployed. These offices also provide unemployment insurance benefits to the insured unemployed who are required

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[24] Examples are artists, medical doctors, lawyers and hairdressers.

to come to the public employment security office in person. The Employment Security Statistic[25] (Employment Security Bureau, Annual Report on Labor Markets) is a statistic collected monthly through these public job introduction services primarily for management purposes. The statistic excludes information on new school leavers.

It is questionable whether this statistic has always measured the same kind of job vacancy. This depends on how frequently companies offer jobs through the public employment security offices. Previous studies have not examined the time-series consistency of this statistic. If companies rely on the formal information path more than the informal path, job offerings through public employment security offices will have a rising trend. Reforms in public job introduction service may have attracted more companies and job-seekers to public employment security offices. The services in the public employment security offices themselves have been changing (Ministry of Labor 1989b, 64-72). They now provide special

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[25] This statistic includes two kinds of job vacancy series. One is active job openings in the current month. This is the sum of new openings in the current month and the job offerings carried over to the current month from the previous month. The other is the active job openings at the end of the month, which is equal to the one-month lagged job offerings carried over to the current month from the previous month. Neither series corresponds correctly to measuring period of the unemployment rate: the Labor Force Survey, which measures the unemployment rate, is conducted over the last week of a month. However, it is expected that the job vacancies at the end of the month is more accurate than the active job openings in the month, since the last day's stock is close to the average at the last week's stock vacancy.

offices near to rail terminal stations in metropolitan areas for part-time job matching. These new offices specialized in only part-time job introduction. As an additional services, they also try to supply more comprehensive and detailed information on labor markets. Because the public job introduction service are regionally insulated, it is believed that there have been double entries to several public employment security offices in both job offerings and job applications (Inoki 1984, 46). However, since the public job introduction service was integrated to an electric data bank service in June 1988 (Ministry of Labor 1989b, 67-68), there should no longer be double entries. The other factor which may affect this statistic is the recent proliferation of job vacancy magazines. Private magazines may be exposed to more job seekers in a short time. The degree to which public employment security office are used varies among regions, industries, occupations, sexes and ages (Inoki 1984, 38-43; Sano and Okazaki 1980, 116). Hence, changes in distribution within these categories alter the characteristic of job vacancy and application through public employment security offices.

There is another vacancy statistic which is invariant to these factors. It is the Survey on Job Offerings, which is conducted as an attached survey to Survey on Employment Trends. This survey is conducted by the Ministry of Labor every June with 15,000 observations from establishments with

more than 5 workers. June is the month immediately after the placement of new school-leavers is completed. Since this statistic measures actual vacant jobs in establishments in all of Japan, it seems more appropriate than the vacancy number in the Employment Security Statistic.

The ratio of job vacancies in the Employment Security Statistic to that in the annual Survey on Job Offerings has a significant upward trend (see table 2). It is difficult to identify what kinds of factors are increasing the numbers of jobs offered through public employment security offices relative to the other statistic. Job vacancy statistic in the Public Employment Security Statistic should not be expected to be accurate without further scrutiny.[26,27]

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[26] The end-of-month vacancy series will be used for the Abraham and Katz test in the fourth chapter, which tests for a positive correlation between the dispersion in sectoral demand shifts and the unemployment rate (Abraham and Katz 1986, 516-517). Despite the above uncertainty in this statistic, there is no alternative statistic which can be used.

[27] The reliability of the JOJA ratio as an indicator of the level of tightness in a labor market is suspicious, since the numerator, job offerings, may have varying characteristics over the long run. It is also unreasonable to assume that when the JOJA ratio is unity, quantity supplied equals quantity demanded in the labor market. Recent evidences supports the assertion that the JOJA ratio has been distorted. An indicator of excess demand in the labor market derived by Fujimoto (1984) through an equilibrium wage function presented different movements from the JOJA ratio after the oil crisis. The JOJA ratio in the Phillips curve has less significance for the seventies than the sixties. Some studies introduced in the next section employ a time trend term or other variables of demographic composition in order to explain the relationship between the unemployment rate and JOJA ratio. However, they might mistakenly capture the change in the vacancy statistic of the public employment security offices.

Table 2

Ratio of Job Vacancy Estimates from the Employment Security Statistics to Job Vacancy Estimates from the Survey on Job Offerings

Year	Ratio
1972	0.98
1973	0.80
1974	1.11
1975	1.02
1976	0.85
1977	1.40
1978	1.03
1979	1.20
1980	1.24
1981	1.54
1982	1.49
1983	1.61
1984	1.42
1985	1.24
1986	1.72

Source: Employment Security Statistics in the Annual Report on Labor Markets by Employment Security Bureau, Ministry of Labor, each year.
Survey on Job Offerings in the Report on the Survey on Employment Trends by Policy Planning and Research Department, Ministry of Labor, each year.

Notes: The numerator, job vacancy estimates from the Employment Security Statistic, is the figure of the end of every June, and not seasonally adjusted. It excludes new graduates and includes part-time jobs.
The denominator, job vacancy estimates from the Survey of Job Offerings, is the figure surveyed July 1st every year.

Job applications filed with the public employment security offices must be checked for chronological consistency, because factors which alter the characteristics of job vacancy information may affect job applications as well. Workers tend to rely on the formal information path more. Job accession through personal connections dropped from 44 percent in the late 1960's to 22 percent in the late 1980's among the workers who accessed to or separated from establishments with more than five employees (Policy Planning and Research Department Report on the Survey on the Employment Trends 1977, 29; 1987, 215). However, job accessions through public employment security offices has remained around 20 percent for the last 20 years. Meanwhile, accessions through job advertisements increased from around 20 percent in the late 1960's to around 30 percent in the late 1980's. This heavier reliance on job advertisements is more typical of female workers.

The private job vacancy magazines flourished recently (Association of Job Journals of Japan 1989). Their origin was a job vacancy magazine for working students in Tokyo in 1966. These magazines have targeted mainly students until mid 1970's. A number of new weekly private job vacancy magazines were published between 1974 and 1982. A later-famous job vacancy magazine targeted at females was issued in 1980. After the early 1980's, job vacancy magazines have begun which focus exclusively on scientific specialists. Currently, the total

circulation of all private job vacancy magazines issued daily, weekly or monthly is around 30 million copies.

This boom in private job vacancy magazines may be one of the factors which pushed up the unemployment rate. Yashiro (1983, 119) pointed out that more active job search by women can affect the unemployment rate since job-searching is a subjective matter, whereas job-separation is an objective matter. This subjectivity was attributed to the lack of clear definition on job-searching in the current Labor Force Survey. If women become more active in their job search, then women classified as part of the non-labor force will be easily reclassified as unemployed. Yashiro ascribed such an easy reclassification from non-participation in the labor force to unemployment conversion to fashionable private job vacancy magazines. These magazines are unlike the traditional public employment security offices with dark and poor images. This may explain some portion of the strong upward trend in the female incidence from non-labor force to the unemployment pool (Ministry of Labor 1988a, 163).

However, the role of the public employment security offices for workers to apply for jobs has not appeared to decrease.[28] The number of the unemployed persons who seek jobs mainly through the public job introduction service have not declined according to the Special Survey of the Labor Force

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[28] Previous research (Inoki 1984, 45) suggested a downward trend from the numbers during 1978 through 1980.

Table 3

Principal Method Used to Seek Jobs by Unemployed Persons

Year	Applying to Public Employment Security Office	Collecting Wanted Ads. or Consulting with Acquaintances
1977	28.3	14.2
1978	36.2	24.8
1979	34.1	30.4
1980	30.6	33.1
1981	-	-
1982	34.0	27.9
1983	-	-
	same as above.	Advertisements and Magazines on Vacancies
1984	34.5	33.9
1985	37.2	33.5
1986	36.6	31.7
1987	34.9	33.3
1988	33.5	33.5

Sources: Statistics Bureau, Management and Coordination Agency, Report on the Special Survey of the Labor Force Survey, each year. This Survey is conducted by the Statistics Bureau almost every February to collect supplementary information to the Labor Force Survey. The design of the Survey changes year by year.

Notes: Figures are the percentage share of unemployed persons who reported each method as mostly expected to the total unemployed persons. The definition of unemployed persons is the same as in the Labor Force Survey.

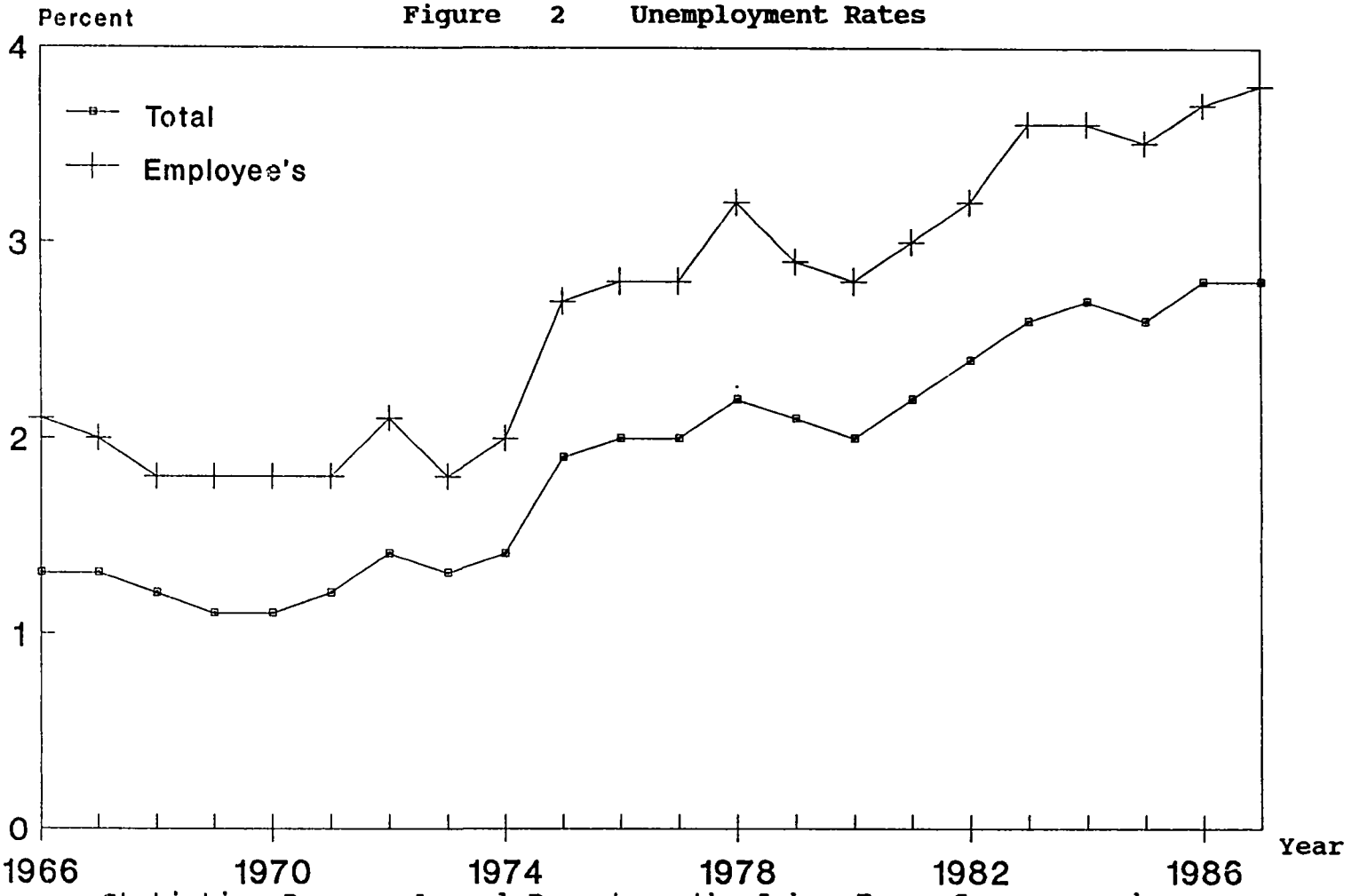
Survey (see table 3). Together with the constant share of new-hire placements by the public employment security's office, the public employment security office still appears to be a major route to job acquisition. Meanwhile, the table seems to show that there was an increased role for the private job vacancy magazines around 1980, because of the declining trend in the usage of informal channels for job accessions.

G. Upward Trend in Unemployment Rate

The unemployment rate in Japan has been on an upward trend over the last 15 years. The unemployment rate computed by the Labor Force Survey was stable in the 1960's, remaining within the range of 1-1.5 percent after falling from a level above 2 percent in the late 1950's. After the oil crisis in 1973, it increased to 1.9 percent in 1975. Even after this, the largest recession since the war, the unemployment rate has maintained its upward trend over the last four business cycles during the 1970's and 1980's. In the second quarter in 1987 the rate of unemployment reached 3 percent. The employees' unemployment rate, which excludes self-employed and family workers from the denominator, have shown the same upward movements as the total rate (see figure 2).

There is a widespread belief that the natural rate of unemployment rate itself has increased, though some portion of this upward trend may be attributed to a decline in the rate of growth of aggregate demand. The term "natural rate of unemployment" could be understood as "the level ground out by

Figure 2 Unemployment Rates



Source: Statistics Bureau, Annual Report on the Labor Force Survey, each year.

Notes: "Total" denotes unemployment rates by the common definition. "Employee's" denotes the employee's unemployment rate.

the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the cost of mobility and so on" (Friedman 1968, 8). Or it could be a level consistent with real forces as opposed to monetary factors (Friedman 1977, 458).

Many analyses have been done to measure the natural rate of unemployment rate and its shift. Those using the Phillips curve (Shimada 1986, 203; Iwata and Goto 1984) suggested that the natural rate of unemployment was between 2.3 percent and 2.6 percent in the early 1980's. Other analyses using U-V curves (Shimada 1986, 206; Ministry of Labor 1988a, 181) estimated the natural rate of employment to be 2.9 percent and 2.2 percent respectively in almost the same period. Though the estimated level of the natural rate of unemployment differs among the studies, each study concludes that the rate is on an upward trend.

However, there is no satisfactory explanation for the upward trend in the natural unemployment rate in these studies. None of the analyses posited a model with the relationship between equilibrium unemployment and the causes of the upward shift. Though some descriptive explanations are provided, none are developed into theoretical frameworks.

Here are three examples. A well-known study which emphasized the natural rate of unemployment in explaining the upward movement of actual unemployment was that by Yoshida and Endo (1982). This study explained the movement of the natural rate of unemployment only in terms of a time trend, while the deviation from it was explained by the JOJA ratio. This ratio was expected to explain the tightness in labor markets: $U = b_0 + b_1JOJA + b_2TIME$. It was concluded that the unemployment rate defined by a JOJA ratio equal to unity plus the time trend term is "the natural rate of unemployment". They emphasized aging, female labor force participation with high job turnover ratio, and shifts to service industries as structural factors. Ono (1983, 124) questioned the result: Yoshida and Endo assumed that a JOJA ratio of unity represents full employment; however, the JOJA ratio had been below the unity since 1974. From the assumption, actual employment had been below the full employment since then; yet, they concluded that the natural rate of unemployment was achieved around 1980. Ono's criticism can be summarized as follows: one should be able to observe the natural rate of unemployment, which is a stock concept, by watching at least the JOJA ratio of unity, which is a flow indicator (Ueda and Yoshikawa 1984, 64). Ueda and Yoshikawa criticized the lack of an explanation of what kind of structural force changed this relationship. Furthermore, the assumption that JOJA equal to unity is a signal of equilibrium in a labor market is doubtful as

discussed. The second example, Hamada and Kurosaka (1986, S291), following Fujimoto (1984), attempted to capture the structural change in the relationship between the unemployment rate and JOJA ratio by replacing the time trend with variables reflecting aging and the increasing share of service industry employment. The third example was based on the U-V curve analysis. The outward moving U-V curve was explained by the share of the aged over 65 in the labor force and the share of services industries in total employment along with the vacancy rate (Ministry of Labor 1988a, 181).

H. Sectoral Shifts in Japan

The upward trend in the unemployment rate in Japan might be explained with the help of the sectoral shift theory. First, tentative evidence in support of this is presented Next, previous Japanese studies in the sectoral shift theory will be reviewed.

From the discussion in the above sections, especially the labor supply section, one may doubt that the sectoral shifts have any room to explain the unemployment rate increase: the supply side seems to explain much of the observed secular increase. However, a closer look into unemployment rate movements reveals that there are many fluctuations within the upward trend of the unemployment rate. In addition, there are two possibilities which could explain even the secular trend: acceleration in sectoral shifts

disturbances themselves and the more sensitive response of the unemployment rate to them.

The smaller and more open an economy is, the larger and more frequent it is hit by sectoral shifts through foreign channels, though this depends on how specialized its industries are. The Japanese economy is more open and smaller than the U.S. economy: it is therefore more sensitive to foreign disturbances such as price changes in raw materials like oil, economic fluctuations in the rest of the world especially in the U.S., changes in real exchange rates under either fixed or flexible exchange rate regimes, and price movements in foreign countries.

The uneven business conditions among industrial sectors were remarkable characteristics of the Japanese economy after each oil crisis. The manufacturing sector was hit most severely. However, demand shifted from large and heavy products to small and light products even within the manufacturing sector. Meanwhile, the service sectors, with many part-time job opportunities in the wholesale and retailer businesses, expanded. Though this unevenness was not believed to be the cause of the general business cycle, uneven distribution of product and factor demands were repeatedly observed (Economic Planning Agency, 1977 185-219; 1978, 54-66, 212-272; 1979, 275-333; 1982, 62-113). For example, one study (ibid 1978, 63-76) analyzed how a large-scale relative price change had generated differentiated effects on various

industrial sectors. One way is through the income transfer by the larger payment for oil. This transfer generated different demand changes among industry's outputs. The other way is the change in the cost of output which depends on the cost structure. This generates further differentiated effects on output demand due to variations in demand elasticity and substitutability. Mismatching in labor markets were noted (ibid 1979, 295): while aged male workers had to separate from their jobs in the manufacturing sector, the new demand for labor consists of mainly part-time or temporary jobs for females in the service sector.

Responses to oil crises may be analyzed through factor price frontiers with technological change (Bruno, 1984). A study (Sakashita et al. 1983, 54) corrected Bruno's mistreatment in Japanese data for the period from 1966 through 1978. The estimated coefficients for manufacturing industry shows that a 1 percent increase in relative raw material prices requires a 4.5 percent of drop in real wages in order to keep the real rate of return on capital constant. Zero technological change during this period was assumed. This required drop in real wages was 0.85 percent for the U.S., 0.64 percent for the United Kingdom, and 0.71 percent for West Germany during the roughly same periods (Bruno ibid, 16). The Japanese economy, when hit by an oil price hike, would have generated much larger unemployment than other countries if real wages had been rigid. This conclusion presumes that

technological progress had not occurred and that capital had not had to bear the cost of the input price rise. The corresponding figures for the raw material intensive industries, and assembly/processing industries are 5.5 percent and 1.65 percent, respectively (Sakashita et al. ibid). Such technical constraints in production explain why oil price hikes hit employment in the raw material intensive industries most severely.

Some points make it uncertain if energy price changes in the presence of labor immobility could be a major reason of unemployment in Japan. The first point is that Japan has no oil producing industry, though it had or has energy intensive industries such as an aluminum or petrochemical refining industry. By contrast, the U.S. economy includes a large energy producing industry. Such a difference may cause dissimilar responses to the oil price changes between the two countries. The second point is the aggregate demand shocks caused by the transfer of the income to and from oil producing countries. This effect may overwhelm the effect of oil price changes as sectoral shift disturbances on unemployment. The third point is that the labor energy price increases raised demand for labor through substitutability, they might mitigate sectoral shift-type unemployment as discussed in the end of chapter two. In particular, the service industries and other labor intensive industries have prospered after the oil crises.

The tendency toward export-led growth grew stronger after the first oil crisis. The contribution of external demand to total real GNP growth had been positive after 1973 until 1986 except in 1978 and 1979 (Economic Planning Agency 1987, 153-155). By using both a multi-country econometric model and multi-variate time series analysis (Economic Planning Agency 1988a, 362-63), the largest source of foreign disturbances was confirmed to be from the U.S.

The boom in the U.S., led by Reagan's fiscal policies in the early 1980's, increased the demand for capital equipment. The nature of the Japanese export increases during this period can be characterized as a surge in capital goods, though exports of some consumer durable goods such as video cassette recorders[29] increased.

The most recent example of a sectoral shift is the rapid yen appreciation after the Plaza agreement in September 1985. This appreciation shifted demand from exports to domestic demand. The export-led growth was hit by the rapid yen appreciation. The sluggish movements in manufacturing industries were contrasted with the steadfast growth in non-manufacturing sectors. Even in the manufacturing sector, those industries related to household consumption showed stable growth. The yen appreciation, which caused the relative price change between tradeable and non-tradeable goods, brought not

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[29] The video cassette recorder is a good example of a sectoral shift due to new technology.

only a direct decrease in demand for export related sectors but also a transfer of income to domestic sectors, hence indirectly increasing demand for service industries.

There occurred much concern about labor mismatching because of such diversity among industries. The employment problem in mid-1987, when the unemployment rate hit its highest level (3.2 percent in May), was depicted as "attributable to not only insufficient demand but also mismatching between labor demand and supply among regions, ages and occupations, which was generated by the rapid restructuring and high tempo of technological progress" (Economic Planning Agency 1987, 277). New hiring in iron and steel, general machinery and transportation equipment manufacturing dropped after the rapid yen appreciation. New hiring in textiles, furniture and fixture manufacturing decreased slightly. Non-manufacturing sectors such as financial institutions, real estate, transportation, communication, and other service industries increased their new hiring. These growing industries were concentrated in the three major metropolitan areas (Tokyo, Nagoya and Osaka), while some small cities were heavily dependent on a specific export industry such as iron and steel. About half of workers who lost jobs in Muroran, which is famous as a Shin-Nipponseitetsu steel town, noted that location of jobs is the most critical condition for job accession (ibid, 284).

A study (Sakurai and Tachibanaki, 1988) tested the changes in degrees of mismatching by region and by age using various indicators proposed by Jackman and Roper (1985). Mismatch by age was found to be increasing for men over the period 1971 to 1985. No similar relationship was found for women. Regional mismatching also did not increase. The predicted result that the macro U-V curve gets located outward of the U-V curve derived from summing up disaggregated U-V curves was not confirmed for any case.

The sectoral shift argument was recently introduced to Japanese literature. Ueda and Yoshikawa (1984) and Yoshikawa (1987) introduced Lilien's argument (1982a) with a criticism of job search theory. Their argument was that neoclassical equilibrium unemployment assumes that the job search activity during unemployment is more efficient than on-the-job search. However, this assumption contradicts the fact that, in Japan, about 90 percent of the newly employed are hired directly from their previous job without any intervening unemployment. They commented also that testing the natural rate of unemployment hypothesis with Lilien's method makes sense if the industrial restructuring is proceeding towards services.

Lilien's raw index of sectoral shocks, measured as the weighted average of the standard deviation of the employment growth rate in each sector, was calculated recently in three studies: White Paper on Labor (Ministry of Labor 1988a, 177-179), Sakurai and Tachibanaki (1988, 42-46) and Sakai (1989).

The first two used the annual employment series by nine industries in the Labor Force Survey. These two raw dispersion indexes showed a declining trend. Sakurai and Tachibanaki found that their raw dispersion index presented a negative trend though it moves countercyclical to the JOJA ratio and total employment growth in the short run. Sakai relied on the annual employment series in the Monthly Labor Survey.[30] His sectoral shift indexes showed positive correlation with unemployment rate before 1973, but negative correlation after 1974.

A more precise application of sectoral shift model to the Japanese case is by Ohtake (1988a). His replication of Lilien- and Davis-type unemployment rate equations used the annual employment series from mid-1960's to 1987. These series were broken down by gross and medium industrial classification, regional classification and occupational classification. However, he could not reach any positive correlation between the sectoral shift indexes and unemployment, even with a time trend. Rather, some indexes are positively correlated with unemployment rate before the first oil crisis. One exception is a horizontal index which indexes a year's direction of labor reallocation over a one-year

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[30] As explained in the data appendix, this statistic is not appropriate due to the discontinuity and lack of information on small establishments.

horizon relative to the previous year's direction over a two-years horizon.

Chapter IV

Tests of the Sectoral Shift Hypothesis

Unemployment equations were estimated to test a sectoral shift hypothesis with certain modifications.[31] As discussed in the third chapter, the employee's unemployment rate is used as the unemployment rate in this chapter. Unemployment equations were estimated with two variables in addition to time trend: sectoral shift indexes and aggregate demand disturbances. Unemployment equations of eight variations were examined. Sectoral shifts, whose effects on the unemployment rate are a primary target of this analysis, are proxied by one of four indexes: raw dispersion index (Lilien 1982a, 783); decomposed sectoral shift index (Neelin 1987, 720); horizontal sectoral shift index, which take past pattern of reallocation of labor into consideration (Davis 1987b, 357); and absolute value of relative energy price changes. Aggregate demand disturbances were expected to be captured by one of two variables (Lilien 1982a, 787): unanticipated money growth or unanticipated price changes.

A. Sectoral Shift Indexes

The sectoral shift indexes were constructed by the four ways basically reviewed in the second chapter. They are raw dispersion index, decomposed indexes, horizontal index, and

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[31] The data used following tests are available upon request either via hard copy or via magnetic tape recorded by the EBCDIC code until January 1990.

absolute value of relative energy price changes (see table 4).

This analysis uses monthly data. No previous test in the sectoral shift theory employed monthly data thoroughly.[32] The sectoral shift theory, whatever the definition of the sector, is meaningful only in the short run. Since a sectoral shift creates demand for labor in another sector, a dismissed worker turns from an unemployed worker to a replaced worker over a period which is long enough to find a new job. Using annual data hides some sectoral shift disturbances and subsequent adjustments within a year. In addition, monthly data increases the degrees of freedom.

Employment series are collected from the Labor Force Survey which has been conducted monthly by the Statistics Bureau, Management and Coordination Agency since 1950. The time series of employment numbers by 16 industries[33] in the

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[32] While Lilien (1982a) manipulated monthly or quarterly data in order to examine the linear approximation of a layoff function, he used annual data to estimate the unemployment equation.

[33] Though the degree of disaggregation affects the measurement of the sectoral shift, more than 16 industry divisions was not possible. Decomposition alters the index's meaning. The second interpretation of the positive relation of Lilien's raw dispersion index and the unemployment rate was that aggregate demand shocks generated the positive relation (Abraham and Katz 1986, 510-13). This interpretation is more plausible for a two sector model with manufacturing and services. If Lilien's raw dispersion index were constructed with only two sectors, it would be a good index of aggregate demand shocks.

Assuming output demand fluctuation in manufacturing sector industries are much larger than in services industry, putting more effort into disaggregating manufacturing is worth considering. The rapidly changing industrial structure, depicted as rapid changes in the composition of major

Labor Force Survey are available from January 1968. Attention was paid to the consistency of the employment time series with respect to industrial classification and other points. Details on this are in the appendix.

If a worker changes his industry, he will be automatically counted in the Labor Force Survey, whatever the size of the firm or establishment. A sampled worker in the Labor Force Survey is attributed to a certain industry according to the kind of business establishment where he is working (Statistics Bureau 1984, 31-32). Statistics Bureau's officers, not the sampled workers themselves, classify workers into industries by checking the content of each questionnaire. Such a household survey has advantages compared to an establishment or enterprise survey: it is invariant to changes in establishment or firm size, changes in products combination in firm, and labor movement across scale-different establishments or firms.

The first, a raw sectoral shift index was constructed from employment numbers by industries following Lilien's original measure (Lilien 1982a, 783) (see figure 3). Average employment growth rate over the economy was calculated excluding the unclassifiable employment series.

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manufacturing exports, also suggests that disaggregation in manufacturing is important.

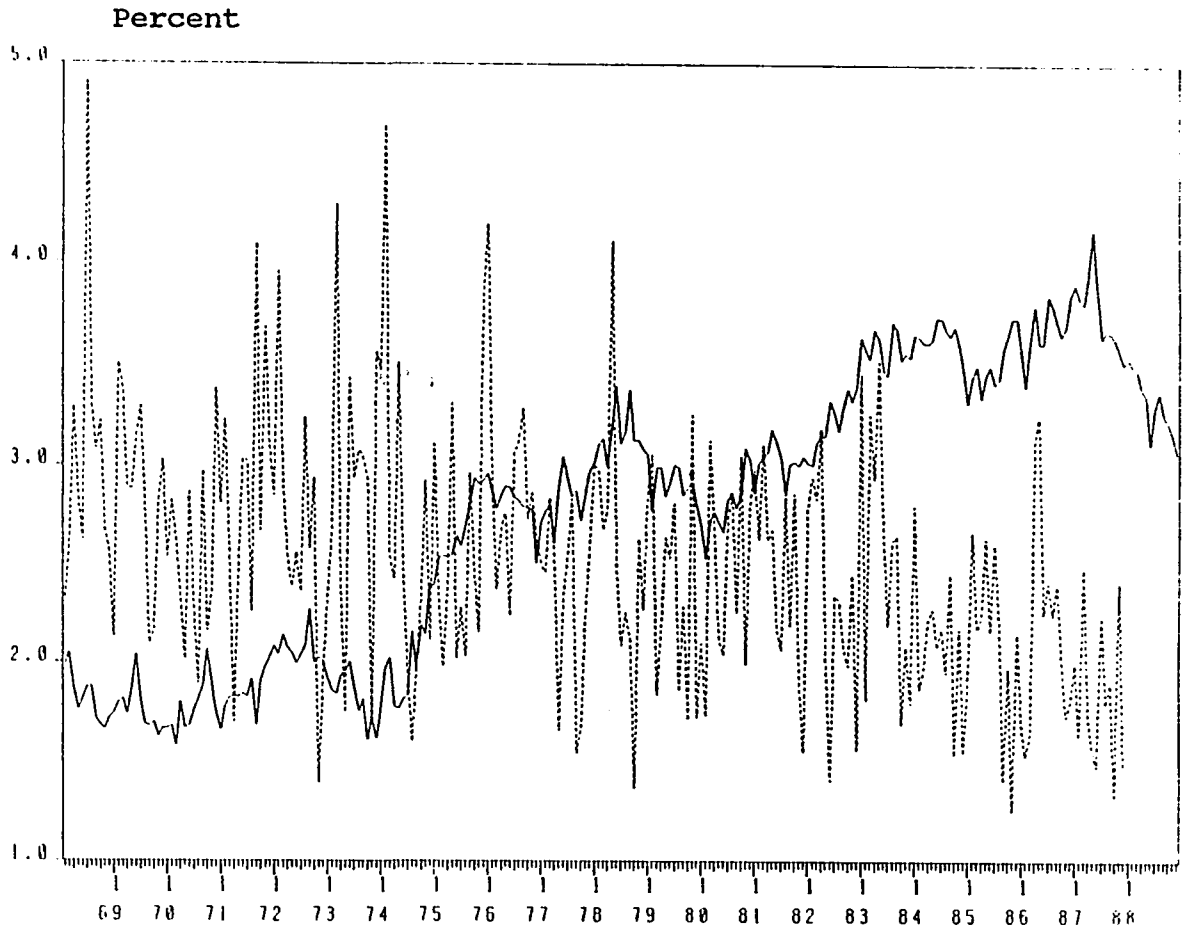
Table 4

Summary of Sectoral Shift Indexes

Sectoral Shift Indexes	Correl. with Un-Employment Rate	Correl. with Raw Index	Mean	SD
Raw Index	-0.39	1.00	2.51	0.63
Horizontal Index	-0.01	0.11	0.53	4.20
Decomposed Index				
By Unanticipated Money Growth				
Unexplained	-0.39	0.93	2.33	0.60
Explained	0.05	0.11	0.66	0.17
By Unexpected Price Changes				
Unexplained	-0.30	0.91	2.30	0.56
Explained	-0.58	0.37	0.73	0.28
Absolute Relative Energy Price Changes	0.08	0.07	2.46	3.75

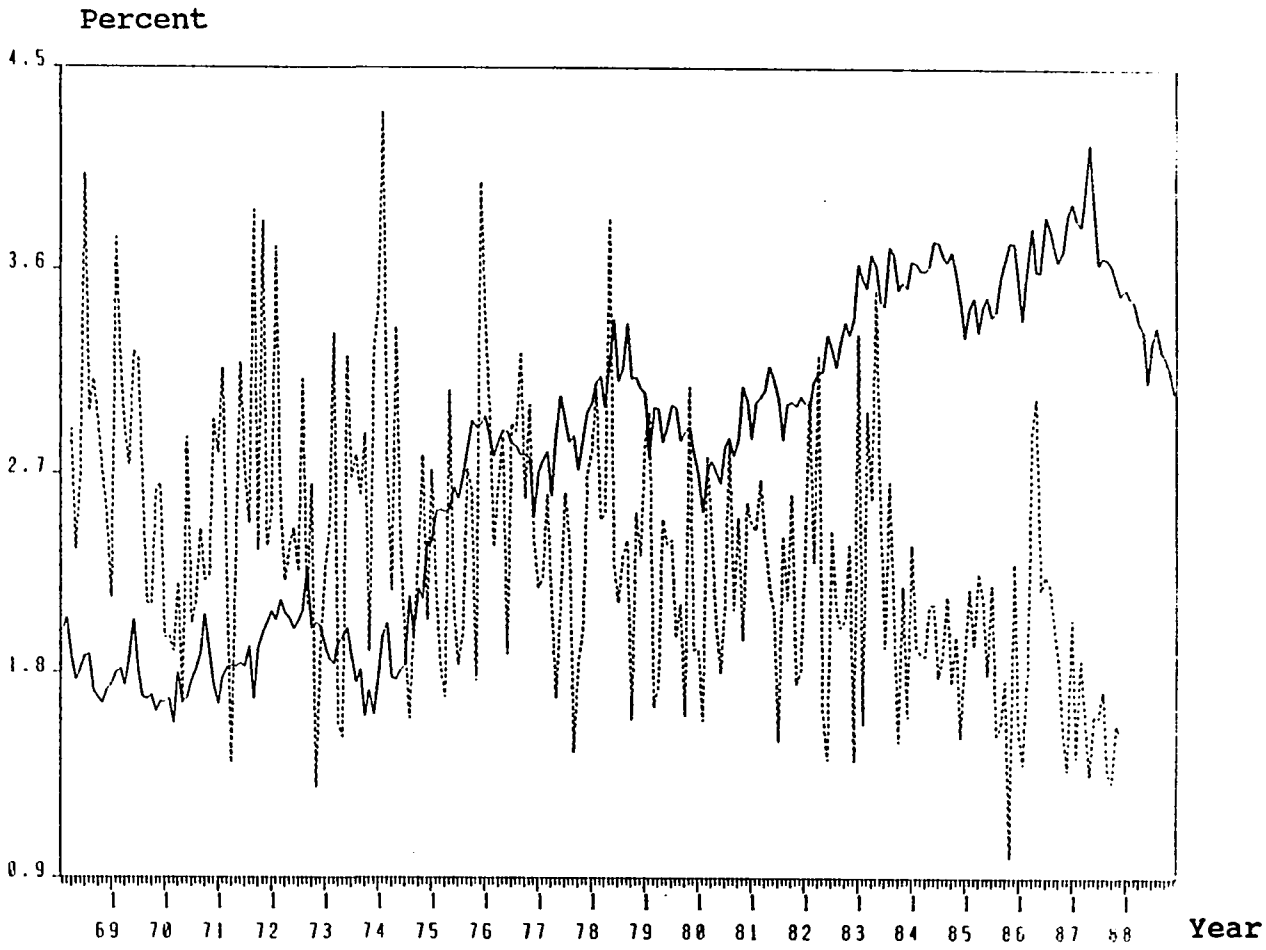
Notes: "Correl." denotes correlation coefficient. "SD" denotes standard deviation. For the meaning of the index, see the text. Units are percentage points. Numbers for horizontal index are from January 1971 to December 1987. Numbers for others are from April 1968 to December 1987.

Figure 3 Unemployment Rate and Raw Sectoral Shift Index



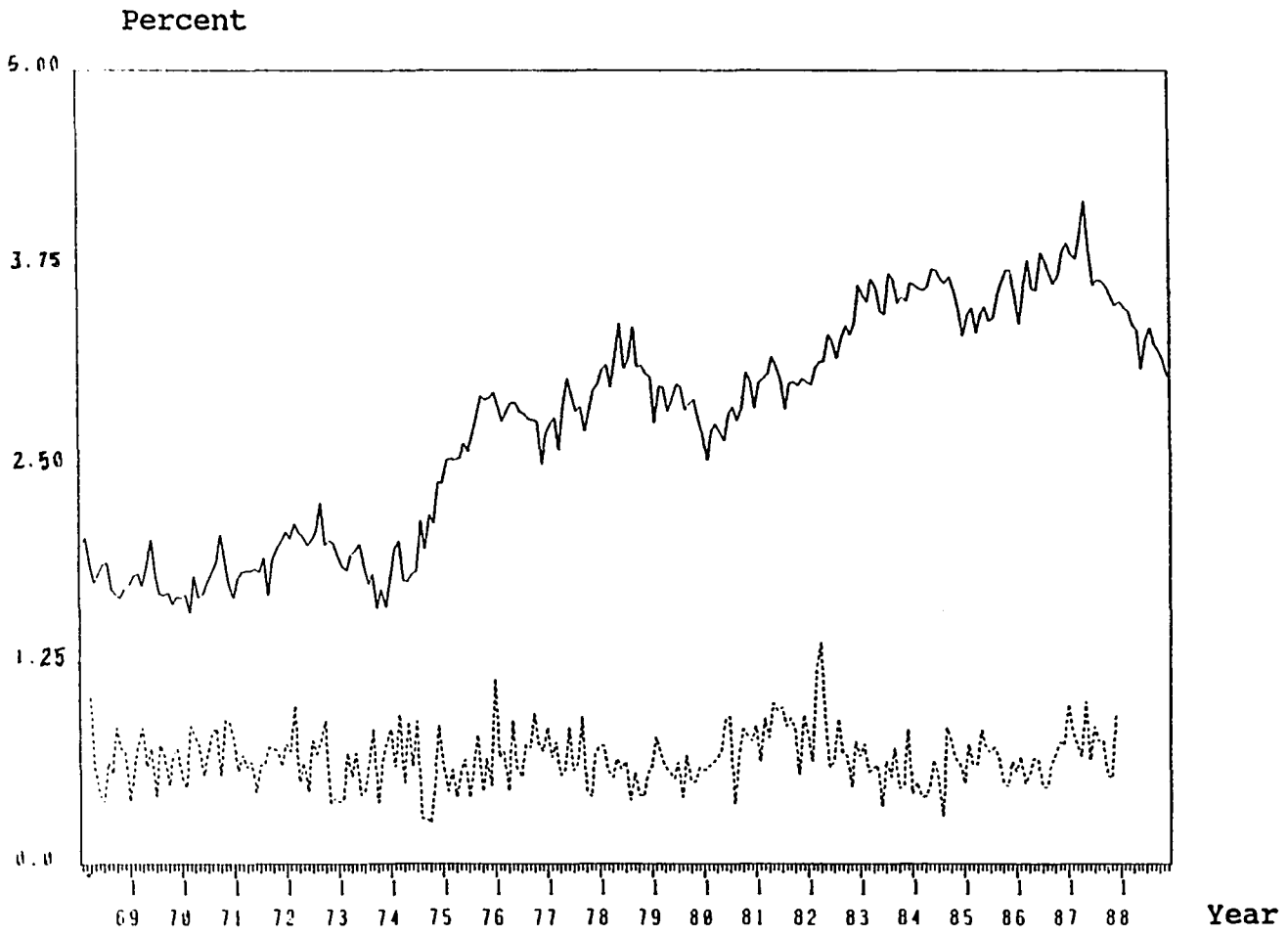
Notes: The solid line is the employee's unemployment rate. The dotted line is the raw sectoral shift index.

Figure 4 Unemployment Rate and Decomposed Sectoral Shift Index (Unexplained by Unanticipated Money Growth)



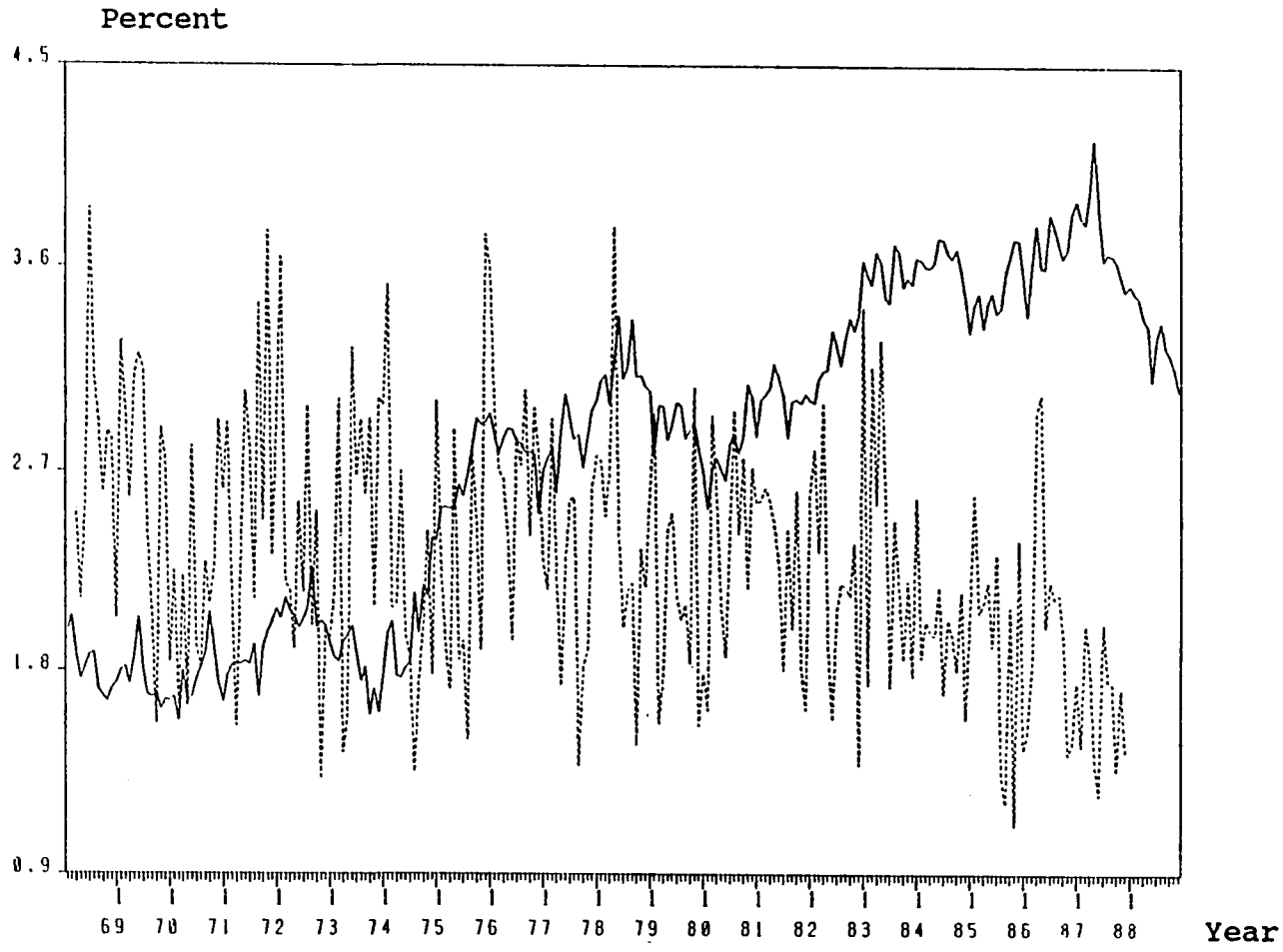
Notes: The solid line is the employee's unemployment rate. The dotted line is the decomposed sectoral shift index unexplained by unanticipated money growth.

Figure 5 Unemployment Rate and Decomposed Sectoral Shift Index (Explained by Unanticipated Money Growth)



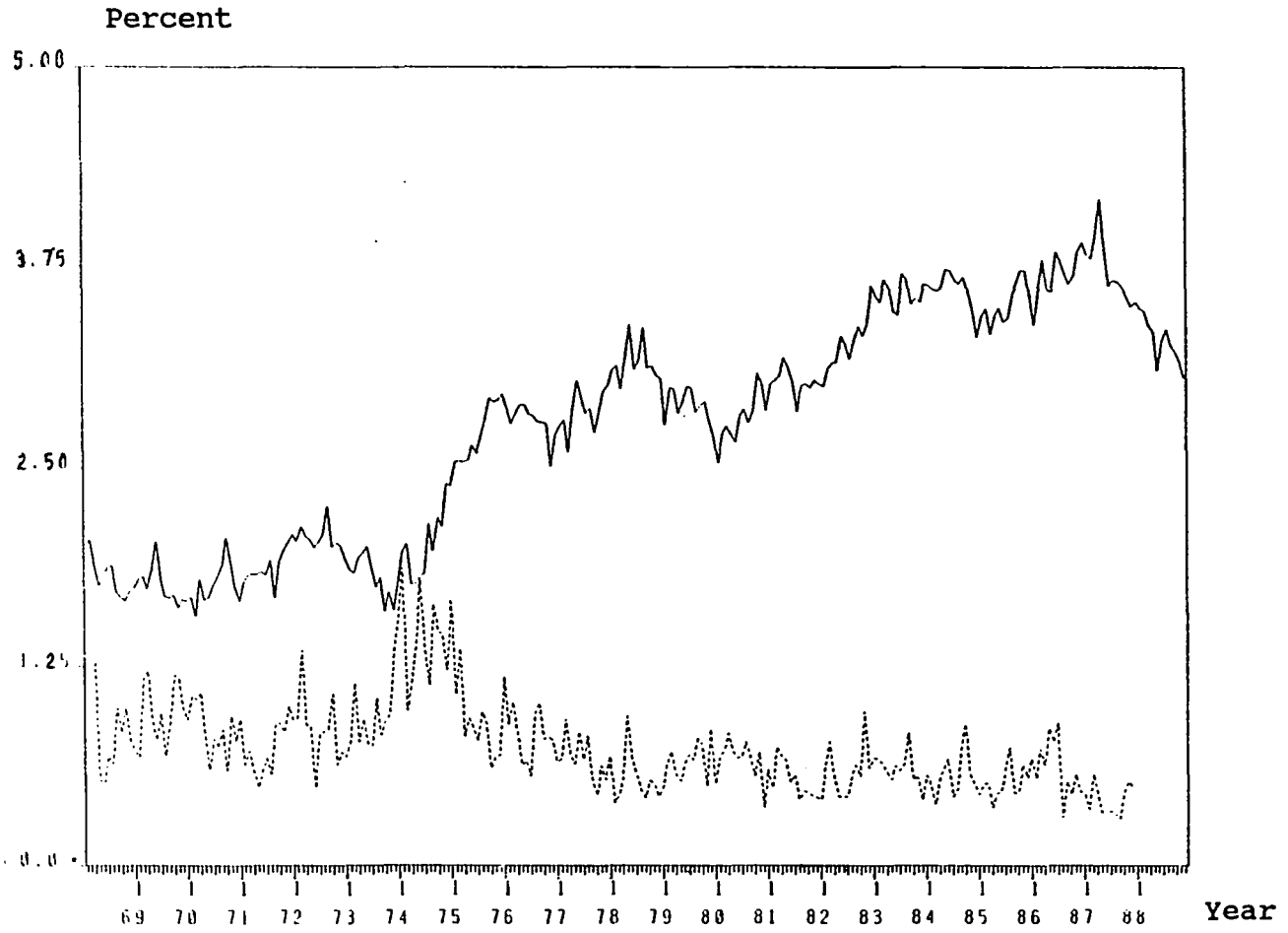
Notes: The solid line is the employee's unemployment rate. The dotted line is the decomposed sectoral shift index explained by unanticipated money growth.

Figure 6 Unemployment Rate and Decomposed Sectoral Shift Index (Unexplained by Unanticipated Price Changes)



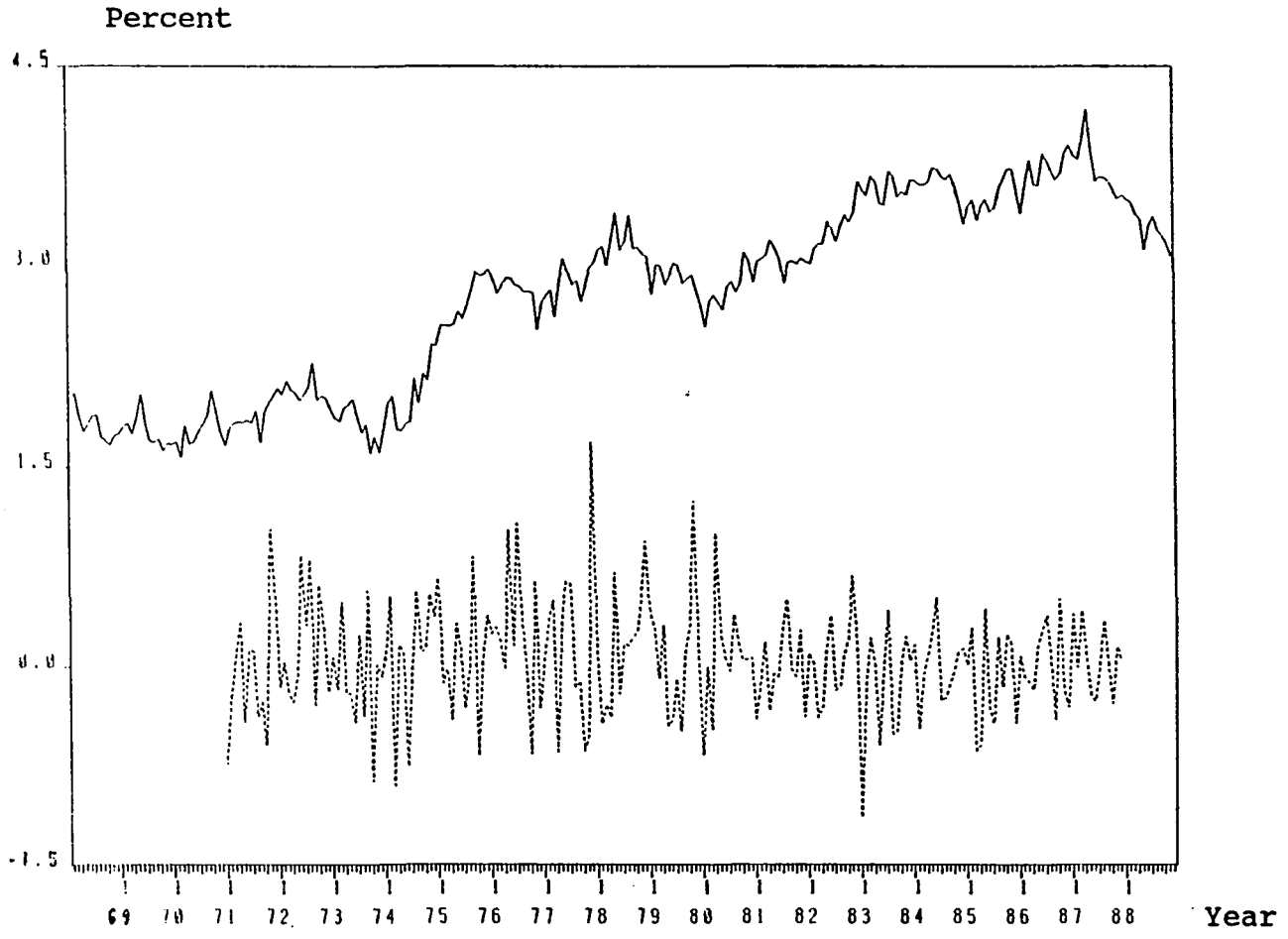
Notes: The solid line is the employee's unemployment rate. The dotted line is the decomposed sectoral shift index unexplained by unanticipated price changes.

Figure 7 Unemployment Rate and Decomposed Sectoral Shift Index (Explained by Unanticipated Price Changes)



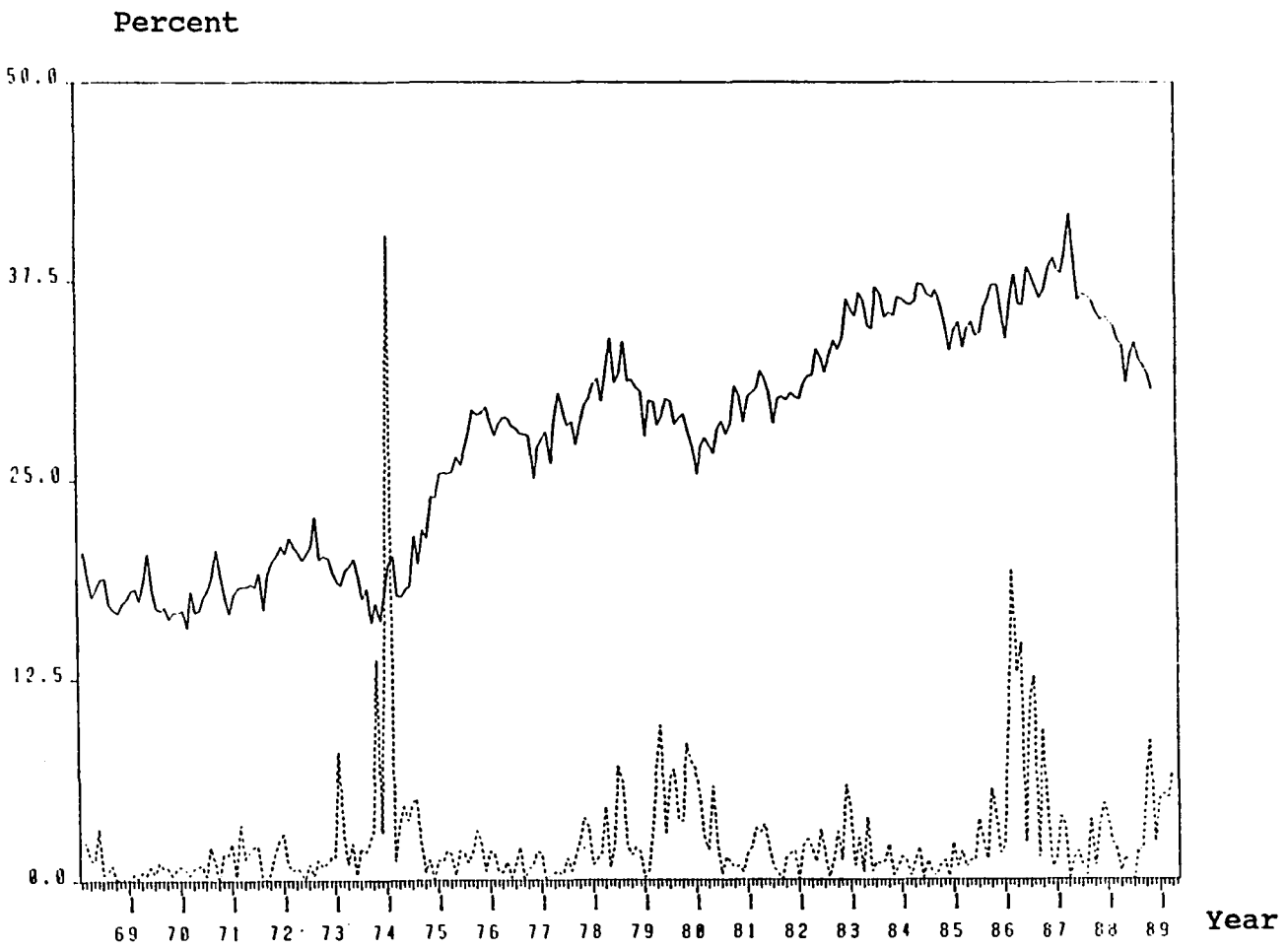
Notes: The solid line is the employee's unemployment rate. The dotted line is the decomposed sectoral shift index explained by unanticipated price changes.

Figure 8 Unemployment Rate and Horizontal Shift Index



Notes: The solid line is the employee's unemployment rate. The dotted line is the horizontal sectoral shift index.

Figure 9 Unemployment Rate and Absolute Value of Relative Energy Price Changes



Note: The solid line is the employee's unemployment rate multiplied by 10.0. The dotted line is the absolute value of the relative energy price changes.

The second sectoral shift index is the decomposed indexes (Neelin 1987, 720). The raw dispersion index was decomposed by either unanticipated money growth or unanticipated price changes as aggregate demand disturbances (see figure 4 to 7). The decompositions were done through two steps in order to purge out portions of employment growth influenced by average or aggregate movements. With the exception of one industry, neither the time trend nor its squared were significant in explaining employment growth rates. Hence, neither was introduced for decomposition. Aggregate demand disturbances were lagged by 12 months. The correlation between indexes unexplained and explained by aggregate demand disturbances were small.

The third sectoral shift index is the horizontal sectoral shift index (Davis 1987b, 357) (see figure 8). It is a dispersion index which incorporates past patterns of labor reallocation. Here, the horizontal index was modified slightly to reflect previous findings:

$$\sigma^{h}_{t,24} = \Sigma_{i=1,N} \, (l_{it}/L_t) \, * \, (\log(l_{it}/l_{it-1}) - \log(L_t/L_{t-1})) \, * \, (\log(l_{it-12}/l_{it-12-24}) - \log(L_{t-12}/L_{t-12-24}))$$

The $\sigma^{h}_{t,24}$ indexes the direction of labor reallocation at the time t over a one-period horizon relative to the direction at the time 12-months ago over a 24-months horizon. The "t-1" in the original model was changed to "t-12", compared to the original invention and the "j" horizon was chosen to be 24 months.

This modification stands on previous sectoral shift analysis and employment adjustment studies. Ohtake (1988a, 7) found that, with annual data, only a horizontal index of this year's direction over a one-year horizon relative to the last year's direction over a two-years horizon was significant in his unemployment equation. "Contemporaneous labor reallocation of which direction reinforces the labor reallocation during the period from three years ago till one year ago" (ibid) affected unemployment. This fact coincides with a fact that in some manufacturing industries a company is likely to dismiss workers after consecutive two years of losing money (Koike 1983, 119-120; Muramatsu 1986, 424).

The last measurement of sectoral shifts is the absolute value of the relative energy price changes (see figure 9). The relative price of energy was defined as imported oil, coal, and natural gas prices relative to domestic manufacturing goods prices as indicated by the Bank of Japan wholesale price indexes. Loungani (1986, 539) dispenses with dispersion indexes and includes the relative price changes of petroleum in order to segregate oil shocks' dispersion effect. Here, the observations on relative energy price changes include negative values, especially after April 1980. Therefore, the absolute value of the relative energy price changes was used. A division of observations into two periods, before and after April 1980, was introduced. This is adequate to see the asymmetric response to the energy price changes.

B. Aggregate Demand Disturbances

Aggregate demand disturbances can be captured in several ways. Misperception in future price changes is generally expected to raise the exit incidence from the unemployment pool. This misperception is caused either directly from erroneous forecast in price changes (Friedman 1968) or indirectly from unanticipated money growth (Lucas 1975). The most frequently employed in previous literature is unanticipated monetary policy (Lilien 1982a, 1982b; Abraham and Katz 1984, 1986; Neelin 1987). Lilien (1982a, 787) suggested using unanticipated price changes as well.

The exogenous shocks to aggregate demand in Japan will not be captured well only by unanticipated monetary policy as in Lilien (1982a) or Barro (1977). Several preceding tests on the macroeconomic rational expectation hypothesis in Japan using the industrial production index in the manufacturing sector revealed that both anticipated and unanticipated monetary policies are positively correlated with the dependent variable: the neutrality hypothesis was rejected. Only one out of six major tests on the Lucas-Sargent-Wallace hypothesis surveyed by Okina (1986) confirms the hypothesis. Furthermore, Gochoco (1986, 464) reported that an estimation with only unanticipated monetary policy as regressors did not converge. These preceding studies suggest that it is not appropriate to use only the unanticipated monetary policy to represent the

aggregate demand shocks.[34] The aggregate demand disturbances should include both anticipated and unanticipated money growth. However, to incorporate both anticipated and unanticipated monetary policy as proxies for the aggregate demand shocks is not harmonious with an equilibrium view on the economy in the sectoral shift models.

If unanticipated monetary policy is replaced by unexpected price changes, the Lilien's original equation (Lilien 1972a, 787) becomes a Phillips curve with a moving natural rate of unemployment and a lagged dependent variable:

$$U_t = a_0 - \Gamma U^*(\sigma_t) + \Phi(p - p^e) + a_1 U_{t-1}$$

where Γ and Φ are lag operators, a_0 and a_1 are coefficients, p and p^e are actual and expected rate of change in prices, and U^* is the moving part of natural rate of unemployment. Johnson and Layard (1986, 986) explained that the difference between the Phillips curve and the neoclassical equilibrium unemployment equations is small: the reversed direction of interpretation on the causal relationship and the way of capturing the price expectation errors. The Phillips curves are empirically supported concepts in Japan (Toyoda 1987, 288).

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[34] This is the same as in the U.S. economy case discussed in the second chapter.

Unanticipated and anticipated money growth, and unanticipated price changes were constructed taking the above discussions into consideration (see table 5).[35]

Unanticipated money growth was the difference between the actual and the anticipated money growth rate. The anticipated money growth rate was estimated following the macro rational expectation hypothesis literature (Barro 1977; Mishkin 1982a,1982b). The variables used to explain anticipated monetary policy were chosen by carefully examining the reasons for discount rate changes announced by the Policy Board of the Bank of Japan (BOJ) (see table 6).[36] Whenever this rate is changed, the Policy Board, which is the supreme decision-making body in the BOJ, announces its reasons by categorizing concerned points into the primary reason, the evaluation of

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[35] Unanticipated aggregate demand such as unanticipated GNP, which is the simplest aggregate disturbance's proxy used in some discussion papers, was not chosen. Neelin (1985, 24) used deviations of real GNP from its two-period lagged auto regressive representation. The deviations were white noise residuals in the sense of Box-Pierce-Lüng portmanteau test, i.e., Q test (Judge et al. 1988, 705; Kmenta 1986, 332). Abraham and Katz (1985, 5) used lagged differences between actual and trend log GNP as aggregate demand variables in the employment equations. Aggregate demand lacks clear foundations of its effects on employment or unemployment, relative to unanticipated price change or unanticipated money growth. Further, there is no appropriate economic indicator to represent aggregate demand on a monthly basis. The index of industrial output is heavily weighted by the machinery and metal industries. Although unexpected industrial output was tried, its autoregressive model does not generate white noise residuals in accordance to the Q test.

[36] The discount rate's change is the most important policy instrument of the BOJ. Its rise corresponds to a contraction in money supply and vice versa.

Table 5

Summary of Aggregate Demand Disturbances

	Correlation Coefficient with Unemployment Rate	Mean	SD
Unanticipated Money Growth	-0.06	0.00	0.50
Anticipated Money Growth	-0.55	1.00	0.44
Unanticipated Price Change	-0.03	0.00	0.61

Notes: Units are percentage points. SD denotes standard deviation. The period referenced is January 1971 to December 1987.

the current economic condition, and additional notes related to the policy change. Though Mishkin (1982b, 29) suggested that "an atheoretical statistical procedure might be superior to economic theory for deciding on the money-growth equation specification", a comprehensive set of aggregate variables was not tried: One reason is that prior information presented in the statement of the Policy Board is rigid and public information on the conduct of monetary policy; the other is that resulting equations are similar to the anticipated money growth equations which examined a more comprehensive range of macro variables. The variables tried were the industrial production index for manufacturing measuring effective demand, the domestic wholesale price and consumer price (excluding imputed rent) measuring prices, current account balance and foreign reserve deflated by the industrial production multiplied by wholesale price measuring the balance of payments under fixed exchange rate period. Under the flexible exchange rate period, yen/dollar exchange rate was added and foreign reserve was excluded.

The estimation period for anticipated money growth was divided into two periods: a fixed exchange rate system period from February 1966 to January 1973 and a flexible exchange rate system period from February 1973 to December 1987. The change in macro constraints with respect to foreign transactions made monetary policy conduct within these respective periods different. This can be confirmed with the

statement by the BOJ's Policy Board. This structural change in monetary policy was confirmed also by Taniuchi (1982, 149) and Hamada and Hayashi (1985, 109) through Chow tests.

Specification of the money growth equation was settled via a set of F tests on a series of a lagged variables listed above as in Mishkin (1982b, 29-30) (see table 7). Some combinations of lag length and variables were tried in order to avoid misspecification. Variables in the anticipated money growth equation for the first period is similar to those in an equation for the 1960's which tried 11 macro variables (Seo and Takahashi 1982, 56). The variables in the second period were close to Gochoco's equation (1986, 461) which originally tried 7 variables from January 1973 through June 1985. As expected, the residuals of each equation do not have any degree of first order serial correlation. This is also white noise in the sense of the Box-Pierce-Lüng portmanteau test.

The Phillips curves have been measured by many researchers. A survey on Phillips curve in Japan by Toyoda (1987, 305-306) summarized that the indicator of labor market conditions is always significant, though the JOJA ratio is better for the period before 1973 and the unemployment rate after 1973. The coefficient of expected prices is significant, though it varies over time. The price expectation was conventionally constructed about an expectation on the consumer price, although the expectation by firms is another important factor. Phillips curves with the adaptive

Table 6
Frequency of the Reasons in the Announcements of Discounts Rate Changes by the Policy Board of the BOJ

Category	Effective Demand	Price	Balance of Payments	Exchange Rate
Primary Reason	4	2	4	0
	17	8	4	9
Evaluation of Current Economic Condition	5	0	4	0
	10	17	4	7
Additional Notes related to the policy	0	0	0	0
	0	13	0	2

Sources: Seo and Takahashi (1982, 51). Economic Planning Agency (1987, 329).

Notes: The upper rows of each category present frequency from September 1967 through January 1973. During this period, the discount rate was changed 10 times.
The lower row on each category presents frequency from February 1973 through December 1987. During this period, the discount rate was changed 28 times.
The total frequency of each topic concerned does not sum up to the frequency of discount rate changed due to double entries.

Table 7

Anticipated Money Growth

Under Fixed Exchange Rate System (February 1966 through January 1973)[a]

$$DM_t = \underset{(0.0058)}{0.0222} \underset{(0.1272)}{-0.3972DM_{t-1}} \underset{(0.1252)}{-0.0920DM_{t-2}} \underset{(0.1196)}{+0.1272DM_{t-3}}$$

$$\underset{(0.1130)}{+0.1557DM_{t-4}} \underset{(0.1232)}{-0.1195DM_{t-5}} \underset{(0.1157)}{+0.1247DM_{t-6}} \underset{(0.1679)}{+0.4068DW_{t-1}}$$

$$\underset{(0.1817)}{+0.4805DW_{t-2}} \underset{(0.1991)}{+0.2112DW_{t-3}} \underset{(0.1940)}{-0.0883DW_{t-4}} \underset{(0.1830)}{-0.1405DW_{t-5}}$$

$$\underset{(0.1828)}{+0.0284DW_{t-6}} \underset{(0.0471)}{-0.0698DI_{t-1}} \underset{(0.0518)}{-0.1013DI_{t-2}} \underset{(0.0489)}{-0.1912DI_{t-3}}$$

$$\underset{(0.0530)}{-0.1146DI_{t-4}} \underset{(0.0542)}{-0.1722DI_{t-5}} \underset{(0.0529)}{-0.0120DI_{t-6}}$$

R square=0.51 S.E.=0.0040

Table 7 (continued)

Anticipated Money Growth

Under Flexible Exchange Rate System (February 1973 through December 1987)[b]

$$DM_t = \underset{(0.0013)}{0.0058} \underset{(0.0794)}{-0.2178DM_{t-1}} \underset{(0.0773)}{-0.0915DM_{t-2}} \underset{(0.0763)}{+0.1992DM_{t-3}}$$
$$\underset{(0.0762)}{+0.2522DM_{t-4}} \underset{(0.0789)}{+0.1317DM_{t-5}} \underset{(0.0377)}{+0.0756DI_{t-1}} \underset{(0.0372)}{-0.0406DI_{t-2}}$$
$$\underset{(0.0371)}{-0.0215DI_{t-3}} \underset{(0.0374)}{+0.0899DI_{t-4}} \underset{(0.0366)}{-0.0226DI_{t-5}}$$

R square=0.26 S.E.=0.0056.

Notes: All the variables were rates of change. They were seasonally adjusted by Census X-11.

DM: M2 + CD (Certificate of Deposit)
DI: Index of Industrial Production
DC: Consumer Price Index
DW: Domestic Whole Sale Price Index
DF: Foreign Reserve / (Domestic Wholesale Price * Industrial Production)
DR: Yen/Dollar Exchange Rate
DA: Current Account in Balance of Payments.

[a]: F statistic that the coefficients on the six lagged variables equal zero were 3.00 for DM, 2.31 for DW, 1.23 for DC, 4.37 for DI, 0.92 for DF and 1.25 for DA as F(6, 60). The critical F(6, 60) value significant at 1 and 5 percent level is 3.12 and 2.25.

[b]: F statistic that the coefficients on the five lagged variables equal zero were 3.71 for DM, 0.29 for DW, 1.37 for DC, 2.78 for DI, 1.24 for DR and 1.70 for DA as F(5, 158). The critical F(5, 120) value significant at 1 and 5 percent level is 3.17 and 2.29.

expectations have been estimated for the sixties and seventies. Shinpo et al. (1978), following Carlson and Parkin (1975), used survey data. However, this survey data were available only after 1970.

Unanticipated price change was derived through adaptive expectation:

anticipated Price Change = $\Sigma_{i=1,n}\ w^i\ \log(p_{t-i}/p_{t-i-1})$

The parameter of geometric decreasing weight, w, was chosen to be 0.5. Values from 0.9 to 0.1 was examined for the case of the unemployment equation with the raw dispersion index. The case with w equal to 0.5 yielded the most significant coefficients by an F test on the joint hypothesis on coefficients of 18 months's lagged unanticipated price changes. It satisfied the sign's condition on 18 out of 19 coefficients. Shimada et al. (1982, 22) reported that Phillips curves are most stable with w equal to 0.6 and many stable cases with 0.5 for the period from 1971 to 1981.

C. Empirical Results

Unemployment equations were estimated using ordinary least square methods (see table 8 to 11). The Durbin's h statistics do not seem to show any first order serial correlation of residuals. The lag length of sectoral shift indexes were settled with respect to its signs and significance of F tests or t tests.

A time trend was introduced as an independent variable to represent variables explaining an upward trend in

unemployment rate, because sectoral shift indexes were not sufficient to explain the rising unemployment rate. None of the seven sectoral shift indexes presented any upward trend, although unemployment rates have risen steadily. The simple correlations between the unemployment rate and sectoral shift indexes were close to zero or negative (see table 4). Any positive correlation between the unemployment rate and sectoral shift indexes was not found without a variable to explain the significant upward trend in the unemployment rate such as portion of female employees, aged workers over 55 years old, young workers less than 24 years old, service industries' employees, or less-than-30-employee establishments' employees. The correlations between these variables and time trend were around 0.9 or above. With the time trend dropped or replaced by some of the upward trend variables, results on the significance of the sectoral shift indexes were not altered.

The coefficients of time trend imply that the unemployment rate increases independently by 0.1 to 0.5 percentage point per year. The time trend with the largest coefficient, which is in the case of unanticipated price changes and decomposed indexes (see table 10), explains almost all of the increase of the actual unemployment rate during the observation period.

Following Lilien's original specification (1982a, 787), a one-period lag of the unemployment rate was introduced on

the right hand side. The coefficient of U_{t-1} was expected to be around 0.75. The average exit incidence in the current month out of the unemployment pool in the last month was calculated as 0.258 according to the average duration of unemployment measured by the unit of month from 1968 to 1987 (Ministry of Labor 1988a, S148). The null hypothesis that the coefficient of lagged unemployment rate was significantly different from 0.75 was rejected for all 8 cases at around 5 percent level except the case with unanticipated money growth and decomposed indexes.

Current and one to four months lagged variables of the sectoral shift indexes were introduced. Some lagged shift indexes were more significant than a concurrent shift index. This may be consistent with the statistical fact that a worker who lost a position in one sector does not become a unemployed immediately.[37] The lagged (24-months) absolute value of the relative energy price changes was introduced on the right hand side (see table 9 and 11).

None of sectoral shift indexes were significant even at the 5 percent level. Sectoral shift indexes introduced here were unable to explain unemployment rate movements. This

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[37] The definition of the unemployed in the Labor Force Survey requires that "persons who did not work at all during the survey week, but were currently available for work and were actively seeking a job or were waiting for the results of the past-job seeking activity" (Statistics Bureau, Annual Report on the Labor Force Survey in 1987, 214). A worker who left a job may not start job seeking activity immediately.

Table 8

Unemployment Equations with Raw Index or Decomposed Indexes, and with Unanticipated and Anticipated Money Growth

Independent Variable	Raw Index	Decomposed Indexes [a]
Undecomposed Shift Index (Current + 1 lag)	0.0212 (0.5864) [2, 207]	-
Shift index Unexplained by Aggregate Demand (Current + 4 lags)	-	0.0265 (0.8868) [5, 207]
Shift index Explained by Aggregate Demand (Current + 4 lags)	-	-0.0406 (0.4920) [5, 207]
Unanticipated Money Growth (Current + 12 lags)	-0.0190 (1.0355) [13, 207]	0.0067 (0.9714) [13, 207]
Anticipated Money Growth (Current + 12 lags)	-0.1122* (2.0489) [13, 207]	- [a]
Lagged Unemployment Rate	0.8182** (22.22)	0.8605** (24.69)
Time Trend	0.0015** (3.9495)	0.0015** (3.6059)
Intercept	0.3888** (3.7293)	0.1714* (1.8160)
R square	0.9782	0.9758
Standard Error	0.1067	0.1119
Durbin's h	-1.263	-1.489
Number of Observations	238 (Mar.1968- Dec.1987)	233 (Aug.1968- Dec.1987)

Table 8 (continued)

**Unemployment Equations
with Raw Index or Decomposed Indexes,
and with Unanticipated and Anticipated Money Growth**

Notes: All the data are seasonally adjusted basis. Dependent variable is employee's unemployment rate. Figures in the parentheses are the t statistics or F statistics. F statistics are accompanied by the degrees of freedom in square brackets. Those which are significant at 1 and 5 percent level are with ** and *, respectively.
[a]: The case with decomposed indexes with both unanticipated and anticipated money growth did not yield a result due to a failure to converge.

Table 9

Unemployment Equations with Horizontal Index or Absolute Value of Relative Energy Price Changes, and with Unanticipated and Anticipated Money Growth

Independent Variable	Horizontal Index	Energy Price Changes
Shift Index (Current + 1 lag)	0.0043 (1.0552) [2, 172]	-
Shift Index (Current + 24 lags)	-	-0.0135 (0.9664) [25, 184]
Unanticipated Money Growth (Current + 12 lags)	-0.0687 (0.9732) [13, 172]	0.0505 (0.9892) [13, 184]
Anticipated Money Growth (Current + 12 lags)	-0.1189* (1.9994) [13, 172]	-0.1467* (1.9832) [13, 184]
Lagged Unemployment Rate	0.8212** (21.02)	0.8034** (20.25)
Time Trend	0.0011** (2.7450)	0.0015** (3.9623)
Intercept	0.4818** (4.7469)	0.5356** (4.9041)
R square	0.9727	0.9805
Standard Error	0.1070	0.1009
Durbin's h	-1.349	-1.014
Number of Observations	203 (Feb.1971- Dec.1987)	238 (Mar.1968- Dec.1987)

Note: See notes for the table 8.

Table 10

Unemployment Equations with Raw Index or Decomposed Indexes, and with Unanticipated Price Changes

Independent Variable	Raw Index	Decomposed Indexes
Undecomposed Shift Index (Current + 1 lag)	0.0293 (1.5967) [2, 214]	-
Shift index Unexplained by Aggregate Demand (Current + 8 lags)	-	0.0707 (1.2628) [9, 189]
Shift index Explained by Aggregate Demand (Current + 8 lags)	-	0.0358 (1.3031) [9, 189]
Unanticipated Price Changes (Current + 18 lags)	-0.5950** (2.8363) [19, 214]	-0.7352** (2.8115) [19, 189]
Lagged Unemployment Rate	0.7826** (20.82)	0.7608** (18.19)
Time Trend	0.0022** (5.6680)	0.0026** (5.5006)
Intercept	0.2638** (3.5815)	0.1589 (1.5057)
R square	0.9795	0.9807
Standard Error	0.1032	0.0990
Durbin's h	-0.364	-0.839
Number of Observations	238 (Mar.1968-Dec.1987)	229 (Dec.1968-Dec.1987)

Note: See notes for the table 8.

Table 11

Unemployment Equations with Horizontal Index or Absolute Value of Relative Energy Price Changes, and with Unanticipated Price Changes

Independent Variable	Horizontal Index	Energy Price Changes
Shift Index (Current + 1 lag)	0.0054 (1.9106) [2, 179]	-
Shift Index (Current + 24 lags)	-	-0.0006 (1.2048) [25, 191]
Unanticipated Price Changes (Current + 18 lags)	-0.5044** (2.8373) [19, 179]	-0.6924** (2.3991) [19, 191]
Lagged Unemployment Rate	0.7860** (18.81)	0.7968** (21.14)
Time Trend	0.0020** (4.7058)	0.0019** (4.9977)
Intercept	0.3407** (5.1961)	0.3302** (5.2445)
R square	0.9746	0.9821
Standard Error	0.1030	0.0966
Durbin's h	-0.450	-0.260
Number of Observations	203 (Feb.1971- Dec.1987)	238 (Mar.1968- Dec.1987)

Note: See notes for the table 8.

result was invariant to any changes of specification about these basic cases such as adding the time trend squared, changes in upward trend variables, or the introduction of a polynomial lag pattern into coefficients of aggregate demand disturbances. Neither did the Cochrane-Orcutt method make the sectoral shift indexes significant, though the h statistics do not reject the null hypothesis of no serial correlation. The results were also invariant to the changes in sampling periods, using Chow tests (Chow 1960).

Some of the variations of these basic eight cases were examined further.[38] The first variation is the combination of horizontal index and other sectoral shift indexes such as raw and decomposed indexes. The horizontal index measures disturbances relative to past disturbances, while other sectoral shifts indexes measure disturbances only in current terms. These two are different variables in this respect. Four combinations were examined: the combination of horizontal and raw indexes, and the combination of horizontal and decomposed indexes, for both kinds of aggregate demand. None of the sectoral shift indexes in those four cases were significant.

The second variation is the exclusion of the explained decomposed sectoral shift index in the two decomposed cases. The explained decomposed sectoral shift index might be the redundant variable since it is governed by aggregate demand

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[38] The empirical results cited but not displayed are available upon request until January 1990.

disturbances.[39] This exclusion did not make any of the remaining sectoral shift indexes significant. The joint variation of the second and the first, excluding explained decomposed index and combining with horizontal index, did not work either.

The third variation is the introduction of the simply decomposed indexes. One concern is that the introduction of the AVERES and first order correlation in the decomposition process might filter the raw index excessively. The unexplained simply decomposed index is the weighted standard deviations of the first step OLS residuals of the decomposition. The explained simply decomposed index is the weighted standard deviations of the estimated value of the first step OLS equations. These simply decomposed indexes were calculated only for the unexpected price change case. They were not significant. None of more complicated joint variations worked: the joint variation of the third and the first, simply decomposed indexes combined with horizontal index; the joint variation of the third and the second, simply decomposed index (but only unexplained one); the joint variation of the third, the second and the first variation,

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[39] As a matter of fact, the correlation coefficient between aggregate demand disturbances and explained portion is -0.04 and 0.07. These low correlation coefficients may be due to the fact that the AVERES is another aggregate demand disturbance.

simply decomposed index (only unexplained one) with the horizontal index.

The fourth variation is the exclusion of the lagged dependent variable. A lagged dependent variable might blur other variable effects through its collinearity with other variables. There found some exceptions of significant sectoral shifts indexes with unanticipated price changes when the lagged unemployment rate was excluded. Raw sectoral shifts index and horizontal index became significant at 5 percent level, respectively. However, if these two are combined into one equation, they became insignificant again. The explained decomposed index became significant at 1 percent level without lagged unemployment rate, while the unexplained one remained insignificant. However, the effects of those sectoral shift index which became significant were still very small as they were with the lagged unemployment rate.

Three sectoral shift indexes in the eight basic versions yielded coefficients opposite to that expected, though they were insignificant. Among them, two were the absolute relative energy prices with both kinds of aggregate demand disturbances (see table 9 and 11). Relative energy price changes with both positive and negative changes, instead of their absolute values, had insignificant negative coefficients as well. The division of observations into relative price increasing and decreasing periods for both relative price cases did not make the coefficients significant. The other case with an

inappropriate sign was the decomposed index with unanticipated money growth (see table 8). This case, which lacks the anticipated part of money growth, may be misspecified.

Aggregate demand disturbances of unanticipated monetary policy did not have any explanatory power (see table 8 and 9). However, anticipated money growth was significant. This consequence was expected from the previous results. There is much doubt with respect to the validity of the macro rational expectation (MRE) hypothesis in the case of Japan as well as U.S.

The introduction of unanticipated price changes instead of monetary disturbances improved the estimated performance of the unemployment equation (see table 10 and 11). The coefficient of lagged unemployment rate was close to 0.75. The serial correlation in residuals seems to be quite small. An unanticipated price rise in the current month by 1 percentage point compared to the previous month would have temporarily reduced the unemployment rate by around 0.6 percentage points, though extreme acceleration in inflation would be necessary to depress the unemployment rate in consecutive months. Still, no sectoral shift indexes turned significant in this Phillips curve version, though the coefficient of sectoral shift indexes in three out of four cases became slightly less insignificant.

The natural rates of unemployment defined as the portions explained by sectoral shift index, time trend and intercept

were calculated as Lilien (1982a, 792). The natural rate of unemployment during this period was almost completely explained by the time trend, whatever the aggregate demand disturbances were. The sectoral shift indexes' trends were flat or declining over time. The coefficients of sectoral shift indexes were so small. The unemployment rate movement's portion explained by the any of the sectoral shift indexes was very small as a result. The actual rate of unemployment went ups and down around the natural rate of unemployment for the case of unanticipated price changes, while the fluctuation of natural rate was quite small.

The Abraham and Katz test with the vacancy index was done for all cases except the two cases with absolute value of relative energy price changes. The unemployment rate was replaced with the vacancy index discussed in the second chapter. However, the result was inconclusive. The sectoral shift indexes' coefficients were either positive or negative, though some of them were negative and significant.

The statistical tests based on these unemployment equations were not supportive of the sectoral shift hypothesis. Though there were some exceptions,[40] their effects were still quite small. The byproducts of these tests are little support of the MRE hypothesis.

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[40] The exceptions may have arisen purely by chance due to the collinearity of the regressors and the extensive specification searches undertaken.

Chapter V

Conclusion

While sectoral shifts seemed to occur more frequently and heavily in the last two decades, the tests here did not show any significant effects of sectoral shifts on unemployment rate. Neither did energy price changes appear to be a major cause of the rise in the unemployment rate. The sectoral shifts among sectors appeared to become larger as a result of the two oil crises and the rapidly moving exchange rate. The faster employment adjustment was observed. This is partially attributable to larger sectoral shifts. Regional mismatching increased. Mobile workers also increased. Despite such phenomena, sectoral shifts were not identified as the source of either short-time fluctuation or the upward trend in the unemployment rate. Supply-side changes such as increased female labor force participation may explain the upward trend.

Several aspects of the Japanese labor markets mechanisms could explain why sectoral shifts are relatively unimportant for unemployment in Japan despite their magnitude is large. Employment adjustment measures which seem to be particular to Japan are posited as the principal reasons which keep sectoral shifts from affecting unemployment. They include the personnel transposition and loaning of workers in the lifetime employment system. These seemingly Japanese-specific methods reallocate labor without employment interruption. The new

businesses developed by a large firm were accompanied by labor provided through these methods. The new graduates from school is another source of labor reallocation in the long run without letting currently existing workers lose jobs. Dismissals do not occur within a short period of cyclical disturbances. The workings of internal labor markets may differ much from other Western countries. The pattern-setting in the annual wage revision might work to conceal the variation of wages among industries due to sectoral shifts. This could reduce labor movement from industries seriously hit by sectoral shifts to newly prosperous industries.

Appendix

Employment Number Statistics

The purpose of this appendix is to explain the original sources of employment number statistics used to construct employment dispersion indexes and how they were handled to construct a set of consistent statistics on employees. Tests on the sectoral shift hypothesis prefer shorter period data with detailed classification in industries, presuming consistent characteristics of numbers. From this point of view, the Labor Force Survey conducted by Statistics Bureau, Management and Coordination Bureau every month is the best set of statistics in Japan. Though the Monthly Labor Survey is also a monthly statistic, it lacks consistency over a time and has no coverage on a small establishments.

A. Japanese Employment Numbers Statistics

There are six major statistics which includes employment numbers by industries: the Population Census (**Census**); the Labor Force Survey (**LFS**); the Basic Survey on Employment Structure (**BSES**); the Monthly Labor Survey (**MLS**); the Census of Establishments (**CE**) ; the Census of Manufactures (**CM**). The first three are statistics from the labor force side, i.e. household surveys. The last three are from the establishments side, i.e. establishment surveys. The summary of these statistics is in the table 12. This appendix focused on the LFS and the MLS because only these two contain monthly time series numbers on employees.

Table 12

Summary of Japanese Employment Statistics

A. Household Surveys

Census: every 5 years, October 1st; Statistics Bureau, Management and Coordination Bureau; Household and Individual ; Comprehensive Survey; A number of volumes.

LFS; every month, last week of a month; Statistics Bureau, Management and Coordination Bureau; 40 thousands of households, 10 thousands of individuals over 15 years old; Stratified two stage sampling methods; Monthly and Yearly Reports.

BSES; every 3 years, July 1st; Statistics Bureau, Management and Coordination Bureau; 340 thousand of households and 870 thousands of individuals over 15; Stratified two stage sampling; Several volumes.

B. Establishments Surveys

MLS: Every Month, end of month's employees ; Policy Research Division, Ministry of Labor; Establishments with over 30 workers and 5 to 29 workers; Random Sampling; Monthly and Yearly Reports.

CE: Every 3 years, July 1st; Statistics Bureau, Management and Coordination Bureau; All establishments except owner-occupied agricultural establishments; Comprehensive survey; Several volumes.

CM: Every year, December 31st; Policy Research Division, Ministry of Trade and Industry; All establishments in manufacturing; Comprehensive survey; Yearly Reports.

Sources: Kosai (1980, 795) and Statistics Bureau (1984, 2).

Notes: See text for the abbreviated statistics' name. Listed items following each abbreviation of statistics's name are: frequency and date; conducting institution; subjects; sample methods; and type of publication.

The LFS is a supplementary statistics for the Census, which is the most comprehensive and basic statistic of the labor force that grasps short-term labor force changes. The LFS's purpose is "to provide up-to-date data on employment and unemployment of the population and on their month-to-month changes mainly at the national level" (Statistics Bureau, Annual Report on the LFS in 1988, 211). Its population coverage is "composed of all persons over 14 years old and over usually residing in this country" (ibid). The reference period on which this Survey is conducted is the one week ending on the last day of each month except December. The sampling method is a stratified two-stage sampling. The units of the first stage of sampling are the enumeration districts of the latest Population Census. The units of the second stage of sampling are dwelling units. One fourth of sampled districts are replaced every month. One half of the sampled households are replaced every month. One half of the sampled households are the same as the same month in the previous year so as to make the statistic comparable across years. A questionnaire, which is delivered to the same household for two consecutive months in a year and next year, are filled not by enumerators but by the household itself. More explanation on the LFS in English is available at the end of every year's Annual Report.

Employment by industries in the LFS is tabulated in the second original tables. The original tables, of which lists

are in every year's Annual Report on the LFS, are direct results of the population estimates in the LFS's. Though numbers in the original tables are the same as in published tables in the Annual or Monthly Report on the LFS, it has much more detailed information on the results. The original tables are available upon request from the Library in the Statistics Bureau, Management and Coordination Agency. The second original tables are recorded on the microfiche or microfilm for the periods from January 1968 through March 1984 (Statistics Bureau, 1988). The tables after April 1984 are available in hard copy.

Industrial classification of employment in the LFS depends on answers by households to a question which asks to "describe specifically the kind of business or industry of the establishment" (Statistics Bureau, Annual Report on the LFS in 1988, 223). Enumerators judge with reference to guidelines on what kind of industry the establishment should be attributed to (Statistics Bureau 1984, 31-32).

The LFS surpasses the MLS with respect to consistency and coverage. Though original statistics in the LFS have some small discontinuity, they are easily corrected. This covers all sizes of establishments automatically. Since the LFS is a household survey, it is invariant to changes in outputs combination of a company, changes in size of establishments and new provision of establishments.

The MLS is another statistic for the short term labor market fluctuation, besides the LFS. However, it lacks numbers on small establishments. Neither does it have chronological continuity. The MLS consists of three national surveys: Ko Survey, Otsu Survey and Special Survey. Ko Survey is on establishments with more than 30 employees. It is the primary survey in the MLS. The Otsu Survey is on establishments with 5 to 29 employees. The Special Survey is a survey conducted once per year in July for establishments with 1 to 5 employees. The information on small establishments from 1 to 5 is not in MLS, except for this Special Survey. Though the employees in these small establishments are a small portion of total employees, about 8 percent in 1987 by the LFS, the employment adjustment is expected to be higher than that of larger establishments.

The MLS maintains consistency as time series data only in the Ko Survey. Some chronological biases in the MLS have not been corrected for the Otsu Survey. Biases are generated by its way of counting employees and sample replacements. The employment number in the MLS is counted by adding accessions and reducing separations from the employment number of the previous months, i.e. by accession and separation adjustment methods. Hence, it neglects the changes in establishments as creation, abolition, and enlargement or reduction across the establishment sizes in the MLS. The MLS corrects this bias annually only for the Ko Survey using the Special Survey in

the MLS and employment insurance information. The other source of a bias is that it revises its samples every three years. However, when it revises its sample, previous results of some indexes such as wages, hours worked and employment numbers in Ko Survey are revised so that continuity is kept.

B. Data Continuity in the LFS

There are only two discontinuities in the LFS during the observation period used in the text. Discontinuity problems of employees' numbers in the LFS can be caused hypothetically by some changes in: questionnaire; sampling districts and households; the enumeration districts' estimated population due to a new Census result; and industrial reclassification. However, the last change in questionnaire was done in September 1967 (Statistics Bureau 1984, 68). Enlargement of sampling districts and households from October 1982 through January 1983 has been done gradually so that discontinuity would not be generated (Statistics Bureau, Annual Report on the LFS in 1988, 195). A change in estimated population in enumeration districts in 1976 has caused one discontinuity (Statistics Bureau, Monthly Report on the LFS in April 1976, 4). The other discontinuity was generated by a revision in industrial classification in January 1985 (Statistics Bureau, Annul Report on the LFS in 1988, 196).

The first discontinuity in the employment series was corrected following an official adjustment method since the Statistics Bureau had recalculated and smoothed only a limited

number of past series, not all of the 16 employment series. The change of population estimates for enumeration districts in the LFS caused small discrepancies between December 1975 and January 1976. The LFS stands on a stratified two-stage sampling method using enumeration districts and their estimated population for the sex and age concerned. These estimated populations for enumeration districts have been revised every 5 years when a result of a new Census becomes public. The result of the 1975 Census is a bit different from the estimated population having been used for enumeration districts from October 1970 through December 1975. This difference caused a 0.5 percent discrepancy in the labor force population in January 1975 estimated by new and old districts' population. This discontinuity in each employment series was smoothed[41] following an official guideline (Monthly Report on the LFS, ibid):

revised number = old number + (b - b') / 64 * i

b: employment number for January 1976 estimated by new population estimates on enumeration districts.

b': employment number for January 1976 estimated by old population estimates on enumeration districts.

i: 1 to 64, starting from October 1970 up to December 1975.

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[41] However, this is a negligible discrepancy for employment numbers of small industries, since this error is often smaller than one unit of the last digit of employment numbers.

C. Industrial Classification in the LFS

The industrial classification in the LFS has been gradually detailed. A division of the manufacturing industry begins from the 1968 LFS. The classification was further detailed in 1976. The classification beginning in 1968 is shown in the table 13. Such improvement itself did not cause any discontinuity. However, the LFS has to be in accordance with the Standard Industrial Classification for Japan (SICJ) as other Government statistics are.

The revision in 1984 SICJ made the second discontinuity in the LFS's classification (Statistics Bureau, Annual Report on the LFS in 1988, 192). The SICJ has been revised nine times since its enactment in 1949 (Statistical Standards Department 1986, Foreword). After 1968, which is a starting year for the used data, it was revised three times: March 1972, March 1976 and January 1984 (Management and Coordination Agency 1984, 1-3). The first two revisions in SICJ were so minor that a revision of classification in the LFS was not necessary. The 1984 revision in the SICJ included two large reclassification. One is the reclassification of veterinarians from agriculture to service industries. The other is a provision of new two digit classification in manufacturing: plastics products manufacturing was separated from other manufacturing in the SICJ.

The Statistics Bureau needed to revise industrial classification in the LFS in accordance with this 1984

Table 13

Industrial Classification in the Labor Force Survey by 1968 Version

Industry	Number
1. Agriculture	1
2. Forestry	2
3. Fishery	3
4. Mining	4
5. Construction	5
6. Manufacturing	
(1) Textile	6
(2) Chemical and Related Products	7
(3) Metal and Machinery	8
(4) Other Manufacturing	9
7. Wholesale, Retail, Finance, Insurance and Real Estate	
(1) Wholesale and Retail	10
(2) Finance, Insurance and Real Estate	11
8. Electricity, Gas, Heat and Water Supply, and Transport and Communication	
(1) Electricity, Gas, Heat and Water Supply	12
(2) Transport and Communication	13
9. Service Industry	
(1) Professional Services	14
(2) Other Services	15
10. Government	16
11. Not Classifiable	

Sources: Statistics Bureau, Management and Coordination Agency, Annual Report on the Labor Force Survey (1968, 152).

revision in SICJ. This reclassification in the LFS generated discontinuities in employment series by industries. Following the 1984 revision in SICJ, the LFS in January 1985 reclassified plastic products manufacturing from other manufacturing to chemical and other related products manufacturing. Reclassified workers in plastic products manufacturing were estimated by Statistics Bureau to be 360 thousands in January 1985. Also, veterinarians were transferred to other services. Veterinary workers were estimated 10 thousands in January in 1985.

The workers in plastic products manufacturing industry were re-reclassified for the consistency with old classification here: the old classification before December 1984 was revived. The reclassification in 1985 in the LFS required the re-reclassification of the employment numbers attributable to plastic parts industries. This number after January 1985 was removed from chemical and other related products manufacturing, and added to other manufacturing. This work was done using the information on employers in plastic products manufacturing in the CM and the CE.

No adjustment was done for veterinarians. Re-reclassification on veterinarian from professional services to agriculture is logically necessary to keep consistent industrial classifications. However, since its number is relatively small and is unavailable, no adjustment was done.

Decomposition within manufacturing industries was

desirable as discussed in the footnote of section A of chapter IV. However, artificial division of manufacturing industries' employment numbers in 1968 classification in the LFS was abandoned.

The first reason is that no significance of decomposition in manufacturing industries was found. For the period after January 1976, the second original table in the LFS provided more detailed industrial classification. A comparison between two Lilien's raw dispersion indexes for the period after January 1976 was done. One was the raw dispersion index used in the text with 16 industrial employment series by 1968 classification. The other was raw dispersion indexes with 21 employment series in the LFS. The difference between these two is whether 7 detailed industrial employment series in metal and machinery, and chemical and related products manufacturing industries were used or not. A correlation coefficient between these two raw dispersion indexes was 0.93. It is suggested that further artificial division of manufacturing industries before 1976 did not make much difference in raw dispersion index. This was due to the small weight of decomposed manufacturing industries, i.e. only 17.5 percent of all industries' employees in 1980.

The second reason is that the artificial decomposition in manufacturing industries' employment numbers did not made reasonable time series. Metal and Machinery manufacturing in 1968 classification was decomposed into 5 divisions

manufacturing as in the 1976 classification. Chemical and related Products manufacturing in the 1968 was divided into 2 divisions as in the 1976 classification. The CM was used to find a yearly division ratio. The CE was used to supplement the CM with information for small establishments with less than 5 workers. The Monthly Labor Survey was used as a reference index to divide yearly series into monthly series by the Lin-Chow method (Chow and Lin 1971). Artificially derived 7 employment numbers were compared with actual numbers after January 1976. Actual and estimated numbers behaved rather differently, except one for the transportation and equipment industry. This result seems to be mainly due to the use of improper reference indexes. The reference indexes employed from the MLS cover only establishments with only over 30 employees, not reflecting employment adjustments in smaller establishments. The transportation equipment industry has many large scale establishments.

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