TIME PATHS OF UNEVEN INDUSTRIAL DEVELOPMENT IN JAPAN

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Abstract

This paper examines the uneven spatial development of manufacturing in Japan from 1990 to 2001, a period of prolonged economic stagnation and crisis. The paper analyzes the annual change in employment in forty-six Japanese prefectures for twenty-one manufacturing industries. The goal of the research is to investigate whether there is a link between economic crisis and the changing spatial differentiation of the industrial landscape, specifically as it pertains to employment. Time paths of uneven development for each industry are constructed using the standard deviation of employment change among prefectures for each year. Most industries became more spatially differentiated over time as the economic crisis in Japan worsened. Furthermore, spikes in the time paths tend to correspond to the onset of crisis generating events, such as the bursting of the bubble economy in 1990-91 and the Asian financial crisis of 1997-98. In the final stage of the research a time series regression examines the relationship between the changing spatial differentiation of employment and changes in the uneven development of manufacturing output and productivity. The results show that changes in the uneven development of most industries is most strongly shaped by changes in the spatial pattern of productivity.

INTRODUCTION

The Japanese economy has been chronically stagnant since the bursting of the financial bubble in 1990-91 (Itoh, 2005). The average annual percentage change in Japanese GDP between 1990 and 2000 was 1.3%, a very low rate of growth by Japanese standards. GDP grew by an annual rate of 4.6 percent in the 1980s, 5.2 percent in the 1970s and 10.2 percent in the 1960s (Brenner, 2002). The growth rate since 2000 has averaged less than two percent (Itoh, 2005). The economic crisis

has been particularly severe in manufacturing, which has suffered from considerable overproduction and the lowest rate of profit since the end of the Second World War. The net profit rate in manufacturing in the 1990s was less than twenty percent, which compares to approximately thirty percent in the 1980s, thirty-five percent in the 1970s and forty percent in the 1960s (Brenner, 2002).

As a result of the crisis, there has been widespread deindustrialization, large-scale shifts in investment capital from less profitable industrial sectors to more profitable ones, and shifts in capital out of manufacturing altogether. At the same time, there have been major geographic movements in production from less profitable regions in the country to more profitable ones, and an acceleration of outward foreign direct investment, particularly in Asia.

One consequence of the economic crisis in manufacturing has been massive job loss. Table 1 shows that 2,306,609 manufacturing jobs were lost in Japan between 1990 and 2001, a decline of 20 percent. Employment fell in all but one of the twenty-one, two-digit level manufacturing industries during this period. The biggest losses were in textiles/apparel (-593,094), electrical machinery (-487,925), general machinery (-198,606), fabricated metals (-147,493), iron/steel (-113,994), ceramics/stone/clay (-110,754), lumber/wood (-100,975) and transportation equipment (-96,464). Proportionately, declines were most severe in textiles/apparel (-53.5%), leather (-47.3%), lumber/wood (-40.0%),

Table 1. Employment Change in Manufacturing by Sector, 1990-2001

	1990 - 2001	
Sector	**Number**	**Percent**
Food Processing	64,622	5.9
Beverages	-20,171	-15.3
Textiles, Apparel	-593,094	-53.5
Lumber, Wood	-100,975	-40.0
Furniture	-75,587	-32.7
Pulp, Paper	-47,687	-16.8
Printing, Publishing	-57,502	-10.4
Chemicals	-37,008	-9.2
Petroleum	-7,002	-21.1
Plastics	-6,878	-1.6
Rubber	-44,953	-26.1
Leather	-37,168	-47.3
Ceramics, Stone, Clay	-110,754	-24.1
Iron, Steel	-113,994	-33.7
Non-Ferrous Metals	-35,655	-21.0
Fabricated Metals	-147,493	-17.4
General Machinery	-198,606	-16.6
Electrical Machinery	-487,925	-25.2
Transportation	-96,464	-10.2
Precision Instruments	-85,429	-34.1
Miscellaneous	-66,886	-26.4
Total	-2,306,609	-20.6

Note: 1. Calculations by authors using Census of Manufactures

precision instruments (-34.1%), iron/steel (-33.7%), furniture (-32.7%), rubber (-26.1%) and electrical machinery (-25.2%). The only industry that grew during this time was food processing, where employment rose by 5.9 percent.

The loss of manufacturing jobs since 1990 has occurred throughout the country. For example, every prefecture in Japan had fewer people employed in manufacturing in 2001 than they did in 1990. However, the decline in employment has been very uneven. The highest rates of decline between 1990 and 2001 were in four regions of the country. Two regions surround the long established industrial cities of Tokyo and Osaka, the third region comprises a cluster of less industrialized prefectures in the northern periphery of the country and the fourth region consists of a cluster of less industrialized prefectures in the southwestern periphery of the country. Lower rates of decline occurred in the center of the country, comprising a number of less industrialized prefectures as well as some established industrial prefectures such as Aichi, where Toyota is located. Lower rates of decline also occurred in the extreme northern and western peripheral regions of the country.

Previous research on the regional decline of manufacturing employment in Japan since 1990 has shown that there are a number of well-established, general reasons for the decline of manufacturing employment in regions throughout the country, foremost among them being the rising value of the Yen, increasing competition and the shift in production overseas. In addition, however, this research has also shown that local or regional context plays an important role in shaping employment trends in particular places. Togashi (2003), for example, found that industrial restructuring in the general machinery and electrical machinery industries affected regional employment in several, and sometimes seemingly contradictory, ways. Many regions lost jobs due to falling demand and plant closures, but others lost them because of technology-driven productivity improvements and the shift to higher value-added production.

Such uneven development of the space-economy is an integral component of capitalist dynamics. Smith (1990) and Harvey (1982) argue that the devaluation of capital which accompanies economic crises creates the economic and spatial conditions for future capital accumulation. Furthermore, economic crises are place-specific. The spatial impact of economic crises is uneven, either because the hardest hit industries are spatially concentrated or the outcome of competition for economic survival

among firms is localized. As a consequence, the spatial landscape during and immediately after an economic crisis tends to be highly differentiated. In the period of expansion that follows, circulating capital in the search for accumulation opportunities begins to equalize these spatio-economic differences, until the onset of the next crisis and the differentiation process begins anew (e.g. Smith and Dennis, 1987).

This paper examines the uneven spatial development of manufacturing in Japan from 1990 to 2001. Specifically, the paper analyzes the change in employment in forty-six Japanese prefectures for each of the twenty-one manufacturing industries listed in Table 1 for every year during this period. The primary goal of the research is to investigate whether there is a link between economic crisis and the spatial differentiation of the industrial landscape, specifically as it pertains to employment. The research uses a multivariate shift-share model to estimate a contextual measure of employment change in each prefecture, together with estimates of the degree to which this change can be attributed to changes in output and productivity. The research then constructs time paths of uneven development for each industry using the standard deviation of the employment change among prefectures for each year. The time paths are used examine the trajectory of uneven development over time and to investigate the impact of economic crises on the spatial differentiation of employment change. Finally, the research uses time series regression to examine the relationship between the time path of the uneven development of industry specific employment and the uneven development of industry specific output and productivity.

The paper is organized as follows. The second section discusses the economic forces which triggered the loss of manufacturing employment in Japan since 1990. The third section discusses the methods and data used in the analysis. The fourth section describes the time paths of uneven development for each industry. The fifth section presents the results of the regression analysis relating the time path of employment to the time paths of output and productivity. The sixth section offers some conclusions.

DEINDUSTRIALIZATION IN JAPAN

The economic stagnation of the 1990s is strongly linked to Japan's so-called bubble economy of the late 1980s. Japanese manufacturers shifted to an export-led growth strategy to escape the crises of the 1970s and early 1980s, but the strength of

the strategy was dramatically curtailed in the mid-1980s as trade frictions with the US and European countries increased (Tsuru, 1993). The US and the other G-5 countries reacted to the success of the Japanese export strategy by pressuring Japan in 1985 to raise the value of the yen, an agreement known as the Plaza Accord (Leyshon, 1994; Brenner, 2002). The revaluation of the yen sharply reduced economic growth in Japan, and in response the Japanese authorities cut interest rates in half and began to encourage bank lending to real estate companies and brokerages so as to inflate land prices and increase consumer spending (Brenner, 2002). An unintentional consequence of these policies, however, was the formation of bubbles in the real-estate and stock markets, eventually pushing stock prices and urban land prices for the six largest metropolitan areas to record highs (Wright, 2002; Kerr, 2002).

When the Japanese government eventually attempted to slow the expansion of the twin bubbles by raising interest rates, it triggered a sudden price collapse. Since overvalued land had been used as collateral for extensive borrowing during the bubble period, the fall of land prices also contributed to the emergence of a banking crisis (Werner, 2003). The collapse depressed consumption and investment after 1990 and pushed the economy into a thirty-two month recession (Oizumi, 1994; Brenner, 2002).

In addition to the formation of the bubble economy, the yen revaluation of the mid-1980s also contributed to a sharp increase in Japanese outward foreign direct investment (FDI) in manufacturing, particularly in Asia (UNCTAD, 2001; Farrell et al., 2004). The problem was compounded as small-sized subcontractors followed larger Japanese firms into Asia (Adachi, 1996; Hatch, 2001). With labor intensive manufacturing increasingly moving overseas, domestic investment turned to higher value-added production in high-tech industries, often located in peripheral regions (Kiyonari, 1993; Banasick, 1999).

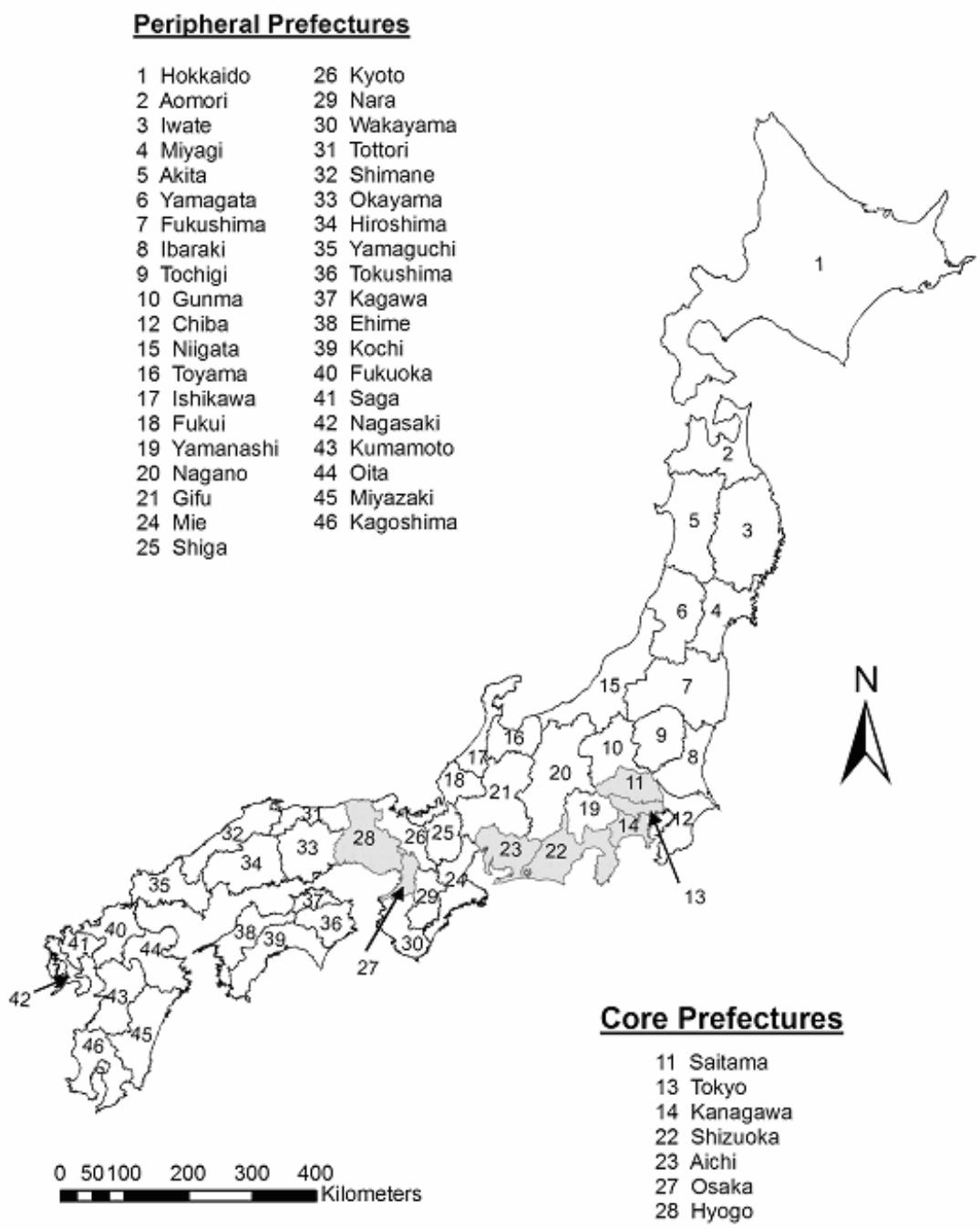
By 1995, Japan's stagnant economy had caused sufficient concern within the Clinton administration in the US, which was already shaken by the collapse of the Mexican peso, to reverse the weak dollar (strong yen) policy instituted in 1985 (Brenner, 2002). The weakening of the yen combined with several extensive stimulus packages instituted by the Japanese government contributed to the emergence of an economic upswing, but it was soon cut short by the 1997-1998 Asian financial crisis and the Japanese government's decision to increase the consumption (sales) tax (Brenner, 2002). The post 1997

economic crisis was even deeper than that of the early 1990s. Japan's GDP fell below one percent for the rest of the decade, the bankruptcy rate for Japanese corporations soared (Gao, 2001) and unemployment rates began to climb to levels not seen since the end of the Second World War, particularly in the northern and southwestern peripheral regions (Economic Planning Agency, 2001).

METHODS AND DATA

This research is carried out in three stages. The first stage uses the multivariate shift-share model developed by Rigby (1992; Rigby and Anderson, 1993) to estimate the employment 'regional effect' (also known in the shift-share literature as the 'competitive' or 'differential' effect) for every year between 1990 and 2001 for twenty-one manufacturing industries. The estimates were calculated for forty-six prefectures in Japan (Figure 1). Okinawa was excluded from the analysis because of the small size of its manufacturing sector. The regional effect provides a measure of employment change in a given prefecture that is due to factors specific to that prefecture, after having filtered out the effect of the change in national employment and the effect of the prefecture's industrial mix on prefectural employment (Loveridge and Selting, 1998). Although not traditionally conceptualized in this way in the shift-share literature, we argue that the employment regional effect measures the impact of regional context (in this case, prefecture-specific context) on changes in prefectural employment, and as such offers a more conceptually focused measure of employment change than the raw employment change. In addition, a distinguishing feature of Rigby's multivariate model, compared to the more common univariate shift-share model, is that it also provides an estimate of the impact of prefecture-specific changes in both manufacturing output and productivity on prefectural employment. These estimates add multivariate, quantitative detail to the prefecture-specific processes involved in shaping prefectural employment change. The shift-share model was estimated using Barff and Knight's (1988) dynamic procedure and Haynes and Dinc's (1997; 2001) modification which highlights labor's contribution to productivity. Haynes and Dinc (1997; 2001) have argued that Rigby's model does not distinguish between the contribution of capital and labor to changes in productivity. They propose a modification to the model which isolates labor's contribution (capital's contribution is relegated to a residual effect in the model). This is accomplished by discounting the estimated productivity effect in Rigby's model by labor's share of value added.

Figure 1.



second stage of the research constructs time paths of the uneven development of manufacturing employment. This

is accomplished by calculating and plotting the standard deviation of the employment regional effect among prefectures in each industry in each year between 1990 and 2000. These time paths are used to determine whether the spatial development of each industry became either more differentiated over time or whether there was a tendency towards equalization. The time paths are also used to draw conclusions about the impact of economic crisis in general and major crisis-inducing events in particular on the uneven development of each industry. Three events in particular are of interest in this period: the collapse of the bubble economy in 1990-91, the revaluation of the Yen in 1995 and the Asian financial crisis of 1997-98.

The third stage of the research analyzes the relationship between the uneven development of manufacturing employment and the uneven development of manufacturing output and productivity from 1990 to 2001. This is accomplished by estimating a time-series multiple regression model for each industry in which the standard deviation of the shift-share regional effect among prefectures is the dependent variable and the standard deviations of the output and productivity determinants of employment from the multivariate shift-share model are the explanatory variables. The model is as follows:

$$EMPStDev = a + b_1\ OUTStDev + b_2\ PRODStDev + e, \quad (1)$$

where EMPStDev is the standard deviation of the shift-share regional effect among prefectures for a given industry in a given year, OUTStDev is the standard deviation of the shift-share output coefficient among prefectures for a given industry in a given year, PRODStDev is the standard deviation of the shift-share productivity coefficient among prefectures for a given industry in a given year, a, b_1 and b_2 are parameters to be estimated and e is the error term. Equation (1) was estimated separately for each industry. Given the possibility of time series autocorrelation, the model was estimated by generalized least squares with a one year lag structure.

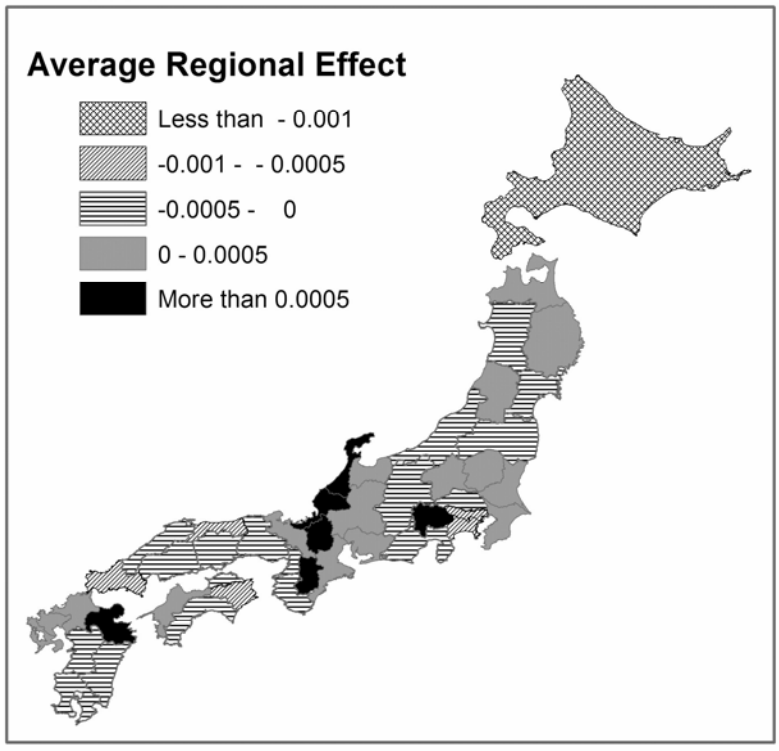
The data required for the analysis are annual employment, output (measured by value added) and productivity (measured by value added per worker, discounted by the wage share of value added) in twenty-one manufacturing industries for each prefecture. These data were obtained from the annual Census of Manufactures for all firms with four or more employees (Ministry of Economy Trade and Industry, various years). Value added and wage data were converted to constant 1995 yen values using

national-level, industry-specific deflators (Economic and Social Research Institute, 2005). Core and peripheral prefectures were identified using the prefectural share of national manufacturing employment for 1990.

THE SHIFT-SHARE REGIONAL EFFECT

The shift-share regional effect aggregated over the period 1990-2001 is shown in Figure 2. There are two clusters of prefectures with positive regional effects. The first cluster centers on the Aichi prefecture in the core and several other peripheral prefectures surrounding it. The second cluster includes four peripheral prefectures located close to Tokyo that have been destination sites for much of the production that has left the core prefectures (Whittaker, 1999; Oda, 1997a; 1997b). Three prefectures in the northern periphery and three in the southern periphery also had positive regional effects.

Figure 2.



Four of the seven core prefectures had negative regional effects during the study period, including the Tokyo and Osaka metropolitan prefectures. Both prefectures had developed major clusters of industrial production during the postwar period, but recent increases in production costs had contributed to an intensification of restructuring processes. The southern periphery stands out for the large cluster of prefectures that performed poorly in terms of the regional effect

TIME PATHS OF UNEVEN DEVELOPMENT

In this section we examine the time paths of uneven development for each industry. This is accomplished by plotting the standard deviation of the employment regional effect among prefectures for each industry annually between 1990 and 2001. The results are shown in Figures 3-6. The time paths can be classified into four groups depending on initial conditions and the trajectory of the standard deviation over time. In the first group the initial level of unevenness is relatively low and there is a dominant tendency for the standard deviation of the regional effect to increase over time (Figure 3). The majority of industries in this grouping are light manufacturing industries experiencing considerable decline (textiles/apparel, printing/publishing, furniture, and lumber/wood), with two additional industries focused on materials manufacturing (chemicals and pulp/paper), and one leading industry centered on assembly/fabrication (electrical machinery).

Figure 3.

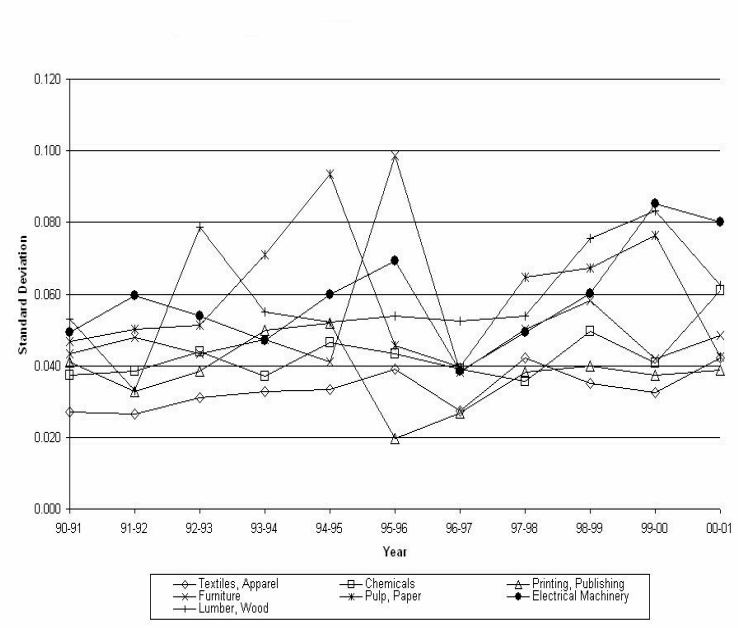
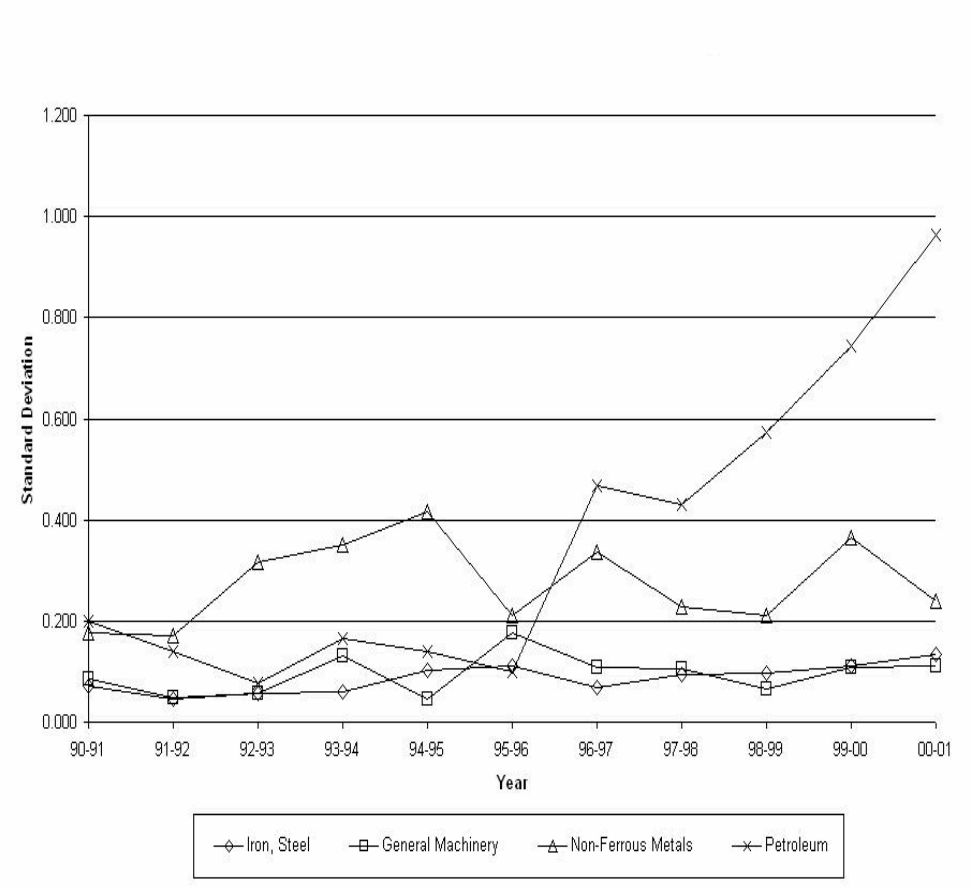


Figure 4.


1.200
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Standard Deviation
90-91
91-92
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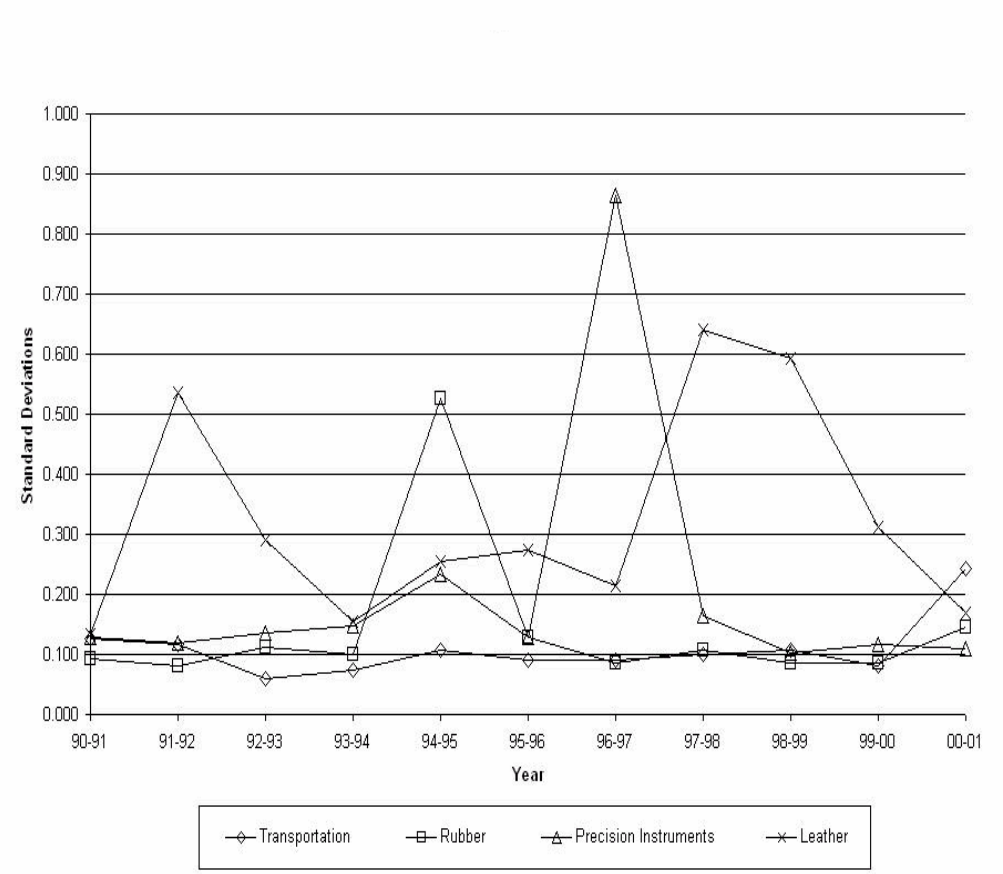
Year
Iron, Steel
General Machinery
Non-Ferrous Metals
Petroleum

Figure 5.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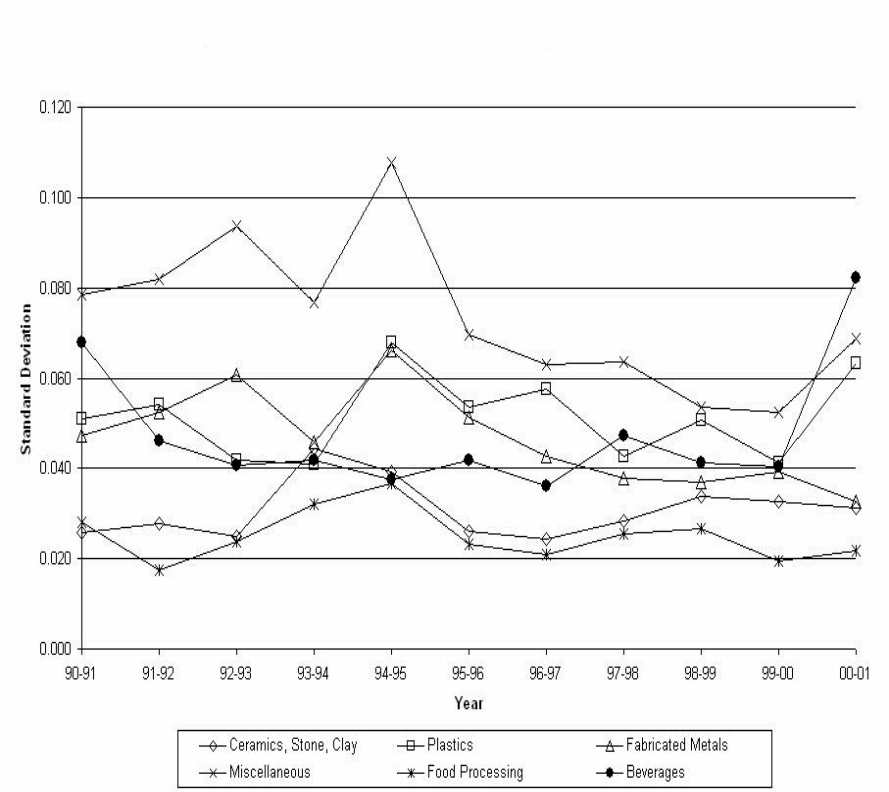
00-01
Year
Transportation
Rubber
Precision Instruments
Leather

Figure 6.



For the second group the initial level of unevenness is relatively high throughout the period compared to the industries in the first group (Figure 4). The standard deviation of the regional effect increases rapidly for petroleum, but tends to fluctuate for the other industries. Two of these industries are the materials based iron/steel and non-ferrous metals. The fourth industry, general machinery, is a leading sector that focuses on assembly/fabrication.

The spatial pattern of employment change for the first group became more uneven during the prolonged economic downturn that occurred from 1990 to 2001, which corroborates Smith and Dennis' (1987) claim that economic crisis generates a more differentiated landscape. In addition, the time path for most of the industries in the first two groups is broken up by sudden changes in the trajectory of the standard deviation over time. An examination of the time paths reveals that these sudden changes are more often than not associated either with the onset of economic crisis or with events that precipitated growth in the space-economy. For example, there was a sustained rise in the standard deviation for most of the industries in these two groups beginning in 1991-92, following the bursting of the bubble economy and the onset of a three year recession. There was also a

sustained rise in the standard deviation in most of these industries after either 1996-97 or 1997-98, corresponding to the onset of the Asian financial crisis. The opposite trend occurred in many of these industries after either 1995-96 or 1996-97 when the standard deviation briefly fell, indicating an evening out of the pattern of employment change. This trend corresponds to the devaluation of the Yen in 1995, which helped, albeit briefly, to trigger a mild economic recovery in the country.

The third group of industries also has relatively high levels of unevenness initially, but their time paths are dominated by a singular spike in their uneven development (Figure 5). The trend in the remaining years tends to be modestly rising. This group is comprised of two leading industries based on fabrication/assembly - precision instruments (1996-97) and transportation equipment (2000-2001) – and two minor industries centered on light manufacturing - rubber products (1994-95) and leather/fur products (1997-98). These surges may result from partial crises which are localized by either prefecture or sector (Harvey, 1982; Smith, 1990). For example, within the transportation equipment industry there has been considerable spatial variation in performance. Some major auto manufacturers such as Toyota and Honda have remained profitable even during the crisis, and prefectures such as Aichi and Shizuoka where many of their large assembly plants are located have had relatively strong economic performance, while Mazda, headquartered in Hiroshima prefecture, struggled throughout the 1990s and eventually looked to Ford Motors for assistance in restructuring some aspects of production (Fujimoto, 1999; Lincoln and Gerlach, 2005).

The fourth group of industries begin with relatively low levels of unevenness and demonstrate time paths of development which trend towards both equalization and differentiation over the study period (Figure 6). This group consisted of four industries focused on light manufacturing (food processing, beverages, fabricated metals, and ceramics/stone/clay), and two industries centered on materials manufacturing (miscellaneous and plastics). Generally the level of unevenness was higher and the fluctuations larger for the materials manufacturing industries. The time paths for food processing and ceramic/stone/clay are relatively less volatile and contain a more complex combination of brief, rather than sustained, equalization and differentiation trends.

REGRESSION ANALYSIS

In this section we analyze the relationship between the uneven development of manufacturing employment and the uneven development of manufacturing output and productivity from 1990 to 2001 by means of the time-series multiple regression model specified in equation (1). The goal of this analysis is to determine the degree to which the uneven development of industrial employment between 1990 and 2001 was shaped by the uneven development of industrial output and the uneven development of industrial productivity. The regression model relates the standard deviation in the regional effect over time to the standard deviations of output and productivity over time.

The explained variance and parameter estimates for equation (1) are shown in Table 2 for each industry. Only parameters significant at the 0.05 level are shown in the table. Given the fact that there are only seven degrees of freedom, these results must be viewed with some caution. However, the fact remains that the explained variance is very high in most industries and the majority of parameters are significant, which is a testament to the strength of the relationship in most cases. In only five industries is neither the standard deviation of output nor the standard deviation of productivity significantly related to the standard deviation of the regional effect. Four of these are light manufacturing industries (textiles / apparel, lumber / wood, printing / publishing, ceramics / stone / clay), and only one is based in materials manufacturing (non-ferrous metals).

The standard deviation of productivity is the most consistently significant variable in the model, and its relationship with the standard deviation of the regional effect is always positive. The relationship holds for fourteen industries. There is considerable variation in the strength of the relationship, varying from 1.784 for rubber to 0.339 for petroleum products. It is important to clarify the meaning of this relationship. It signifies that changes in the unevenness of the pattern of employment change over time correspond to changes in the unevenness of the pattern of change in productivity. When productivity changes in an industry become more (less) spatially differentiated, the result is an increase (decrease) in the spatial differentiation of employment change. In other words, the uneven development of employment is positively linked to the uneven development of productivity over time.

When the productivity parameter is approximately equal to one, this indicates that changes in the uneven development of productivity over time are

matched by the same amount of change in the uneven development of employment. This is the case for the transportation equipment, iron/steel, chemicals and pulp/paper industries. When the parameter is more than one, this indicates that changes in the uneven development of productivity generate a greater amount of change in the uneven development of employment. This is the case for rubber, furniture and miscellaneous. When the parameter is less than one, changes in the uneven development of productivity generate a smaller amount of change in the uneven development of employment. This is the case in beverages, electrical machinery, food processing, fabricated metals, general machinery, plastics, and petroleum. Finally, there is no significant link between the uneven development of employment and productivity in textiles/apparel, lumber/wood, printing/publishing, leather, ceramics/stone/clay, non-ferrous metals and precision instruments.

The standard deviation of output is significantly related to the standard deviation of the regional effect for twelve industries. The relationship is negative in nine industries, which indicates that when changes in output become more (less) spatially differentiated, changes in employment become less (more) spatially differentiated. In other words, the uneven development of employment is inversely linked to the uneven development of output over time. This inverse relation holds, in order of magnitude, for furniture, miscellaneous, chemicals, transportation equipment, pulp/paper, iron/steel, beverages, electrical machinery and general machinery. The relationship between the uneven development of employment and output is positive in three industries, which indicates that when changes in output become more (less) spatially differentiated, changes in employment also become more (less) spatially differentiated. This positive relation holds for leather, petroleum and precision instruments. There is no significant link at all between the uneven development of output and employment in food processing, textiles/apparel, lumber/wood, printing/publishing, plastics, rubber, ceramics/stone/clay, non-ferrous metals and fabricated metals.

CONCLUSIONS

This research has shown that manufacturing industries developed very unevenly in Japan from 1990 to 2001, a period of prolonged economic stagnation and crisis. The spatial pattern of employment change became more differentiated and uneven in most industries as the economic crisis intensified over time. The pattern of development also responded to major economic events, both crisis- and growth-inducing. The

bursting of the financial bubble in 1990-91 and the Asian financial crisis of 1997-98 both triggered an increase in the spatial differentiation of the development of many industries, and the mild economic recovery sparked by the devaluation of the Yen in 1995 triggered a trend, albeit brief, toward equalization in several industries.

The regression analysis showed that the change in the uneven development of most industries over time was positively associated with the uneven development of productivity and negatively associated with the uneven development of output. In other words, changes in the spatial pattern of employment became more (less) differentiated when productivity became more (less) differentiated. However, changes in the spatial pattern of employment became more (less) differentiated when output became more (less) uniform. What this suggests is that the spatially varied landscape of employment change which occurs during economic crisis is shaped by a spatially varied pattern of changes in productivity and a more spatially uniform pattern of changes (presumably falling) in output.

Despite the general findings outlined above, it is also clear that there are substantial variations in the results. Time paths of uneven development, the impact of economic crisis on these time paths and the extent to which they are shaped by the uneven development of productivity and output all vary among industries. Some of these differences, for example, may be due to the degree to which an industry is capital or labor intensive, others to the degree to which an industry is export dependent. Further research must examine these differences in greater depth.

BIBLIOGRAPHY

Adachi F. 1996. Kyûseichô suru Ajia to Nihon Chûshô Kigyô" [A Rapidly Growing Asia and Japanese Small and Medium Sized Firms]. In *Shin-chûshô Kigyô-ron o Manabu* [*Toward A New Analysis of Small and Medium Sized Firms*], edited by N. Tatsumi and Y. Sato, pp. 182-203. Tokyo: Yuhikaku.

Banasick, Shawn. 1999. Uneven development of the electrical machinery industry in northern Japan: 1981 – 1995, *The Pennsylvania Geographer* 37(1): 2-16.

Barff R.A. and Knight III P. L. 1988. Dynamic shift-share analysis, *Growth and Change* 19: 1–10.

Brenner R. 2002. *The Boom and the Bubble: The US in the World Economy*. New York: Verso.

Economic and Social Research Institute, Cabinet Office, Government of Japan 2005. National Accounts for 2003. http://www.esri.cao.go.jp/en/sna/h17-nenpou/17annual-report-e.html. Last accessed July 27, 2005.

Economic Planning Agency 2001. *Regional Economic Report.* Tokyo: Government of Japan.

Farrell R., Gaston N. and Sturm J. 2004. Determinants of Japan's foreign direct investment: an industry and country panel study 1984-1998, *Journal of the Japanese and International Economies* 18: 161-182.

Fujimoto T. 1999. *The Evolution of a Manufacturing System at Toyota.* Oxford: Oxford University Press.

Gao B. 2001. *Japan's Economic Dilemma: The Institutional Origins of Prosperity and Stagnation*. Cambridge: Cambridge University Press.

Harvey D. 1982. *The Limits to Capital.* Chicago: University of Chicago Press.

Hatch W and Yamamura K. 1996. *Asia in Japan's Embrace: Building a Regional Production Alliance*. Cambridge: Cambridge University Press.

Hatch W. 2001. Regionalizing Relationalism: Japanese Production Networks in Asia. Working Paper 01.07. Center for International Studies MIT Japan Program

Haynes K. and Dinc M., 1997. Productivity change in manufacturing regions: a multifactor/shift-share approach. *Growth and Change* 28: 210-221.

Haynes K. and Dinc M., 2001. Change in manufacturing productivity in the U.S. South: implications for regional growth policy. In *Theories of Endogenous Regional Growth: Lessons for Regional Policies*, editors B. Johansson, C. Karlsson, and R. Stough, pp. 368-392. Berlin: Springer.

Itoh M. 2005. The Japanese economy in structural difficulties. *Monthly Review* 56: 32-44.

Kerr D. 2002. The 'place' of land in Japan's postwar development, and the dynamic of the 1980s real-estate 'bubble' and 1990s banking crisis. *Environment and Planning D* 20: 345-374.

Kiyonari, T. 1993. Restructuring urban-industrial links in Greater Tokyo. In *Japanese Cities in the World Economy*, editors K. Fujita and R. Child Hill. Philadelphia, PA: Temple University Press.

Leyshon, A. 1994. Under pressure: Finance, geo-economic competition and the rise and fall of Japan's postwar growth economy. In *Money, Power and* Space, edited by S. Corbridge, N. Thrift, and R. Martin, pp. 116-145. Cambridge MA: Blackwell.

Lincoln J. R., and Gerlach M.L. 2005. *The Evolution of Japan's Network Economy: A Structural Perspective on Industrial Change*. Cambridge: Cambridge University Press.

Loveridge S. and Selting A.C. 1998. A review and comparison of shift-share identities. *International Regional Science Review* 21: 37-58.

Ministry of Economy Trade and Industry [previously known as Ministry of International Trade and Industry] various years. *Census of Manufacturers.* Tokyo: Research and Statistics Division, Minister's Secretariat.

Oda, H. 1997a. The locational dynamics of the Japanese plastic-mold manufacturing industry during the microelectronics innovation. *Geographical Review of Japan Ser. B* 70(1): 10-31. [in Japanese]

Oda, H. 1997b. Transformation of the metropolitan machinery production system during the microelectronics innovation: A case study of the plastic-mold manufacturing industry in the Keihin area, Japan. *Geographical Review of Japan A* 70(9): 555-576.

Oizumi, E. 1994. Property finance in Japan: Expansion and collapse of the bubble economy. *Environment and Planning A* 26: 199-213.

Rigby D. 1992. The impact of output and productivity changes on manufacturing employment, *Growth and Change* 23: 405-427.

Rigby D. and Anderson W. 1993. Employment change, growth and productivity in Canadian manufacturing: an extension and application of shift-share analysis, *Canadian Journal of Regional Science* 16: 69-88.

Smith, N. 1990. *Uneven Development. Nature, Capital and the Production of Space,* Second Edition. Oxford: Basil Blackwell.

Smith, N. and Dennis, W. 1987. The restructuring of geographic scale: Coalescence and fragmentation of the northern core region. *Economic Geography* 63(2): 160-182.

Togashi K. 2003. Globalization or hollowing out? The restructuring of Japanese manufacturing industries and the transformation of spatial systems in the 1990s, *Annals of Japan Association of Economic Geographers* 49: 119-141.

Tsuru, S. 1993. *Japan's Capitalism: Creative Defeat and Beyond.* New York: Cambridge University Press.

United Nations Commission on Trade and Development UNCTAD. 2001. *World Investment Report 2001, Trends and Determinants*. Geneva: UNCTAD.

Werner R. 2003. *Princes of the Yen: Japan's Central Bankers and the Transformation of the Economy*. New York: East Gate.

Whittaker D. 1999. *Small Firms in the Japanese Economy*. Cambridge: Cambridge University Press.

Wright M. 2002. *Japan's Fiscal Crisis: The Ministry of Finance and the Politics of Public Spending, 1975-2000*. Oxford: Oxford University Press.