4501

IMPACT OF INTERNATIONAL TRADE ON WAGE INEQUALITY

IN JAPANESE MANUFACTURING INDUSTRIES

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ABSTRACT

This research analyzed the impact of international trade on the wage inequality among workers with three different characteristics in Japanese manufacturing industries: the wage inequality (1) between skilled workers and unskilled workers, (2) between workers in large firms and workers in small firms, and (3) between regular workers and non-regular workers.

Chapter 2 presented an empirical analysis on the impact of international trade on wage inequality between skilled and unskilled workers. The hypothesis for the regression analysis was that international trade, either import or export, would raise the wage gap between skilled and unskilled workers. The regression results showed that the hypothesis was not supported and that the regression results with Japanese data were found inconsistent with the existing studies.

Chapter 3 examined whether Japanese data could support a theoretical model, which predicted that firms in concentrated industries would lose market power and pay lower wages when increased imports caused competition with foreign suppliers. The regression results rejected the prediction, failing to detect significant relationship between the relative wage and international trade. The regression results with an alternative dataset with education characteristics of workers again rejected the hypothesis that imports would "discipline the market" in concentrated industries.

Chapter 4 presented an analysis of the impact of trade on the wage inequality between regular and non-regular workers. The regression results did not provide evidence that international trade would affect the initial relative initial salary of regular

workers. The results also found that starting wage of non-regular workers was more sensitive to business environment than starting salary of regular workers.

In conclusion, this research did not find evidence to support a hypothesis that international trade reduces the relative wages of unskilled workers, workers in small firms, and non-regular workers in Japanese manufacturing industries. There was no evidence that would justify for a claim for protectionism to prevent a wage decline of domestic workers. Finally, this research identified many potential topics for future analysis, which would provide informative suggestions in the context of social and economic changes in Japanese labor markets.

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CHAPTER 1. INTRODUCTION

1.1. Background

Until the 1990s, most Japanese thought of themselves as "middle class". They were either employed or engaged in business, earning modestly high income. They were wealthy enough to send their children to college. They could buy their own housing with mortgaged loans. It was a time when a book by a labor economist, Tachibanaki (1998), surprised the public. In spite of the "middle class fantasy" shared by many Japanese, he showed that inequalities in income and asset distribution were expanding. He also illustrated that wage inequality had been expanding between large and small firms, and he described that some firms had started introducing new wage systems based on competition and productivity replacing the previous seniority-based wage systems. He predicted that the wage inequality might expand further in the future if a wage system based on competition and performance becomes more widely applied.

Tachibanaki (1998) documented that the sources of the changes in inequality are changes in wage income and in composition of household. He did not relate the changes in wage to other factors outside the domestic system. However, the period of observation coincides with active expansion of international trade and investment. Employment loss and wage decrease, caused by outward investment, foreign outsourcing, and reverse imports, have been one of the major concerns in industrial policies. For example, several textile firms cooperated in 2001 to establish the Japan Sharing, one of the registered non-profit organizations in Osaka, Japan. This organization aims to promote consuming domestic products instead of importing foreign products to prevent

industrial hollowing.[1] Protectionism is not apparent in Japan, and activities of groups such as the Japan Sharing have not attracted nation-wide support.

Welfare of disadvantaged workers is a growing problem, however, because those workers have been more vulnerable in the persistent recession in Japan. Firms adjust both employment and labor costs when economy is in recession. Brown, Clair, et al. (1997) introduce how Japanese firms responded to the recession in the first half of 1990s. Large firms protected lifetime employment of regular workers by reducing overtime allowances, decreasing recruits, providing less and slower promotion, transferring senior workers to branches of distant locations, and reducing the bonus and even basic salaries. Medium firms cut their work force by reducing part-timers, temporary workers, foreigners, and seasonal workers.[2] When recession continued and worsened in the late half of 1990s, firms started to reduce the work force of regular workers to reduce further costs. Early retirements of workers were encouraged, and remained senior workers got fired. Reduction of work force after mergers of firms was also observed.

The trade impact on wages can be discussed in both positive and normative perspectives. The positive perspective is to present theoretical frameworks and methodologies that can explain and measure the impact of international trade on labor markets. The normative perspective is to present policy alternatives for protecting the welfare of workers from the negative impact of trade without harming a country's

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[1] Detailed information and rationale of their activities can be obtained at the web page of the organization: www.j-sharing.jp.

[2] Brown, Clair, et al. (1997), pp. 55-58

industrial competitiveness. As International Labour Office (2001) suggests, "critics of trade liberalization have blamed it for a host of ills such as rising unemployment and wage inequality in advanced countries."[3] To introduce effective policy alternatives, it is important to implement empirical analyses and clarify the relationship between international trade and wage inequality among workers with different characteristics. Therefore, it is beneficial to examine by empirical methods whether the changes in inequality are related to expansion of international trade in Japanese manufacturing industries.

1.2. Purpose and outline of the research

The purpose of this research is to analyze the impact of international trade on relative wages of workers with different characteristics in Japanese manufacturing industries. This research focuses on the wage inequality between (1) skilled and unskilled workers, (2) workers at large firms and at small firms, and (3) regular workers and non-regular workers. Each analytical chapter in this research examines one of these three respectively.

Chapter 2 will analyze the impact of trade on a wage gap between skilled and unskilled workers. This chapter employs a specific-factors model, which can reflect the heterogeneity in Japanese labor markets. The hypothesis for the regression analysis is that international trade, either import or export, will raise the wage gap between skilled and unskilled workers. This is compatible with the 'Stolper-Samuelson-like' effects because Japan is a relatively skilled-labor-abundant country, exporting

[3] The International Labor Office (2001), p. 1

skilled-labor-intensive goods, and importing unskilled-labor-intensive goods. Data used for the analysis is taken from official statistics of wages, industry, and trade at the 2-digit standard industry category (SIC) level during the period of 1988-1995.

Chapter 3 will examine whether Japanese data can support a theoretical model, which explains the effect of trade on wages at firms in imperfectly competitive markets. The model predicts that firms would lose market power when imports cause competition with foreign supplier, and that the wage gap between firms in imperfectly competitive market and firms in perfectly competitive market will decline. This chapter explains the relationship between trade and the relative wage of workers at firms that previously had economic rent of oligopoly, examining whether international trade increases a wage gap between workers at large and small firms.

Chapter 4 will analyze the impact of export on the growth of initial wage for part-timers (non-regular workers) relative to that for full-timers (regular workers). This analysis is based on an ad hoc model, and uses a firm-level quasi-panel dataset, which covers about 300 manufacturing firms, to confirm whether an expansion of export will increase or decrease the relative growth of wage for part-timers.

The discussion in each analytical chapter will be summarized in Chapter 5. Significance of the research results in the context of economic change in Japan, and future development of the research will also be discussed in the chapter.

1.3. Contribution of the research

The scope of this research has two limitations. First, this research does not compare the impact of trade and that of biased technical change. Existing literature

finds that a wage gap can be caused either by trade with developing countries or by technological development.[4] This research focuses on the impact of trade on wages, by adjusting the technological change, instead of measuring the impact of trade relative to biased technological changes. Second, this research does not employ an empirical model that is based on production fragmentation theories. Recent theoretical literature, such as Markusen and Venables (1999), Burda and Dluhosch (2000), and Jones and Kierzkowski (2001), analyzes the production fragmentation or foreign outsourcing.[5] Empirical studies based on the fragmentation theories, however, require firm-level panel data, which were not available for this research. An empirical analysis of the combined impact of outward foreign direct investment and reverse import on labor market is left for further exploration.

The limitation mentioned above does not degrade contribution of this research to the existing literature. There has been little research on the effect of international trade on wage and employment in Japan. This is partly because of the difficulty in matching data among trade, wages, and industry. Matching trade data to others is a problem, because the former is based on commodity classification and the latter is classified by industries. There is no direct concordance between the two groups. Therefore, research using a harmonized dataset of Japan's trade, industry, and wages will be a contribution to the empirical literature, allowing for comparisons of results for Japan,

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[4] Gregory and Machin (2000) and Beissinger and Moller (2000) review two lines of major literature: one analyzes the impact of trade on labor market using the Heckscher-Ohlin approach, and the other focuses on biased technological changes. Those literature reviews do not provide clear conclusion which of the two sources is stronger.

[5] Gaston and Nelson (2002) make a review of recent literature of theories and empirical evidence on the impact of foreign direct investment on domestic labor markets.

the UK and US. This analysis is the first empirical research that employs the harmonized dataset of Japan's trade, industry, and wages. The unionization ratio is also originally created for this analysis. To obtain unionization ratio at 2-digit level, an original dataset is created by combining labor union membership number provided by official statistics on labor unions is combined with the employment data provided by other official statistics on manufacturers.

CHAPTER 2. ANALYSIS (1): SKILL PREMIUM

2.1. Introduction

This chapter analyzes the impact of international trade on wage inequality between skilled and unskilled workers after adjusting characteristics of workers and industries. Existing empirical literature finds that international trade hurts unskilled workers in labor markets in the US and the UK. However, there has been relatively little research on the effect of international trade on the wage inequality between different skill groups in Japanese manufacturing industries.

The analysis in this chapter employs a specific-factors model to analyze the impact of trade on the wage inequality in Japanese manufacturing industries. Following the theoretical discussion, an empirical model is presented. Analysis on the empirical results comes next, followed by conclusions.

2.1.1. Definitions

Educational attainment is used as a proxy for "skill" in this analysis. Certain skills can be obtained through on-the-job training (OJT) and experience at a workplace. However, it is important to focus on formal education because skills that are generally applicable to any workplaces can only be obtained at school. OJT and experience tend to generate more firm-specific skills.

There are four major ways to classify different skill groups in the existing literature: two educational groups, more than two educational groups, several age/education/gender groups, and occupational groups. Cline (1997) finds that most of the previous studies define "skilled" and "unskilled" workers either (1) as non-production

versus production workers in manufacturing industries, or (2) in education distinctions, such as more educated than high school or less. He concludes the latter definition is usually considered superior, because skilled workers are often included in the production worker's category and vice versa. Johnson and Stafford (1999) also warn that the use of occupational data has the problem of potential endogeneity.

2.1.2. Stylized facts

Landmann (2000) introduces four stylized facts on the labor market effects of globalization that are observed in European OECD countries: (1) the share of emerging economies in world exports of manufactured goods has increased since 1970 and is about to increase further in the future; (2) changes in the structure of labor demand since at least 1980 have favored skilled workers at the expense of unskilled workers; (3) wage differentials have markedly widened in the United States and the United Kingdom, but remained largely constant or even narrowed in most continental European countries; (4) countries that have avoided the increase in wage inequality have typically experienced rising unemployment rate, in particular among the unskilled.

The following tables indicate statistical evidence about the wage inequality between different skill groups and its change in Japan. As background information, Table 1 shows the distribution of workers with different educational attainment in manufacturing industries in 2001. Workers with senior high school education constitute the majority for both male and female workers. Graduates of four-year university have much larger share for male workers than for female workers.

Table 1. Distribution of workers with different educational attainment in manufacturing industry

Male

Education attainment	Employment	Ratio (%)
Elementary and junior high school	1,082,800	14.34
Senior high school	3,909,800	51.77
Junior college & higher professional schools	570,600	7.56
4-year university and above	1,984,100	26.27
Total	7,551,600	100.00

Female

Education attainment	Employment	Ratio (%)
Elementary and junior high school	756,700	21.17
Senior high school	2,032,400	56.85
Junior college & higher professional schools	564,600	15.79
4-year university and above	219,900	6.15
Total	3,601,900	100.00

Source: Employment Status Survey, 2002 (Ministry of Public Management, Home Affairs, Posts and Telecommunications) – manufacturing industry total

Tables 2 and 3 show the changes of relative monthly salary of workers with advanced degree and with high school education, during 1988-2002 period.[6] The nominal income of workers with senior high school education is indexed as 100. College graduates receive higher salaries than high school graduates, but the salary gap between senior high school graduates and advanced degree holders is stable over time for male workers. The gap is larger and growing, however, for female workers. The relative salaries of female workers with four-year university degree have been increasing. The next section provides more detailed explanation on the change in the wage gap between skilled and unskilled workers, and on the change in international trade.

[6] The relative salary income is based on nominal monthly salary, and not controlled for workers' tenure or age. Fringe benefits are not included in the relative salary income.

Table 2. Change in relative monthly salary of skilled workers in manufacturing industries (male)

Year	Senior high school	Junior college	4-year university
1985	100	103.27	119.32
1986	100	102.23	119.81
1987	100	103.10	120.35
1988	100	101.80	119.19
1989	100	100.30	120.01
1990	100	99.94	120.21
1991	100	99.01	120.34
1992	100	98.40	120.77
1993	100	97.79	122.28
1994	100	96.84	120.37
1995	100	97.16	120.72
1996	100	95.79	120.86
1997	100	96.96	120.25
1998	100	98.67	122.32
1999	100	98.18	120.66
2000	100	97.05	120.06
2001	100	98.21	121.21
2002	100	99.02	121.48

Source: Basic Survey of Wage Structure (Ministry of Health, Labor and Welfare) – manufacturing industry average

Table 3. Change in relative monthly salary of skilled workers in manufacturing industries (female)

Year	Senior high school	Junior college	4-year university
1985	100	111.97	134.29
1986	100	112.69	135.54
1987	100	111.26	136.95
1988	100	111.90	137.21
1989	100	111.96	143.23
1990	100	112.43	144.41
1991	100	112.03	142.88
1992	100	112.29	142.35
1993	100	112.54	141.97
1994	100	111.94	143.48
1995	100	111.67	143.14
1996	100	111.28	143.09
1997	100	112.17	140.79
1998	100	114.05	151.00
1999	100	114.37	146.47
2000	100	111.87	142.71
2001	100	113.33	144.63
2002	100	115.24	147.26

Source: Basic Survey of Wage Structure (Ministry of Health, Labor and Welfare) – manufacturing industry average

2.1.3. Statistical evidence

Official statistics of labor and trade provide an overview of changes in employment, wages, imports, and exports. Total employment in manufacturing industries decreased 3.5% from 798 million in 1988 to 770 million in 1995. The skill composition of employment also changed. The share of workers with a junior high school education dropped from 29.7% in 1988 to 19.5% in 1995. On the other hand, the share of workers with senior high school education increased from 52.8% to 56.8%, workers with some college education increased from 4.2% to 6.8%, and workers with a university degree increased from 13.3% to 18.9%. Senior high school graduates have the largest share in employment in Japanese manufacturing industries.

Trade significantly grew during the period of 1988-1995. On average, imports measured in nominal value increased more than 50% from 15,761 billion yen in 1988 to 23,733 billion yen in 1995. Imports decreased in two industries: non-ferrous metal (18% decline) and steel industries (11% decline), but increased in other industries. A decline in export value is observed in six industries: food, textile, apparel, wood, print, and steel. However, an increase in export value in machinery industries overrode the decline.

Table 4 shows the changes in the relative wage of unskilled workers and the growth in trade values. The left half of the table shows the fixed-weight average ratio of the average hourly wage high school graduates to the average hourly wage of university

graduates for cells defined by industry and education category.[7] The fixed weight for each cell is the cell's average share of total employment over the period of 1988-1995. These figures are weighted relative average value of labor income, adjusted by CPI, with regard to the number of worker-hours (number of workers times number of working hours) basis. On average, unskilled workers received about 56% of labor income that skilled workers received. At the same time, the inequality varies across industries. It is the largest in the food and apparel industries, where unskilled workers earned about only half of the wages that skilled workers did. The wage inequality is the smallest in the beverage, print, metal, and general machinery industries in 1988, where unskilled workers received more than 60% of the wages that skilled workers did. The wage inequality in 1995 is the smallest in chemical industry. By comparing the relative wages in 1988 and in 1995, four out of twenty industries experienced a decline in the relative wage of unskilled workers, while the rest experienced an increase in the relative wage.

Table 4. Comparison of relative wages and trade in 1988 and 1995

		Relative wages (unskilled/skilled)			Imports (billion Yen)			Exports (billion Yen)		
SIC	SECTOR	1988	1995	**Change**	1988	1995	**Growth**	1988	1995	**Growth**
12	Food	0.5029	0.6831	**35.83%**	2,120.57	3,152.85	**48.7%**	212.08	163.44	**-22.93%**
13	Beverage	0.6069	0.6530	**7.59%**	290.41	521.58	**79.6%**	23.18	54.07	**133.24%**
14	Textile	0.5254	0.5799	**10.37%**	921.67	1,179.57	**28.0%**	644.45	624.36	**-3.12%**
15	Apparel	0.5014	0.5402	**7.75%**	561.67	1,206.03	**114.7%**	62.49	39.88	**-36.18%**
16	Wood	0.5406	0.6610	**22.28%**	589.00	1,008.60	**71.2%**	9.95	6.90	**-30.61%**
17	Furniture	0.5809	0.6084	**4.72%**	130.26	258.30	**98.3%**	43.46	45.96	**5.74%**

[7] The relative wage of unskilled workers shown in Table 4 grew between 1988 and 1995, contrary to the findings in Tables 2 and 3. Major difference between Table 4 and Tables 2 and 3 includes that the relative wage in Table 4 is (1) adjusted by CPI, (2) calculated to obtain per actual working hour wage based on monthly salary and bonus, (3) weighted by the average share of total employment over the period of 1988-1995, and that (4) data of male and female workers are aggregated.

18	Paper	0.5690	0.6256	**9.95%**	422.04	489.58	**16.0%**	217.14	245.41	**13.02%**
19	Print	0.6380	0.6302	**-1.22%**	54.41	85.31	**56.8%**	54.80	39.52	**-27.88%**
20	Chemical	0.5621	0.7065	**25.68%**	1,754.64	2,147.78	**22.4%**	2,150.61	3,194.20	**48.53%**
22	Plastic	0.5500	0.6217	**13.05%**	105.25	201.48	**91.4%**	244.52	375.21	**53.45%**
23	Rubber	0.5220	0.5440	**4.23%**	175.53	289.62	**65.0%**	397.18	499.79	**25.84%**
25	Ceramic	0.5810	0.6006	**3.36%**	225.35	301.05	**33.6%**	443.52	599.02	**35.06%**
26	Steel	0.5198	0.6255	**20.34%**	642.52	573.87	**-10.7%**	1,949.80	1,634.96	**-16.15%**
27	Non-ferrous	0.5440	0.5398	**-0.78%**	2,110.80	1,722.17	**-18.4%**	437.70	629.02	**43.71%**
28	Metal	0.6219	0.6062	**-2.52%**	153.52	297.23	**93.6%**	499.69	550.48	**10.17%**
29	General Machinery	0.6439	0.6328	**-1.73%**	698.00	1,095.81	**57.0%**	4,905.32	6,747.27	**37.55%**
30	Electric Machinery	0.5164	0.6745	**30.61%**	1,532.33	4,628.34	**202.0%**	10,114.15	13,349.64	**31.99%**
31	Transportation Machinery	0.5707	0.6067	**6.31%**	920.64	1,604.92	**74.3%**	9,162.84	9,626.58	**5.06%**
32	Precision Machinery	0.5763	0.6359	**10.33%**	333.29	702.00	**110.6%**	1,201.49	1,432.52	**19.23%**
	All	0.5609	0.6205	**10.63%**	15,761.02	23,733.40	**50.6%**	32,774.37	39,858.24	**21.61%**

The Stolper-Samuelson theorem predicts that the relative wage of unskilled workers would decline after trade because Japan exports skilled-labor-intensive commodities and imports unskilled-labor-intensive products. As seen in the above table, however, an overview of changes in wage inequality and changes in trade at each industry does not present a clear relationship. The change in the relative wage is, in general, much smaller than the change in international trade. For example, the relative wage grew 7.59% in the beverage industry while import and export increased 79.6% and 113.24% respectively. Some industries, on the other hand, recorded larger growth in the relative wage in spite of small growth or even decline in trade. Food, chemical, and steel industries are examples of these. It requires regression analysis to confirm whether an increase in trade hurts unskilled workers.

The changes in relative labor income of university graduates exhibited in Tables 2 and 3 were rather small. Table 2 shows that the relative salary of male university graduates in manufacturing industry grew from 119.19 to 120.72 during the period of 1988-1995. Table 3 shows that the relative wage of female university graduates grew from 137.21 to 143.14 during the same period. The growth rates are only 1.3% for male workers and 4.3% for female workers. The change in relative wage of university graduates in each manufacturing industry exhibited in Table 4 is much larger. It is possible that small changes in relative wage at the aggregate level mask a large change at the industry level. It is necessary to analyze the impact of trade on relative wages at the industry level to obtain more precise results.

2.2. Literature review

Existing literature analyze how trade affects wage inequality between workers with different skill levels. A group of literature, such as Murphy and Welch (1991), Katz and Murphy (1992), Borjas, et al. (1997), Haskel (2000), and Goux and Maurin (2000), compares the impact of trade and the impact of technological changes on relative wages of skilled workers through the changes in their relative demand and relative supply.[8] These find that international trade is a factor that favorably changed the relative demand for skilled workers, increasing their relative wages, in the US and in France.

Slaughter and Swagel (1997) review the literature and introduce links through which international trade with developing countries contributes to rising wage inequality

[8] Extensive literature reviews on this topic include Deardorff and Hakura (1994), Cline (1997), and Freeman (2003).

between skilled and unskilled workers. These links are either through labor demand, labor supply, or through other channels. The first link is the changes between the prices of commodities and the prices of factors (the Stolper-Samuelson theorem). A decrease in the relative price of goods relatively intensively using unskilled workers leads to a shift in demand toward skilled workers and to an increase in the relative wages of skilled workers.

The second link is the factor content of trade. The increased volume of imports embodying lower technology function in the labor market as if the supply of unskilled workers increase, leading to the decrease in the relative wage of unskilled workers. Borjas, et al. (1997) employ this approach and find that trade had small effects on the overall implicit labor supply of unskilled workers. The factor content approach is a common method, but it is also controversial. Katz and Autor (1999) criticize the factor content analysis because it may underestimate the effect of external pressure on relative wages when the threat of trade, outsourcing, or plant relocation can lead to wage changes.

The third link is a change in the elasticity of labor demand. An increase in trade makes demand for unskilled workers more elastic. Combined with the effects of trade on factor prices, the impact of trade on wage inequality becomes larger.[9] Jean (2000), Slaughter (2001), Krishna, et al. (2001), and Hasan, et al. (2003) employ this approach to analyze the trade impact on labor markets.

[9] According to Slaughter (2001), the effect of trade on labor demand is an application of one of the four Hicks-Marshallian rules on the elasticity of derived demand. Hicks (1963) mathematically proves the rule and states, "the demand for anything is likely to be more elastic, the more elastic is the demand for any further thing which it contributes to produce." (Hicks (1963), pp. 242-246)

2.2.1. Empirical work on the US and UK

It is observed in some of the OECD countries that wage inequality between skilled and unskilled labor has grown since 1980. There are a number of studies that analyze the cause of the change in skill premium in the US and in Europe. They find that the increasing relative wage of skilled workers can be explained in part by increasing imports from developing countries.

Cline (1997) reports the trends in income distribution and wage inequality among Americans. The author also critically reviews literature by trade economists, labor economists, and development economists on the impact of foreign trade on growing inequality of income and wages. According to the literature review by the author, "international influences contributed about 20 percent of the rising wage inequality in the 1980s. This point estimate from the literature for the impact of external influence would be higher as the unskilled category shifts toward lower skills and as the definition widens to include migration."[10]

Sachs and Shatz (1998) find an empirical linkage of American trade with developing countries and US wage inequality between skilled and unskilled workers, as the Stolper-Samuelson theorem predicts. They find that the increase in value-added product prices adjusted for total factor productivity in unskilled-worker-intensive industries was below that in skilled-worker-intensive industries. The authors conclude that falling relative prices of products intensively using unskilled labor contributed to the

[10] Cline (1997), p. 144

widening wage inequality between skilled and unskilled workers, although they do not quantify the contribution of the change in productivity on the change of wages.

Baldwin and Cain (2000) attempt to find the impact of trade on relative wages of skilled workers, comparing it with the roles of changes in technology and in relative factor endowments. They use 79 two-digit sectors of input-output table, price data, and labor data prepared by US government agencies for the period from 1967 to 1992. The authors find that increased import-competition is an important contributory factor of the decrease in the relative wages of the least educated workers. They also find that technical progress could have been the main force not only to decrease the relative wages of the least educated workers but also to widen the wage gap between the other education groups.

Greenaway, et al. (1999) use an industry-based panel combining trade, industrial structures and labor market data to estimate wage equations across 167 manufacturing industries at a four digit SIC level in the UK. The data period covers from 1979 to 1991. The regression results show that trade with East Asian economies increases the gap in wages between skilled and unskilled workers in the UK.

Empirical papers such as Berman, et al. (1994) analyze the impact of trade on the changes in the demand for skilled workers, and on their relative wage. Berman, et al. (1994) find that the contribution of trade to increased demand for skilled workers is small, observed by both between-industry and within-industry skill upgrading.

Overall, most literature using the US and UK data find results compatible with the Stolper-Samuelson theorem: increased trade with developing countries has

contributed to higher returns to skilled workers and lower returns to unskilled workers. The mainstream of the empirical literature such as Haskel and Slaughter (2000) contains an analysis where the change in wages is regressed by the changes in trade and in other characteristics. There are substantial empirical studies about the trade impact on wage inequality between skill groups in the US and the UK. One reason is that individual-level wage data of American workers are available and they can be used for analyses. Another reason is that wages of American and British workers are more flexibly changed than those of other European countries. Thus, the impact of trade on wage may be more clearly observed in the US and the UK.

2.2.2. Empirical work on Japan

Some existing empirical studies analyze wage changes and the correlation between the changes of international trade and the changes in wages in the Japanese labor market.[11] However, there has been relatively little research on the effect of international trade on the wage inequality between different skill groups in manufacturing industries.

Higuchi (1989) empirically investigates how external demand shocks affect the inter-industry wage disparities among different skills and age groups. He uses aggregate wage data based on the Basic Survey on Wage Structure for the period 1970-1987. He employs the foreign exchange rate instead of trade data to represent an external demand shock. The regression results show that the appreciation of the yen exerted a direct restraining pressure on wages of workers with longer tenure more than on wages of younger workers in traded goods industries. Profits in the industries decline when the

[11] Tomiura (2002) analyzes the impact of imports on employment in Japanese manufacturing industries.

yen appreciates. The relative wages of the senior workers declines because they would rather accept wage cuts than job losses, since turnover costs are larger for them. The author, however, does not estimate the effect of the exogenous shock (such as international trade) on wage inequality between different skill groups.

Tachibanaki, et al. (1998) examines the issue for Japanese imports, paying particular attention to the effect of manufacturing imports from Asian countries on employment and wages in Japan. The authors find that there was a negative correlation between the import penetration ratio and wage premium. The correlation between the export ratio and the wage premium was statistically insignificant. The authors also find that the correlation between the increase in wage gap between production and non-production workers and the increase in import penetration ratio is statistically insignificant. The correlation between the change in wage gap and the change in export ratio was negative and statistically significant. The authors assume that non-production workers are skilled and production workers are unskilled. They do not classify workers according to education attainment and other characteristics of workers, or control with respect to workers' attributes.

Genda (1998) finds that there were structural changes in wage differentials by education and experience among male workers in the 1980s, using wage data during the 1980-1992 period. College graduates under 34 years old gained because the demand for younger college graduates increased. On the other hand, younger high school graduates lost wages relative to older groups of the same education attainment. The data that the author used is highly aggregated, so no industry-level results are produced.

Kosai, et al. (1998) attempt to find the relationship between increased imports of labor-intensive goods and gaps in employment and wages between skilled and unskilled workers. They at first find a relationship between the increase in relative employment of workers with higher education and the decline in their relative wages. Using 2-digit SIC data from the Basic Survey of Wage Structure, they find that in almost every sector of manufacturing, the employment ratio of educated to less-educated workers rose, while the relative wages of the former declined in 1994 compared to 1985. The negative relationship between relative employment and relative wages of workers with a college degree to high school graduates becomes stronger when data are classified by the size of firms. However, the authors do not provide regression analysis, nor do they show whether and how these results are related to increased imports.

Rebick (1999) estimates how much international trade affects wages of different components of the labor markets. His approach has two major weaknesses. One is that he does not present a theoretical model regarding the impact of trade on wages. He looks for simple correlations between changes in product demand as measured by domestic sales, exports, and imports, and changes in wages. The other weakness is that he does not use annual data. He uses data by combining the Wage Census and the Input-Output Tables for Japan, with the latter published every five years. His analysis covers the period 1965-1990, but because of the restriction mentioned above, his dataset includes only 6 annual observations.

Sakurai (2000) measures the impact of international trade on the relative wages between skilled and unskilled workers in manufacturing industries, comparing the

wages in 1980 with the wages in 1990. The approach applied in this study is the factor content of trade. He calculates the hypothetical relative wages between non-production and production workers in 1990, assuming the amount of trade is the same as in 1980. He then compares the hypothetical relative wage with the observed figure to measure the impact of trade on the relative wage. He uses input-output tables with 39 manufacturing industries. Wages in the analysis are calculated as average cash salaries in an industry, taken from the Census of Manufacturing. The results show that trade increased the relative wage of skilled workers by 1.3 percentage points. The author concludes that the impact of trade is small on the level of the relative wage but it is large on the changes of the relative wage. The author assumes that non-production workers are skilled and production workers are unskilled. He does not classify workers according to education attainment and other characteristics of workers. Another weakness of his analysis is that he only uses two years' data.

Higuchi (2001) estimates the impact of exports and imports on wage levels in each manufacturing industry at the 2-digit SIC level. Based on the human capital model, he regresses log of real hourly wages on education years, age, tenure, size of firms, export share and import share in an industry, and annual dummy variables. He takes data of wages and other characteristics of workers from the Basic Survey of Wage Structure. Data on export shares and import shares are calculated from the Census of Manufacturing and the Trade Statistics. He concludes that international competition, either through importing or exporting, lowers wages, on average. However, the author

does not show whether the relative wages of workers with higher education empirically increased.

2.2.3. Significance of the analysis

There has been little research in Japan on the effect of international trade on wage and employment. This is partly because of the difficulty in matching data among trade, wages, and industry. Matching trade data to others has been a problem, because the former is based on commodity classification and the latter is classified by industries. There has been no direct concordance between the two groups. Therefore, research using a harmonized dataset of Japan's trade, industry, and wages will be a contribution to the empirical literature, allowing for comparisons of results for Japan, the UK and US. It is necessary to analyze the impact of trade on relative wages at the industry level, because small changes in relative wage at the aggregate level may mask a large change at the industry level. This analysis is the first empirical research at the industry level, which employs the harmonized dataset of Japan's trade, industry, and wages.

2.3. Theoretical model

The theoretical model used in this research is based on Feenstra and Hanson (2003). It is a specific-factors model with two countries, three factors, and two industries. A specific-factors model can represent the heterogeneity in Japanese labor markets better than the standard Heckscher-Ohlin framework. Another justification to use the model by Feenstra and Hanson (2003) is that capital is sector-specific for the period of empirical analysis while labor is mobile across industries whether they are

skilled or unskilled. A specific-factors model is valid to observe the 'Stolper-Samuelson-like' effects among skilled and unskilled workers when fixed factors exist. All of the notations and equations that follow are taken from Feenstra and Hanson (2003). They use cost functions in analyzing the impact of trade on relative wages. Their methodology is unique and useful in measuring the impact of trade on wages in empirical analyses. The production factors in the model are unskilled labor, skilled labor, and capital. It is assumed that capital is sector-specific in the short-run. So the model can be used as a two-factor model for the short-run analysis. Other assumptions for the model are as follows:

1. Goods markets are perfectly competitive and production technology is homogeneous both at home and abroad. The change of the price of imported goods is exogenous.
2. Domestic products and imports are perfect substitutes.
3. No change in labor supply for both skilled and unskilled workers. It is also assumed that unskilled workers cannot become skilled workers.[12]
4. Production factors are fully employed.
5. Workers are perfectly mobile across domestic industries, but immobile across skill groups. Workers are not mobile across countries, either.

2.3.1. Model

There are three industries: industry 1 produces an unskilled-labor intensive intermediate good (good 1), industry 2 produces a skilled-labor intensive intermediate good (good 2), and the final good industry assembles intermediate goods and produces a

[12] This assumption is appropriately applicable to the Japanese labor market because it is not common that workers with high school education go to college and become skilled workers while they continue working.

final good. Intermediate goods are tradable: good 1 is importable and good 2 is exportable. Let $x_1<0$ denote the imports of good 1, and $x_2>0$ denote the exports of good 2. The final goods are produced in each country.

It is assumed that each intermediary good is produced using unskilled labor (L), skilled labor (H), and capital (K), with concave and linearly homogeneous production functions. The production functions of the intermediary goods industries are expressed as follows:

$$y_i = f_i(L_i, H_i, K_i),\ i = 1,2$$

The production function of the final goods is given by $y_m = f_m(y_1 - x_1, y_2 - x_2)$, and is also concave and linearly homogeneous. The production process of the final goods is a bundling activity using the available amounts of good 1 and good 2. It is assumed that the bundling activity does not need additional labor and capital inputs.

It is assumed that the production factors, that is, unskilled labor, skilled labor, and capital, are fully employed. The total factor usage in the manufacturing industry is expressed as: $L_1 + L_2 = L_m,\ H_1 + H_2 = H_m,\ K_1 + K_2 = K_m$.

The optimal output in the industry is obtained by solving the following maximization problem. With an assumption of perfect competition, the value of output from the final good, plus net trade, will be maximized subject to the resource constraints:

$$Y_m = F_m(L_m, H_m, K_m, p_m, p) \equiv \max_{x_i, L_i, H_i, K_i} p_m y_m + p x_1 + x_2$$

subject to

$$y_i = f_i(L_i, H_i, K_i),\ i = 1,2$$

$$y_m = f_m(y_1 - x_1, y_2 - x_2)$$

$$L_1 + L_2 = L_m,\ H_1 + H_2 = H_m,\ K_1 + K_2 = K_m$$

where p_m is the price of the final good, and p is the price of good 1 (importable good). The function $F_m(L_m, H_m, K_m, p_m, p)$ is linearly homogeneous in prices, so it can be alternatively written as $Y_m = p_m F_m(L_m, H_m, K_m, 1, p/p_m)$.

We can make use of the cost function that is dual to the production function mentioned above, because we want to think of labor as being optimally adjusted in response to changes in factor prices. A short-run cost function is obtained when the level of capital and output is fixed. It is defined as follows:

$$C_m(w, q, K_m, Y_m, p/p_m) = \min_{L_m, H_m} wL_m + qH_m$$
$$\text{subject to} \quad ,$$
$$Y_m = p_m F_m(L_m, H_m, K_m, 1, p/p_m)$$

where w is the wage of unskilled labor and q is the wage of skilled labor. Alternatively, we can define a long-run cost function, which is obtained when labor and capital are both chosen optimally:

$$C_m(w, q, r, Y_m, p/p_m) = \min_{L_m, H_m, K_m} wL_m + qH_m + rK_m$$
$$\text{subject to}$$
$$Y_m = p_m F_m(L_m, H_m, K_m, 1, p/p_m)$$

where r is the rental on capital.

We can also define the long-run cost function for the disaggregate production activities within the industry. If labor and capital are optimally chosen for the industry overall, then they must also be optimally chosen within each of the production activity for intermediary goods. Thus, the long-run cost function is defined as:

$$C_i(w,q,r,Y_i) = \min_{L_m,H_m,K_m} wL_m + qH_m + rK_m$$

subject to

$$y_i = f_i(L_i,H_i,K_i),\ i = 1,2$$

Since the production functions of intermediary goods are assumed to be linearly homogeneous, then the cost function mentioned above will be homogeneous of degree one in Y_i. This means that the cost function can be rewritten as

$$C_i(w,q,r,Y_i) = Y_i c_i(w,q,r),$$

where $c_i(w,q,r)$ is the unit-cost function, which is equal to marginal cost.

Choosing good 2 as the numeraire and setting the price of good 1 as p, the zero-profit conditions for domestic production activities 1 and 2 for intermediary goods can be written as:

$$p = c_1(w,q,r)$$
$$1 = c_2(w,q,r)$$

Totally differentiating these unit-cost functions, the change of p is decomposed of change in factor prices and cost-share of factors:

$$\hat{p} = \theta_{1L}\hat{w} + \theta_{1H}\hat{q} + \theta_{1K}\hat{r}$$
$$0 = \theta_{2L}\hat{w} + \theta_{2H}\hat{q} + \theta_{2K}\hat{r}$$
$$\therefore$$
$$\hat{p} = (\theta_{1L} - \theta_{2L})\hat{w} + (\theta_{1H} - \theta_{2H})\hat{q} + (\theta_{1K} - \theta_{2K})\hat{r}$$

where $\hat{p},\hat{w},\hat{q},\hat{r}$ means the percentage change in import price and the percentage change in factor prices, respectively, and where θ_{ij} is the cost-share of factor j in activity i, with $\sum_j \theta_{ij} = 1$.

We can assume that capital has equal cost shares in the two industries, so that $\theta_{1K} = \theta_{2K}$, for simplicity. If so, using the equation above, we can obtain

$$\hat{p} = (\theta_{1L} - \theta_{2L})(\hat{w} - \hat{q})$$

Since industry 1 is assumed to be unskilled-labor intensive, $(\theta_{1L} - \theta_{2L}) > 0$. Thus, a decrease in the price of the imported intermediate good leads to a decrease in the relative wage of unskilled labor, $(\hat{w} - \hat{q}) = \hat{p}/(\theta_{1L} - \theta_{2L}) < 0$. This means that the effect consistent with the Stolper-Samuelson theorem holds for the model with two mobile factors.

2.3.2. Hypothesis

The hypothesis for the regression analysis is drawn from the theory: international trade, either import or export, will raise the wage gap between skilled and unskilled workers in Japan. This is compatible with the 'Stolper-Samuelson-like' effect because Japan is a relatively skilled-labor-abundant country, exporting skilled-labor-intensive goods, and importing unskilled-labor-intensive goods. The empirical analysis in the following section is going to examine whether this hypothesis can be sustained with the Japanese data.

2.4. Regression specification

2.4.1. Variables

This analysis uses a simple ordinary least squares (OLS) model, which has the relative wage of unskilled workers as the dependent variable. The dependent variable is the change in the fixed-weight average ratio of the average hourly wage high school

graduates to the average hourly wage of four-year university graduates for 57 cells defined by industry and firm size category.[13] The fixed weight for each cell is the cell's average share of total employment over the period of 1988-1995.[14]

Three different dependent variables are used to compare the impact of international trade on different relative wages. The first is the change in relative wage of unskilled workers to skill workers using data of all workers. The second and the third are the change in relative wages of unskilled workers at large firms and those at small firms, respectively. A specific-factors model does not predict difference between large and small firms. However, the difference between large and small firms may affect the results because some institutional difference between those firms is prominent in Japanese manufacturing industries.

The effects of international trade on the wage gap between skilled and unskilled workers will be different between large and small firms. One hypothesis is that small firms are more responsive to international trade while large firms protect their workers from changes in business environment. This hypothesis expects to find the 'Stolper-Samuelson-like' effects on small firms more than on large firms. Furthermore, the effects of international trade on wages in large and small firms will be different if the market structure for large firms is not the same as that for small firms. Imports will reduce the relative wage in large firms if the competition with foreign suppliers forces

[13] Graduates of junior colleges (two-year college) and colleges of technology (koto senmon gakko) are included neither with high school graduates nor with university graduates.
[14] This methodology is similar to Katz and Murphy (1992).

large firms to lose market power that they have had. Detailed discussion on the difference of wages between large and small firms is reserved for the next chapter.

The analysis uses a dataset that covers 19 industries for 8 years from 1988 through 1995. The cross-sectional data in each year is pooled to create a quasi-panel dataset. Surveyed workers and firms in each industry are different every year. However, it is legitimate to pool annual data because characteristics in each industry remain same during the analysis period.

Explanatory variables in this analysis include the change in the import ratio, the change in the export ratio, and the change in industry characteristics to control non-trade-related changes in each industry. Industry characteristics variables used here are industry sales (a proxy of market size of an industry), the capital-labor ratio (a proxy of the technological advancement status of an industry), the ratio of female workers[15], the ratio of sales share of large firms (a proxy of the status of non-competitive structure of an industry), the average age of workers, the relative average tenure of unskilled workers[16], and unionization ratio. Table 5 shows definitions and predicted coefficient signs of each explanatory variable.

Table 5. Explanatory variables

Variables *	Definition	Predicted coefficient sign
Import ratio	Ratio of value of imports to the value of sales of output in domestic market in an industry.	Negative
Export ratio	Ratio of value of exports to the sales of output in	Negative

[15] Female workers ratio variable is necessary to control for the effect of the wage gap between male and female workers. It is predicted that the skilled / unskilled wage gap is larger when the female worker ratio is larger.

[16] Relative average tenure variable is necessary to control for the effect of the wage profile of unskilled workers relative to skilled workers.

	domestic market in an industry.	
Industry sales of output	Total annual sale of products at plants in the survey, aggregated according to industries and firm sizes. A plant's sales amount includes sales to another plant that belongs to the same company and the amount of products self-consumed at the plant.	Undetermined
Capital labor ratio	Amount of capital is calculated as the accumulated physical investment in the recent 4 years, including the current year, discounted by a depreciation rate. Physical investment in a year is the total amount of annual investment on land, buildings, and equipments. The denominator of the ratio is the number of employment in an industry.	Negative
Ratio of female workers	Ratio of female workers to all workers in an industry. This ratio excludes the workers with university degree because their data are not available in many industries. The value is calculated as a weighted average value with regard to the number of worker-hours.	Negative
Ratio of sales share of large firms	Ratio of sales by large firms to the total sales in an industry. This ratio is a measurement of concentration ratio of large firms.	Undetermined
Relative average tenure	Average tenure of unskilled workers relative to skilled workers in an industry. The tenure variable shows average tenure year of the workers in a specific category because only aggregated data are available. This value is also calculated as a weighted average value with regard to the number of worker-hours.	Positive
Unionization ratio	Ratio of labor union members to all workers in an industry.	Positive

* Changes in these variables are used in regressions as explanatory variables.

The coefficients of trade variables will be negative. The Stolper-Samuelson theorem predicts that the relative wage of unskilled workers would decline after trade because Japan exports skill-labor-intensive commodities. The capital labor ratio will have a negative coefficient because demand for skilled workers will increase relative to demand for unskilled workers. The female worker ratio will also have a negative coefficient since most of female workers do not have advanced skills. Variables of relative average tenure and unionization ratio will have positive coefficients, assuming

that the wage increases with longer tenure and that activities of labor unions are in favor of unskilled workers. Signs of the industrial sales variable and the large firms sales share variable are not determined. The coefficients will be negative if firms pay more to skilled workers when they have larger sales.

2.4.2. Data

This analysis uses labor data taken from government statistics: the Basic Survey of Wage Structure (hereafter as "BSWS") provided by the Ministry of Health, Labor and Welfare; industry data taken from the Census of Manufacturers (hereafter as "CM") provided by the Ministry of Economy, Trade and Industry; trade data taken from Trade Statistics (hereafter as "TS") provided by the Tariff and Customs Bureau, Ministry of Finance; labor union membership data taken from the Basic Survey of Labor Unions (hereafter as "BSLU") provided by the Ministry of Health, Labor and Welfare. All of these data are published annually, and this study uses data from 1988 through 1995. The CM gives information on each industry at the 4-digit standard industry category (SIC) level. However, the BSWS provides wage data only at the 2-digit SIC level. Thus, this study provides analysis using aggregated data at the 2-digit SIC level. Table 6 shows detailed definitions of the labor data. Monetary terms such as cash earnings or sales are real value of 1995 price adjusted by CPI.

Table 6. Definitions of data

Salary	A monthly pre-tax salary paid for June in the survey year, which is calculated according to employment contracts or office rules. The salary is a cash payment and includes basic payment, a function allowance, a commuting allowance, a family allowance, and an overtime allowance. *

Working hours	Monthly working hours consisting of actual working hours based on employment contracts or office rules and overtime working hours.
Tenure	Number of years for a worker kept to be employed at a company from the recruitment to the date of the survey.
Education attainment	Highest certificate or a degree a worker has already completed. If a worker obtains a higher degree during the working years, the higher degree is applied. "Junior high school" indicates that the worker completed 9 years of schooling. "Senior high school" shows that the worker finished 12 years of schooling. "Junior college" indicates that the worker finished approximately 14 years of schooling by attending a junior college or a college of technology. "University" means that the worker completed 16 years of schooling or more by attending undergraduate or higher programs.
Worker / Employee	A "worker" in the BSWS is defined as one of the following: (i) an employee without agreed employment period, (ii) an employee with a fixed employment period more than a month, or (iii) an employee with a fixed employment period within a month or employed on a daily basis, who was employed more than 17 days each in April and in May. The definition of an "employee" in the CM is broader than a "worker" in BSWS. In addition to the categories in the BSWS, self-employees and their family members who are engaged in their business without payments are also regarded as employees in the CM. The difference in the definition of a worker can be ignored because workers in very small companies with less than 10 employees are excluded in this analysis.
Firm size	Size of a plant measured by the number of employees, classified into three categories: small (10-99), medium (100-999), and large (1000 or more).
Union membership	Number of employees who are members of labor unions in an industry. A member works at either a public enterprise or a private firm.

(Note) * The itemized components of the salary are not reported and they are not separable.

Values of import and export, and unionization ratio at 2-digit level used in this analysis are obtained by matching different official statistics. First, import penetration ratio and export ratio are obtained by matching the CM and the TS. The TS is classified based on Harmonized Commodity Description and Coding System for tariff classification purpose, and it goes down to the 9-digit level of product disaggregation. However, the product classification of the TS does not automatically match the industry classification

of the CM. There is no official concordance between the TS and the CM. To match the TS and the CM, this analysis uses the same methodology introduced by Tomiura and Uchida (2001). A certain product category code is first matched with corresponding industry category codes of the Input-Output Table. Then the industry codes of the Input-Output Table are matched with corresponding industry codes of the CM. Tomiura and Uchida (2001) present a concordance between the TS and the CM for imports. The export concordance is originally produced for this analysis.

The unionization ratio is also originally created for this analysis. The Basic Survey of Labor Unions (BSLU) presents unionization ratio at 1-digit level, but labor union membership data is available in the BSLU. To obtain unionization ratio at 2-digit level, an original dataset is created by combining labor union membership number provided by the BSLU with the employment at firms with 4 or more employees provided by the CM.

2.4.3. Limitation of the analysis

This analysis cannot cover every aspect in Japanese labor market, partly due to limited data availability caused by strict privacy protection by the Japanese government. The limitation of this analysis is summarized as follows. First, this analysis does not examine whether trade disproportionately affects skilled workers or unskilled workers, because the wages are measured in relative terms. Second, this analysis does not cover the impact of trade on wages of workers in firms where there are less than 10 employees, because the datasets on workers do not include this data. Finally, this analysis substantially uses data of male workers. The BSWS datasets miss much data on female

workers with a university degree. Data on female workers with a university degree (i.e., wages, working hours, tenure, and number of workers in a sector) are available only in some industries and only recently: they are available in three industries (print, chemical, and electric machinery) for the period between 1992 and 1995 only. This analysis is still of value in spite of these limitations because empirical analysis on the impact of trade on wage inequality in Japanese labor market has not been studied before.

2.5. Analysis of regression results

2.5.1. Regression results

The empirical analysis intends to test the hypothesis and to find the impact of trade (import ratio and export ratio) on relative labor income of workers with different education attainment at 2-digit industry level in Japanese manufacturing industry. The analysis period is from 1989 through 1995.

Table 7. Change in the hourly wage based on monthly salary of workers with senior high school education relative to workers with a university degree, regressed by changes in industrial variables.

		All workers			Large firm only			Small firms only		
		Coef.		S.E.	Coef.		S.E.	Coef.		S.E.
Changes in	Export ratio	0.483		0.445	0.245		0.229	0.383		0.337
	Import ratio	0.163		0.132	-0.047		0.068	0.190	*	0.100
	Unionization ratio	-0.378	*	0.201	-0.046		0.103	-0.284	*	0.152
	Female worker ratio	-0.135		0.276	-0.157		0.142	-0.167		0.209
	Capital-labor ratio	-0.004		0.003	-0.003		0.002	-0.002		0.002
	Large firm sales ratio	0.005		0.310	0.011		0.160	0.088		0.235
	Relative avg tenure	0.119	***	0.030	0.131	***	0.042	0.133	**	0.062
Constant		0.007	**	0.003	0.001		0.001	0.004	*	0.002
Number of obs.		133			133			133		
Adjusted R-squared		0.0888			0.0663			0.0365		

*	significant at 10% level
**	significant at 5% level
***	significant at 1% level

The results do not support the hypothesis that an increase in international trade would increase the relative wages of skilled workers. We find that overall fit of regression is very low. The value of adjusted R-squared is 0.0888 at best for the regression for all workers. The value is lower than the overall fit of regressions in existing empirical studies while the regression specifications are not the same.[17]

The coefficient of the export ratio variable is positive while it is statistically insignificant for all cases. The coefficient of the import ratio variable is positive in cases for all workers and for small firms. It is statistically significant for the small firm case, while it is negative and statistically insignificant for the large firm case. A hypothesis that the 'Stolper-Samuelson-like' effects on small firms are more than those on large firms is rejected.

These results are not consistent with the predictions of the theoretical model. First, the model predicts that the coefficients of trade variables are negative, indicating that trade increases the wage gap between skilled and unskilled workers. Second, the model predicts that there is no difference between large and small firms. It is also observed that the empirical results on the impact of trade on wages are different from the results of the previous studies using data in the US and the UK.

[17] For example, Baldwin and Cain (2000) regress the change in trade ratio with the change in factor share of skilled and unskilled workers in manufacturing industries during 1986-1992 period. The value of R-squared is around 0.2.

The signs of coefficients of other variables are the same as predicted. A variable that increases the wage gap between skilled and unskilled workers is the change in unionization ratio. The coefficient of the unionization ratio is negative in all cases, and is statistically significant in cases for all workers and for small firms. The result means that firms in highly unionized industry are more protective for skilled workers than for unskilled workers in terms of wage. The coefficient of the relative average tenure variable is positive and statistically significant in all regressions. This means that seniority wage system is prominent in Japanese manufacturing firms, and the finding is consistent with the stylized facts in Japanese labor markets.

2.5.2. Alternative dependent variable

The workers' income in the above analysis consists of monthly salary that includes various allowances. In Japan, however, determination of salary and allowances are structured and especially lacks downward flexibility. Bonus is decided, on the other hand, upon an annual negotiation between firm management and its labor union according to the profit of the firm and performance of the individual workers.[18] Therefore, bonus should be included in the income variable to reflect the difference in wages.

[18] Bonus is usually equivalent to the salary of several months, and paid in June and in December.

Table 8. Change in the hourly wages based on monthly salary and bonus of workers with senior high school education relative to workers with a university degree, regressed by changes in industrial variables.

		All workers			Large firm only			Small firms only		
		Coef.		S.E.	Coef.		S.E.	Coef.		S.E.
Changes in	Export ratio	0.278		0.445	0.199		0.230	0.347		0.353
	Import ratio	0.229	*	0.132	-0.044		0.068	0.233	**	0.105
	Unionization ratio	-0.333	*	0.200	-0.002		0.104	-0.316	**	0.159
	Female worker ratio	-0.154		0.276	-0.185		0.143	-0.174		0.219
	Capital-labor ratio	-0.005		0.003	-0.003		0.002	-0.003		0.003
	Large firm sales ratio	0.026		0.310	-0.013		0.160	0.135		0.246
	Relative avg tenure	0.124	***	0.030	0.112	***	0.042	0.170	***	0.065
Constant		0.007	**	0.003	0.001		0.001	0.005	**	0.002
Number of obs.		133			133			133		
Adjusted R-squared		0.104			0.0561			0.0626		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The fit of overall regression becomes improved in the cases for all workers and for small firm workers, while the value of adjusted R-squared is still low. The coefficient of the import ratio variable in the regression of all workers becomes statistically significant. The hypothesis that the 'Stolper-Samuelson-like' effects on small firms are more than those on large firms is again rejected. Signs of the coefficients of trade-related variables, unionization ratio, and relative average tenure variable are the same as the previous regressions. The coefficients of the relative average tenure remain statistically significant for all three cases.

One contrast that appears in the previous regression and the alternative regression is the effect of the ratio of sales by large firms to the total sales in an industry. This ratio is a measurement of concentration ratio of large firms, and a larger

concentration ratio indicates that large firms can gain economic rents in the non-competitive industry. In industries with a larger concentration ratio, the relative wage of unskilled workers at large firms decreases and that in small firms increases. It is a puzzle that the relative wage of unskilled workers at large firms declines when the industrial sales grow. The wage gap between workers at large firms and those in small firms will be discussed in the next chapter.

These regression results mentioned above do not support the hypothesis that an increase in international trade would increase the relative wages of skilled workers. Instead, they show that international trade would contribute to a decline in the relative wages of skilled workers. The regression results with Japanese data are found inconsistent with the existing studies in which American and British manufacturing industry data are used. One factor that contributes to the results is that Japan has not experienced the kind of decline in relative wage of unskilled workers that the US and the UK have. As shown in Table 4 in this chapter, the wage gap between skilled and unskilled workers in manufacturing industries on average decreased in spite of the growth in international trade during the analysis period.

The next question is why the wage gap between groups with different education attainment seems to be shrinking, unlike the cases in the US and the UK. It is possible that institutional aspects in Japanese labor markets are different from those in American and British labor markets. In spite of the existence of the wage gap between skilled and unskilled workers, Japanese employment and personnel management system that do not allow large labor mobility across firms may have a distribution effect in favor of

unskilled workers. Further exploration on labor market institution in Japanese manufacturing industry is needed to reveal why the wage gap between skilled and unskilled workers has been stable.

2.6. Conclusion

This chapter presented an empirical analysis on the impact of international trade on wage inequality between skilled and unskilled workers. A substantial number of empirical papers explain the impact of trade on labor markets in the US and the UK. However, there has been relatively little research on the effect of international trade on the wage inequality between different skill groups in various manufacturing industries in Japan. This is partly because of the difficulty in matching data among statistics of trade, wages, and industry. This chapter contributed to the empirical literature because it was the first empirical research that employs the harmonized dataset of Japan's trade, industry, and wages, allowing for comparisons of results for Japan, the UK and US.

The purpose of this analysis was to analyze the impact of trade on the wage inequality in Japanese manufacturing industries. For this purpose, this chapter employed a specific-factors model. The model can reflect the heterogeneity in Japanese labor markets. The hypothesis for the regression analysis was that international trade, either import or export, would raise the wage gap between skilled and unskilled workers. This is compatible with the 'Stolper-Samuelson-like' effects because Japan is a relatively skilled-labor-abundant country, exporting skilled-labor-intensive goods, and importing unskilled-labor-intensive goods.

The regression results showed that both the import ratio and the export ratio increase the relative wage of unskilled workers. The results did not support the prediction of the model. Furthermore, the comparison of the coefficients of import ration variables showed that imports hurt the relative wages of unskilled workers at large firms while imports favored unskilled workers in small firms. A hypothesis that the 'Stolper-Samuelson-like' effects on small firms are more than those on large firms is rejected. The theoretical model did not anticipate these results because the model did not distinguish the size of firms.

These results mentioned above did not support the hypothesis that an increase in international trade would increase the relative wages of skilled workers. Instead, they showed that international trade contributed to a decline in the relative wages of skilled workers. The regression results with Japanese data were inconsistent with the existing studies in which American and British manufacturing industry data were used. One possibility that would contribute to the results was that Japan has not experienced the kind of decline in relative wage of unskilled workers that the US and the UK have. The next question was why the wage gap between groups with different education attainment did not seem to be changing much, unlike the cases in the US and the UK. It is possible that institutional aspects in Japanese labor markets are different from those in American and British labor markets. Further exploration on labor market institution in Japanese manufacturing industry is needed to reveal why the wage gap between skilled and unskilled workers has been stable.

CHAPTER 3. ANALYSIS (2): FIRM-SIZE PREMIUM

The previous chapter analyzed the impact of trade on the wage gap between skilled and unskilled workers. One assumption in the previous analysis was that both commodity market and factor market are perfectly competitive and production technology is homogeneous. However, the results may become different if some firms face perfectly competitive markets for commodity and factors while other firms do not.

This chapter analyzes the trade impact on the wage gap between large and small firms. The impact of trade on wages can be different between workers at large and small firms even if workers are homogeneous. Large firms can extract economic rents because they can take advantage of an imperfectly competitive commodity market at home, while small firms face competitive market. An increase in trade will have different impacts because large and small firms are in different market structure. Thus, it is beneficial to focus on the difference in trade impact over firm sizes.

3.1. Introduction

This chapter examines whether Japanese data can support hypotheses derived from a theoretical model, which explains the effect of trade on wages at firms in imperfectly competitive markets. The empirical analysis in this chapter attempts to explain the relationship between the change in trade and the change in relative wage of workers at firms that previously have economic rent of imperfect competition. The analysis is based on aggregate data because individual-level or firm-level wage data are not available.

3.1.1. Significance of the analysis

This analysis presents an empirical study based on a model of trade impact on wage gap between firms with market power and firms in competitive market. The model includes workers in two different groups of firms: firms in imperfectly competitive commodity market and firms in perfectly competitive market. This analysis examines whether hypotheses based on the model can be supported by Japanese data. Japanese manufacturing industries have characteristics that the model describes. Another contribution of this research is that the dataset used in this analysis is harmonized between industry, trade, and labor data. There has been little research in Japan on the effect of international trade on wage and employment, partly because of the difficulty in matching data among trade, wages, and industry. This analysis employs the harmonized dataset, allowing for comparisons of results for Japan and other countries.

3.1.2. Definition

We can employ a legal definition of small and medium firms. A Japanese law aims to encourage business of small and medium firms. A small or medium firm in a manufacturing sector that can be a beneficiary of the policies based on the Basic Law for Medium and Small Enterprises (Revised in 1999) is a firm with 300 or less employees, or a firm with 300 million yen or less paid-in capital. The Law defines that a small-scale firm is a firm with 20 or fewer employees.[19]

A small firm in the empirical section in this chapter is defined as a firm with 19 or fewer employees, unless being specified otherwise. This is slightly different from the

[19] Article 2 of the Law

legal definition, because the statistics from which data was taken do not follow the legal classification on the firm size. The difference, however, is negligible. A large firm in the empirical section in this chapter is defined as a firm with 1000 or more employees.

3.1.3. Stylized facts

Tachibanaki and Ohta (1994) use Japanese micro data on wage and characteristics of 35,000 workers in 1978 and 1988 to find the wage differentials by the size of firm. They find that the size of firms affects wages even after controlling for various labor quality variables such as education, age, gender, and others. Larger firms are able to offer substantially higher wages than smaller firms, and their higher wages are not explained by the higher qualifications of employees in those firms.

Ariga, et al. (2000) describe the changes in the wage and employment structures of large and medium-sized firms from 1976 to 1996, using selected datasets of male workers. In the manufacturing industry as a whole, they find that at large firms relative wages of managerial workers to non-managerial workers dropped sharply in the late 1970s and gradually decreased in the 1980s and 1990s. In medium-sized firms, the relative wages decreased gradually throughout the period.

3.1.4. Statistics on large and small firms

Establishments with less than 20 employees account for more than 80% of the total number of establishments in manufacturing industries, while their share of employment is about 25% of the total employment. In contrast, establishments with more than 300 employees account for less than 1% of the number of establishments, but

more than 25% in employment. Table 10 shows the firm sizes and their share of employment.

Table 9. Number of establishments and their employment classified by firm size

Size of establishment	No. of establishment	Share	No. of employment	Share
1- 9 persons	461,038	70.8	1,699,045	15.3
10- 19 persons	88,951	13.7	1,200,972	10.8
20- 99 persons	84,458	12.9	3,345,187	30.2
100- 299 persons	12,423	1.9	1,992,086	17.9
300 persons and over	3,877	0.6	2,879,855	25.9
All sizes	650,950	100.0	11,126,145	100.00

Source: Jigyo-sho Kigyo Tokei Chosa (*Establishment and Enterprise Census of Japan*), 2001, published by the Ministry of Public Management, Home Affairs, Posts and Telecommunications – Manufacturing industry total; privately-owned firms

The following two tables show the various sizes of firms in manufacturing industries. Small and medium firms account for more than 95% of total number of firms in most manufacturing industries. They also account for high percentage of total number of employment in many industries. However, small and medium firm account only for small percentage of employment in chemical, electronic machinery, and transportation machinery industries.

Table 10. Number of establishments and their employment classified by firm size in manufacturing industries

(Firms)

Industries	Total	Small and Medium Firms			Large Firms	Ratio of Small & Medium Firms (%)
			Small Firms	Medium Firms		
Food	52,450	52,018	42,913	9,105	432	99.2
Beverage, tobacco and feed	7,321	7,246	6,414	832	75	99.0
Textile mill products	48,319	48,266	46,043	2,223	53	99.9
Apparel and other finished products made from fabric and similar materials	66,158	66,066	60,326	5,740	92	99.9
Lumber and wood products	25,217	25,191	23,451	1,740	26	99.9
Furniture and fixtures	35,345	35,315	33,864	1,451	30	99.9
Pulp, paper and paper products	14,856	14,774	12,494	2,280	82	99.4
Publishing, printing and allied industries	55,769	55,587	50,441	5,146	182	99.7
Chemical and allied products	4,829	4,522	2,891	1,631	307	93.6
Petroleum and coal products	428	407	290	117	21	95.1
Plastic products	27,419	27,283	23,558	3,725	136	99.5
Rubber products	7,375	7,322	6,462	860	53	99.3
Leather tanning and leather products, and fur skins	11,316	11,314	10,810	504	2	100.0
Ceramic, stone and clay products	26,828	26,725	22,996	3,729	103	99.6
Iron and steel	7,619	7,535	6,078	1,457	84	98.9
Non-ferrous metals and products	4,732	4,661	3,827	834	71	98.5
Fabricated metal products	80,441	80,264	73,715	6,549	177	99.8
General machinery	70,182	69,847	62,449	7,398	335	99.5
Electrical machinery, equipment and supplies	36,206	35,479	27,373	8,106	727	98.0
Transportation equipment	24,219	23,814	19,147	4,667	405	98.3
Precision instruments and machinery	11,409	11,316	9,801	1,515	93	99.2

(Thousand Workers)

Industries	Total	Small and Medium Firms			Large Firms	Ratio of Small & Medium Firms (%)
			Small Firms	Medium Firms		
Food	1,139.5	743.6	241.6	501.9	395.9	65.3
Beverage, tobacco and feed	192.4	78.9	35.7	43.3	113.5	41.0
Textile mill products	310.0	266.0	153.2	112.9	44.0	85.8
Apparel and other finished products made from fabric and similar materials	605.8	539.7	268.0	271.7	66.1	89.1
Lumber and wood products	202.2	183.9	111.9	72.0	18.2	90.9
Furniture and fixtures	210.4	186.9	120.3	66.6	23.5	88.8
Pulp, paper and paper products	268.5	188.5	69.6	118.9	79.9	70.2
Publishing, printing and allied industries	661.1	498.2	238.9	259.4	162.9	75.4
Chemical and allied products	583.4	148.9	19.0	130.0	434.5	25.5
Petroleum and coal products	37.9	x	x	x	x	x
Plastic products	409.3	317.8	128.0	189.8	91.5	77.6
Rubber products	143.5	77.1	32.5	44.7	66.4	53.7
Leather tanning and leather products, and fur skins	62.9	x	x	x	x	x
Ceramic, stone and clay products	382.2	291.6	115.0	176.6	90.6	76.3
Iron and steel	275.4	119.0	35.2	83.8	156.4	43.2
Non-ferrous metals and products	170.9	77.4	21.3	56.1	93.5	45.3
Fabricated metal products	802.8	642.9	329.3	313.7	159.9	80.1
General machinery	1,115.8	702.2	300.7	401.5	413.6	62.9
Electrical machinery, equipment and supplies	1,820.8	695.5	169.1	526.4	1,125.3	38.2
Transportation equipment	1,149.9	395.7	109.9	285.9	754.2	34.4
Precision instruments and machinery	214.9	138.7	49.4	89.3	76.2	64.5

Source: Sho-Kogyo Jittai Kihon Chosa (*Basic Survey of Commercial and Manufacturing Structure and Activity*), 1998, published by the Small and Medium Enterprise Agency.

It is rational to think that per-firm sales amount of large firms is higher than those of small firms. The following table shows the evidence.

Table 11. Per-firm sales amount by size of enterprise

(Million Yen)

Size of Enterprise (number of employees)	1000 -	500-999	10-19	4-9
Food	22,316	13,415	177	51
Beverage, tabacco and feed	-	66,097	283	88
Textile mill products	-	-	162	46
Apparel and other finished products made from fabric and similar materials	-	-	102	38
Lumber and wood products	-	-	201	62
Furniture and fixtures	-	-	166	51
Pulp, paper and paper products	-	-	194	57
Publishing, printing and allied industries	77,289	24,961	181	57
Chemical and allied products	97,173	53,919	405	159
Petroleum and coal products	-	262,449	598	360
Plastic products	42,550	22,878	185	61
Rubber products	59,981	27,651	156	55
Leather tanning and leather products, and fur skins	-	-	198	58
Ceramic, stone and clay products	51,739	29,468	296	94
Iron and steel	194,243	36,626	346	110
Non-ferrous metals and products	73,041	32,015	270	76
Fabricated metal products	55,889	20,717	191	63
General machinery	83,226	30,543	193	66
Electrical machinery, equipment and supplies	106,774	25,358	152	56
Transportation equipment	277,001	30,019	180	59
Precision instruments and machinery	59,440	24,466	155	54
Miscellaneous manufacturing industries	166,104	31,566	167	53
Manufacturing industries, Average	*139,818*	*32,789*	*192*	*61*

Source: Kogyo Tokei Chosa (*Census of Manufacturers*), 2003, published by the Ministry of Economy, Trade, and Industry.[20]

[20] Information of large firms at some industries is not available either because there are no large firms in the industries or because information is confidential to protect firms that can be easily identified. Such protection of information is necessary in industries where there are only a few large firms.

Large firms can produce more than small firms partly because there are economies of scale in production by larger firms. With economies of scale, large firms have economic rents of imperfect competition, while small firms do not have because they face with more competitive markets. Workers at large firms receive higher benefits than those in small firms thanks to the economic rents.

One of the differences among Japanese firms of different size emerges in provision of compensation and other fringe benefits. Large firms provide higher salaries, longer paid holidays, and better fringe benefits for their employees than small firms within the same industry. Table 13 shows that the average cash income per employee is higher at larger firms. Table 14 shows that workers at large firms have longer paid holidays than workers in small firms. Table 15 shows that large firms bear higher costs of fringe benefit for regular workers than small firms do.

Table 12. Average cash earning per regular employee by size of enterprise

(Thousand Yen)

Size of Enterprise (number of employees)	1000 -	500-999	10-19	4-9
Food	3,769	2,800	2,423	1,948
Beverage, tabacco and feed	-	5,813	3,437	2,822
Textile mill products	-	-	3,019	2,253
Apparel and other finished products made from fabric and similar materials	-	-	2,056	1,802
Lumber and wood products	-	-	3,232	2,709
Furniture and fixtures	-	-	3,356	2,874
Pulp, paper and paper products	-	-	3,325	2,755
Publishing, printing and allied industries	6,371	5,507	3,918	3,228
Chemical and allied products	7,496	6,356	4,318	3,868
Petroleum and coal products	-	7,876	5,207	4,802
Plastic products	6,157	5,598	3,154	2,744
Rubber products	6,047	5,476	2,997	2,613
Leather tanning and leather products, and fur skins	-	-	2,772	2,197
Ceramic, stone and clay products	6,144	6,320	3,902	3,156
Iron and steel	7,263	5,816	4,157	3,654
Non-ferrous metals and products	5,652	6,049	3,638	3,117
Fabricated metal products	5,128	5,121	3,783	3,359
General machinery	6,944	6,203	4,220	3,766
Electrical machinery, equipment and supplies	6,850	5,880	3,117	2,997
Transportation equipment	7,295	5,829	3,480	3,064
Precision instruments and machinery	6,346	5,245	3,672	3,291
Miscellaneous manufacturing industries	6,602	5,647	3,376	2,849
Manufacturing industries, Average	*6,795*	*5,525*	*3,368*	*2,907*

Source: Kogyo Tokei Chosa (*Census of Manufacturers*), 2003, published by the Ministry of Economy, Trade, and Industry.

Table 13. Average acquisition rate of paid holidays per employee by size of enterprise

(%)

	All size	1000 -	300-999	100-299	30-99
Food, Beverage, tabacco and feed	*45.1*	48.2	43.4	44.0	42.8
Textile mill products	*41.8*	43.2	41.4	40.8	42.8
Apparel and other finished products made from fabric and similar materials	*49.3*	57.9	39.4	44.8	53.7
Lumber and wood products	*49.2*	41.7	45.0	53.5	50.3
Furniture and fixtures	*43.3*	44.9	47.6	40.3	41.8
Pulp, paper and paper products	*52.6*	51.2	55.7	56.2	48.2
Publishing, printing and allied industries	*41.0*	40.0	42.3	40.1	42.0
Chemical and allied products	*55.7*	56.9	57.0	51.5	50.2
Petroleum and coal products	*77.0*	82.2	74.8	60.5	61.2
Plastic products	*50.9*	46.9	45.2	60.4	49.8
Rubber products	*47.1*	43.4	51.0	49.8	54.1
Leather tanning and leather products, and fur skins	*46.1*	-	65.3	41.0	46.8
Ceramic, stone and clay products	*52.4*	54.1	52.1	51.8	51.6
Iron and steel	*56.9*	58.7	53.8	59.8	49.1
Non-ferrous metals and products	*61.1*	66.0	58.2	53.8	54.8
Fabricated metal products	*45.9*	30.7	47.1	52.5	50.1
General machinery	*56.9*	60.3	56.3	52.7	55.2
Electrical machinery, equipment and supplies	*62.0*	64.3	62.4	55.0	50.5
Transportation equipment	*68.9*	75.3	61.4	52.9	48.9
Precision instruments and machinery	*53.0*	60.5	47.8	45.4	52.0
Miscellaneous manufacturing industries	*51.0*	46.7	54.8	52.6	55.2
Manufacturing industries, Average	*56.2*	*61.6*	*53.7*	*50.5*	*49.4*

Source: Shuro Joken Sogo Chosa (*General Survey on Working Conditions*), 2002, published by the Ministry of Health, Labor and Welfare

Table 14. Costs of fringe benefit for regular workers per month per employee by size of enterprise

(Yen)

Size of Establishment	*All sizes*	5000 -	1000-4999	300-999	100-299	30-99
Food, Beverage, tabacco and feed	*10,118*	28,725	11,222	11,419	3,667	4,292
Textile mill products	*6,583*	-	8,728	9,711	5,905	4,611
Apparel and other finished products made from fabric and similar materials	*4,457*	20,426	8,239	6,154	2,464	1,775
Lumber and wood products	*10,674*	-	39,312	10,879	6,171	4,306
Furniture and fixtures	*8,614*	-	14,209	11,745	5,860	6,129
Pulp, paper and paper products	*13,437*	-	28,622	14,455	7,230	8,248
Publishing, printing and allied industries	*7,652*	22,210	12,234	6,420	5,636	3,531
Chemical and allied products	*25,297*	38,693	31,659	13,857	10,289	7,329
Petroleum and coal products	*44,889*	-	50,634	33,325	16,830	11,256
Plastic products	*9,297*	32,130	16,107	10,805	6,061	5,450
Rubber products	*12,107*	22,442	15,471	8,089	4,990	5,054
Leather tanning and leather products, and fur skins	*7,254*	-	-	8,754	5,484	8,050
Ceramic, stone and clay products	*12,805*	39,756	20,117	11,018	7,031	4,016
Iron and steel	*21,521*	33,868	23,130	13,584	9,372	6,223
Non-ferrous metals and products	*21,570*	32,893	34,978	15,537	9,129	7,974
Fabricated metal products	*9,204*	4,159	16,206	10,882	8,477	6,500
General machinery	*13,723*	36,024	17,654	7,703	12,510	5,533
Electrical machinery, equipment and supplies	*19,739*	36,602	12,515	10,744	5,637	6,699
Transportation equipment	*19,055*	29,826	17,051	9,009	6,545	4,746
Precision instruments and machinery	*12,852*	29,374	19,108	10,783	7,651	5,404
Miscellaneous manufacturing industries	*10,059*	18,392	8,923	9,261	6,706	8,027
Manufacturing industries, Average	*15,083*	*32,961*	*17,616*	*10,400*	*6,638*	*5,209*

Source: Shuro Joken Sogo Chosa (*General Survey on Working Conditions*), 2002, published by the Ministry of Health, Labor and Welfare

Attractive compensation and fringe benefits would be good tools to prevent turnover of employees. Small firms may not be able to afford such payments. The information mentioned above can be interpreted that large firms can spend more on those tools to keep their employees because large firms invest much on their skill development through on-the-job training.[21]

[21] Ishikawa (2001) uses samples from the panel data of *the 1979 Employment Status Survey Results for Japan* and finds that, among male workers in the age group 30-39 in manufacturing industry, the turnover rate in small firms is over 30% while the turnover rate at large firms is about 4%. (p.256)

These stylized facts show that (1) the total number of employment in large firms is smaller than that in small and medium firms, (2) the sales amount per firm of large firms are larger than that of small and medium firms, and (3) workers in large firms have higher earnings, more fringe benefits and longer paid holidays than workers in small and medium firms. These support a theory that workers in large firms gain earning premium generated by economic rents of their firms. The wage gap between large and small firms can be analyzed in several aspects. The following section reviews perspectives that explain the wage gap.

3.2. Literature review

Three groups of literature are reviewed in this section. The first group is the labor literature that explains the wage gap between large firms and small firms. The second group evaluates a "dual structure hypothesis," which explains one of the characteristics of Japanese labor markets in that large and small firms face qualitatively different labor markets. The third group is the trade literature that provides theoretical models on the relationship between trade and firm behavior in imperfectly competitive markets, and empirically analyzes whether international trade affects market structure and market discipline.

3.2.1. Labor literature

Existing literature presents hypotheses on the reasons why a wage gap exists between large firms and small firms. Literature such as Groshen (1991) and Brown, Charles and Medoff (1989) classifies explanations why there is positive relationship

between firm size and wages in the US labor market. First, workers at large firms are more productive. They are more productive because they have skills for management, coordination, and supervision as well as for production. Workers at large firms have more opportunity to raise skills through on-the-job training or by utilizing management techniques embedded in organizational structure. Second, workers inside firms exercise a claim on rent. Current workers ("insiders") bargain with an employer so that they can maintain employment and higher wages and apply pressure for the employer not to hire new employees ("outsiders").[22] Payoffs of the current workers and the employer coincide when labor turnover cost or training cost is high, as observed at large firms. Third, large firms pay efficiency wage, which is above the market wage, to avoid labor shirking and reduce monitoring costs. Shapiro and Stiglitz (1984) develop a model where employees put better effort at work fearing that they would lose jobs with higher wages otherwise. Firms can take advantage of their fear by paying higher wages when monitoring their work is costly. Finally, large firms have more ability to pay and share the rent with workers.

Having examined Japanese labor markets, Tachibanaki (1996) suggests that the quality differences hypothesis, 'ability to pay' hypothesis, and 'rent-sharing' hypothesis are applicable in Japan.[23] The author examines whether the 'ability to pay' hypothesis is relevant to explain the wage premium by size in Japan, using about 50,000 individual-level data taken from the Basic Survey of Wage Structure conducted in 1978

[22] Lindbeck and Snower (1986)
[23] Tachibanaki (1996) states that the 'rent-sharing' hypothesis is a variant of the 'ability to pay' hypothesis. (p.68)

and in 1988. The Industry Survey is also used to obtain data on productivity, sales, and profits. This is a cross-sectional analysis, which pools two years' data. The dependent variable is wage premium by firm size, adjusted by gender, age, job tenure, education, industry, occupation, and region. Explanatory variables are profit rate, labor productivity, capital-labor ratio, unionization ratio, and labor separation ratio. Variables found statistically significant at 5% are profit rate, labor productivity, capital-labor ratio, and unionization ratio. The coefficients of these variables are positive. Based on these results, the author concludes that the 'ability to pay' hypothesis and/or the 'rent-sharing' hypothesis are supported in Japan in the determination of firm-size wage premiums. Tachibanaki (1996) does not show the detailed definition of variables, the methodology of the regression, or how the profit rate and labor productivity are calculated. It is also unclear how industries are classified.

The 'ability to pay' hypothesis illustrates two characteristics of Japanese firms. One is that large firms in many sectors are oligopolists and have market power. Market power is defined here as the ability of a market participant to influence the price, quantity, and nature of the product in the market. Large firms with market power ensure long-term profitability, and possibly pay higher wages.[24] The other is that large firms have many subcontracting firms. These subcontractors sell their products continuously, with cheaper prices and better quality, to a "parent" firm in a long-term relationship.

It requires detailed data to examine whether the 'ability to pay' hypothesis is supported. Industry-level data is not appropriate to examine the quality difference of

[24] Tachibanaki (1996) supports this view. (p. 172)

workers between large and small firms. It requires individual level or firm level data to analyze whether a wage gap is caused by difference in firms' ability to pay.

3.2.2. "Dual structure hypothesis"

Existing literature evaluates "dual structure hypothesis." The hypothesis assumes that the labor market is divided into several different markets: workers at large firms belong to internal labor market while workers in small firms belong to external labor market. The hypothesis claims that the wage gap between large and small firms can be explained by the difference of these markets. Some studies relate the wage gap to the vertical corporate relationship between large and small firms.

Ishikawa (2001) discusses about factors underlying a persisting wage disparity between firms of different size. He critically reviewed the prevailing interpretation in existing empirical studies that the wage disparity reflects differences in workers' average quality at hiring. He presents an alternative explanation based on the dual labor market hypothesis. One of the core concepts of the dual labor market hypothesis is that internal labor market and external labor market are contrasted. While both large firms and small firms have both types of labor markets, the wage disparity emerges among firms of different size because (a) large firms have a larger proportion of internal labor than small firms do, and (b) among the internal workers, the learning intensity of firm-specific skills is higher at large firms.[25] The author further explains that the reason (a) is a reflection of the fact that the subcontractors (which make up a large proportion of small firms) play the

[25] If his explanations are true, observed wages at large firms do not necessarily reflect their workers' marginal productivity. The impact of trade on the wage gap between large and small firms would depend not only on the sensitivity of market wages to trade but also on the sensitivity of the institution to trade.

role of external labor to large firms. His empirical analysis does not refer to the subcontracting relationship between large and small firms.

Aoki (1988) analyzes characteristics of the institutional setting of the hierarchical corporation grouping with a large firm and subordinate suppliers and contractors, observing firms in automobile manufacturing industry. He refers to the organizational characteristics as *quasi integration*, because subcontractors not only function as the in-house division of a cooperate group, but also pursue their own research and development, where development of new technology provides them with bargaining power in the future negotiation of profit margins (p. 214). Aoki (1988) criticizes the traditional dual-structure hypothesis that has made the monopsonic power of the primary contracting firm a focal point as one-sided, because the traditional hypothesis ignores an insurance function of subcontracting by the primary manufacturers. However, his analysis focuses mainly on industrial structures, and his analysis on wage inequality between large and small firms is limited. Analyses using empirical methods can provide a more detailed picture of the wage inequality.

Ishikawa and Yee (1996) show that average wages at small and medium firms with a subcontract with a single parent firm are lower than average wages at firms of the same size without subcontracts. They use cross-sectional data for 1987, combining individual-level data on wages and firm-level data on production, covering more than 4,000 individuals. Workers at firms who sell more than 90% of their output to their parent firms receive lower wages than workers with the same characteristics (such as male, female, production workers, or administrative workers) at firms with no

subcontracts. On the other hand, average wages at firms that have multiple parent firms are higher than firms with no subcontracts. These results support a view that subcontracting relationships affect wages regardless of firm sizes.

As presented above, a wage gap between large firms and small firms reflects, in part, the relationship between primary manufacturers and subcontractors. It may be desirable for theoretical and empirical models to show how international trade affects the "subcontracting premium (or discount)" of small firms. Subcontracting is one of the reasons that large firms, primary manufacturers, obtain economic rents when small firms (subcontractors) do not. The following table shows the ratio of small and medium subcontractor firms in manufacturing industries. The ratio has been high in textile, apparel, leather, and machinery industries. The ratio has been low in food and beverage industries. On average, more than half of small and medium firms in manufacturing industries have been subcontracted.

Table 15. Ratio of small and medium subcontractor firms in manufacturing industries

(%)

Industries / Year	1966	1971	1976	1981	1987	1998
Food	16.5	30.2	14.5	17.5	8.2	8.6
Beverage, tobacco and feed	-	-	-	-	-	5.9
Textile mill products	79.8	75.9	84.5	84.9	79.7	76.4
Apparel and other finished products made from fabric and similar materials	73.6	71.4	83.9	86.5	79.1	70.8
Lumber and wood products	35.0	43.8	42.9	48.0	21.7	22.2
Furniture and fixtures	45.6	49.4	41.2	51.6	38.5	23.7
Pulp, paper and paper products	51.0	43.9	44.8	51.6	41.3	44.2
Publishing, printing and allied industries	46.3	51.0	50.8	59.0	42.0	30.8
Chemical and allied products	40.2	38.7	37.1	38.5	22.5	23.4
Petroleum and coal products	30.1	30.7	27.0	38.9	18.4	11.8
Plastic products	-	-	-	-	68.7	58.5
Rubber products	62.3	54.3	61.1	71.8	65.6	58.4

Leather tanning and leather products, and fur skins	60.0	64.5	62.5	68.8	64.7	61.7
Ceramic, stone and clay products	33.8	34.0	29.4	36.6	35.5	27.0
Iron and steel	66.0	66.0	70.4	72.0	52.6	47.4
Non-ferrous metals and products	67.1	69.7	68.7	73.6	62.3	45.4
Fabricated metal products	66.3	71.7	74.8	78.6	71.0	58.4
General machinery	70.7	75.8	82.7	84.2	74.8	59.2
Electrical machinery, equipment and supplies	81.4	78.9	82.3	85.3	80.1	65.2
Transportation equipment	67.1	77.9	86.2	87.7	79.9	69.3
Precision instruments and machinery	72.3	70.7	72.4	80.9	70.4	58.8
Miscellaneous manufacturing industries	50.8	58.7	56.5	62.2	43.5	31.4
Manufacturing Industries, total	*53.3*	*58.7*	*60.7*	*65.5*	*55.9*	*47.9*

Ratio = Number of small and medium subcontractors / Number of small and medium firms in the industry

Source: Kogyo Jittai Kihon Chosa (*Basic Survey of Manufacturing Structure and Activity*), 1966-1987, published by the Small and Medium Enterprise Agency; Sho-Kogyo Jittai Kihon Chosa (Basic Survey of Commercial and *Manufacturing Structure and Activity*), 1998 published by the Small and Medium Enterprise Agency.

However, it is neither necessary nor realistic to construct such models that can show the effect of international trade on subcontracting premium. First, not all small firms are engaged in subcontracting. Second, the dependency on a primary manufacturer is not similar among subcontractors. Subcontracting firms may have exclusive contracts with a single primary firm and others may have contracts with several primary firms. Sales share to primary firm(s) may vary from one subcontractor to another. A model would become complicated if all of these classifications were included in the model. Finally, data on subcontractors' dependency on primary firms was not published between 1987 and 1998.

3.2.3. Trade literature

Labor literature explains why wages vary in firms of different sizes. However, labor literature cannot explain whether and how international trade affects the wage gap

between large and small firms. Trade literature provides theoretical models and empirical analyses on the relationship between international trade and market structure. The idea of the models is that domestic firms lose rents and behave more competitively when imports increase in markets where otherwise domestic firms have market power. This idea is named as the "imports-as-market-discipline" hypothesis.[26]

Helpman and Krugman (1989) present an oligopolist model, where restrictive trade policies reduce domestic competition. The model can explain the opposite case. Domestic firms, who may have had oligopoly profits in a domestic market, are forced to behave more competitively, when competition with foreign products becomes intensified after trade liberalization.

Borjas and Ramey (1995) construct a model of two sectors, one of which is perfectly competitive and the other is characterized as Cournot oligopoly. They assume that the markup on goods sold abroad is the same as the markup on goods sold domestically, so that a decrease in exports has the same impact on profits as an increase in imports. The production function in the model is rather simple, and labor is the only production factor. The model predicts that an increase in net imports reduces economic rents of oligopoly firms, so the wage premium to workers employed by them also decline. The model assumes that there is a labor union in oligopoly industry, and that each firm negotiates with the union over wages and employment. However, this assumption is not necessary for the prediction.

[26] Levinsohn (1993) introduces this hypothesis and examined empirically, while the concept itself was presented previously.

Existing empirical literature analyzes whether international trade affects market structure and market discipline. Levinsohn (1993) examines whether import liberalization in 1984 reduced markups in the pricing policy of firms in Turkish manufacturing industries. He uses firm-level data in eleven 3-digit ISIC industries, covering about 800 firms for 4 years. He finds that markups decreased in imperfectly competitive industries in which trade was liberalized.

Harrison (1994) examines whether increased competition caused by import liberalization increases productivity among manufacturing firms in Cote d'Ivoire. Using plant-level data of 246 firms during the period 1979-197, she explores changes in market power and productivity after the 1985 trade liberalization. She finds that increased openness such as import penetration and tariffs lowers excess profits and increases productivity.

Abowd and Lemieux (1993) assess whether product market competition affects negotiated wage settlements in Canadian manufacturing industries. The authors find that prices of import and export represent exogenous demand shocks that increase product market competition. Increased foreign competition in the form of lower import prices reduces both wages and quasi-rents per worker.

Katics and Petersen (1994) find that changes in import competition, measured by market share of imports, had negative correlation with changes in price-cost margins during the 1976-1986 period, using 67 sector of industry data at 4-digit level for the US. Their findings support a view that increased import competition reduced oligopoly rents in industries that had high level of domestic concentration.

Borjas and Ramey (1995) compare wages of different skill levels in both "concentrated" (that is, oligopolistic) and competitive industries during 1976-1990 period. The authors find that trade negatively affected overall employment of unskilled workers in concentrated industries, and that trade could have accounted for a tenth of rise in the returns to skills in the industries.

Black and Brainerd (2002) look at the impact of import liberalization on labor market from a different perspective, implicitly assuming that increased imports are equivalent to an increase in competition within an industry. They test the hypothesis that increased competition resulting from trade will force employers to reduce wage discrimination against female workers. They use individual-level wage data combined with 3-digit level trade data over the 1976-1993 period. They find support for their hypothesis: the loss of market power in an industry is likely to reduce discrimination and increase the relative price of female workers.

The empirical literature mentioned above explains consequences of competition resulting from increased trade. The empirical analysis in this chapter is in the same context as these previous studies, and attempts to explain the relationship between the change in trade and the change in relative wage of workers at firms that previously have economic rent under imperfect competition.

3.3. Theoretical Model

The theoretical model in this chapter is based on a model presented by Borjas and Ramey (1995), from which the notations and equations are taken. My model is different from Borjas and Ramey (1995) in that my model assumes homogeneous labor

while their model assumes that workers can be divided into educated and less educated groups. In spite of the difference, my model can explain the relationship among international trade, rent gained from imperfect competition, and wage determination assuming that the rent is shared with workers.

3.3.1. Assumptions and specification

The model has the following basic assumptions:

1. There are two symmetric countries, Home and Foreign. In each country, there are two industries. One is an imperfectly competitive industry, and the other is an industry characterized by perfect competition and constant returns to scale.
2. Labor is homogeneous. However, workers cannot freely move between industries in the short run because of institutional reasons in the imperfectly competitive industry.
3. The ratio of total wage bill to the sales value of a firm remains constant over time. No technical development over the analysis period.
4. Perfect information and homogeneous technology across countries.
5. Changes in trade are given as exogenous.
6. Balanced trade in two countries.

The model is constructed as follows. Consumption goods, x_0 and x_1, are produced at sectors, 0 and 1, respectively. The sector 1 is set as the imperfectly competitive sector, and it has n firms that behave as Cournot oligopolists participating in a symmetric equilibrium. Goods in this sector are also produced and consumed in Foreign. The demand for the good x_1 by domestic consumers is given by the inverse demand curve:

$$p_1 = \alpha_0 - \alpha_1 x_1$$

where p_1 is the price of x_1 relative to the price of x_0. The inverse demand function perceived by each domestic firm i is given by:

$$p_1 = \alpha_0 - \alpha_1 \left[x_{1i} + (n-1)x_1' + m \right]$$

where x_{1i} is the amount produced by firm i, x'_1 is the amount produced by each other domestic firm, and m is the net import of the good. It is implicitly assumed that the mark up on exported goods is the same as the markup on the goods sold domestically. Thus, a decrease in exports has the same impact on profits as an increase in imports.

It is assumed that labor is the only factor of production. The production function for firm i is specified as $x_1 = L_{1i}$, where L_{1i} is the number of workers employed by firm i in sector 1. It is further assumed that a firm in sector 1 pays higher wage for their employees than firms in sector 0 do, in order to prevent turnover of the workers, to maintain certain quality of labor, and / or to avoid possible collective actions of workers. The economic rents of firm i are given by

$$\text{Rents}_i = p_1 x_{1i} - w_0 L_{1i}$$

and w_0 is the wage in the competitive sector. The wage in the sector 1, w_1, will be set so that workers receive a fraction of γ of the rents. The value of the fraction depends on the firm's calculation of expected wage. For simplicity, it is assumed that γ is constant in this analysis.

By maximizing the rents by each firm and its workers, equilibrium production of x_{1i} is obtained as:

$$x_{1i}^* = \frac{\alpha_0 - w_0 - \alpha_1 m}{\alpha_1 (n+1)},$$

and equilibrium rents of firm i and its workers become

$$\text{Rents}_i^* = \frac{(\alpha_0 - w_0 - \alpha_1 m)^2}{\alpha_1 (n+1)^2}.$$

The rents that workers at the firm capture are equal to the product of γ and the equilibrium rents. Therefore,

$$(w_1 - w_0) L_{1i} = \gamma \frac{(\alpha_0 - w_0 - \alpha_1 m)^2}{\alpha_1 (n+1)^2}.$$

By using the product function to replace the equilibrium employment with the equilibrium production, the equilibrium wage in sector 1 is obtained as

$$w_1^* = w_0 + \gamma \frac{\alpha_0 - w_0 - \alpha_1 m}{n+1}.$$

With this model, it is clear that an increase in net imports decreases the equilibrium wage in sector 1. An increase in net imports reduces rents in the imperfectly competitive sector, and the wage premium to workers employed in the sector declines. As mentioned before, the effect is the same whether the increase is due to an increase in imports or to a decline in exports to the Foreign market.

Under the assumption of a symmetric equilibrium, the industry output in sector 1 is nx_{1i}^*. Thus, the number of workers employed in sector 1 is given by nL_{1i}^*, or

$$L_1^* = \frac{n}{n+1} \frac{\alpha_0 - w_0 - \alpha_1 m}{\alpha_1}.$$

The equilibrium wage in sector 1 is not efficient, in the sense that labor demand does not depend on w_1. The demand for labor in this sector will not be equal to the supply of labor. It is assumed that the parameter values are such that there will be excess supply of labor in the sector.

Regarding the competitive sector, sector 0, it is assumed that its production function is similar to that in sector 1: $x_0 = L_0$. The price of x_0 has been normalized to one, and so is the wage in the competitive sector: $p_0 = w_0 = 1$.

It is assumed that there is a representative worker-consumer, who supplies labor. The consumer has the utility function,

$$U = x_0 + \alpha_0 x_1 - \frac{1}{2}\alpha_1 x_1^2, \text{ where } \alpha_0, \alpha_1 > 0$$

with labor endowment

$$L_0 + L_1 = 1.$$

As mentioned above, equilibrium employment in sector 1 will be determined by the demand for labor in the sector, rather than by the consumer's choice, because of the assumed presence of excess supply of labor. The employment in sector 0 will be the difference between labor endowment and the employment in sector 1:

$$L_0^* = 1 - \frac{n}{n+1}\frac{\alpha_0 - w_0 - \alpha_1 m}{\alpha_1}$$

We can calculate the effect of net imports on the equilibrium wage in the oligopoly sector relative to competitive sector by following comparative static exercises:

$$\frac{\partial L_0^*}{\partial m} = \frac{n}{n+1} > 0$$
$$\frac{\partial L_1^*}{\partial m} = -\frac{\partial L_0^*}{\partial m} < 0$$
$$\frac{\partial w_1^*}{\partial m} = \frac{\partial (w_1^* / w_0^*)}{\partial m} - \frac{\gamma \alpha_1}{w_0^*(n+1)} < 0$$

Thus, an increase in net imports of the good produced in the oligopoly industry shifts labor from the oligopoly sector to the competitive sector, and decreases the wage in the oligopoly sector relative to the wage in the competitive sector.

3.3.2. Hypothesis

The model predicts that the relative wage for workers in oligopoly industries will decline when the competition with imports becomes more severe. Considering that the market power of large firm is larger than that of small firms, it is assumed that oligopoly industries are mainly comprised of large firms and that competitive industries involve small firms. The hypothesis brought in and examined in this chapter is that the wage of workers at large firms relative to the wage at small firms falls when large firms lose oligopoly rents in the domestic market through import competition.

3.4. Regression Specification

The regression analysis intends to examine how trade affects the earnings of workers at large firms relative to those at small firms. The impact of trade on the wage gap between large firms and small firms can be estimated by the following equation:

$$d\left(\frac{w_l}{w_s}\right) = \alpha + \beta_1 d(trade_i) + \gamma d(z_i) + \varepsilon \qquad \text{(Specification I)}$$

If the dataset has small firms in concentrated industries and large firms in competitive industries, the intra-industry wage gap at concentrated industries can be estimated by an alternative specification:

$$d\left(\frac{w_{i,l}}{w_{i,s}}\right) = \alpha + \beta_1 d(trade_i) + \beta_2 concen_i + \beta_3 d(trade_i \times concen_i) + \gamma d(z_i) + \varepsilon \qquad \text{(Specification II)}$$

where d ($trade_i$) is the change in the import share and export share in industry i, and $concen_i$ is an indicator variable which is equal to one if the industry was concentrated in 1988.[27] Specification II is an ad hoc model because the theoretical model does not predict about intra-industry wage gap. Specification II regression aims to find the correlation between trade and the wage gap in concentrated industries. In this specification, the inclusion of the dummy variable for concentrated industries is necessary because the dummy variable allows for a differential change in the wage gap between large and small firms for concentrated industries relative to competitive industries. The variable z represents other industry characteristic variables. The primary parameter of interest is β_3, which represents the marginal effect of trade on concentrated industries.

3.4.1. Variables

The dependent variable for the regression of Specification I is the change in the average cash earnings per worker at large firms in concentrated industries relative to

[27] This methodology is similar to Borjas and Ramey (1995) and Black and Brainerd (2002). As in their analyses, a continuous variable is not used to represent the concentration ratio. Increased competition caused by international trade could affect the concentration ratio in the industry. The concentration indicator is not allowed to vary over the analysis period to capture the full impact of trade on competition.

those at small firms in competitive industries. The dependent variable for Specification II is an annual change in the fixed-weight average of the ratio of average cash earnings per employee at large firms to average cash earnings per employee in small firms in each industry. The average cash earnings per employee are obtained as firms' total cash payment amount divided by the total number of employees in the category. The fixed weight for each industry is defined as the industry's average share of total employment over the period of 1988-1995. A "concentrated" industry is defined as an industry where the ratio of sales by large firms to the total sales is larger than 40% in 1988. Concentrated industries in the dataset are steel (SIC 26), electronic machinery (SIC 30), and transportation machinery (SIC 31).

Explanatory variables in this analysis include changes in trade-related variables, concentrated market indicator, and change in capital labor ratio to control characteristics of each industry. Trade-related variables are the import ratio, the export ratio, and interaction terms between trade variables and concentrated market indicator. A change in variables is obtained by subtracting a year's data from the data of the previous year. Concentrated market dummy and the interaction terms are used only in the regression for Specification II. The following table shows definitions of the explanatory variables.

Table 16. Explanatory variables

Import ratio	Ratio of value of imports to the value of sales of output in domestic market in an industry.
Export ratio	Ratio of value of exports to the sales of output in domestic market in an industry.
Concentrated market indicator	This is equal to one if the ratio of sales by large firms to the total sales in an industry is larger than 40% in 1988. This ratio is a proxy for sales concentration ratio of large firms. *
Import ratio x Concentrated market indicator	Interaction term

Export ratio x Concentrated market indicator	Interaction term
Capital labor ratio	Amount of capital is calculated as the accumulated physical investment in the recent 4 years, including the current year, discounted by a depreciation rate. Physical investment in a year is the total amount of annual investment on land, buildings, and equipments. The denominator of the ratio is the number of employment in an industry.

(Note)
* The definition of market concentration ratio in this table does not follow a standard definition. The sales share of several largest firms is usually used to measure market concentration ratio. However, 2-digit SIC level is so aggregated that market concentration ratio in the standard definition cannot be obtained.

For Specification I, import variable should have a negative coefficient and export variable should have a positive variable. The sign of the coefficient of capital labor ratio is undetermined. For Specification II, the predicted sign of the concentrated market indicator coefficient is positive because large firms in concentrated industries have economic rent. The predicted sign of coefficient of the interaction term between concentrated market indicator and import ratio is negative because imports would make large firms lose market power. The predicted sign of coefficient of the interaction term between concentrated indicator and export ratio is positive because large firms will gain more market power by exporting. The table below summarizes the predicted signs of coefficients for the second specification.

Table 17. Predicted signs of the coefficients of explanatory variables (Specification II)

Explanatory variables	Prediction
Concentrated market indicator	Positive
Change in Concentrated x Import	Negative
Change in Concentrated x Export	Positive
Change in capital labor ratio	Unclear

3.4.2. Data

The data are taken from government statistics: industry data taken from the Census of Manufacturers (hereafter as "CM") provided by the Ministry of Economy, Trade and Industry; and trade data taken from Trade Statistics (hereafter as "TS") provided by the Tariff and Customs Bureau, Ministry of Finance. All of these data are published annually, and this study uses data from 1988 through 1995. The CM gives information on each industry at the 4-digit standard industry category SIC level. However, this study provides analysis using aggregated data at the 2-digit SIC level, because trade statistics and industry statistics are matched at 2-digit level using the same method used in Chapter 2. Analysis using more disaggregated data is left for further investigation. Finally, monetary terms such as cash earnings or sales are real value of 1995 price adjusted by CPI.

Table 18.Definition of data

Cash earnings	Total of annual cash payment including basic wages, bonuses, retirement allowances, and other allowances and premiums.
Employee	Employees refer to the regular employees, working proprietors, self-employees, and their family members who are engaged in their business without payments.
Firm size	Size of a plant measured by the number of employees. Small firms have employees less than 20. Large firms have 1000 or more employees.
Sales of output	The total of the value of manufactured goods shipments, receipts from processing or repairing, sales of scrap and wastes and other receipts (such as receipts from cold storage, advertising, sales of surplus electric power generated by establishments, etc.)

3.4.3. Limitation of the analysis

The limitation of this analysis is summarized as follows. First, this analysis does not examine whether trade disproportionately affects large firm workers or small

firm workers, because the wages are measured in relative terms. Second, this analysis does not examine the procedure of the wage determination mechanism at large firms that is described in the theory. The empirical results will be used to judge whether Japanese data supports the theory or not. It is not in the scope of the study to find which procedure is inconsistent with the data when the regression results show the theory is not supported. Finally, this analysis does not use more disaggregated data because the Census of Manufacturers does not disclose numbers, such as total cash earnings and sales of output, which can be used to identify specific firms. This strict policy is to secure confidentiality of the firms. Data of large firms are not available when there are only one to three large firms in an industry. In spite of these limitation, the analysis is still of value because empirical analysis on the impact of trade on wage inequality in Japanese labor market has not been fully studied before.

3.5. Analysis of regression results

3.5.1. Regression results

The empirical analysis intends to test the hypothesis and to find the impact of trade (import ratio and export ratio) on average cash earnings per worker at large firms relative to average cash earnings in small firms. The model of the Specification I assumes that concentrated industries are mainly comprised of large firms and that competitive industries involve small firms. The analysis covers 1988-1995 period. The dependent variable for the regression of Specification I is the change in the average cash earnings per worker at large firms in concentrated industries relative to those at small firms in competitive industries. Explanatory variables are the changes in import

and export ratios, and changes in capital labor ratio. The following table summarizes the regression results.

Table 19.Change in the average cash earnings per worker at large firms in concentrated industries relative to those at small firms in competitive industries, regressed by changes in industrial variables. (Specification I)

		Base			Including K/L ratio		
		Coef.		S.E.	Coef.		S.E.
Change in	Import ratio	2.085	*	0.938	2.195		0.947
	Export ratio	-2.981		1.468	-2.593		1.523
	Capital labor ratio	-		-	-0.019		0.019
	Constant	-0.007		0.015	-0.011		0.015
Adjusted R-square		0.600			0.598		
Number of Obs		7			7		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The number of observations is small because there is only one observation for a year. The signs of coefficients are not consistent with the prediction of the theory. The import variable has a positive and statistically significant variable for the regression without the variable of capital labor ratio. The export variables in both cases have negative but statistically insignificant coefficients.

The fit of overall regression is high in spite of significance of each coefficient, and it is possible that there is substantial multi-collinearity relationship among import ratio, export ratio, and capital labor ratio. Because of this problem, the regression results become less reliable. It is possible that there is no significant relationship between the relative wage in concentrated industry and international trade.

3.5.2. Alternative dependent variable

The dataset contains large firms and small firms both in oligopoly industries and in competitive industries. The alternative regression intends to confirm the predicted signs of coefficients for Specification II using industry data at 2-digit industry level. The next table summarizes the results of the estimation.

Table 20. Change in the average cash earnings per worker at large firms relative to those in small firms, regressed by changes in various industrial variables. (Specification II)

		Coef.		S.E.
Concentrated Market Indicator		0.007		0.024
Change in	Import ratio	0.374		0.447
	Export ratio	1.152		1.509
	Import x Concentration	2.416		2.821
	Export x Concentration	-1.702		2.589
	Capital labor ratio	-0.033	***	0.011
	Constant	-0.014		0.011
	Adjusted R-square	0.078		
	Number of Obs	98		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The coefficients of two explanatory variables of primary interest do not confirm the predicted signs, while they not statistically significant. The interaction term between concentrated market indicator and import rate has positive coefficient, while the interaction term between concentrated indicator and export rate has negative coefficient, but neither coefficient is statistically significant. Even if the coefficients were significant, their signs are the opposite of that predicted by the hypothesis. These results show that there is no evidence to support the hypothesis that imports in concentrated industry would reduce the economic rent and the relative wage of large firms.

The results for Specifications I and II show that the hypothesis of the model and the prediction is not consistent with the Japanese data. One factor that contributed to the results is that some assumptions of the model are not fulfilled. The assumptions that may not be consistent with the data include (1) that the share of total wage bill in a firm's sales value remains constant over time; and / or (2) that the good produced in the concentrated sector is traded.

The ratio of total wage bill to a firm's total sales may vary when pricing policy of the firm changes. Firms may raise the price of their products but do not increase the wage bill in proportion to the increase of the product price, raising the markup rate of the sales. The markup rate will be unity for small firms because they face with competitive market. The markup rate may vary for large firms reflecting their optimal pricing policies in imperfectly competitive market. If this is the case, the empirical estimation of the impact of trade on wages at large firms will not be accurate.

International trade may affect small firms even when large firms can keep the market power. Small firms producing domestic commodities that can be substituted by imports are sensitive to changes in international trade. The average cash earnings at large firms relative to the average cash earnings in small firms increase when small firms face severe competition with imports, and decrease when the sales by small firms becomes larger by exporting to foreign markets. Foreign outsourcing is an example that imports hurt workers in small firms because products supplied by foreign firms are cheaper than and competing against domestic products of small firms. The contents of traded goods should be distinguished to empirically examine whether this view is

supported by data. Data at 4-digit SIC level at least or plant level at best will be necessary for the analysis.

3.5.3. Controlling for the change in unionization ratio for Specification II

The model in this analysis assumes that the average cash earnings at large firms are set higher than those in small firms. One factor that may affect the regression results and that was not included in the analysis is the change in unionization over the period. It is necessary to control for the change in unionization rate in estimating the impact of trade on the wage structure, because otherwise the estimation results may reflect the impact of lower union power. The following table includes the change in the percentage of workers unionized in each industry.

Table 21. Change in the average cash earnings per worker at large firms relative to those in small firms, regressed by changes in various industrial variables including unionization rate. (Specification II)

		Base			Alternative		
		Coef.		S.E.	Coef.		S.E.
Concentrated Market Indicator		0.007		0.024	0.006		0.024
Change in	Import ratio	0.374		0.447	0.114		0.465
	Export ratio	1.152		1.509	1.404		1.631
	Import x Concentration	2.416		2.821	3.326		2.843
	Export x Concentration	-1.702		2.589	-1.717		2.620
	Capital labor ratio	-0.033	***	0.011	-0.034	***	0.012
	Unionization rate	-		-	-0.320		0.701
	Constant	-0.014		0.011	-0.013		0.011
	Adjusted R-square	0.078			0.056		
	Number of Obs	98			98		

* significant at 10% level
** significant at 5% level

*** significant at 1% level

The results are nearly identical to those without unionization. The overall fit of the regression becomes lower because the unionization variable has a statistically insignificant coefficient. This suggests that the results do not reflect changes in unionization rates within industries.

3.5.4. Alternative dataset for Specification II

One of the shortcomings of data in the Census of Manufacturers is that characteristics of workers are not included. It is reasonable to examine the trade impact on the wage gap between large and small firms, controlling for the education attainment of the workers. An alternative dataset is used to estimate the impact of trade on the wage gap, while the regression specification remains the same. The dataset is the one used in the analysis in Chapter 2, consisting of combined data from the Basic Survey of Wage Structure and the Census of Manufacturers. For this alternative analysis, a small firm is defined as a firm with 10 through 99 employees. The dependent variable is an annual change in the fixed-weight average of the ratio of average annual income (that is, salary and bonus) at large firms to average annual salary in small firms for high school graduates. The fixed weight for each industry is defined as the industry's average share of total employment over the period of 1988-1995. The following table shows the estimates of the impact of trade on the wage gap between large and small firms.

Table 22. Change in the average annual income at large firms relative to those in small firms, regressed by changes in various industrial variables.

		Base			Including unionization		
		Coef.		S.E.	Coef.		S.E.
Concentrated Market Indicator		-0.005		0.013	-0.008		0.013
Change in	Import ratio	-0.582	***	0.207	-0.684	***	0.213
	Export ratio	0.513		0.716	-0.394		0.860
	Import x Concentration	0.034		1.589	0.271		1.579
	Export x Concentration	-1.177		1.420	-0.506		1.452
	Capital labor ratio	-0.008		0.005	-0.003		0.005
	Unionization rate	-		-	0.611	*	0.328
	Constant	-0.007		0.005	-0.007		0.005
	Adjusted R-square	0.051			0.069		
	Number of Obs	133			133		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The regression results using the alternative dataset also show that there is no evidence to support the hypothesis that imports in concentrated industry would reduce the economic rent and the relative wage of large firms. The overall fit of the regression is slightly lower than the regression with original dataset. The results using the alternative dataset show that the coefficient of import ratio variable is negative and statistically significant with or without unionization rate variable. The coefficient of the interaction term between market concentration indicator and import ratio is positive and the coefficient of the interaction term between concentration indicator and export ratio is negative. The both coefficients are statistically insignificant. These results mean that imports tend to decrease the wage gap between large and small firms, but they do not function as forces "to discipline the market" in concentrated industries.

One major difference in estimation results between the base dataset and the alternative dataset can be found in the coefficient of unionization ratio. Unionization ratio has a negative and statistically insignificant coefficient with the base dataset, and it has a positive and statistically significant coefficient with the alternative dataset. If concentrated industries are more unionized than other industries, and large firms are more unionized than small firms, then the rise in unionization rates would likely to enlarge the wage gap between workers at large and small firms. The estimation result with the alternative dataset makes more sense with the interpretation.

3.6. Conclusion

This chapter examined whether Japanese data could support a theoretical model that explained the effect of trade on the relative wage in oligopoly markets. Existing empirical literature explained various consequence of increased competition resulting from increased trade, such as the loss of markups, increases in productivity, or declines in discriminatory wage gaps. The model predicted that firms in concentrated industries would lose market power when increased imports caused competition with foreign suppliers. This chapter explained the relationship between trade and the inter-industry wage gap between oligopoly industries and competitive industries based on the model. The impact of trade on the intra-industry wage gap between large and small firms in oligopoly industry was also explored based on an ad hoc regression specification.

The regression results based on the theoretical model showed that the average cash earnings in oligopoly industries relative to those in competitive industries increased when import ratio increased. However, the results may not be reliable because it was

likely that there was substantial multi-collinearity relationship among import ratio, export ratio, and capital labor ratio. It is possible that no significant relationship was detected between the relative wage and trade.

The regression results based on the ad hoc model showed that there was no evidence to support the hypothesis that imports in concentrated industry would reduce the economic rent and the relative wage of large firms. An alternative dataset that included characteristics of workers was used to control for the education attainment of the workers. The regression results with the alternative dataset showed similar results on the trade impact on wages in oligopoly industries. They showed no evidence for the hypothesis that trade would function as forces "to discipline the market" in oligopoly industries.

These results showed that data in Japanese manufacturing industries did not support the theory that imports would reduce the market power of large firms and would decrease their relative wage, unlike existing studies with other countries' data. It is possible that the theoretical model did not reflect the institutional aspects. Furthermore, some assumptions of the theoretical model were violated. The violated assumptions included (1) that the share of total wage bill in a firm's sales value remained constant over time; and / or (2) that the good produced in the concentrated sector was traded. Empirical analysis with more disaggregated data will be required to prove uniqueness of Japanese labor markets.

CHAPTER 4. ANALYSIS (3): REGULAR EMPLOYMENT PREMIUM

The previous chapter analyzed the impact of international trade on the wage gap between different markets. The difference in the impact reflected the difference in market structure even if workers were assumed to be homogeneous. The results of the previous chapter also highlighted the importance of labor market institution.

This chapter analyzes another aspect of labor market institution: the wage difference between regular workers and non-regular workers. The impact of trade on workers would be different if some of them are more protected from changes in market environment than others. It is beneficial to reveal the difference because such institution, namely, internal labor market, is one of the characteristics of the Japanese labor markets.

4.1. Introduction

This chapter presents an analysis of the impact of trade on the wage inequality between regular and non-regular workers. Definitions of "regular" and "non-regular" workers vary in surveys, which are conducted even by the same organization. Three major documents, issued by the Ministry of Health, Labor, and Welfare of Japan, have different definitions for "non-regular" workers.[28] Several types of workers are

[28] "Non-regular" workers are defined in three documents as follows:
(1) Ministry of Health, Labour and Welfare (2003b): *Seiki koyo* (regular employment) is to employ full-time at a specific firm with a continuous employment relationship. Diversified types of employment (i.e., other than regular employment) include part-time workers, "arubaito" workers, dispatched workers, contracted employees, self-employees, and family employees.
(2) Ministry of Health, Labour and Welfare (2001): A *sei-shain* (regular worker) is an employee whose employment period is not specified. A *hi-sei-shain* (non-regular worker) is an employee who is not a regular worker. He / she can either be a contracted employee, a temporary worker, a part-timer, a seconded employee, or a dispatched worker.

categorized as non-regular workers. Common characteristics of non-regular workers can be summarized as follows: (1) on average, dispatched workers and contracted employees work as long hours per week as full-time workers do, while part-timers work for less than half hours that full-time workers do; (2) the employment period of non-regular workers is either specified or unspecified; and (3) they are not regarded as regular workers at the work place and they are not usually entitled to receive bonus or fringe benefits. In return they do not have to transfer to different plants or offices.[29]

Definition of non-regular workers also differs in countries.[30] For example, the OECD definition of part-time employment covers persons *usually* working *30* or fewer hours per week in their main job. This criterion is different from the US definition, which covers persons *usually* working fewer than *35* hours per week in their main job.[31] The Japanese definition of part-time employment, shown in the Labor Force Survey conducted by the Statistics Bureau of the Ministry of Public Management, Home Affairs, Posts and Telecommunications, covers persons who *actually* worked *35* or fewer hours per week in their main job during the survey week. However, some of the Japanese part-timers work as long as full-timers do. About 30% of workers who are regarded as

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(3) Ministry of Health, Labour and Welfare (2003a): A *joyo rodosha* (ordinary worker) is defined as one of the following: (i) an employee without a specified employment period, (ii) an employee with a fixed employment period for more than a month, or (iii) an employee with a fixed employment period within a month or employed on a daily basis, who was employed more than 17 days each in April and in May. An ordinary worker is either a general worker or a part-time worker. A general worker is a worker who is not a part-time worker. A part-time worker is either (i) an employee whose daily contracted working hours are less than a general worker, or (ii) an employee whose daily contracted working hours are the same as a general worker but whose weekly working days are less than a general worker.

[29] The first two characteristics are reported in Ministry of Health, Labour and Welfare (2003b).

[30] Emphasis in italic letters in this paragraph is added by the author.

[31] Sorrentino and Moy (2002), p.16.

part-timers work more than 35 hours per week.[32] Because of these differences, it is difficult to compare levels of Japanese part-time employment with the US and other OECD countries. For simplicity, this analysis uses the definition of a non-regular worker mentioned in Ministry of Health, Labour and Welfare (2001): non-regular workers are the ones who are not employed as regular workers, whether they are contracted employees, temporary workers, or part-timers.

Analysis of trade impact on the wage gap between regular and non-regular workers is important for several reasons. First, the analysis is different from the analysis of trade impact on the wage inequality between skilled and unskilled workers. Non-regular workers are not always unskilled. Some voluntarily choose to be non-regular workers. They prefer to avoid long-term commitment to a specific firm, or they want to utilize their skills that are not fully appreciated in a regular employment contract.[33] Second, the wage gap between regular and non-regular workers has become one of the current labor policy issues. Per hour payments to non-regular workers are lower than those to regular workers even when they are engaged in similar work. Japanese government already started discussion on the fair treatment of non-regular workers, but major revisions of current laws governing non-regular working or an enactment to abolish discriminatory wages for non-regular workers have not been realized yet. Finally, an institutional change in labor market is undergoing in Japan as

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[32] Ministry of Health, Labour and Welfare (2003b).

[33] Ministry of Health, Labour and Welfare (2001) reports the reasons why they chose to become non-regular workers. The most frequent answer is to supplement earnings (34.2%). The second most frequent answer is that they can work at their convenient time (32.8%). The third most frequent answer is that non-regular employment makes it possible to cope with other activities and daily life (29.4%).

international transaction and competition becomes more frequent. It has been difficult for a non-regular worker to become a regular worker because institutional reasons in Japan, but such labor institutions are changing. It is worthwhile to examine whether international trade affects the wage gap between regular and non-regular workers, because the analysis will become a good foundation for policy alternatives for labor market reforms in the future.

The content of this chapter is as follows. After introducing stylized facts and statistical evidence on non-regular workers, this chapter reviews existing literature regarding wage determination hypotheses, and evaluates how these hypotheses are related to the trade impact on wage inequality between regular and non-regular workers. Empirical analysis is presented next. The analysis in this chapter is based on ad hoc model, and does not intend to examine a specific theory. Instead, the analysis attempts to find correlation between the change in international trade and the change in the wage inequality between regular and non-regular workers. Discussion on the regression results will be presented next followed by conclusion at the end of this chapter.

4.1.1. Stylized facts on non-regular workers

Osawa (2002) summarizes characteristics of non-regular workers in Japan, comparing those in the US. First, the concept of a "part-time worker" differs in Japan and the US. 80% of American part-time workers have working contract with unspecified employment period. In contrast, a part-time worker in Japan can be distinguished from a regular worker in that the employment period of a part-time worker must be longer than one month and less than one year. A part-timer in Japan has no

obligations of overtime work or a transfer to different workplace. Part-time worker, however, does not get seniority wages that regular workers are entitled to. Second, a wage gap between regular and non-regular workers in Japan grows with tenure. A wage profile for a non-regular workers is set so that the wage does not increase as much as a regular worker, even when he /she have worked in a firm for many years. In contrast, the hourly wage for a part-timer in the US is lower than a regular worker, but the slope of the wage profile is steeper. Finally, the mobility from a part-time job to a regular job is lower in Japan. The ratio of part-time workers who became full-time regular workers in the next year in the US is more than three times larger than in Japan.

4.1.2. Statistical evidence

Ministry of Health, Labour and Welfare (2001) reports the composition of non-regular workers in manufacturing industries. About 19% of the total workers employed in surveyed firms are non-regular workers. About 80% of all the non-regular workers are part-time workers. The composition varies in manufacturing industries. Next two tables provide the statistics.

Table 23. Comparison of regular and non-regular workers

(%)

	Regular	Non-regular
Consumer-related manufacturing industries (C)	72.2	27.8
Industrial material-related manufacturing industries (I)	85.1	14.9
Machinery-related manufacturing industries (M)	85.4	14.6
Manufacturing industries, total (T)	81.3	18.7

Table 24. Composition of non-regular workers

(%)

	Contracted	Temporary	Part-timer	Seconded	Dispatched	Others	Total

	employee	worker		employee	worker		
(C)	5.4	1.8	87.1	2.9	1.8	1.4	100.0
(I)	6.7	3.3	69.1	9.3	7.4	4.7	100.0
(M)	6.8	1.4	67.8	13.0	8.9	2.1	100.0
(T)	6.4	2.1	77.0	7.5	5.3	2.1	100.0

Consumer-related manufacturing industries: food, beverage, textile, apparel, furniture, printing, leather, and miscellaneous manufacturing.
Industrial material-related manufacturing industries: lumber, pulp and paper, chemical, petroleum and coal, plastic, rubber, ceramic, steel, non-ferrous metals, and fabricated metals.
Machinery-related manufacturing industries: general machinery, electric machinery, transportation machinery, and precision machinery.

Source: General Survey on Diversified Types of Employment, 2001 (Ministry of Health, Labor and Welfare) – workers total.

A report by the Ministry of Health, Labour and Welfare (2001) also provides reasons why firms hire non-regular workers. The following are the major five reasons responded by firms that hire or hired non-regular workers in a past year. Multiple responses were allowed.

- To reduce personnel costs (61.0%).
- To adjust employment in accordance with business change (30.7%).
- To respond to business peaks and bottoms in a day or in a week (29.6%).
- To respond to demand of professional or specialized works (23.8%).
- To hire competent workers (23.7%).

These show that diversified labor demand, as well as financial consideration, is a major reason to hire non-regular workers.

The following table, based on the Basic Survey of Wage Structure, shows the change of relative hourly wage of female part-time workers in the manufacturing industry as a whole. Most of part-time workers in Japan are female. As the table shows, the relative wage of part-time workers to full-time workers is declining during the survey

period regardless of the firm size. The relative wages of part-timers in 2001 are 10 percentage points below their relative wages in 1985. It is also noteworthy that the level of relative wage is different according to the firm sizes. On average, part-time workers at small-scale firms receive the highest relative wages, while those at large firms receive the lowest relative wages.

Table 25. Hourly wage of female part-time workers relative to female full-time workers

Year	Average	Large firm	Medium firm	Small firm
1985	81.61	72.33	84.04	87.49
1986	81.07	72.38	83.19	86.91
1987	80.17	71.42	80.83	87.50
1988	79.74	70.90	81.45	85.98
1989	80.20	71.11	82.38	85.84
1990	80.30	69.98	83.33	86.10
1991	79.47	71.91	80.92	85.05
1992	78.61	71.52	81.42	83.44
1993	76.26	68.43	79.28	81.65
1994	76.74	69.18	78.73	82.64
1995	76.09	68.74	78.47	81.50
1996	76.38	66.15	78.60	82.42
1997	74.56	64.75	76.83	80.75
1998	74.00	64.92	76.03	79.38
1999	73.07	65.04	75.18	78.41
2000	73.38	62.83	75.64	79.14
2001	73.49	63.72	76.75	78.90

Source: Basic Survey of Wage Structure (Ministry of Health, Labour and Welfare, Labor and Welfare) – manufacturing industry average

The wage gap between regular and non-regular workers can be observed in labor markets in the U.S. "Contingent workers" in the U.S. are equivalent to non-regular workers in Japan. Contingent workers are defined as individuals who do not perceive themselves as having an explicit or implicit contract with their employers for ongoing employment. Hipple (2001) reports that the results of the February 1999

Contingent and Alternative Work Arrangements Supplement to the Current Population Survey reveal the earning gap between full-time and part-time workers. The following table shows median weekly earnings of each worker category in American manufacturing industry in 1999. It shows clear disparity among the worker groups. However, it is necessary to adjust demographics, education, and employment tenure to obtain residual difference among the groups.

Table 26. Median weekly earnings of full- and part-time contingent and non-contingent wage and salary workers by industry

(US$)

	Full-time workers		Part-time workers	
	Contingent	Non-contingent	Contingent	Non-contingent
Manufacturing, total	389	551	196	198
Durable goods	407	585	209	274
Non-durable goods	358	505	124	175

Source: February 1999 Contingent and Alternative Work Arrangements Supplement to the Current Population Survey (Bureau of Labor Statistics), manufacturing industry, quoted in Hipple (2001)

4.2. Literature review

As presented in the previous section, the wage gap between regular and non-regular workers is prominent in Japan. Several hypotheses can explain the wage gap between full-time workers and part-time workers.[34] First, the wage gap can be explained by a human capital hypothesis, which focuses on differences in education, training, and experience of workers. Second, the wage difference between occupational groups can be analyzed by a hedonic wage approach that puts emphasis on the difference in non-monetary aspects of work. Third, another hypothesis is that the wage gap is caused by substitutive nature of non-regular workers. The wage inequality will be

[34] These are based on the list of hypotheses presented by Furugori (1997) and Ohtake (2000).

larger if non-regular workers are substitutes of regular workers, and less prominent if both types of workers are complementary. Finally, the wage gap at entry level may reflect an optimal combination of regular (long-term) and non-regular (short-term) workers. Starting salary for regular workers can be set at a different level from market wage level, which is used for non-regular workers. Following sections review and discuss about these hypotheses.

4.2.1. Human capital hypothesis

Human capital hypothesis is, in short, that wage reflects the accumulation of human capital for the person.[35] Human capital can be developed by schooling, training, and general health conditions. Tenure and job experience will represent the levels of firm-specific training and general training for the worker.[36] The human capital hypothesis predicts that the wage difference between regular and non-regular workers can explained by the difference in education and training. The wage gap will become smaller when non-regular workers accumulate human capital by developing their skill through education and training programs.

However, the empirical research indicates that the part in the wage gap that the human capital hypothesis can explain is not large. Nagase (2003) shows that unexplainable wage gap between regular and part-time workers still remains even after controlling for workers' characteristics such as education, experience, age, job category, and family structure. The author finds that the part of wage gap explained by workers'

[35] Mincer (1974) and Becker (1993) develop the theoretical discussion of human capital hypothesis.
[36] A firm-specific training makes a worker more productive to a single employer. A general training will make a worker valuable for many employers.

characteristics is only as large as 50%. This result shows that the explanatory power of the human capital hypothesis is limited. The other half of the wage gap must be attributed to factors related to labor demand and non-market factors.

4.2.2. Hedonic wage hypothesis

Hedonic wage theory, or compensating wage differential theory, shows that an equilibrium wage in labor market depends on characteristics of work.[37] Decision of labor demand reflects a set of job candidates' characteristics as well as the wage that an employer offers. Decision of labor supply depends not only on offered wage but also on a set of work characteristics that an employee finds essential. A hypothesis based on hedonic wage theory explains that the wage of non-regular workers, especially of part-time workers, is lower because wages of part-timers reflect non-monetary incentives related to working environment such as flexible working hours and convenience in commuting.

Nakamura and Chuma (1994) estimate wage determination of married middle-aged female part-time workers by non-linear three-step least square (NL3SLS) method, using individual data of 4500 part-timers in 1991. They find that (1) occupation category dummies are statistically insignificant, (2) wage is higher in unionized firms, and (3) not only working hours but also commuting hours raise bidding wage. This result implies that characteristics related to working environment affect wages for non-regular workers.

[37] The concept of hedonic wage is based on Rosen (1974).

Part-timers should be satisfied with their choice if the hypothesis is correct. However, an empirical study shows that part-timers are not satisfied with their wage and the wage gap between full-timers and part-timers. Shinozaki, et al. (2003) use individual data obtained by a survey designed for understanding part-time employment in 1999, and find that a third of part-timers that voluntarily and willingly work as part-timers are not satisfied with the wage difference with full-time workers after they obtain the jobs. They also find that part-timers feel unsatisfied when their responsibility is as large as or larger than the responsibility of full-timers. These show that the hypothesis based on compensating wage differentials theory has limitation in explaining the wage gap between regular and non-regular workers.

4.2.3. Regular and non-regular workers: complements or substitutes?

Wage disparity between regular and non-regular workers may increase if they are substitutes and if labor supply of non-regular workers is more inelastic than labor supply of regular workers. Three studies examine whether regular and non-regular workers are complements.

Ko (2003) uses employer data of a nationwide human resources survey in the US. He finds that it is statistically significant that employers who had engaged in intensive screening of suitable employees were more likely to use temporary workers as a buffer to protect regular employees from economic fluctuation. He concludes that regular and temporary workers are complements.

Hara (2003) uses firm data of a survey on fringe benefits of Japanese firms in 1998. Manufacturing firms constitute 39.4% of the dataset. The author finds that

regular and part-time workers are complementary in manufacturing firms. She also finds that they are complementary at large firms (with 1000 or more employees) but substitutive in small firms (with 30-99 employees). The author discusses two possible reasons of this result: (1) it is easy to substitute regular workers with part-time workers in small firms because regular workers are not highly skilled or well-trained; and (2) small firms use part-time workers whom they can replace easily because small firms are more vulnerable to changes in product demand. This result implies that part-timers in small firms are more vulnerable in job security than those in large firms.

Friesen (1997) uses a dynamic adjustment cost model to estimate the demand for part-time and full-time workers. The dataset used in the analysis is constructed from individual data engaged in various service industries from the US Current Population Survey from 1979 to 1987. The author finds that part-time and full-time workers appear to be dynamic *p*-complements, the terms used by Hamermesh (1993).[38]

These studies include data other than manufacturing industries, but the conclusion using American data shows consistency with the conclusion using Japanese data. It is possible that differences in market institution and industries affect the relationship between regular and non-regular workers. Still, there is evidence to suggest that regular and non-regular workers are complementary. The hypothesis that the wage gap is caused by substitutive nature of non-regular workers is not supported.

[38] If two inputs are dynamic *p*-complements, a greater disequilibrium in the demand for one factor slows adjustment of the demand for the other. (Hamermesh 1993, p.233)

4.2.4. Hypothesis of internal and external labor markets: overview

It is possible that wage determination for non-regular workers is different from wage determination for regular workers. Labor markets in Japan are composed of internal labor markets and external labor markets. The internal and external labor markets can be distinguished by the wage determination mechanism in each market. Ariga, et al (2000) explain that the internal labor markets are "employment systems characterized by four key features: (a) long-term employment relationships; (b) new hiring occurring at designated ports of entry; (c) allocation of labor after entry based mainly on internal promotion; and (d) individual pay influenced by administrative rules and only partially affected by market forces." [39] The internal labor market typically consists of male, white-collar, and full-time workers. Female workers, production workers, and part-time workers usually participate in the external labor market. Wage in the internal labor market is largely determined by non-market factors such as administrative rules, while wage in the external labor market is determined by demand and supply of labor.[40] Jobs are still secured for workers in internal labor markets, contrary to popular rhetoric of "the end of lifetime employment". Kato (2001) compares ten-year job retention rates of workers in various tenure groups for the period of 1977-1987 with those for the period of 1987-1997. He finds that the rates did not fall except for young workers (ages 20-24 and 25-29) and middle age employees with short tenure (ages 30-34, 35-39, 40-44 with 0-4 years of tenure).

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[39] p.1

[40] Using case studies that analyzed wages and career paths of managerial workers in the U.S., Baker and Holmstrom (1995) find "market forces have a material impact on wages at the time of entry, but much less so inside the firm, suggesting a significant internal-labor-market effect." (p.259)

Internal labor market can be observed even in small firms, while it is more prominent in large firms. Tachibanaki (1996) finds that workers in small firms are not homogeneous, using individual data of the Basic Survey of Wage Structure. He concludes "the *majority* of employees in these firms receive lower wages, while *some* employees in these firms receive distinctively higher wages whose levels are comparable with wage levels in larger firms and even in extremely large firms."[41] Using firm level data in Aichi Prefecture, Koike (1999) observes that workers in small firms are composed of several different groups: a core group who has high and various skills, semi-skilled group, and unskilled group. Workers in the core group develop their skills through experience and that their wages increase with tenure, as observed in large firms. Mitani (2002) provides a review of recent literature and of official statistics on the wage determination at small and medium scale firms. He finds that there is large difference in wages of workers, and that the wage determination system in small firms is different from that in large firms. These observations suggest that internal labor markets exist even in small firms.

Reduction of employment for regular workers will affect the wage of non-regular, if the wage of regular workers is determined by the mechanism in the internal labor market and if the wage of non-regular is determined by the mechanism in the external labor market, whether they are in large firms or in small firms. An exogenous shock that decreases demand for regular workers will cause more employment of part-timers but their wage becomes lower. The wage gap between regular and

[41] p. 74. Emphasis by italic words is on the original document.

non-regular workers will become larger because the wage for regular worker is more sticky than the wage for non-regular workers.

This suggests that it is important to analyze the impact of exogenous change, such as international trade, on the wage gap between the entry (starting) salary of regular workers and market wage. However, characteristics of the internal labor market at Japanese small firms, especially differences between regular and non-regular workers in small firms, are not studied in detailed. Research based on micro data tend to focus on wage differentials either among different sizes of firm or between regular and non-regular workers.

4.2.5. Difference in starting salaries of regular and non-regular workers

The concept of internal and external labor markets can explain why there is difference in the impact of exogenous shocks on starting salaries between regular and non-regular workers. However, there are not many empirical studies focusing on the gap of entry wages and the impact of demand shock on the wage gap. Higuchi and Genda (1999) analyze the impact of trade and other overseas business on employment and wages in small and medium firms in Japan, but their analysis do not cover the impact of trade on the relative entry wage of part-time workers.

Rebick (1993) empirically analyzes the impact of exogenous productivity shocks on wages of workers at large and small firms in the model, using an overlapping generation model. He assumes that workers at large firm are employed for two periods, and their wages are not affected by regional shocks because they can be transferred to any offices in the country. He also assumes that workers at small firm are hired in every

period, and that their wage is a spot wage in the local labor market. These assumptions fit better in the context of comparison between regular and non-regular workers. The model predicts that demand shocks, either economy-wide or specific to a region will reduce the wage differential between the two groups of workers.

Chuma and Higuchi (1995) use industrial data to estimate how the seniority wage is affected by technical development, relative employment of regular workers, human capital accumulation of senior workers, and demand shock of output. They find that uncertainty of product demand reduces the wage of senior workers relative to the wage of new workers. They do not analyze how uncertainty of product demand affects the wage of new regular workers relative to non-regular workers.

The theoretical framework of Chuma and Higuchi (1995) is useful for our wage analysis. Their model is an overlapping generation model, where permanent workers are employed in their lifetime (two periods) and temporary workers are employed just for one period by a firm in a perfectly competitive product market. Temporary workers receive same wage, assuming that the labor market is perfectly competitive. A permanent worker receives a wage offer in period 1, and the offered wage is the same for all permanent workers. In period 2, some of the permanent workers get promoted and receive higher wages. The firm decides the new employment of permanent and temporary workers after observing the price and demand for its output. The demand is assumed to be a stochastic variable. Wages for temporary workers will vary depending on the business cycle. The model predicts that the starting wage of permanent workers is equal to or smaller than the wage of temporary workers. However, their model does

not clearly show whether output demand shock affects the wage gap between permanent and temporary workers positively or negatively.

4.2.6. Summary of literature review

In this section, the literature that provided several hypotheses regarding the wage gap between full-time workers and part-time workers were reviewed and evaluated. First, hypotheses based on human capital theory and compensating wage differentials theory had some explanatory power, but there remained major parts that were not explained by the hypotheses. Second, the literature found that there was evidence to suggest that regular and non-regular workers were complementary. The hypothesis that the wage gap was caused by substitutive nature of non-regular workers was not supported. Finally, the literature suggested that the labor markets for regular and non-regular markets were different. An exogenous change, such as international trade, would differently affect these markets. However, characteristics of the internal labor market at Japanese small firms, especially differences between regular and non-regular workers in small firms, have not been studied in detailed. The literature uses a model in which permanent and temporary workers are the only inputs for production, but leaves an unsolved question how an exogenous shock in product market would affect the wage gap between permanent and temporary workers. It is worthwhile to examine this question using empirical data.

4.3. Objectives and assumptions for empirical analysis

The purpose of the empirical analysis in this chapter is to find whether an increase in international trade will affect the difference in starting wages between regular and non-regular workers in small manufacturing firms. International trade will have both positive and negative impacts on the demand for a domestic firm's product. Trade will have negative impact if the product competes with imports, and positive impact if the market of the product expands by exporting. Trade also have positive impact when inputs are provided from foreign sources. If international trade has positive impact on product demand in local markets, then output of the firms will increase. The wage of non-regular workers will rise and their employment will increase, assuming that demand for non-regular workers is more responsive to the change in product market than demand for regular workers. The empirical analysis intends to examine whether this view is supported by Japanese data.

This analysis is based on the following additional assumptions. First, the commodity market is perfectly competitive. Second, labor productivity of non-regular workers is assumed to be the same as that of regular workers. Regular and non-regular workers will receive different level of wage because their contracted working duration periods are different. Regular workers will work for a longer period than non-regular workers will. Regular workers are assumed more committed to their work, spending more time and energy. They receive higher wage and job security in return. Third, the production technology is homogeneous for all firms. Finally, this analysis is based on an ad hoc model, and examines correlations between the change in the ratio of starting

salary for regular workers to initial wage for non-regular workers, and the change in international trade.

4.4. Regression specification

The regression analysis intends to examine how much international trade affects the starting salary for fulltime workers relative to initial wage for part-time workers. The analysis is based on an ad hoc model and employs a simple ordinary least squared (OLS) method to obtain the correlation between the change in the relative starting wage and the changes in import ratio and in export ratio. It is going to estimate the following equation:

$$d\left(\frac{w_R}{w_{NR}}\right) = \alpha + \beta_1 d(import_i) + \beta_2 d(\text{export}_i) + \gamma d(z_i) + \varepsilon,$$

where w_R is starting salary for regular workers, w_{NR} is initial wage for non-regular workers, $d\ (import_i)$ and $d\ (export_i)$ are the change in the import share and export share in industry i, respectively, and the variable z represents other industry characteristic variables.

4.4.1. Variables

The dependent variable is the change in the fixed-weight average of the ratio of starting salary for full-time workers to initial wage for part-time workers between 1992 and 1997. The fixed weight for each industry is defined as the industry's average share of the employment of regular workers at firms included in the survey over the period. It is necessary to note that the ratio will not calculate relative wages per working time. The wage of part-time workers is quoted as hourly wage, while the salary of full-time

workers is quoted as monthly salary. Actual working hours in a month for full-time workers are not available.

Explanatory variables are a set of trade-related variables, firm size dummies, and a labor union dummy. Part-time workers usually do not participate in labor unions and their wages are revised when an employment contract expires. The labor union dummy is necessary to control for its effect on the wage gap between full-timers and part-timers. The choice of explanatory variables is limited because the dataset does not contain much information on changes in industrial characteristics. The following table shows definitions of the explanatory variables.

Table 27. Explanatory variables

Labor union dummy	Whether the firm has a labor union: existence of labor union, or existence of employee association (compared with firms with no unions or associations)
Import ratio	Ratio of value of imports to the sales of output in domestic market at a 2-digit SIC level in a manufacturing industry.
Export ratio	Ratio of value of exports to the sales of output in domestic market at a 2-digit SIC level in a manufacturing industry.

Our concern in this analysis is to find whether the impact of trade on the relative wages is positive or negative. Positive coefficients of trade-related variables indicate that trade affects in favor of full-time workers relative to part-time workers, and that trade will increases wage inequality in relative terms.

The predicted sign of the export ratio coefficient is negative because an increase in export will expand demand for the output of a firm, raising labor demand for both regular and non-regular workers. The wage of non-regular workers will increase

relative to the wage of regular workers because the wage of non-regular workers is determined more flexibly.

The impact of import on the relative wage is more complicated because imports will have both demand effect and supply effect. An increase in import may reduce demand for the output if a firm produces a good that can be substituted by imports. On the other hand, imports may expand demand for the output if the firm's product is complimentary to imports. The coefficient of import variable will show the net effect of these. The predicted sign of the labor unionization coefficient is positive because non-regular workers are usually non-members of a labor union. The following table summarizes the prediction of the coefficients.

Table 28.Prediction on the coefficients of explanatory variables

Explanatory variables	Prediction
Change in import ratio	Positive if a firm's output is replaced by imports. Negative if a firm's output is complementary to imports.
Change in export ratio	Negative
Change in labor unionization	Positive

4.4.2. Data

Aggregate statistics of non-regular workers are available but cannot be used for this analysis, because they are classified at 1-digit SIC level. Instead, this analysis uses a firm-level quasi-panel dataset, which covers about 300 manufacturing firms. The dataset was produced for the research project, "Management of Small and Midsize Companies in the Global Economy: Survey of Manufacturing and Non-Manufacturing Industries, 1997." It was based on replies to a questionnaire sent to firms. Requests

were sent to 4,041 firms and 642 firms responded. The response rate was 15.9%. The data was provided from JTUC (Rengo) Research Institute for Advancement of Living Standards, through SSJ Data Archive, Information Center for Social Science Research on Japan, the University of Tokyo with permission from the provider. The dataset contains initial salary for full-time workers (high school graduates) and an hourly wage of part-time workers in 1992 and 1997. Data in 1992 were retrospectively collected in 1997. The survey for the dataset was conducted in order to capture (1) the extent of trade and overseas operation, (2) their effects on wages and working conditions as well as on training and transmission of skills (a factor which has supported the manufacturing industry), and (3) problems caused by trade and overseas operations. Data of import ratio and export ratio are in the dataset composed of the Census of Manufacturers and Trade Statistics, aggregated at 2-digit level using the same method used in Chapter 2. They are the same ones that were used for analyses in Chapters 2 and 3. Trade data in 1997 are not included in the dataset. Therefore, trade variables show the change in trade between 1990 and 1995, not between 1992 and 1997. Assumption is that firms use industrial data lagged in two years to decide wages. Details of each data category newly introduced here are provided below.

Table 29. Definition of data

Salary of full-time worker	Initial monthly salary of a male full-time worker, who became employed in the survey year, having finished senior high school education. Allowances other than over-time charges are included in salary.
Wage of part-time worker	Initial hourly wage of a part-time worker, who became newly employed in the survey year.

4.4.3. Limitation of the analysis

The dataset that this analysis uses is potentially biased. First, the sample was not randomly selected. Survey questionnaire was sent to two different groups of firms. The first group (3,086 firms) was selected by the JTUC Research Institute for Advancement of Living Standards, from the firms located in cities where small and medium scale firms are concentrated. The second group (955 firms) consists of firms that responded to a previous survey implemented in 1994. The reply ratio of the first group was much lower than the second group. Only 11.5% of the first group responded to the questionnaire, while 30.2% of the second group responded. Thus, the dataset potentially has a selectivity bias. Secondly, the employment and wage data were collected by a retrospective manner. The data in 1992 may be biased because the data may not be correctly recorded at the firms. Finally, firms in the dataset did not report the change in import value and in export value. Instead, they reported whether the value of imported parts and materials had changed and whether the export ratio had changed. Therefore, aggregated data have to be used to measure the impact of exports and imports on the wage gap at the expense of individuality of firm data. In spite of these problems, the dataset is the only reliable source of firm-level data on trade and wages that is currently available.

4.5. Analysis of regression results

4.5.1. Regression results

The empirical analysis intends to find the impact of the change in exports and imports on the change in full-timers' initial salary relative to part-timers' initial wage,

using firm-level wage data and industry-level trade data. The analysis is based on the change from 1992 to 1997. The next table summarizes results of estimation.

Table 30. The change in initial salary for full-timers relative to the initial wage for part-timers, regressed by changes in international trade.

	Coef.		Std.Err.
Change in export ratio	-0.699		0.451
Change in import ratio	0.255		0.409
Constant	-0.023	**	0.011
Adjusted R-square	0.007		
Number of Obs	59		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The overall fit of the regression is very low. The aggregation of firm-level data would contribute to the loose fit of the regression. Firm-level data of approximately 300 manufacturing firms are aggregated into about 60 cells distinguished by industry, firm size, and the existence of labor union. The overall fit would be different if firm-level trade data had been used for the regression.

The constant term is -0.023 and is statistically significant. This indicates that the starting salary of full-timers relative to the initial wage of part-timers decreased during the observation period. The coefficients of the change in trade variables show that international trade does not affect the relative wage of regular workers, given that the coefficients are statistically insignificant. An inclusion of the labor union dummy and firm size dummies does not affect the results.[42] The coefficient of the union dummy is

[42] The estimation result with these dummies is omitted to save the space.

positive, but statistically insignificant. The coefficients of two firm size dummies are both negative and statistically insignificant.

4.5.2. Alternative specification

The previous regression result showed that international trade would not affect the relative wage of regular workers, but it is still not clear whether trade affects wages of both types of workers in the same direction or trade does not affect wages at all. To solve this question, separate regressions are implemented to estimate the impact of trade on the change in starting salary of regular workers and on the change in starting wage of part-time workers, respectively. The tables below show the results of the estimation. The first table shows the estimation for regular workers, and the second table for part-time workers. The tables include the results with and without labor union dummy.

Table 31. The change in initial salary for full-timers, regressed by changes in international trade.

	Base			With union dummy		
	Coef.		Std.Err.	Coef.		Std.Err.
Change in export ratio	0.6059188		0.4030044	0.6055323		0.4063445
Change in import ratio	-0.6319268	*	0.3419352	-0.6329995	*	0.3449573
Union at the firm	-		-	-0.0015136		0.0168797
Constant	1.102138	***	0.0096076	1.102747	***	0.0118292
Adjusted R-square	0.0373			0.0214		
Number of Obs	64			64		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

Table 32. The change in initial wage for part-timers, regressed by changes in international trade.

	Base			With union dummy		
	Coef.		Std.Err.	Coef.		Std.Err.
Change in export ratio	1.512255	***	0.5420723	1.51748	***	0.5467567
Change in import ratio	-1.104028	**	0.4906912	-1.109173	**	0.4949746
Union at the firm	-		-	-0.007077		0.0227691
Constant	1.127153	***	0.013004	1.12969	***	0.0154442
Adjusted R-square	0.1137			0.0992		
Number of Obs	59			59		

* significant at 10% level
** significant at 5% level
*** significant at 1% level

The overall fit of the regression is better in both regressions than the one for relative wages. Tables show that the constant is positive and statistically significant in all the estimation results. They also show that labor union dummy does not affect the changes in wages either for regular workers or for non-regular workers.

The tables show that the impact of change in trade affects the change in wages differently for regular workers and for non-regular workers. The first table shows that imports reduce the starting salary of regular workers. The coefficient of import variable is negative and statistically significant. On the other hand, the coefficient of export variable is statistically insignificant while the sign is positive. Exporting provides a positive impact on the firm's output demand. Importing has a negative impact on the output demand if the output competes with imports, and has a positive impact if the output is complementary products or if inputs are imported. The result show that it is possible that imports compete with the firm's output. The opposite signs for both variables indicate a strategy of a firm in deciding initial salary for regular workers to

absorb the demand shock by wages at the entry stage, because the wage profile for the regular workers are usually upward.

The second table shows that coefficients of both import and export variables are statistically significant. The direction of effects of trade is the same for both regular and non-regular workers. Exports increase and imports decrease the starting wage of non-regular workers. The impact of trade on the change in wages for non-regular workers is more noticiable than the impact for regular workers. The coefficient of export variable is statistically significant at 1% level and the coefficient of import variable is statistically significant at 5% level for non-regular workers. The coefficient of import variable is significant at 10% level for regular workers. These results show that the impact of trade on the relative wage of regular workers is small because trade affects wages of both types of workers in the same direction.

The regression results in the tables also show that the signs of trade coefficients in the estimation for the relative wage and the signs in the estimation for wages for each type are opposite. This indicates that starting wage of non-regular workers are more sensitive to business environment than starting salary of regular workers. This interpretation is consistent with the statistical fact that the top three reasons to hire non-regular workers are to reduce personnel costs, to adjust employment in accordance with business change, and to respond to business peaks and bottoms in a day or in a week.

While the regression results are informative as mentioned above, one remained puzzle is that whether it is robust that international trade does not affect the starting salary

of regular workers relative to the starting wage of non-regular workers. This is still to be solved both theoretically and empirically by using more disaggregated data over a longer time period. Other issues are also left for future research. The wage data of non-regular workers other than part-timers can be analyzed in the future to clarify the comprehensive impact of international trade. Sector-specific analysis will also be valuable if firms in the sector use one type of non-regular workers, such as contracted employees, more than firms in other sectors.

4.6. Conclusion

This chapter presented an analysis of the impact of trade on the wage inequality between regular and non-regular workers. Non-regular workers attract attention of both labor economists and policy makers. Statistics show that the wage gap between regular and non-regular workers is both prominent and growing.

Previous literature provided several hypotheses regarding the wage gap between full-time workers and part-time workers. The hypotheses were reviewed and evaluated. First, hypotheses based on human capital theory and compensating wage differentials theory had some explanatory power, but there remained major parts that were not explained by the hypotheses. Second, the literature found that regular and non-regular workers were complementary. The hypothesis that the wage gap was caused by substitutive nature of non-regular workers was not supported. Finally, the literature suggested that the labor markets for regular and non-regular markets were different, and that an exogenous change would affect the wage gap between the entry (starting) salary of regular workers and market wage. The literature used a model in

which permanent and temporary workers were the only inputs for production, but left an unsolved question how an exogenous shock in product market would affect the wage gap between permanent and temporary workers.

The empirical analysis attempted to find whether an increase in international trade would affect the difference in starting wages between regular and non-regular workers in small manufacturing firms, using an ad hoc model and a firm-level quasi-panel dataset, which covers about 300 manufacturing firms. However, the regression results did not provide evidence that international trade would affect the initial salary of regular workers relative to the initial wage of non-regular workers. The existence of labor union and firm size did not affect the result, either.

The results showed that imports affected the initial salary of regular workers. They also showed that both imports and exports would affect the initial wage of non-regular workers. The signs of coefficients of trade variables in the estimation for the relative wage and the signs in the estimation for wages for each type were opposite. Starting wage of non-regular workers was more sensitive to business environment than starting salary of regular workers. This interpretation was consistent with the statistical fact that the top three reasons to hire non-regular workers are to reduce personnel costs, to adjust employment in accordance with business change, and to respond to business peaks and bottoms in a day or in a week.

While the regression results are informative as mentioned above, one remaining puzzle was whether it was robust that international trade would not affect the starting salary of regular workers relative to the starting wage of non-regular workers. This is

still to be solved both theoretically and empirically by using more disaggregated data. Other issues are also left for future research. The wage data of non-regular workers other than part-timers can be analyzed in the future to clarify the comprehensive impact of international trade. Sector-specific analysis will also be valuable if firms in the sector use one type of non-regular workers, such as contracted employees, more than firms in other sectors.

CHAPTER 5. CONCLUSION

Wage inequality has been one of major labor policy issues in Japan. In spite of its importance, the impact of international trade on wage inequality has not been fully studied in empirical papers. This research provided a set of empirical analyses on the issue. Previous three chapters analyzed the impact of international trade on wage inequality among workers with different characteristics. Following the summary of these findings, their significance in the context of economic change and future development of the research will be discussed in this chapter.

5.1. Summary of the research

Chapter 2 presented an empirical analysis on the impact of international trade on wage inequality between skilled and unskilled workers. A substantial number of empirical papers explained the impact of trade on labor markets in the US and the UK. However, there has been relatively little research on the effect of international trade on the wage inequality between different skill groups in Japanese manufacturing industries. The chapter contributed to the existing empirical literature because it was the first empirical research that employed the harmonized dataset of Japan's trade, industry, and wages, allowing for comparisons of results for Japan, the UK and US.

The analysis employed a specific-factors model. The model could reflect the heterogeneity in Japanese labor markets. The hypothesis for the regression analysis was that international trade, either import or export, would raise the wage gap between skilled and unskilled workers.

The regression results showed that both the import ratio and the export ratio increase the relative wage of unskilled workers. The results did not support the prediction of the model. The regression results with Japanese data were inconsistent with the existing studies that used American and British manufacturing industry data.

One possibility that would contribute to the results was that Japan has not experienced the kind of decline in relative wage of unskilled workers that the US and the UK have. The next question was why the wage gap between groups with different education attainment did not seem to be changing much, unlike the cases in the US and the UK. It is possible that institutional aspects in Japanese labor markets are different from those in American and British labor markets. Further exploration on labor market institution in Japanese manufacturing industry is needed to reveal why the wage gap between skilled and unskilled workers has been stable.

Chapter 3 examined whether Japanese data can support a theoretical model that explained the effect of trade on wages at firms in oligopoly industries. Existing empirical literature explained various consequence of increased competition resulting from increased trade, such as the loss of markups, increases in productivity, or declines in discriminatory wage gaps. The model predicted that firms in concentrated industries would lose market power when increased imports caused competition with foreign suppliers. The relationship between trade and the inter-industry wage gap between oligopoly industries and competitive industries was examined based on the theoretical model. The impact of trade on the intra-industry wage gap between large and small firms in oligopoly industry was also explored based on an ad hoc regression specification.

The regression results based on the theoretical model showed significant relationship between the relative wage in oligopoly industries and imports. However, it was likely that there was substantial multi-collinearity relationship among import ratio, export ratio, and capital labor ratio. Because of this problem, the regression results became less reliable, and it is possible that there was no significant relationship between the relative wage and international trade.

The regression results based on the ad hoc model showed that there was no evidence to support the hypothesis that imports in concentrated industry would reduce the economic rent and the relative wage of large firms. The regression results with the dataset that included characteristics of workers showed similar results on the trade impact on wages in oligopoly industries. They showed no evidence for the hypothesis that trade would function as forces "to discipline the market" in oligopoly industries.

These results showed that data in Japanese manufacturing industries did not support the theory that imports would reduce the market power of large firms and would decrease their relative wage, unlike existing studies with other countries' data. It is possible that the theoretical model did not reflect the institutional aspects. Empirical analysis with more disaggregated data will be required to prove uniqueness of Japanese labor markets.

Chapter 4 presented an analysis of the impact of trade on the wage inequality between regular and non-regular workers. The empirical analysis was to find whether an increase in international trade would affect the difference in starting wages between regular and non-regular workers in small manufacturing firms, using an ad hoc model and

a firm-level quasi-panel dataset, which covers about 300 manufacturing firms. However, the regression results did not provide evidence that international trade would affect the initial salary of regular workers relative to the initial wage of non-regular workers. The existence of labor union and firm size did not affect the result, either.

The results showed that imports affect the initial salary of regular workers and that both imports and exports would affect the initial wage of non-regular workers. The regression results also showed that the signs of coefficients of trade variables in the estimation for the relative wage and the signs in the estimation for wages for each type were opposite. Starting wage of non-regular workers was more sensitive to business environment than starting salary of regular workers. This interpretation was consistent with the statistical fact that the top three reasons to hire non-regular workers are to reduce personnel costs, to adjust employment in accordance with business change, and to respond to business peaks and bottoms in a day or in a week. One remaining puzzle was whether it was robust that international trade would not affect the starting salary of regular workers relative to the starting wage of non-regular workers. This is still to be solved both theoretically and empirically by using more disaggregated data.

5.2. Significance of the research results in the context of economic change in Japan

This research did not find evidence to support a hypothesis that international trade reduces the relative wages of unskilled workers, workers in small firms, or non-regular workers. As shown in previous chapters, the wage inequality between worker in large and small firms and between regular and non-regular workers is more noticeable than the one between skilled and unskilled workers. This research

demonstrated that there was no evidence for the theory that international trade contributed to the growing wage inequality among these worker groups in Japan. There has been a claim for protectionism for consuming domestic products instead of importing foreign products to prevent a wage decline of domestic workers. This research found that there was no evidence that would justify for the claim. Reasons of growing wage inequality could be found in factors other than international trade such as technological development, foreign outsourcing, changes in personnel management system, discrimination based on gender and age, or difference in preference of working conditions. Attempts to clarify the reasons of increasing wage gaps are left for future studies.

5.3. Future development of the research

This research found potential topics for future studies. First, the impact of trade on wage inequality among other groups of workers, which was not discussed in this research, is a source of future research topics. Analyses of the impact of international trade on the following wage inequalities will provide informative suggestions in the context of social and economic changes in Japanese labor markets.

1. Inter-industry wage gap with an analysis of the endogenous protection in industries with different characteristics
2. Gender-based wage gap
3. Wage gap between junior workers and senior workers
4. Wage gap between executives and no-rank workers

5. Inequality of wage and other working conditions between immigrant workers and Japanese nationals

Another possible development of the research is to classify the types of non-regular workers and analyze the trade impact on relative wages of those types. This research used wage data of part-time workers, but wage data of other types of non-regular workers can be analyzed in the future to clarify more comprehensive impact. Sector-specific analysis on the wage gap will also be valuable because firms in some industries use one specific type of non-regular workers, such as contracted employees, more than firms in other industries.

An empirical analysis of the combined impact of outward foreign direct investment and reverse import on labor market is left for further exploration. This analysis requires a firm-level panel data, which is difficult to obtain. The analysis is important and will provide information on more detailed impact of trade and investment on Japanese labor market.

Finally, studies on labor institution in Japan that would protect workers from changes in business environment are worthwhile doing. This research found that the impact of trade on wages with Japanese data were not consistent with the existing studies with American and British data. It was suspected that difference in labor institution across economies would lead to difference in the impact of trade on wages. Studies on Japanese labor institution would contribute to revealing something special in Japan.

REFERENCES

Abowd, John A. and Thomas Lemieux. 1993. "The Effects of Product Market Competition on Collective Bargaining Agreements: The Case of Foreign Competition in Canada." *Quarterly Journal of Economics* 108: 4, pp. 983-1014.

Aoki, Masahiko. 1988. *Information, Incentives, and Bargaining in the Japanese Economy.* New York: Cambridge University Press.

Ariga, Kenn, Giorgio Brunello, and Yasushi Ohkusa. 2000. *Internal Labor Markets in Japan.* Cambridge, UK: Cambridge University Press.

Baker, George and Bengt Holmstrom. 1995. "Internal Labor Markets: Too Many Theories, Too Few Facts." *American Economic Review* 85: 2, pp. 255-259.

Baldwin, Robert E. and Glen G. Cain. 2000. "Shifts in Relative U.S. Wages: the Role of Trade, Technology, and Factor Endowments." *Review of Economics and Statistics* 82: 4, pp. 580-595.

Becker, Gary S. 1993. *Human Capital.* Chicago: University of Chicago Press.

Beissinger, Thomas and Joachim Moller. 2000. "Unemployment: Theoretical Explanations," in *Globalization and Unemployment.* Helmut Wagner ed. Heidelberg, Germany: Springer-Verlag, pp. 89-133.

Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufacturers." *Quarterly Journal of Economics* CIX: 2, pp. 367-398.

Black, Sandra E. and Elizabeth Brainerd. 2002. "Importing Inequality? The Impact of Globalization on Gender Discrimination." *NBER Working Paper 9110*: National Bureau of Economic Research: Cambridge, MA.

Borjas, George J., Richard B. Freeman, and Lawrence F. Katz. 1997. "How Much Do Immigration and Trade Labor Market Outcomes." *Brookings Papers on Economic Activity, 1:1997*: Brookings Institute: Washington, D.C.

Borjas, George J. and Valerie A. Ramey. 1995. "Foreign Competition, Market Power, and Wage Inequality." *Quarterly Journal of Economics* 110: 4, pp. 1075-1110.

Brown, Charles and James Medoff. 1989. "The Employer Size-Wage Effect." *Journal of Political Economy* 97: 5, pp. 1027-1059.

Brown, Clair, Yoshifumi Nakata, Michael Reich, and Lloyd Ulman. 1997. *Work and Pay in the United States and Japan*. New York: Oxford University Press.

Burda, Michael C. and Barbara Dluhosch. 2000. "Fragmentation, Globalisation and Labour Markets." *International Economic Association Conference on "Globalisation and Labour Markets"*: University of Nottingham.

Chuma, Hiroyuki and Yoshio Higuchi. 1995. "Keizai Kankyo no Henka to Choki Koyo Sisutemu (Business Environment Change and Long-term Employment System)," in *Nihon no Koyo Sisutemu to Rodo Shijo (Japanese Employment System and Labor Markets)*. Takenori Inoki and Yoshio Higuchi eds. Tokyo: Nihon Keizai Shinbunsha, pp. 23-56.

Cline, William R. 1997. *Trade and Income Distribution*. Washington, DC: Institute for International Economics.

Deardorff, Alan V. and Dalia S. Hakura. 1994. "Trade and Wages - What Are the Questions?," in *Trade and Wages - Leveling Wages Down?* Jagdish Bhagwati and Marvin H. Kosters eds. Washington, D.C.: The AEI Press, pp. 76-107.

Feenstra, Robert C. and Gordon H. Hanson. 2003. "Global Production Sharing and Rising Inequality: A Survey of Trade and Wages," in *Handbook of International Trade*. E. Kwan Choi and James Harrigan eds. Oxford: Blackwell Publishing, pp. 146-185.

Freeman, Richard B. 2003. "Trade Wars: The Exaggerated Impact of Trade in Economic Debate." *NBER Working Paper 10000*: National Bureau of Economic Research: Cambridge, MA.

Friesen, Jane. 1997. "The Dynamic Demand for Part-time and Full-time Labour." *Economica* 64: pp. 495-507.

Furugori, Tomoko. 1997. *Hiseiki Rodo no Keizai Bunseki (Economic Analysis of Non-Regular Labor)*. Tokyo: Toyo Keizai Shinposha.

Gaston, Noel and Douglas Nelson. 2002. "Integration, Foreign Direct Investment and Labour Markets: Microeconomic Perspectives." *The Manchester School* 70: 3, pp. 420-459.

Genda, Yuji. 1998. "Japan: Wage Differentials and Changes Since the 1980s," in *Wage Differentials: An International Comparison*. Toshiaki Tachibanaki ed. New York: St. Martin's Press, pp. 35-71.

Goux, Dominique and Eric Maurin. 2000. "The Decline in Demand for Unskilled Labor: An Empirical Analysis Method and Its Application to France." *Review of Economics and Statistics* 82: 4, pp. 596-607.

Greenaway, David, Robert Hine, and Peter Wright. 1999. "Further Evidence on the Effect of Foreign Competition on Industry Level Wages." *Research Paper 99/11*: Center for Research on Globalisation and Labour Markets, School of Economics, University of Nottingham:

Gregory, Mary and Stephen Machin. 2000. "Trade or Technological Change? Which is Working against the Low Skilled?," in *Labour Market Inequalities*. Mary Gregory, Wiemer Salverda, and Stephen Bazen eds. New York: Oxford University Press, pp. 177-197.

Groshen, Erica L. 1991. "Five Reasons Why Wages Vary Among Employers." *Industrial Relations* 30: 3, pp. 350-381.

Hamermesh, Daniel S. 1993. *Labor Demand.* Princeton, NJ: Princeton University Press.

Hara, Hiromi. 2003. "The Estimation of the Elasticities of Complementarity between Regular and Non-Regular Employees in Japan." *Nihon Rodo Kenkyu Zasshi (The Japanese Journal of Labour Studies)* 45: 9, pp. 17-30.

Harrison, Ann E. 1994. "Productivity, Imperfect Competition, and Trade Reform." *Journal of International Economics* 36: pp. 53-73.

Hasan, Rana, Devashish Mitra, and K. V. Ramaswamy. 2003. "Trade Reforms, Labor Regulations, and Labor-Demand Elasticities: Empirical Evidence form India." *NBER Working Paper 9879*: National Bureau of Economic Research: Cambridge, MA.

Haskel, Jonathan E. 2000. "The Trade and Labour Approaches to Wage Inequality." *Review of International Economics* 8: 3, pp. 397-408.

Haskel, Jonathan E. and Matthew J. Slaughter. 2000. "Have Falling Tariffs and Transportation Costs Raised U.S. Wage Inequality?" *NBER Working Paper 7539*: National Bureau of Economic Research: Cambridge, MA.

Helpman, Elhanan and Paul R. Krugman. 1989. *Trade Policy and Market Structure*. Cambridge, MA: MIT Press.

Hicks, J. R. 1963. *The Theory of Wages*. New York: St. Martin's Press.

Higuchi, Yoshio. 1989. "Japan's Changing Wage Structure: The Impact of Internal Factors and International Competition." *Journal of the Japanese and International Economies* 3: pp. 480-499.

Higuchi, Yoshio. 2001. *Koyo to Shitsugyo no Keizaigaku (Economics of Employment and Unemployment)*. Tokyo: Nihon Keizai Shimbunsha.

Higuchi, Yoshio and Yuji Genda. 1999. "Chusho Seizogyo no Gurobaruka to Rodo Shijo heno Eikyo (Globalization of Small and Medium-size Manufacturing Firms and Its Impact on Labor Market)," in *Gurobaru Keizai Jidai no Sangyo to Koyo (Industries and Employment in the Era of Global Economy)*. Sueo Sekiguchi, Yoshio Higuchi, and Research Institute for Advancement of Living Standards eds. Tokyo: Toyo Keizai Shinposha, pp. 123-156.

Hipple, Steven. 2001. "Contingent Work in the Late-1990s." *Monthly Labor Review* 124: 3, pp. 3-27.

International Labour Office. 2001. "Trade Liberalization and Employment." Governing Body, International Labour Office: Geneva.

Ishikawa, Tsuneo. 2001. *Income and Wealth*. New York: Oxford University Press.

Ishikawa, Tsuneo and Seung-Yeol Yee. 1996. "Seizogyo Shitaukesei no Chingin Koka (Wage Effects of Subcontract System in Manufacturing)." *Nihon Rodo Kenkyu Zasshi (The Japanese Journal of Labour Studies)* 38: 1, pp. 2-16.

Jean, Sebastien. 2000. "The Effect of International Trade on Labour-Demand Elasticities: Intersectoral Matters." *CEPII Working Papers 00-07*: Centre d'Etudes Prospectives et d'Informations Internationales: Paris.

Johnson, George and Frank P. Stafford. 1999. "The Labor Market Implications of International Trade," in *Handbook of Labor Economics, Volume 3B*. Orley Ashenfelter and David Card eds. New York: Elsevier, pp. 2215-2288.

Jones, Ronald W. and Henryk Kierzkowski. 2001. "A Framework for Fragmentation," in *Fragmentation*. Sven W. Arndt and Henryk Kierzkowski eds. New York: Oxford University Press, pp. 17-34.

Katics, Michelle M. and Bruce C. Petersen. 1994. "The Effect of Rising Import Competition on Market Power: A Panel Data Study of US Manufacturing." *The Journal of Industrial Economics* 42: 3, pp. 277-286.

Kato, Takao. 2001. "The End of Lifetime Employment in Japan?: Evidence from National Surveys and Field Research." *Journal of the Japanese and International Economies* 15: 4, pp. 489-514.

Katz, Lawrence F. and David H. Autor. 1999. "Changes in the Wage Structure and Earnings Inequality," in *Handbook of Labor Economics, Volume 3A*. Orley Ashenfelter and David Card eds. New York: Elsevier, pp. 1463-1555.

Katz, Lawrence F. and Kevin M. Murphy. 1992. "Changes in Relative Wages, 1963-1987: Supply and Demand Factors." *Quarterly Journal of Economics* 107: 1, pp. 35-78.

Ko, Jyh-Jer Roger. 2003. "Contingent and Internal Employment Systems: Substitutes or Complements." *Journal of Labor Research* 24: 3, pp. 473-490.

Koike, Kazuo. 1999. *Shigoto no Keizaigaku (Economics of Work), 2nd ed.* Tokyo: Toyo Keizai Shinposha.

Kosai, Yutaka, Reiko Suzuki, and Yukiko Ito. 1998. "Boeki no Koyo to Chingin ni Ataeru Eikyo (Impact of Trade on Employment and Wage)." *JCER Discussion Paper No.51*: Japan Center for Economic Research: Tokyo.

Krishna, Pravin, Devashish Mitra, and Sajjid Chinoy. 2001. "Trade Liberalization and Labor Demand Elasticities: Evidence from Turkey." *Journal of International Economics* 55: pp. 391-409.

Landmann, Oliver. 2000. "Wages, Unemployment, and Globalization: a Tale of Conventional Wisdoms," in *Globalization and Unemployment*. Helmut Wagner ed. Heidelberg, Germany: Springer-Verlag, pp. 165-191.

Levinsohn, James. 1993. "Testing the Imports-As-Market-Discipline Hypothesis." *Journal of International Economics* 35: 1, pp. 1-22.

Lindbeck, Assar and Dennis J. Snower. 1986. "Wage Setting, Unemployment, and Insider-Outsider Relations." *American Economic Review* 76: 2, pp. 235-239.

Markusen, James R. and Anthony J. Venables. 1999. "Multinational Production, Skilled Labour, and Real Wages," in *Dynamic Issues in Applied Commercial Policy Analysis*. Robert E. Baldwin and Joseph F. Francois eds. New York: Cambridge University Press, pp. 138-172.

Mincer, Jacob. 1974. *Schooling, Experience, and Earnings*. New York: Columbia University Press.

Ministry of Health, Labour and Welfare. 2001. "Shugyo Keitai no Tayoka ni kansuru Sogo Jittai Chosa Hokoku (*Report of the General Survey on Diversified Types of Employment*) 1999." National Printing Bureau: Tokyo.

Ministry of Health, Labour and Welfare. 2003a. "Chingin Sensasu (*Wage Census*): Basic Survey on Wage Structure 2002." Rodo Horei Kyokai: Tokyo.

Ministry of Health, Labour and Welfare. 2003b. "Rodo Keizai Hakusho (*White Paper on Labour*) 2003." Japan Institute of Labour: Tokyo.

Mitani, Naoki. 2002. "Chusho Kigyo no Chingin Seido to Chingin Kozo (Wage System and Structure at Small and Medium Scale Firms)," in *Maikuro Bizinesu no Keizai Bunseki (The Economic Analysis of Micro-Businesses: Managers of Small Firms and Job Creation)*. Naoki Mitani and Akira Wakisaka eds. Tokyo: University of Tokyo Press, pp. 197-218.

Murphy, Kevin M. and Finis Welch. 1991. "The Role of International Trade in Wage Differentials," in *Workers and Their Wages*. Marvin H. Kosters ed. Washington, D.C.: The AEI Press, pp. 39-69.

Nagase, Nobuko. 2003. "Danjo kan oyobi Shugyo Ketai kan no Chigin Kozo to Chingin Kakusa no Suikei (Estimation of Wage Gap between Genders and Employment Status)." *Hitenkei Koyo Rodosha no Tayo na Shugyo Jittai (Variety of Employment for Atypical Labor) - Research Report No. 158*: Japan Institute of Labour: Japan.

Nakamura, Jiro and Hiroyuki Chuma. 1994. "Hedonikku Chingin Apurochi niyoru Joshi Patotaimu Rodosha no Chingin Kettei (Wage Determination of Female Part-timers by Hedonic Wage Approach)." *Nihon Rodo Kenkyu Zasshi (The Japanese Journal of Labour Studies)* 36: 9, pp. 23-29.

Ohtake, Fumio. 2000. "90 Nendai no Shotoku Kakusa (Income Disparity in the 1990s)." *Nihon Rodo Kenkyu Zasshi (The Japanese Journal of Labour Studies)* 41: 9, pp. 2-11.

Osawa, Machiko. 2002. "Hiseiki Rodosha no Zoka ga Motarasu Rodoshijo no Nikyoku Bunka (Bipolarization of Labor Markets Caused by an Increase in Non-Regular Workers)," in *Nihon no Shotoku Bumpai to Kakusa (Income Distribution and Differentials in Japan)*. Hiroshi Miyajima and Research Institute for Advancement of Living Standards eds. Tokyo: Toyo Keizai Shinposha, pp. 119-151.

Rebick, Marcus E. 1993. "The Persistence of Firm-Size Earning Differentials and Labor Market Segmentation in Japan." *Journal of the Japanese and International Economies* 7: pp. 132-156.

Rebick, Marcus E. 1999. "Trade and the Wage Structure in the Presence of Price Differentials in the Product Market: The Japanese Labor Market 1965-1990." *Journal of the Japanese and International Economies* 13: pp. 22-43.

Rosen, Sherwin. 1974. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy* 82: 1, pp. 34-55.

Sachs, Jeffrey D. and Howard J. Shatz. 1998. "International Trade and Wage Inequality in the United States: Some New Results," in *Imports, Exports, and the American Worker*. Susan M. Collins ed. Washington, D.C.: Brookings Institution Press, pp. 215-254.

Sakurai, Kojiro. 2000. "Gurobaruka to Rodo Shijo (Globalization and Labor Market)." *Keizai Keiei Kenkyu*, Vol. 21:

Shapiro, Carl and Joseph E. Stiglitz. 1984. "Equilibrium Unemployment as a Worker Discipline Device." *American Economic Review* 74: 3, pp. 433-444.

Shinozaki, Takehisa, Mamiko Ishihara, Takatoshi Shiokawa, and Yuji Genda. 2003. "Pato ga Seishain tono Chigin Kakusa ni Nattoku shinai Riyu ha Nanika (Why are Part-timers not Satisfied with the Wage Disparity against Regular Workers?)." *Nihon Rodo Kenkyu Zasshi (The Japanese Journal of Labour Studies)* 45: 3

Slaughter, Matthew J. and Phillip Swagel. 1997. "The Effect of Globalization on Wages in the Advanced Economies." *IMF Working Paper WP/97/43*: International Monetary Fund: Washington, D.C.

Sorrentino, Constance and Joyanna Moy. 2002. "U.S. Labor Market Performance in International Perspectives." *Monthly Labor Review* 125: 6, pp. 15-35.

Tachibanaki, Toshiaki. 1996. *Wage Determination and Distribution in Japan*. New York: Oxford University Press.

Tachibanaki, Toshiaki. 1998. *Nihon no Keizai Kakusa (Economic Inequalities in Japan)*. Tokyo: Iwanami Shinsho.

Tachibanaki, Toshiaki, Masayuki Morikawa, and Taro Nishimura. 1998. "Economic Development in Asian Countries, and the Effect of Trade in Asia on Employment and Wages in Japan." *Asian Economic Journal* 12: 6, pp. 123-151.

Tachibanaki, Toshiaki and Souichi Ohta. 1994. "Wage Differentials by Industry and the Size of Firm, and Labor Market in Japan," in *Labor Market and Economic Performance*. Toshiaki Tachibanaki ed. New York: St. Martin's Press, pp. 56-92.

Tomiura, Eiichi. 2002. "Yunyu Shinto to Nihon no Koyo (Import Penetration and Employment in Japan)." *Kokumin Keizai Zasshi* 186: 4, pp. 67-78.

Tomiura, Eiichi and Yukio Uchida. 2001. "The Impact of Import Competition on Gross Job Creation and Destruction." *Discussion Paper #01-DOF-36*: Research Institute of International Trade and Industry: Tokyo.