

## Globalization and Labor Demand Elasticities: Empirical Evidence from Nine OECD Countries\*

Hwan-Joo Seo\*\* · Han Sung Kim\*\*\* · Young Soo Lee\*\*\*\*

*This study empirically analyzes the impact of globalization on the elasticity of demand for labor using manufacturing data for nine OECD countries. While previous studies focused on the relationship between trade and elasticity of demand for labor, we also consider the effect of international capital mobility. Our main findings can be summarized as follows. Firstly, the results confirm that increased trade has made labor demand more elastic in Austria, Finland, France, Germany, the UK and the US. Second, financial opening, as in the case of trade liberalization, affects labor demand, making it more elastic. We confirm this finding for Finland, Sweden, Korea, Germany and the UK. In the case of Finland, Germany and the UK, both trade and financial opening render labor demand more elastic. Finally, we find that globalization has reduced the share of labor within total revenue, possibly due to reduction in the bargaining power of workers as suggested by Rodrik (1997).*

JEL Classification: F16, F66

Keywords: Globalization, Financial Openness, Trade Integration, Labor Demand Elasticities

### I. Introduction

Along with financial factors, income inequality has been identified as one of the

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*Received: Oct. 15, 2014. Revised: March 24, 2015. Accepted: May 20, 2015.*

\* This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2013S1A2A1A01033345).

\*\* First Author, Professor, School of Business Administration, Hanyang University, 171 Sa 1-dong Sangrok-gu, Ansan 15588, Republic of Korea, Phone: +82-31-400-5638, e-mail: seohwan@hanyang.ac.kr

\*\*\* Associate Professor, Department of Economics, Ajou University, San 5, Woncheon-dong Yeongtong-gu, Suwon 16499, Republic of Korea, Phone: +82-31-219-3536, e-mail: hkim1@ajou.ac.kr

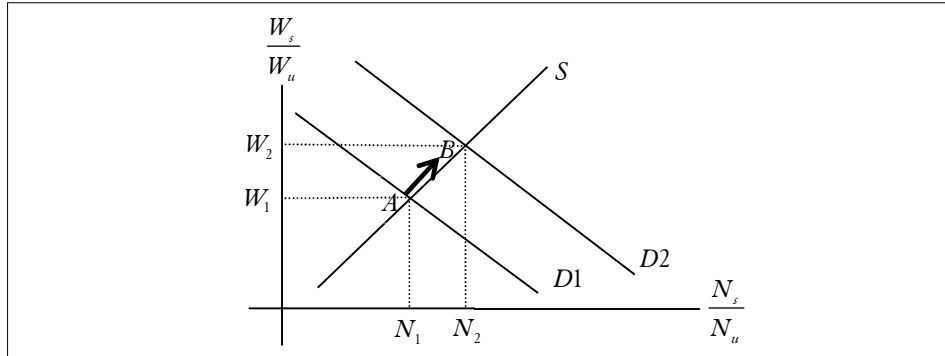
\*\*\*\* Corresponding Author, Professor, School of Business, Korea Aerospace University, 76, Hanggongdaehak-ro, Deogyang-gu, Goyang-si, Gyeonggi-do 10540, Republic of Korea, Phone: +82-2-300-0098, e-mail: yslee@kau.ac.kr

major causes of the global financial crisis in 2008 (Rajan, 2010; Fitoussi and Stiglitz, 2009; Fitoussi and Saraceno, 2010; Kumhof and Ranci re, 2011; Tridico, 2012). Studies focusing on income inequality have taken the position that the interaction between income inequality, leverage and the financial cycle caused the global financial crisis, such that the widening of income inequality brought out a sudden increase in household debt, which heightened vulnerability in the financial sector. As a result, these studies have concluded that widening income inequality brought about the financial crisis when the subprime mortgage crisis hit the US economy in 2008.

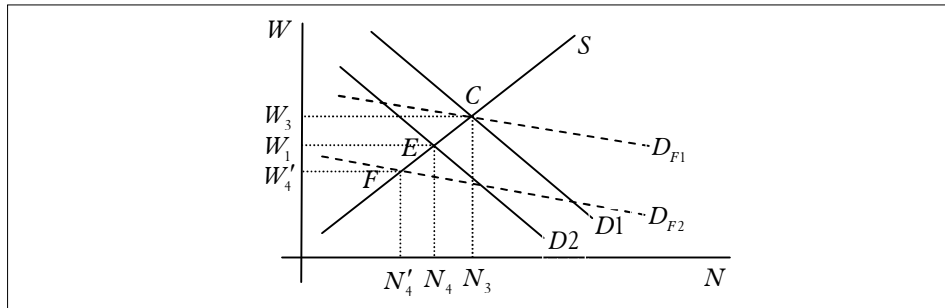
As income inequality is considered to be a major factor leading to the financial crisis, researchers have turned their attention to investigating the causes of this widening income inequality and decline in the labor share. Recent studies have focused on the role of globalization (increasing trade volume, direct investment and outsourcing across borders) to explain changes in the labor market and widening income inequality.

Two approaches have been taken to identify the relationships among globalization, labor markets and income inequality. One approach, which is shown in Figure 1, argues that globalization has increased the relative demand for skilled labor (from  $D1$  to  $D2$ ), resulting in higher relative wages for skilled labor ( $\frac{W_s}{W_u}$ ) and widening the income gap between skilled and unskilled labor. Another approach asserts that labor share, which describes the distribution of income between employers and employees, has fallen as globalization makes the demand for labor more elastic. As shown in Figure 2, with inelastic labor demand ( $D1$ ), when a trade shock hits an economy, labor demand shifts from  $D1$  to  $D2$  and the labor market equilibrium moves from point  $C$  to  $E$ . On the other hand, if labor demand ( $D_{F1}$ ) is elastic, when an economy faces the same economic shock, the labor market equilibrium moves from point  $C$  to  $F$  because of higher employment and wage volatility. In other words, both the wage and employment responses to a given (trade) shock tend to intensify with higher levels of labor demand elasticity. For this reason, the second approach posits that employment and wage volatility rise if labor demand becomes more elastic and that this results in a fall in labor union bargaining power and a decline in labor share. The first approach focuses on the factors which shift labor demand and identifies globalization and the proliferation of IT as major factors in shifting labor demand. In contrast, the second approach concentrates on the impact of globalization on the elasticity of labor demand and takes the position that globalization increases factor substitutability, making labor demand more elastic.

[Figure 1] Globalization and labor demand for skilled workers



[Figure 2] Globalization and elasticity of labor demand



Both approaches share the view that globalization impacts labor markets and results in increased income inequality, but they identify different paths toward these changes. The first approach focuses on how globalization shifts labor demand, while the second approach concentrates on how globalization affects the slope of labor demand. Also, the first approach gives more emphasis to wage inequality between skilled and unskilled labor; the second approach centers on functional income inequality between wage income and capital income earners. According to an OECD report (2011), globalization has brought about various types of income inequality (disparity of hourly wages among full-time workers, general wage disparity among workers, individual earnings inequality among the entire working-age population, and functional income inequality). Therefore, these two approaches complement each other in their analysis of various patterns of income inequality.

The first approach tests whether increased international trade has brought about a skill premium and decline in labor share as predicted by the Heckscher-Ohlin model and Stolper-Samuelson theorem (Baldwin, 1995), whether skill-biased technological change occurred (Autor, Katz and Krueger, 1998; Berman, Bound and Machin, 1998; Berman, Bound and Griliches, 1994), or whether an increase in global outsourcing affected the wage gap between skilled and unskilled labor

(Feenstra and Hanson, 1996; Strauss-Kahn, 2003; Hijzen, Gorg and Hine, 2004). Previous studies have considered the mismatch between labor demand and supply, especially the mismatch in skilled labor markets, as a cause of wage disparity. They have indicated that the demand for skilled labor rapidly increased while that for unskilled labor decreased, and such changes in the labor market widened wage disparity between the two groups. The increase in global trade, skill-biased technological change and/or knowledge-intensification in the service industry have contributed to an upward shift in demand for skilled labor.

The second approach to recent changes in the labor market focuses on the elasticity of demand for labor or the threat effect of globalization. Rodrik (1997), Slaughter (2001), Crotty, Epstein and Kelly (1998), Senses (2010) and Hasan, Mitra, and Ramaswamy (2007) showed that trade made the demand for labor more elastic, leading to larger volatility in employment and wages. Also, the increase in the absolute value of elasticity resulted in erosion of the bargaining power of labor vis-à-vis capital in the sharing of rents. Finally, the increase in the elasticity of demand for labor has made it possible for firms to put a larger burden of their non-wage costs (e.g., payroll taxes) onto the workers. For these reasons, Rodrik (1997) asserted that the increased elasticity of labor demand could have a negative impact on the labor share.

Rodrik and Slaughter pointed out that the price elasticity of labor demand is determined by two effects: 1) the scale effect, which explains the variation of labor demand due to wage-induced changes in the demanded output; and 2) the substitution effect, where firms substitute other inputs for labor due to rising wages. In this context, trade liberalization might influence labor demand elasticity via scale effects due to increased competition in the product market and/or via the substitution effect generated by the increased possibility of employing a larger variety of intermediate inputs and capital equipment, produced both domestically and abroad. Rodrik and Crotty, Epstein and Kelly also argued that the threat of moving production abroad or outsourcing by firms could have an important impact on the elasticity of demand for labor, even if the actual levels of offshoring did not change.

Our study analyzes the decline in labor share for nine OECD countries (Austria, Denmark, Finland, France, Germany, Korea, Sweden, the UK and the US) based on the second approach. Many empirical studies have been carried out based on the first approach, testing whether increases in trade, proliferation of IT and/or deepening of global outsourcing widen income inequality between skilled and unskilled labor. On the other hand, only limited attempts have been made to test the model of the second approach. Also, previous studies using the second model have only looked at a small number of countries, and focused mostly on the role of increases in trade.

Our study is based on the second approach. It is different from previous analyses

in that we make cross-country comparisons and take into account trade liberalization, as well as financial market liberalization, as effects of globalization. We empirically test whether globalization has had an impact on the elasticity of labor demand in nine OECD countries and whether this has brought about a decline in labor share. In other words, we analyze the relationships among globalization, elasticity of labor demand and income inequality.

While previous studies focused on the relationships between trade and elasticity of demand for labor, we take into account the effect of international capital mobility. That is, in interpreting globalization, we consider not only the increase in international trade but also increased international capital mobility, and analyze the impact of these two sides of globalization on labor markets.

We propose two channels through which an increase in financial transactions across national borders can affect the elasticity of demand for labor. Firstly, opening the financial markets promotes the international mobility of capital and thus facilitates inward foreign direct investment by multinational corporations. As more multinational firms enter the domestic market and produce their outputs, consumers may find it easier to substitute between different offerings, which leads to an increase in the elasticity of demand for products. A higher elasticity of product demand may then increase the elasticity of demand for labor via scale effects. The second channel is the substitution effect. Capital market openness makes it easier for firms to relocate their plants to other countries. It enables firms to easily substitute inputs manufactured in foreign subsidiaries for inputs produced by domestic labor in response to changes in factor prices. In this situation, the threat to move production bases to less-developed countries might have a maximum effect even in the absence of actually relocating plants abroad, because capital account openness increases the firms' likelihood to invest abroad.

In our paper, we compare and analyze the impact of globalization on the elasticity of demand for labor, considering not only trade integration but also financial market opening effects, for nine OECD countries. The remainder of this paper is organized as follows. Section II summarizes previous research and Section III provides our empirical model, data and test results. Finally, Section IV provide the concluding remarks.

## II. Literature Review

### 1. Price Elasticity of Demand for Labor

The impact of globalization on labor demand elasticity can be shown by equation (1). According to equation (1), the price elasticity of demand for labor ( $\eta_{LL}$ ) is determined by the weighted average of two components: i) the constant-output

elasticity of substitution,  $\sigma$ ; and ii) price elasticity of product demand,  $\eta$  (Slaughter, 2001; OECD, 2007).

$$\eta_{LL} = -(1-s)\sigma - s\eta \quad (1)$$

where  $\eta_{LL} < 0$ ,  $s$ ,  $\sigma$  and  $\eta > 0$ .

The first term on the right-hand side shows the substitution effect, reflecting the degree of a firm's substitution of labor for other production factors, holding the output level constant. The second term represents the scale effect. That is, an increase in wages due to an increase in the cost of production and the equilibrium price reduces the scale of production and, hence, reduces the quantity of labor demanded.  $s$  in equation (1) is the weighting factor between the substitution and scale effects, and reflects the share of labor in overall output. When globalization causes firms to pursue flexible means of production (such as outsourcing and/or regional production networks), the substitutability of domestic labor ( $\sigma$ ) for intermediate inputs from abroad increases, and the demand for labor becomes more price sensitive. Thus, the smaller the share of labor in total cost ( $s$ ), the larger the substitution effects ( $\frac{\partial \eta_{LL}}{\partial \sigma} = -(1-s) < 0$ ). When trade liberalization causes domestic firms to face higher competition in the market, the price elasticity of demand for products ( $\eta$ ) increases so that the scale effects go up when the share of labor cost in total cost ( $s$ ) increases ( $\frac{\partial \eta_{LL}}{\partial \eta} = -s < 0$ ). Using equation (1), Rodrick explained that globalization increased the substitutability of domestic labor by foreign intermediate input, as well as competition between domestic and foreign firms.

Past studies have looked at the effect of an increase in trade on the substitution and scale effects, but financial openness could also have a similar impact (Jayadev, 2007).<sup>1</sup> Capital market openness helps domestic firms more easily move their production bases abroad and could increase substitutability ( $\sigma$ ) as products produced abroad substitute for domestic labor. As the opening of financial markets increases multinational corporate FDI into the domestic market, increased competition in the domestic market between existing domestic firms and newcomers raises the price elasticity of product demand ( $\eta$ ). This implies that the effect of globalization on labor market should take into account not only goods market but also financial market opening.

## 2. Empirical Studies

There have been many empirical attempts which investigate the impact of trade on the elasticity of demand for labor. Using a two-stage approach, Slaughter (2001) tested the relationship between international trade and elasticity of demand for

<sup>1</sup> Jayadev, (2007) argued that capital account openness weakened the bargaining power of labor unions and lowered the labor share.

labor in eight US manufacturing sectors during the 1961-1991 period. In the first stage, Slaughter found that demand for production labor became more elastic in manufacturing overall and in five of eight manufacturing sectors. However, the same results did not hold for non-production labor. In the second stage, when estimated elasticities were regressed on a set of trade variables, the impact of trade on the elasticities of labor demand for both production and non-production workers was not clear.

The experiences of dramatic change in trade regimes in a number of developing countries might be considered as an appropriate context for investigating the link between globalization and labor demand elasticities. Krishna, Mitra and Chinoy (2001) empirically tested whether trade liberalization made the demand for labor more elastic in Turkey during the 1983-1986 period, but they failed to find significant effects. Fajnzylber and Maloney (2005) and Slaughter (2001) looked at the Central and South American countries of Chile (1979-1995), Colombia (1977-1991) and Mexico (1984-1990) but they also did not uncover significant evidence of a link between trade liberalization and labor demand elasticities.<sup>2</sup>

Hasan et al. (2007) tested whether changes in trade policy had an impact on labor demand elasticity in India. Using industry-level data disaggregated by fifteen major states, Hasan et al. (2007) examined the impact of Indian trade reforms, initiated in 1991, on labor demand elasticities in the manufacturing sector. Spanning the 1980-1997 period, they found that trade liberalization raised labor-demand elasticities. They also suggested that the response of labor demand elasticities was conditioned by the nature of labor institutions; having flexible labor markets and low adjustment costs (that is, fewer restrictions on the hiring and firing of labor), India saw not only a more elastic demand for labor but also a more accelerated impact of trade reforms on those labor demand elasticities. Senses (2010) analyzed the relationship between offshoring and labor demand elasticities over the period of 1972-2001 using firm-level US manufacturing data. The results suggested that conditional demand elasticities for production workers were positively associated with offshoring and that controlling for skill-biased technological change did not alter the positive impact of offshoring on labor demand elasticities.

Another set of studies analyzed whether the elasticity of labor demand might be affected by the nationality of ownership. The primary question of these studies was whether multinational firms had higher elasticities of labor demand and reacted more to a given shock than domestic firms. From a theoretical point of view, this might be due to the fact that multinationals can rapidly transfer production sites across borders in response to wage changes. For that reason, labor demand could be more elastic in multinational firms. Fabbri et al. (2003) and Hakkala et al. (2010)

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<sup>2</sup> They only found a significant result showing that trade liberalization raised the elasticity of demand for Mexican blue-collar workers.

found that wage elasticity was higher in multinational firms than in national firms, and in particular for medium-skilled workers. On the other hand, Buch and Lipponer (2010) found no significant differences. Görg et al., (2009) found contrary empirical results from previous studies. They investigated the link between nationality of ownership and wage elasticities of labor demand at the firm level using Irish Economy Expenditure Survey data for the 1983-1998 period. They found that labor demand in multinationals became less elastic with respect to wages in plants having backward linkages with the local economy. They argued that if locally sourced inputs were to some degree specific due to better quality and availability, or lower transport costs, than imported inputs, labor demand in multinationals became less elastic as it had backward linkages with domestic suppliers.

### III. Estimation Model and Data

#### 1. Model Specification<sup>3</sup>

Suppose that a representative firm in industry  $j$  of country  $i$  has a Cobb-Douglas production function as follows,

$$Q_{i,j,t} = A_{i,j,t}^\gamma K_{i,j,t}^\alpha N_{i,j,t}^\beta \quad (2)$$

where  $Q$ ,  $K$ ,  $N$ , and  $A$  stand for value-added, capital stock, employment and technical efficiency, respectively.  $t$  represents time.

A profit-maximizing firm hires workers and capital at the point where marginal revenue product of labor is equal to wage ( $w$ ) and marginal revenue of capital is the same as user cost of capital ( $c$ ). Based on this, we can rewrite equation (2) as follows:

$$Q_{i,j,t} = A_{i,j,t}^\gamma \left( \frac{\alpha N_{i,j,t}}{\beta} \cdot \frac{w_{i,j,t}}{c_{i,j,t}} \right)^\alpha N_{i,j,t}^\beta \quad (3)$$

Let  $\frac{w_{i,j,t}}{c_{i,j,t}} = R_{i,j,t}$ . Taking the logarithm and rearranging equation (3) allows us to derive the demand for labor as

$$\ln N_{i,j,t} = \theta_0 + \theta_1 \ln R_{i,j,t} + \theta_2 \ln Q_{i,j,t} + \theta_3 \ln A_{i,j,t} \quad (4)$$

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<sup>3</sup> See Seo and Kim (2013).



$$\text{where } \theta_0 = -\frac{\alpha \ln \alpha - \alpha \ln \beta}{\alpha + \beta}; \theta_1 = -\frac{\alpha}{\alpha + \beta}; \theta_2 = \frac{1}{\alpha + \beta}; \theta_3 = -\frac{\gamma}{\alpha + \beta}$$

According to Greenaway, Hine and Wright (1999) and Konings and Vandebussche (1995), trade may be a vehicle for technological spillovers, through both the import of goods embodying foreign knowledge and the acquisition of useful information. All these factors contribute to enhancing the technical efficiency of the production process. Therefore it is hypothesized that parameter  $A$  in the production function varies over time in the following manner,

$$A_{i,j,t} = e^{\delta_0 T_{i,j}} G_{i,j,t}^{\delta_1}, \quad \delta_0 > 0 \text{ and } \delta_1 > 0 \quad (5)$$

where  $T$  shows the time trend and  $G_{i,j,t}$  stands for the effect of globalization, which is a variable capturing the degree of exposure to international competition of country  $i$  in industry  $j$ . The time trend  $T$  indicates the exogenous improvement of technical efficiency over time.

If the exposure to international competition improves technical efficiency, then  $\delta_1 > 0$ . But, as Egger and Egger (2006) showed, excessive dependence on imported parts and components could attenuate complementarity among domestic firms so that productivity could deteriorate as the globalization process deepens. In this case,  $\delta_1 < 0$ . That is, depending on which effect dominates,  $\delta_1$  can have either a positive or negative sign.

Inserting equation (5) into equation (4) and adding an error term, we can derive demand for labor as follows,

$$\ln N_{i,j,t} = \theta_0 + \theta_1 \ln R_{i,j,t} + \theta_2 \ln Q_{i,j,t} + \theta_4 \ln G_{i,j,t} + \theta_5 T_{i,j} + \eta_{i,j,t} \quad (6)$$

where  $\theta_4 = \delta_1 \theta_3$  and  $\theta_5 = \theta_3 \delta_0$ .  $\eta_{i,j,t}$  is an error term

Rodrik (1997), Slaughter (2001) and Senses (2010) assumed that globalization increased labor demand elasticity. Thus we suppose that labor demand elasticity ( $\theta_1$ ) is a function of  $G$  which represents globalization.

$$\theta_1 = \kappa_0 + \kappa_1 \ln G_{i,j,t} \quad (7)$$

Using equation (6) and (7), we have equation (8) as follows:

$$\begin{aligned} \ln N_{i,j,t} = & \theta_0 + \kappa_0 \ln R_{i,j,t} + \kappa_1 [(\ln R_{i,j,t}) \times (\ln G_{i,j,t})] + \theta_2 \ln Q_{i,j,t} \\ & + \theta_4 \ln G_{i,j,t} + \theta_5 T_{i,j} + \eta_{i,j,t} \end{aligned} \quad (8)$$

Equation (8) is the baseline equation for our empirical test.

Since the price elasticity of demand for labor ( $\varepsilon_{N,R}$ ) should be a negative value, it has to satisfy the following condition.

$$\varepsilon_{N,R} = \frac{\partial \ln N_{i,j,t}}{\partial \ln R_{i,j,t}} = \theta_1 = \kappa_0 + \kappa_1 \ln G_{i,j,t} < 0 \quad (9)$$

In equation (9), globalization makes labor demand more elastic when  $\kappa_1 < 0$ . Therefore, the globalization variable  $G$  can affect the demand for labor not only through labor demand elasticity, and but also directly as a demand shifter ( $\theta_4 \ln G_{i,j,t}$  in equation (8)).

## 2. Dynamics of the Labor Demand Function

If there are costs associated with labor adjustments, then the level of employment may deviate from its steady state as adjustments to equilibrium take place. This leads to the introduction of a lag on employment in equation (8). If the adjustment speeds are different across industries then the introduction of additional lags may be necessary in order to take heterogeneous effects into consideration (Greenway et al., 1999). Hence the dynamic estimating equation for a panel of industries can be written as follows:

$$\begin{aligned} \ln N_{i,j,t} = & \theta_0 + \sum_n \tau_n \ln N_{i,j,t-n} + \sum_n \kappa_{0,n} \ln R_{i,j,t-n} + \sum_n \kappa_{1,n} [(\ln R_{i,j,t-n}) \times (\ln G_{i,j,t-n})] + \\ & \sum_n \theta_{2,n} \ln Q_{i,j,t-n} + \sum_n \theta_{4,n} \ln G_{i,j,t-n} + \theta_5 T_{i,j} + \eta_{i,j,t}, \end{aligned} \quad (10)$$

To account for unobservable components at the industry level, we estimate equation (10) using first differences:

$$\begin{aligned} \Delta \ln N_{i,j,t} = & \sum_n \tau_n \Delta \ln N_{i,j,t-n} + \sum_n \kappa_{0,n} \Delta \ln R_{i,j,t-n} + \sum_n \kappa_{1,n} [(\Delta \ln R_{i,j,t-n}) \times (\Delta \ln G_{i,j,t-n})] + \\ & \sum_n \theta_{2,n} \Delta \ln Q_{i,j,t-n} + \sum_n \theta_{4,n} \Delta \ln G_{i,j,t-n} + \theta_5 + \Delta \eta_{i,j,t} \end{aligned} \quad (11)$$

However, OLS estimates are biased and inconsistent if the lagged variable is correlated with the error term, which occurs frequently in dynamic panels with a short time dimension. Equation (11) is therefore estimated by using a system GMM estimator proposed by Blundell and Bond (1998), which also allows unbiased

coefficients to be estimated in a dynamic panel.

### 3. Data

We analyze the impact of globalization on labor demand elasticity for nine OECD countries, including Austria, Denmark, Finland, France, Germany, Korea, Sweden, the UK and the US. These are the OECD countries with obtainable International Investment Position (IIP) values. IIP is a measure that proxies financial openness of a country. The source of the data is OECD STAN DB (Rev. 3, 2008). The data covers the 1990-2009 period and includes 23 industries according to ISIC Revision 3. Additional information about industry classifications and the period of analysis is provided in Tables 1 and 2 in the Appendix. The analysis covers the period after 1990, because the globalization process, especially financial market liberalization, became prominent after 1990 (see Figure 3) and there has been relatively little research covering the period following 1990. This is also because IIP data is only available for some countries after 1990. The variables are defined as follows: employment ( $N$ ) and wages ( $w$ ) are measured in terms of total persons engaged and total labor costs divided by the number of employees, respectively. The output variable ( $Q$ ) is the volume of value added at constant prices based on year 2000. User cost of capital ( $c$ ) is constructed by multiplying the deflator for capital goods by the sum of interest rates and rate of depreciation (assumed to be 10%). For capturing the degree of globalization ( $G$ ), we use the following proxies.

The first proxy is the import penetration ratio ( $m$ ), which is defined as,

$$m_{i,j,t} = \frac{M_{i,j,t}}{Y_{i,j,t} + M_{i,j,t} - X_{i,j,t}} \quad (12)$$

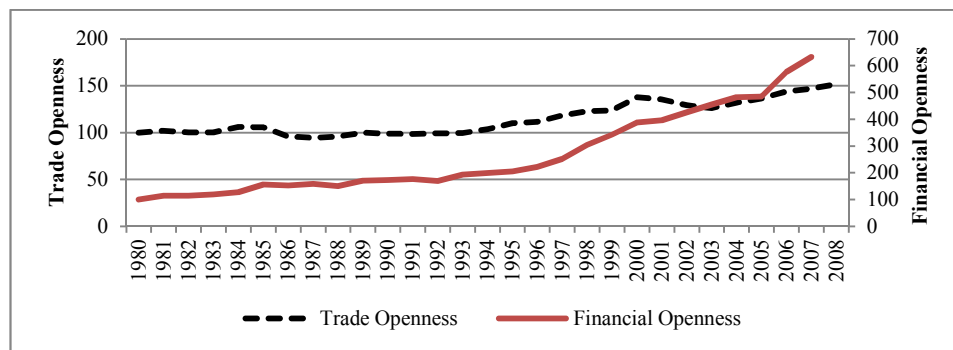
where  $M_{i,j,t}$  refers to the value of imports of industry  $j$  by country  $i$ , and  $X_{i,j,t}$  captures the value of exports of industry  $j$  in country  $i$ .  $Y$  stands for gross output. The import penetration ratio data was obtained from OECD STAN indicators (Rev. 3) (<http://stats.oecd.org/>).

As a second proxy variable for international integration, we utilize import intensity (imports divided by value added). The above two measures of import competition are used to estimate the impact of trade on labor demand as suggested by OECD (2007) and Slaughter (2001). Import and value-added data for import intensity was acquired from the OECD STAN database (Rev. 3, 2008) and all units are based on national currencies. Lastly, we use IIP, which is the share of foreign assets and liabilities in GDP, as a proxy for financial openness. It is obtained from the Bureau of Economic Analysis (<http://www.bea.gov/International/Index.htm>) for the US, the Office for National Statistics for the UK (<http://www.ons.gov.uk/ons>), and the Deutsch Bundesbank (<http://www.bundesbank.de/Navigation/EN/>

Statistics/) and Banque de France (<https://www.banque-france.fr>) for Germany and France, respectively. In Korea, the IIP is provided by the Bank of Korea (<http://ecos.bok.or.kr/>) and for other countries, the Eurostat Database ([http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database)). The currency used in measuring assets, liabilities and GDP is the US dollar for Korea and the US, British pounds for the UK, and Euros for France, Germany, Austria, Denmark, Finland and Sweden.

Summary statistics for the data used are provided in Table 3 of the Appendix.

[Figure 3] Developments in trade integration and financial openness, OECD average, 1980-2008  
(Unit: index)

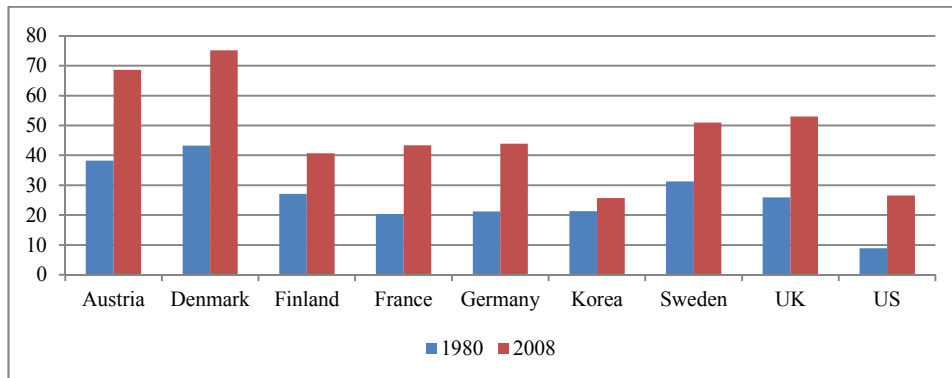


Note: 1980 = 100.

Source: OECD (2011), *Divided We Stand: Why Inequality Keeps Rising*, p. 29.

Figure 3 depicts trade integration and financial openness for the OECD countries. Trade integration (left axis) is measured as a ratio of the volume of trade to GDP and financial openness (right axis) is the sum of cross-border liabilities and assets as a percentage of GDP (i.e., IIP). The degree of globalization in terms of trade integration and financial openness has been rapidly increasing since the mid-1990s. It is noticeable, however, that the degree of globalization measured in terms of financial openness has increased faster than trade openness. During 1980-2008, financial openness increased by 6.5 times while that for trade increased only by 1.5 times.

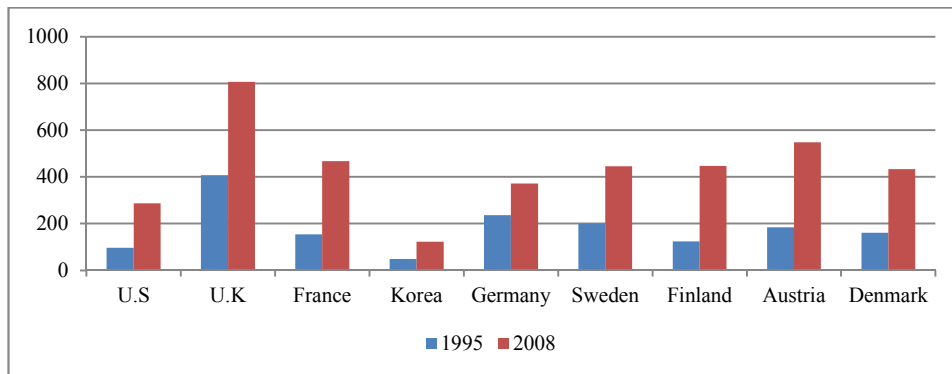
Figure 4 shows import penetration ratios for the nine OECD countries being investigated in this study. All these countries recorded increases in import penetration and as of 2008, the import penetration ratio for Denmark was the highest at 75%. This was followed by Austria (68%), the UK (53%), and Sweden (51%). Both France and Germany scored 43%, and Finland was slightly lower with 41% import penetration. The US and Korea were relatively lower than other countries, with 27% and 26%, respectively. Comparing 1980 with the end of the 2000s, the import penetration ratio for the US has increased by about three times and for the UK, Germany and France, it has roughly doubled.

**[Figure 4]** Import penetration ratio (Unit: %)

Note: Last year of data for Korea, Sweden, the UK and the US is 2006, with Korea's starting year being 1994.

Source: OECD DB.

The International Investment Position (IIP), which captures the degree of financial openness, is provided in Figure 5. As of 2008, the UK scored the highest level with 805%, followed by Austria (548%), France (468%), Finland (447%), Sweden (445%), Denmark (432%), Germany (371%) and Korea (122%). During the 1995-2008 period, IIP for Finland rose by 3.6 times, and it approximately tripled in the US, France and Austria.

**[Figure 5]** Developments in financial openness: International investment position (Unit: %)

Note: The graphs for Sweden and Austria are based on 1997 data. Denmark is based on 2007.

## 4. Estimation Results

### 4.1. Progress of Globalization and the Elasticity of Demand for Labor

As shown in equation (1), the deepening of globalization increases the elasticity of labor demand by raising the substitution possibilities among input factors and/or rendering product demand to be more elastic. We empirically estimate the effects of

globalization, which is proxied by trade integration and financial openness. In the following tables,  $G1$  stands for import penetration ratio,  $G2$  is import intensity and  $G3$  means IIP. Thus  $G1$  and  $G2$  represent trade openness while  $G3$  denotes financial openness.

The estimation results of equation (11) are summarized in Tables 1-3. We estimate the model using system GMM, which eliminates the potential problem of endogeneity caused by the inclusion of lagged dependent variables among explanatory variables. As shown in Tables 1-3, Sargan over-identification test results reject the null hypothesis of no misspecification, confirming the correct combination of control variables. The test results of AR (1) reject the null hypothesis of no autocorrelation while the test results with regard to AR (2) accept the null hypothesis of no autocorrelation, except in the case of Germany in Model 1.

[Table 1] Labor demand elasticities: Austria, Denmark and Finland

	Austria			Denmark			Finland		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
$\ln(N_{-1})$	0.953 (0.134)***	0.980 (0.094)***	0.903 (0.105)***	0.909 (0.068)***	0.903 (0.111)***	0.869 (0.147)***	1.144 (0.105)***	1.189 (0.104)***	1.016 (0.103)***
$\ln(N_{-2})$	-0.056 (0.089)	-0.004 (0.103)	0.133 (0.060)**	-0.173 (0.046)***	-0.192 (0.070)***	-0.288 (0.105)***	-0.382 (0.068)***	-0.461 (0.079)***	-0.283 (0.066)***
$\ln(R)$	0.416 (0.418)	-0.174 (0.136)	-0.815 (0.674)	-0.236 (0.249)	0.212 (0.262)	-1.629 (0.567)***	-0.812 (0.334)**	0.038 (0.172)	-0.303 (0.182)*
$\ln(R_{-1})$	-0.555 (0.384)	0.231 (0.094)**	0.499 (0.597)	0.264 (0.232)	0.287 (0.265)	1.278 (0.442)***	0.946 (0.321)***	0.323 (0.160)**	0.661 (0.137)***
$\ln(G1) \times \ln(R)$	-0.099 (0.096)			0.017 (0.062)			0.203 (0.114)*		
$\ln(G1_{-1}) \times \ln(R_{-1})$	0.119 (0.086)			-0.073 (0.057)			-0.297 (0.097)***		
$\ln(G2) \times \ln(R)$		0.025 (0.019)			-0.064 (0.044)			-0.056 (0.040)	
$\ln(G2_{-1}) \times \ln(R_{-1})$		-0.035 (0.018)**			-0.072 (0.049)			-0.051 (0.033)	
$\ln(G3) \times \ln(R)$			0.138 (0.116)			0.259 (0.099)***			0.011 (0.036)
$\ln(G3_{-1}) \times \ln(R_{-1})$			-0.092 (0.104)			-0.252 (0.085)***			-0.122 (0.027)***
$\ln Q$	0.269 (0.085)***	0.065 (0.068)	0.177 (0.037)***	0.321 (0.041)***	0.356 (0.014)***	0.343 (0.026)***	0.367 (0.040)***	0.279 (0.063)***	0.319 (0.045)***
$\ln Q_{-1}$	-0.213 (0.085)**	-0.043 (0.043)	-0.130 (0.036)***	-0.031 (0.029)	-0.026 (0.031)	-0.010 (0.041)	-0.100 (0.036)***	-0.157 (0.034)***	-0.038 (0.049)
$\ln G1$	0.720 (0.833)			-0.220 (0.617)			-1.676 (0.880)*		

$\ln G1_{-1}$	-0.837 (0.720)			0.874 (0.574)			2.340 (0.746)***		
$\ln G2$		-0.293 (0.190)			0.677 (0.447)			0.463 (0.323)	
$\ln G2_{-1}$		0.406 (0.190)**			0.779 (0.484)*			0.362 (0.277)	
$\ln G3$			-1.057 (0.913)			-2.423 (0.944)***			-0.077 (0.266)
$\ln G3_{-1}$			0.708 (0.834)			2.381 (0.811)***			0.934 (0.199)***
Constant	0.790 (2.117)	-0.860 (0.327)***	1.074 (1.522)	-4.676 (1.565)***	-10.238 (4.191)**	-0.260 (3.110)	-4.021 (2.570)	-2.716 (2.142)	-5.990 (1.848)***
Obs	378	378	252	300	300	300	373	373	373
No of groups	21	21	21	20	20	20	21	21	21
Sargan test	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AR1	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.02	0.01
AR2	0.87	0.95	0.69	0.53	0.53	0.49	0.91	0.82	0.96

Note: The values in parenthesis show standard error. (\*\*) and (\*\*\*) refer to significance at the 5% and 1% levels, respectively.

[Table 2] Labor demand elasticities: France, Germany and Korea

	France			Germany			Korea		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
$\ln(N_{-1})$	0.677 (0.092)***	0.636 (0.070)***	0.784 (0.110)***	0.979 (0.149)***	1.039 (0.096)***	0.913 (0.165)***	0.961 (0.163)***	0.946 (0.125)***	0.875 (0.119)***
$\ln(N_{-2})$	0.161 (0.105)	0.206 (0.080)***	0.095 (0.040)**	-0.276 (0.097)***	-0.265 (0.081)***	-0.170 (0.085)**	-0.011 (0.162)	-0.013 (0.177)	-0.041 (0.050)
$\ln(R)$	0.634 (0.355)*	0.876 (0.182)***	0.031 (0.318)	-0.124 (0.146)	0.117 (0.162)	-0.630 (0.504)	-0.084 (0.046)*	0.039 (0.119)	-0.683 (0.122)***
$\ln(R_{-1})$	-0.528 (0.374)	-0.895 (0.164)***	-0.153 (0.304)	0.001 (0.191)	-0.215 (0.180)	1.142 (0.710)*	0.109 (0.054)**	-0.030 (0.063)	0.671 (0.154)***
$\ln(G1)$ $\times \ln(R)$	-0.279 (0.099)***			-0.020 (0.034)			-0.014 (0.027)		
$\ln(G1_{-1})$ $\times \ln(R_{-1})$	0.192 (0.108)*			-0.019 (0.052)			-0.008 (0.015)		
$\ln(G2)$ $\times \ln(R)$		-0.225 (0.034)***			-0.046 (0.027)*			-0.042 (0.042)	
$\ln(G2_{-1})$ $\times \ln(R_{-1})$		0.185 (0.035)***			0.030 (0.028)			0.026 (0.022)	
$\ln(G3)$ $\times \ln(R)$			-0.065 (0.059)			0.081 (0.080)			0.108 (0.027)***
$\ln(G3_{-1})$ $\times \ln(R_{-1})$			0.068 (0.056)			-0.211 (0.127)*			-0.130 (0.032)***

$\ln Q$	0.425 (0.076)***	0.421 (0.045)***	0.338 (0.045)***	0.176 (0.044)***	0.134 (0.026)***	0.152 (0.036)***	0.516 (0.046)***	0.496 (0.034)***	0.371 (0.023)***
$\ln Q_{-1}$	-0.169 (0.106)	-0.162 (0.075)**	-0.269 (0.060)***	-0.014 (0.033)	-0.035 (0.029)	0.057 (0.047)	-0.422 (0.036)***	-0.378 (0.020)***	-0.204 (0.040)***
$\ln G1$	2.176 (0.767)***			0.218 (0.285)			0.210 (0.341)		
$\ln G1_{-1}$	-1.340 (0.815)*			0.189 (0.420)			0.126 (0.182)		
$\ln G2$		1.829 (0.289)***			0.475 (0.241)**			0.685 (0.596)	
$\ln G2_{-1}$		-1.405 (0.294)***			-0.279 (0.226)			-0.446 (0.300)	
$\ln G3$			0.486 (0.480)			-0.597 (0.629)			-1.704 (0.368)***
$\ln G3_{-1}$			-0.507 (0.4441)			1.671 (0.981)*			1.991 (0.447)***
Constant	-5.313 (0.757)***	-4.444 (0.618)***	0.772 (0.912)	0.510 (1.657)	0.922 (1.521)	-6.020 (3.168)*	-2.641 (1.312)**	-2.901 (2.033)	-2.636 (0.521)***
Obs	294	294	252	336	336	336	249	252	252
No of groups	21	21	21	21	21	21	21	21	21
Sargan test	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AR1	0.02	0.02	0.02	0.00	0.00	0.00	0.03	0.03	0.01
AR2	0.80	0.54	0.61	0.07	0.13	0.37	0.32	0.76	0.49

Note: The values in parenthesis show standard error. (\*\*) and (\*\*\*) refer to significance at the 5% and 1% levels, respectively.

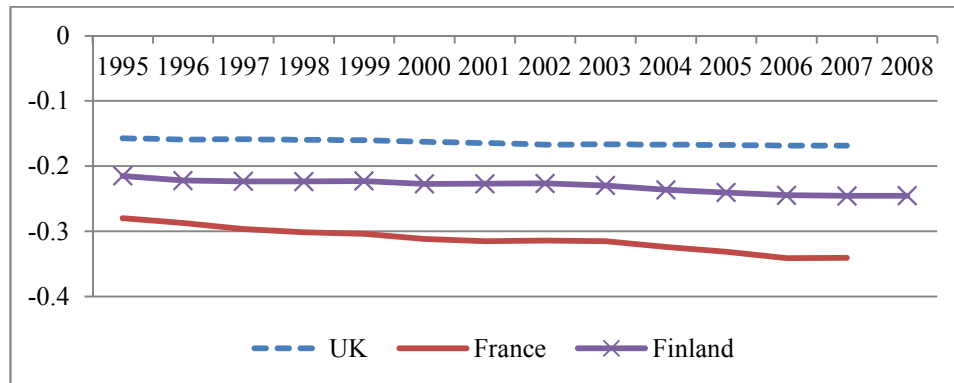
[Table 3] Labor demand elasticities: Sweden, UK and US

	Sweden			UK			US		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
$\ln(N_{-1})$	0.898 (0.051)***	0.888 (0.049)***	0.800 (0.097)***	0.882 (0.081)***	0.760 (0.097)***	0.789 (0.059)***	1.539 (0.316)***	0.536 (0.386)	0.827 (0.344)
$\ln(N_{-2})$	0.042 (0.058)	0.045 (0.069)	0.142 (0.093)	-0.053 (0.062)	-0.028 (0.066)	0.004 (0.036)	-0.611 (0.230)***	-0.139 (0.189)	-0.502 (0.116)***
$\ln(R)$	0.119 (0.199)	-0.156 (0.054)***	1.662 (0.634)***	-1.240 (0.236)***	-0.822 (0.183)***	0.014 (0.235)	0.367 (0.894)	1.652 (0.825)**	-0.519 (0.334)
$\ln(R_{-1})$	-0.107 (0.201)	0.109 (0.063)*	-0.772 (0.462)*	1.216 (0.222)***	0.890 (0.152)***	0.122 (0.198)	-0.839 (0.680)	0.222 (0.456)	-0.454 (0.667)
$\ln(G1)$ $\times \ln(R)$	-0.058 (0.054)			0.219 (0.061)***			-0.152 (0.319)		
$\ln(G1_{-1})$ $\times \ln(R_{-1})$	0.033 (0.059)			-0.255 (0.061)***			0.295 (0.251)		
$\ln(G2)$ $\times \ln(R)$		0.005 (0.009)			0.087 (0.034)***			-0.456 (0.220)**	
$\ln(G2_{-1})$ $\times \ln(R_{-1})$		-0.013 (0.013)			-0.138 (0.031)***			-0.108 (0.129)	

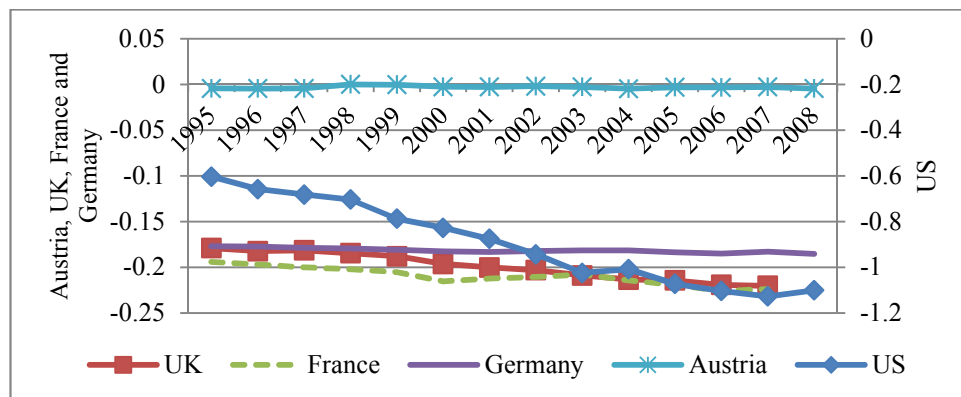




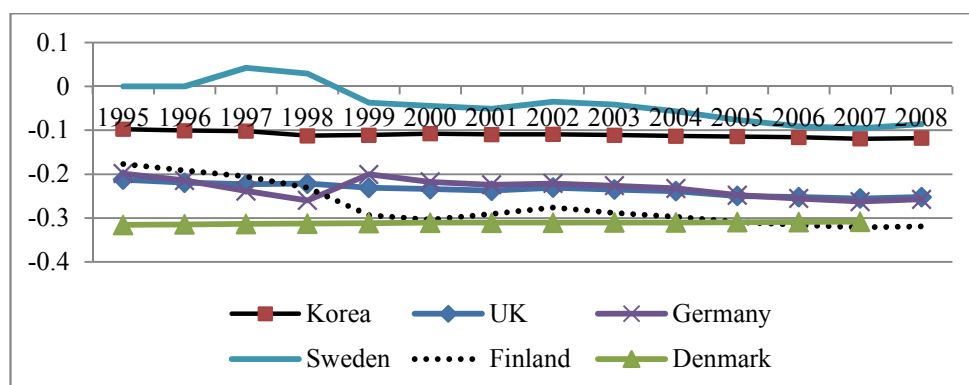
[Figure 6] Wage elasticities: Import penetration



[Figure 7] Wage elasticities: Import intensity



[Figure 8] Wage elasticities: Financial openness



Our main findings can be summarized as follows. First, we find variation in the speed of labor adjustment across countries. The summation of coefficients for  $\ln(N_{-1})$  and  $\ln(N_{-2})$  ( $\sum_n \tau_n$  in equation (11)) represents the speed of labor

adjustment. Table 4 summarizes the average value of coefficients for each country. For example, the sums of coefficients of  $\ln(N_{-1})$  and  $\ln(N_{-2})$  for Austria are 0.897, 0.976 and 1.036 in Models 1, 2, and 3, respectively (see Table 1). Table 4 shows the average value of these coefficients, which is 0.97. If the summation of coefficients is closer to zero, it means that the labor market is flexible and there is no adjustment cost. Previous studies (Burgess and Dolado, 1989; Hamermesh and Pfann, 1996; Cooper and Willis, 2004; Abowd and Kramarz, 2003) showed that there was non-negligible adjustment costs in labor markets and that the speed of labor adjustment was affected by the degree of legal protection for labor markets and labor union bargaining power. The summation of coefficients for  $\ln(N_{-1})$  and  $\ln(N_{-2})$  differs among the countries and the US has the lowest value at 0.55, meaning it has the most flexible labor market among the countries under investigation (see Table 4). On the other hand, Austria and Sweden, which have strong legal protection for employment, have summations of coefficients for  $\ln(N_{-1})$  and  $\ln(N_{-2})$  of 0.97 and 0.94, respectively, implying that the speed of labor adjustment for these countries is relatively slow. It is noticeable that Denmark has the second lowest value in speed of labor adjustment after the US. This could be the result of Denmark's flexicurity model, which is reflected in its Active Labor Market Policy (Campbell and Pedersen, 2007). Denmark's labor laws make it easy to lay off workers; however, the government also provides generous unemployment benefits and facilitates reemployment through employment programs. By doing so, Denmark achieves both flexibility and stability in its labor market and a speed of labor adjustment that is faster than in other European countries. This is similar to the results obtained by Navaretti et al., (2003), which estimated labor demand in the EU using firm-level data for the 1994-2000 period.

Secondly, as described in Section II, increasing international integration may be expected to raise labor demand elasticities. The interaction terms reported in Tables 1-3 capture these effects. Negative coefficients of interaction terms imply that trade openness and/or financial openness make labor demand more elastic. When globalization is measured in terms of the import penetration ratio ( $G1$ ), the coefficients of interaction terms ( $\ln(G1) \times \ln(R)$ ) turn out to be negative and statistically significant for Finland, France and the UK. For Finland, the coefficients of interaction terms at time  $t$  and  $t-1$  are both statistically significant and sum up to  $-0.094$ . When globalization is proxied by import intensity ( $G2$ ), the coefficients of interaction terms ( $\ln(G2) \times \ln(R)$ ) for Austria, France, Germany, the UK and the US have statistically significant negative values. For Austria, the coefficients of the interaction terms are statistically significant only at time  $t-1$ , and the sum of the coefficients for times  $t$  and  $t-1$  is  $-0.010$ . The estimation results for the US show that trade liberalization increased the elasticity of demand for labor in the US manufacturing sector. This result differs from Slaughter (2001), which estimated over the 1960-1991 period. But the apparent contradiction could be

the result of differences in estimation methods and investigation periods. As shown in Figure 3, the globalization process has accelerated since the 1990s. Therefore, Slaughter (2001), which focused on the pre-1990 period, may not have captured the effects of globalization on labor demand elasticity, while our study does capture it by focusing on the post-1990 period. For France and the UK, regardless of whether globalization is proxied by the import penetration ratio or import intensity, the coefficients are negative and statistically significant. The results reveal that in the case of Austria, Finland, France, Germany, the UK and the US, trade openness exposed these countries to international competition so that their labor demand become more elastic.

When globalization is measured in terms of financial openness ( $G3$ ), the interaction terms ( $\ln(G3) \times \ln(R)$ ) for Finland, Sweden, Korea, Germany, and the UK have statistically significant negative coefficients. This means that for these countries, freer capital mobility resulting from the opening of financial markets has made their labor demand more elastic. In Finland, the coefficient of the interaction term at time  $t-1$  has a negative value which is statistically significant and the summation of coefficients at time  $t$  and  $t-1$  is  $-0.111$ . For Denmark, both coefficients at time  $t$  and  $t-1$  are statistically significant, with  $0.259$  at time  $t$  and  $-0.252$  at time  $t-1$ . The sum of the coefficients is close to zero ( $0.007$ ). As  $\kappa_1 \approx 0$  in equation (6), this means that liberalization of the financial markets has hardly affected labor demand elasticity. The results show that both trade and financial openness have led to greater labor demand elasticity in Finland, Germany and the UK. While previous studies investigated the effects of trade openness on the elasticity of demand for labor (Rodrik, 1997; Slaughter, 2001; Senses, 2010), our results confirm that the opening of financial markets has also brought about a significant impact on labor demand elasticity.

Thirdly, Table 5 and Figures 6-8 show calculations for labor demand elasticity in equation (9) ( $\varepsilon_{N,R} = \kappa_0 + \kappa_1 \ln G_{i,j,t}$ ) from the estimation results in Tables 1-3. Table 5 provides average values and Figures 4-6 present overall trends during the investigation period. In most cases, it turns out that  $\kappa_0 > 0$ . In equation (9), when  $\kappa_1 < 0$ ,  $\ln G$  should be larger than  $\frac{\kappa_0}{\kappa_1}$  in order for  $\varepsilon_{N,R} < 0$ . For example, this is the case in Model 3 for Finland (see Table 1),  $\varepsilon_{N,R} = 0.258 - (0.111 \times \ln G3)$ . In order for the elasticity to be a negative value ( $\varepsilon_{N,R} < 0$ ), it must be the case that  $\ln G3 > 0.358$ . That is, the financial openness index ( $G3$ ) should be greater than 25%. But since the smallest value is 72.3% during the investigation period, it confirms that  $\varepsilon_{N,R} < 0$ . As shown in Figures 4-6, for most countries (except Sweden in the mid-1990s), condition  $\ln G > \frac{\kappa_0}{\kappa_1}$  is satisfied. Cross-country comparison based on Table 5 shows significant differences among countries. When globalization is proxied by the import penetration ratio, the elasticity of demand for labor ranges from  $-0.31$  to  $-0.16$ . France has the most elastic labor demand at  $-0.31$ . This is similar to Navaretti et al. (2003); estimating labor demand for EU

countries using firm-level data for the 1994-2000 period, they reported that labor demand was more elastic for southern European nations, such as Spain, France and Italy, than other European countries. On the other hand, when globalization is measured by import intensity, labor demand elasticity ranges from  $-0.89$  to  $-0.00$ . Austrian labor demand elasticity is close to zero while that for the US is the most elastic at  $-0.89$ , during the investigation period.<sup>4</sup> Lastly, when globalization is expressed in terms of financial openness, the elasticity of demand for labor turns out to be between  $-0.31$  and  $-0.04$ . Denmark appears to be the most elastic at  $-0.31$  and Sweden the least at  $-0.04$ . The UK, Finland and Germany have similar labor demand elasticity (all values in the range of  $-0.27$  to  $-0.23$ ).

[Table 6] Labor share and globalization: Fixed effects

	$\ln \frac{(W \times L)}{(P \times Q)}$								
	Austria	Denmark	Finland	France	Germany	Korea	Sweden	UK	US
ln G1			0.056 (0.038)	-0.435 (0.051)***				-0.088 (0.029)***	
Constant			2.747 (0.138)***	4.503 (0.187)***				3.499 (0.105)***	
Obs			415	336				378	
R <sup>2</sup>			0.01	0.01				0.01	
	$\ln \frac{(W \times L)}{(P \times Q)}$								
ln G2	-0.179 (0.034)***			-0.038 (0.026)***	-0.417 (0.029)***			-0.071 (0.016)***	-0.214 (0.023)***
Constant	4.020 (0.179)***			4.453 (0.129)***	5.079 (0.136)***			3.522 (0.738)***	3.832 (0.087)***
Obs	420			336	378			378	260
R <sup>2</sup>	0.01			0.21	0.08			0.02	0.08
	$\ln \frac{(W \times L)}{(P \times Q)}$								
ln G3		-0.141 (0.016)***	-0.140 (0.014)***		-0.486 (0.036)***	-0.141 (0.028)***	-0.222 (0.026)***	0.002 (0.019)	
Constant		3.995 (0.093)***	3.716 (0.079)***		5.883 (0.207)***	3.185 (0.122)***	4.252 (0.150)***	3.172 (0.123)***	
Obs		340	415		378	273	204	336	
R <sup>2</sup>		0.03	0.03		0.05	0.01	0.01	0.01	

Note: The values in parenthesis show standard error. (\*\*) and (\*\*\*) refer to significance at the 5% and 1% levels, respectively.

Lastly, Table 6 contains estimation results for the relationship between

<sup>4</sup> The estimation result with respect to the US is consistent with Slaughter (2001).

globalization and labor share. Rodrik (1997) insisted that globalization leads to a reduction in the labor share because increased labor demand elasticity weakens the bargaining power of labor relative to capital. That is, globalization makes labor demand more elastic, and that in turn lowers labor share. Given that there are limits on directly estimating whether elastic labor demand brings about a deterioration of the labor share, we analyze it indirectly by using the estimation results provided in Tables 1 to 3. That is, we test whether the globalization variable which leads to increased elasticity in labor demand lowers the share of labor, and we estimate the relationship between labor's share in total revenue ( $s$  in equation (1)) and the globalization variable. For example, labor share in total revenue is regressed on  $G1$  and  $G3$  for Finland because Table 1 shows that  $G1$  and  $G3$  increase the elasticity of labor demand.

The results reveal that globalization reduces the share of labor, except in Finland, when globalization is proxied in terms of import penetration, and in the UK when financial openness is used as a proxy for globalization. Table 6 shows that trade liberalization and financial openness have led to a reduction in the share of labor in total revenue, possibly due to a reduction in the bargaining power of workers as explained in Rodrik (1997).

#### IV. Summary and Conclusion

There has been extensive discussion about income disparity since the global financial crisis. Endeavoring to find the reasons for income disparity, these have looked into the role of human capital and education and efficient tax systems to reduce income disparity, and/or the effects of political inequality on income disparity (for example, see *Journal of Economic Perspectives*, 2013, Vol. 27, No 3). Our paper is based on Rodrik (1997), who analyzed the relationships among labor demand elasticity, globalization and income disparity. We empirically test the effects of globalization on labor demand elasticity for nine OECD countries (Austria, Denmark, Finland, France, Germany, Korea, Sweden, the UK and the US). Using the system GMM method, we focus on the 1990-2009 period when globalization deepened.

Firstly, our paper differs from previous approaches in the following ways: i) while previous studies used only trade-related variables to capture the globalization process, we consider the effect of financial liberalization as another proxy for globalization, in addition to trade-related variables. Increasing financial transactions across borders through financial-market opening can have an impact on labor demand elasticity that is similar to trade; ii) unlike previous studies which mostly look at the pre-1990s period, we deal with the post-1990 period when globalization has deepened, and present cross-country comparisons about the similarities and

differences among nine OECD countries.

Second, the results confirm that increased trade makes labor demand more elastic in Austria, Finland, France, Germany, the UK and the US.

Third, financial opening, as in the case of trade liberalization, affects labor demand, making it more elastic. We confirm this for Finland, Sweden, Korea, Germany and the UK. In Finland, Germany and the UK, both trade and financial opening render labor demand more elastic.

Finally, we find that globalization has reduced the share of labor in total revenue, possibly due to a reduction in the bargaining power of workers as suggested by Rodrik (1997).

Previous studies have shown that globalization increases demand for skilled labor and widens the income gap between skilled and unskilled labor. Building on that, our results confirm that there exists another route through which globalization increases income disparity. These results show that globalization causes labor demand to become more elastic and, as a result, brings about a decline in labor share. Also, we find that financial market liberalization, which has been largely overlooked in studies of the relationship between globalization and income disparity, has contributed to widening income disparity in OECD countries. This is the first empirical study showing the effect of financial market liberalization on income disparity.

Deepening globalization has had various positive impacts on the world economy. Increased trade and overseas investment have contributed to improvements in productivity and increases in employment and wages. Also, expanding international trade has reduced the evils of domestic monopolies and facilitated the efficient allocation of resources. However, in contrast to these positive effects, globalization has also had the negative result of deepening income disparity. For this reason, governments around the world are introducing policies to boost worker welfare, especially that of unskilled workers. The recent surge in social upheaval related to the welfare systems in many developing economies, including China and Korea, can be understood in this context. Governments seek policy measures and welfare systems that achieve flexibility and income stability at the same time.

We find a heterogeneous response to trade openness and capital movement across OECD member countries. Hasan, Mitra and Ramaswamy (2007) argued that such variations were caused by differences in the labor systems in each country. According to them, countries with more flexible labor markets and systems tend to experience higher increases in labor demand elasticity as globalization progresses. Regrettably, while our focus in this study was to investigate the relationships between globalization, labor markets and income disparity, we were not able to investigate the reasons for these differences between countries. This would be a valuable future research topic.

## &lt;Appendix&gt;

[Table 1] Industry numbers and names

ISIC Rev. 3	
15	Food products and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel, dressing and dyeing of fur
19	Leather, leather products and footwear
20	Wood and products of wood and cork
21	Pulp, paper and paper products
22	Printing and publishing
23	Coke, refined petroleum products and nuclear fuel
24	Chemicals and chemical products
25	Rubber and plastics products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products, except machinery and equipment
29	Machinery and equipment, n.e.c.
30	Office, accounting and computing machinery
31	Electrical machinery and apparatus, n.e.c.
32	Radio, television and communication equipment
33	Medical, precision and optical instruments
34	Motor vehicles, trailers and semi-trailers
35	Other transport equipment
36	Manufacturing n.e.c.
37	Recycling

[Table 2] Sample coverage

	Period covered	Industry coverage (ISIC Rev. 3)
Austria	1990-2009	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
Denmark	1991-2007	15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
Finland	1990-2009	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
France	1992-2007	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
Germany	1991-2008	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
Korea	1994-2006	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
Sweden	1993-2008	17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 33, 34, 35
UK	1990-2007	15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 30, 31, 32, 33, 34, 35
US	1990-2009	20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35



[Table 3] Summary statistics

	Austria					Denmark				
	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max
<i>N</i>	420	9.81	1.21	6.82	11.46	340	9.36	1.18	5.72	11.42
<i>R</i>	420	7.78	0.53	6.68	11.37	340	9.72	0.37	7.69	10.92
<i>Q</i>	420	20.80	1.14	16.50	22.67	340	22.24	1.19	17.99	24.07
<i>G1</i>	420	4.03	0.65	1.83	5.43	340	4.12	0.79	1.74	6.19
<i>G2</i>	420	5.24	1.06	2.72	8.97	340	5.36	1.28	2.14	8.95
<i>G3</i>	273	5.86	0.37	5.21	6.33	340	5.56	0.33	5.07	6.07
	Finland					France				
	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max
<i>N</i>	415	9.44	1.17	4.60	11.17	336	11.59	1.09	7.57	13.26
<i>R</i>	415	7.54	0.59	4.40	9.88	336	7.79	0.57	5.17	10.03
<i>Q</i>	415	20.27	1.45	14.91	23.65	336	22.57	1.04	18.91	24.07
<i>G1</i>	420	3.56	0.82	1.64	5.02	336	3.62	0.62	2.09	4.95
<i>G2</i>	415	7.78	1.29	2.35	10.33	336	4.94	0.87	3.05	7.88
<i>G3</i>	420	5.48	0.59	4.20	6.27	273	5.64	0.36	5.03	6.19
	Germany					Korea				
	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max
<i>N</i>	336	11.59	1.09	7.57	13.26	273	11.82	1.08	8.18	13.24
<i>R</i>	336	7.79	0.57	5.17	10.03	273	13.81	0.74	11.88	15.88
<i>Q</i>	336	22.57	1.03	18.91	24.04	273	29.18	0.92	27.23	31.88
<i>G1</i>	336	3.62	0.62	2.09	4.95	270	2.94	0.71	0.76	5.02
<i>G2</i>	336	4.94	0.87	3.05	7.88	273	4.25	0.86	1.48	6.23
<i>G3</i>	273	5.64	0.36	5.04	6.19	273	4.35	0.29	3.80	4.74
	Sweden					UK				
	Obs	Mean	Std. dev	Min	Max	Obs	Mean	Std. dev	Min	Max
<i>N</i>	272	9.87	1.26	7.09	11.58	378	11.67	1.04	8.38	13.16
<i>R</i>	272	10.00	0.43	9.22	12.07	378	7.37	0.48	5.46	8.64
<i>Q</i>	272	23.13	1.34	19.85	25.09	378	22.27	0.88	19.70	23.73
<i>G1</i>	272	3.84	0.68	2.15	5.01	378	3.61	0.67	1.99	5.17
<i>G2</i>	272	5.12	1.21	2.94	7.52	378	4.75	0.95	2.41	7.09
<i>G3</i>	204	5.84	0.26	5.30	6.16	336	6.29	0.26	5.80	6.74
	US									
	Obs	Mean	Std. dev	Min	Max					
<i>N</i>	260	13.49	0.66	11.60	14.49					
<i>R</i>	260	8.15	0.31	7.45	9.08					
<i>Q</i>	260	24.91	0.56	23.75	25.99					
<i>G1</i>	260	2.64	0.79	0.24	3.92					
<i>G2</i>	260	3.73	0.93	1.03	5.52					
<i>G3</i>	260	4.90	0.42	4.34	5.66					

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