Foreign Direct Investment, Labor Income and Inequality: Evidence from OECD Countries

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Abstract
This study investigates whether and to what extent Foreign Direct Investment (FDI) affects labor income and inequality in fourteen OECD countries by using a panel approach over the 1990-2010 period. The study uses four main labor income measures: the average annual wage, the statutory annual minimum wage, the labor income share, and the relative wage. By using different income measures the study identifies to what extent the effect of FDI differs on different classes of labor (i.e. average wage earners versus minimum wage earners). Moreover, the relative wage indicator helps us to measure the effect of FDI on labor income inequality. The estimation results show that FDI increases labor income in OECD countries. Both the average and the minimum wage earners benefit from FDI. However, the positive effect of FDI is distributed unevenly between them. It implies that FDI would widen the labor income inequality between the average and the minimum wage earners in OECD countries. Such an effect of FDI on the different classes of labor should be considered by policy makers while designing and following pro-FDI policies.

JEL Classification: F21, F23, J31

Keywords: Foreign Direct Investment, Labor Income, Inequality, Wage, OECD Countries
1. Introduction

With the rise of globalization, global FDI inflows increased dramatically. The growth in FDI inflows exceeded the pace of trade and economic growth. Nevertheless, host country effects of FDI remain indecisive. Although several OECD reports (2002, 2008) and many scholars (e.g. Stiglitz, 2000; Meyer, 2004; Lipsey 2004) show that the positive impacts of FDI outweigh the negative ones, there is still considerable amount of empirical findings that find FDI is not beneficial for the host country or even harmful for development (e.g. Das, 2002; Vijaya and Kaltani, 2007).

This study aims to make an empirical contribution to this strand of the economic literature by investigating the labor income effect of FDI and its implications on inequality in host countries. More specifically, the study seeks an answer whether FDI improves labor income and whether it makes a contribution to the labor income inequality in host countries by using four labor income measures: the average wage, the statutory minimum wage, the labor income share and the relative wage. Especially, the relative wage indicator helps us to measure to what extent FDI affects labor income inequality. The study uses a panel of 14 OECD countries for the period 1990-2010 and employs the panel OLS estimation method with fixed effects. It also takes a possible lagged effect of FDI on labor income measures into account.

The study differs from other studies in two respects. First, the study examines the labor income effect of FDI without discriminating between domestic and multinational firms. Many previous studies mainly concentrated on the labor income effect of FDI either on domestic firms or multinational firms in host countries. Moreover, these effects were investigated mostly with firm-level data for a single or for a few countries (e.g. Aitken et al., 1996). Such studies cannot draw economy-wide conclusions about the total labor income effect of FDI which leaves the question of whether FDI improves labor income in host countries unclear. Also, it is also hard to make cross-country comparisons by using firm-level datasets that are generated and collected in different ways.

Second, in investigating the labor income effect of FDI our study uses four labor income measures as the dependent variables: the average wage, the statutory minimum wage and the labor income share and the relative wage. Such a setting helps us to identify possible different effects of FDI on different classes of the labor force (i.e. average wage earners versus statutory minimum wage earners). To our knowledge the effect of FDI on the statutory minimum wage level has not been investigated before in this context. The use of the labor income share further helps us to understand whether the labor income share increases with FDI in OECD countries in aggregate terms. Moreover, the use of labor income share serves us as a robustness check of the first two measures. Finally, the use of relative wage variable shed lights on FDI and inequality relation.

The results of the study reveal that an increase in the inward FDI stock associates with an increase in the average wage, the statutory minimum wage and the labor income share in OECD countries. Moreover, the lagged impact of FDI is found as positive and grows over time, which suggests both in the short and the medium run an increase in the inward FDI stock increases labor income. The results show that a 10 percentage-point increase in the inward FDI stock leads to a 0.014 percent increase in the annual average wage and a 0.012 percent increase in the annual minimum wage within two years. It implies that the positive effect of FDI on the average wage earners and the minimum wage earners is positive and statistically significant. But the size of the
effect is economically small and it is distributed unevenly between the average and the minimum wage earners.

The key message of the study is that FDI improves labor income in host countries. Nevertheless, workers with some level of education (i.e. average wage earners) might benefit more from FDI than the minimum wage earners. It means that FDI may lead to an increase in labor income inequality in OECD countries. It is also clear that FDI neither hurts the average wage earners nor the minimum wage earners, unlike what some scholars such as Stehrer and Woerz (2009) or Seguino (2007) claim. Finally, it is found that labor productivity affects the average wage, the minimum wage and the labor income share positively in all specifications, whereas the effects of trade openness and employment are stayed mixed. A policy implication of the findings is that policy makers should follow pro-FDI policies accompanied with labor-skill improvement measures such as labor trainings and education programs which will improve disadvantaged workers’ income. Also, more general policies towards increasing the absorption capacity of all current and future workers such as promoting vocational education and increasing the quality of education would increase the magnitude of the FDI effect on labor income.

2. Literature Review

Recent empirical literature has evolved in two directions. A first set consists of studies which use firm and sector-level data that provide micro-level and sector specific information on the labor income effect of FDI (e.g. Aitken et al. 1996; Lipsey and Sjoholm, 2004). A second set of studies use aggregate data and a panel approach. Such studies have a wider coverage of countries and a longer span of time (e.g. Vijaya and Kaltani, 2007; Gopinath and Chen, 2003). We survey some selected relevant studies from both strands to provide an insight how the labor income effect of FDI is treated in the literature.

Surveys

Lipsey (2004) reviews the results of studies which investigated the impact of FDI on wages. He reports that the evidence is strong enough to conclude that FDI increases wages on average. OECD (2008) surveys the firm level and worker level studies that examined the impact of FDI on wages and concludes that multinationals pay higher wages than domestic companies. Multinationals might generate a positive spillover effect on pay and working conditions but such a spillover effect does not spread over evenly across different sectors in host countries. In an another benchmark survey, Gorg and Greenaway (2004) find that empirical evidence on productivity and wage spillovers from FDI on domestic firms is mixed at best. Cross-section studies tend to overestimate the effect, whereas panel studies generate mostly ambiguous results. Supporting this finding, a recent survey concludes that “contrary to the direct effects of FDI on performance (e.g. capital and economic growth), the indirect effects (e.g. wage spillovers) are not clear-cut: the results differ according to the country or period analyzed and the econometric methodology” (Hanousek et al., 2011, p. 10).

Empirical Studies

Aitken et al. (1996) explore the relationship between wages and FDI in Mexico, Venezuela and the United States by using a plant level dataset which was collected by surveys between 1977 and 1990. They aggregate up the dataset to a four-digit industry level for their analysis. FDI is measured as the share of employment in enterprises with foreign equity investment. This measure shows the share of foreign presence in the industry. For the combined plant data, which
cover both foreign and domestically-owned plants, they find that for both skilled and unskilled workers, a higher share of FDI raises the wage level. The coefficient of FDI varies from 0.22 (for unskilled workers) to 0.29 (for skilled workers), suggests that a 10 percent increase in the share of foreign investment in the overall employment of a region leads to a 2.2 percent increase in wages. And the magnitude of the impact is similar across three countries. They conclude that “higher foreign investment is associated with higher wages for the labor force as a whole” (Aitken et al., 1996, p. 353).

Gopinath and Chen (2003) investigate the impact of FDI on wages with a factor endowment approach. They use a panel dataset of 26 countries over the period 1970-1995. The estimation results with OLS fixed effects reveal that FDI inflows increase the host country wage level of skilled labor both in developed and developing countries. For the aggregate labor force, the elasticity of wage with respect to FDI is estimated as 0.12. In country-specific estimations, the effect of FDI on wages varies between 0.2 and 0.05. However, they find a negative effect of FDI on unskilled wage levels in developing countries that for every 1 percent increase in FDI inflows, the wage level of unskilled workers decreases by 0.07 percent. They discuss that FDI might increase wage inequality in developing countries due to the bias of foreign investors towards skilled labor. According to Gopinath and Chen (2003), in developed countries both skilled and unskilled workers would enjoy high wages backed by FDI inflows.

Lipsey and Sjoholm (2004) look into whether foreign-owned plants pay higher wages than domestic-owned plants in Indonesia. They use a plant-level dataset that covers 19911 plant observations, which can identify labor characteristics in the plants. They find that in Indonesia foreign-owned plants pay about 50 percent higher than private domestic plants (at the three-digit industry level). They also test whether foreign-owned plants pay more because they hire higher educated workers. Even controlling for education levels, foreign-owned plants pay 40 percent higher wages than domestic-owned plants.

Almeida (2007) investigates the effect of foreign acquisition on wages in acquired firm by using a Portuguese matched employer–employee dataset. The results show that foreign acquisition has a little effect in the human capital of workforce in Portugal. Hourly wages for the higher educated workers increase by 3.5 percent following the acquisition and average hourly wages for the low educated workers remain unchanged. According to Almeida (2007), foreign-owned plants pay higher wages simply because they acquire the most productive firms in host countries (i.e. cherry picking) and also hire more educated workers.

Driffield and Taylor (2000) investigate the labor market effect of FDI inflows in the UK manufacturing sector. They find that FDI generates some positive productivity spillovers. The results show that FDI inflows increase wage inequality by increasing the demand for skilled labor and crowding-out unskilled labor. Therefore, FDI might lead to some remarkable negative effects on wage shares of unskilled labor. Also FDI does not bring any solution to the structural unemployment problem in the UK regions where workers abundantly unskilled.

Onaran and Stockhammer (2008) use a cross-country sector-specific econometric analysis to analyze how FDI affects wages. They use one-digit level panel data for the manufacturing industry in the Czech Republic, Hungary, Poland, Slovakia, and Slovenia over the period 2000–2004. Their results show that FDI raises wages modestly in the short run that a 10 percentage point increase in the FDI stock to output ratio leads to a 1.2 percent increase in
average annual real wages. Especially, in the capital intensive and skilled-labor employing sectors such as chemicals and transport equipment production such an effect is more evident.1

In a follow up study, Onaran and Stockhammer (2009) question the effect of FDI on sectoral wage determination for the sample of Czech Republic, Hungary, Poland, Slovakia, Slovenia, and Lithuania between 1999 and 2003. They include the openness of the sector (in terms of exports and imports relative to output), the nation-wide average wage rate and the lagged level of the FDI stock (relative to output) into the regression. The results point out that FDI affects sectoral wages positively in four out of six countries and the effect size varies between 0.9 and 0.1. The role of sectoral openness on wages remains unclear that its coefficient is found as negative and statistically significant for two countries, and it is insignificant in four countries. As in Onaran and Stockhammer (2008), they find that in more capital-intensive sectors the size of the FDI effect on wages is larger.

Stehrer and Woerz (2009) investigate the host country effects (output, export and wage growth) of FDI by using a sample of OECD and non-OECD countries over the period 1981–2000. They use a system of simultaneous equations and find that the inward FDI stocks affect output and export growth positively. However, it leads to a decrease in wage growth that a 1 percent increase in the inward FDI stocks associates with a -0.02 percent wage growth.

Majid (2004) investigates the impact of globalization or openness by using two commonly used proxy variables: trade/GDP and FDI/GDP. He explores the International Labor Organization’s October Inquiry database which covers the period of 1983-1998. He concludes that trade and FDI have a negative temporary impact on real wages. Nevertheless, in developed countries over time the negative effects are eliminated by labor market adjustments. In developing countries, however, the negative effect of FDI and trade on wages might remain for a longer period due to the lack of well-functioning labor markets.

Some studies use the bargaining power approach in investigating the labor market effects of FDI. Basically, the bargaining power approach claims that foreign investors have a higher bargaining power than the labor force in host countries, which reduces the payoff to the labor force. According to Eckel and Egger (2009), multinational firms are in a better position in wage bargaining because they have plants and operations in different countries. The existence of such a power lowers the influence of labor unions and the labor force in wage bargaining. Vijaya and Kaltani (2007) examine the effect of FDI on nominal wages by using the wage bargaining approach in the manufacturing sector of 19 countries for the period 1987-2001. They find that FDI lowers wages and the effect is greater for female workers. The coefficient of FDI inflows variable in their baseline specification shows that a 1 percent increase in FDI inflows leads to a 0.045 percent decrease in the wage rate.

Similarly, Seguino (2007) examines a panel of 37 semi-industrialized economies over the period 1970-2000. His hypothesis is that an increase in total FDI flows (inward plus outward) indicates an increased firm mobility. “Firm mobility may be read by workers as a credible threat that firms are able to relocate in the event of unacceptably strong wage demands on the part of labor. The increase in firm bargaining power, even if not acted on via firm relocation, can lead to slower wage growth” Seguino (2007, p. 28). The estimation results with OLS fixed effects and GMM show that a 1 percent increase in total FDI flows (as a proxy for firm mobility and the bargaining power) leads to a 0.19 percent decrease in the wage growth rate.

Feliciano and Lipsey (2006) examine how foreign ownership affected wages in the US manufacturing and non-manufacturing industries over the 1987-1992 period. They use OLS estimation and find that wages increase with foreign ownership in companies. In the manufacturing sector, a 1 percent increase in foreign ownership ratio increases the sector wage level by 0.06 percent. The results also show that foreign firms pay about 4 percent higher wages than domestic firms. In a similar fashion, Ramstetter (1999) uncovers the differences between multinational and local companies in five Asian countries between 1983 and 1996. He finds that multinational companies have a higher export propensity and productivity but pay a similar wage to local firms. It implies that the expected relation between productivity and wages is broken in the multinational companies operating in five Asian countries. Nevertheless, Conyon et al. (2002) examine the UK firm level data for the period 1989-1994. They find that foreign firms pay equivalent workers 3.4 percent more than domestic firms. The study also shows that labor productivity in firms which have been acquired by foreign firms in the UK is about 13 percent higher than domestic firms.

The review of some surveys and selected empirical studies points out that the results of both strands of studies (micro-level and panel) remain mixed at best and therefore the subject needs further research to explore how and to what extent FDI affects labor income in host countries. Especially, the labor income effect of FDI on different classes of workers (i.e. average wage and minimum wage earners) remains unanswered.

3. Theory

Three main theoretical approaches are used in the literature to explain the labor income effect of FDI. These approaches also constitute the basis of our empirical models used in the study.

3.1 Productivity and Wage Spillover Effects of FDI

Standard economic theory expresses nominal wages as $W = P \times MPL$ where $P$ represents the price of final goods and $MPL$ is the marginal product of labor. The real wage rate can be written as $W/P = MPL$, which implies that labor payoff is directly depending on its marginal product. Therefore, any increase in the real wage stems from an increase in the marginal product of labor. The increase in marginal product of labor (or labor productivity) should not necessarily stem from an improvement in human capital or skills of labor. Any improvement in technology used by labor or a better organization of the labor force in a company can increase the marginal product of labor and therefore would associate with higher wages.

With FDI inflows, incoming multinationals are assumed to bring with them certain, largely intangible, assets that are then used to offset any advantages of incumbency possessed by domestic firms (Stiglitz, 2000). “Among those assets most frequently cited in the literature on multinational firms are technological knowledge, brand name capital and organizational capabilities” (Conyon et al., 2002, p. 87). Hence, the access to knowledge backed by FDI is expected to make the local labor force permanently more productive (Aitken, et al., 1996). All else equal, higher productivity is expected to associate with a greater surplus and therefore would increase the marginal product of labor and wage rates. In other words, a larger presence of foreign employers in a host country might have the effect of increased productivity levels and wages in both domestic and other foreign firms.

Domestic firms in a host country might also try to raise their productivity to compete with foreign firms (the competition effect) as a response and also would offer higher wages so as not to lose their best workers. “This is sometimes referred to in the literature as a wage spillover
effect, analogous to the more frequently analyzed productivity spillovers” (Feliciano and Lipsey, 2006, p. 83). Put simply, FDI is expected to increase labor income by increasing its marginal product in both domestic-owned and foreign-owned companies.

Nevertheless, if the human capital and technology level discrepancy between host and home country (industry or firm) is too large, the size of productivity effect of FDI would be limited due to the low degree of absorption capacity. In such a case, the productivity gain of the host country (industry or firm) and therefore the wage spillovers effect would be small. In the literature, this is called as the technology gap problem (Findlay, 1978; Gorodnichenko et al., 2007). “Positive spillovers are therefore found in more technologically advanced sectors or in more industrialized countries [such as in OECD countries]” (Hanousek et al., 2011, p. 6).

3.2 Labor Market Effects of FDI

The labor market effects of FDI are discussed under two effects: factor endowment effect and labor demand effect. The factor endowment effect occurs due to increased total capital stock (K) in a host country which stems from more FDI inflows. An increased capital stock would make labor scarce relative to capital. In other words, due to increased capital stock for a given labor force K/L ratio increases in a host country with FDI inflows. The Heckscher–Ohlin model suggests that if a factor of production (K) becomes more abundant, its return will fall. And the return for the other factor of production (L) will rise. Therefore, FDI inflows would increase wages.

The effect of FDI on labor demand and wages can be explained with an aggregate labor demand and supply schedule, as shown in Figure 1. For a given labor market equilibrium (point A), more FDI inflows lead to an increase in labor demand (right shift of the demand curve from \(D_L\) to \(D_{L1}\)) due to the rise in total capital stock, all else equal. Such an increase in labor demand shifts the market equilibrium from point A to point B, by moving along the supply curve \(S_L\). It implies that the final average wage rate would occur at a higher level (at point B) compared to pre-FDI level (point A) both for domestically and foreign-owned companies in a host country. In such a set up, labor market shifts would work more in favor of labor, especially in developed countries where labor markets function well and labor supply is more inelastic (Majid, 2004).

![Figure 1. The Effect of an Increase in FDI on Labor Income](image-url)
Nevertheless, FDI not only leads to an increase in wages due to changes in K/L ratio, productivity or labor demand. Foreign investors may also pay higher wages in host countries for several other reasons:

- **a)** to decrease labor turnover that will lead to technology leakage to other firms and will increase production costs,
- **b)** to attract best workers (the most skilled ones) in the market which may have a preference to work in domestic companies due to home bias of local workers (due to culture and language) (Decreuse and Maarek, 2008; Lipsey and Sjoholm, 2004),
- **c)** to have good public relations with the society which constitutes the potential local customers (Lipsey, 2004).

### 3.3 Wage Bargaining Effect of FDI

According to the wage bargaining approach, reduced transportation costs across countries, technological improvements, and globally declining trend of labor unions bring multinational companies in a better position, if not superior, in the wage bargaining. Multinational companies operate in different countries and benefit from having plants in different countries. Thus, they are partially or fully able to shift their production and services across different host countries, so called the mobility advantage. Compared to multinationals, the ability of domestic firms to move production elsewhere is limited. The domestic labor force also does not have much room to move across different countries. As a factor production, mobility of the domestic labor force is restricted due to several reasons such as home bias (e.g. culture, language, and working environment), boundaries between countries, limited skills of labor, and uncertainty in other markets (Eckel and Egger, 2009). In addition, pro-FDI policies of governments have given more room in wage negotiations to multinationals.

In a nutshell, all factors seem to be working in favor of multinationals according to this approach. Therefore, some scholars claim that the power of multinationals in wage bargaining might outweigh the abovementioned positive effects of FDI on labor income such as wage spillovers and might reduce labor payoff (Eckel and Egger, 2009).²

In sum, the wage spillovers and the labor market effects of FDI suggest a possible positive final effect on labor income in host countries whereas the wage bargaining approach claims the presence of a negative effect on labor income.

### 3.4 Empirical Model

By keeping the insights from the three abovementioned approaches in mind, we use an empirical model to explain whether and to what extent FDI affects the labor income measures in 14 OECD countries:

\[
\ln (Y_{it}) = a_i + \beta_1 FDI_{it} + \beta_2 \ln (LP_{it}) + \beta_3 OPEN_{it} + \beta_4 EMP_{it} + \beta_5 FDI_{it-1} + \beta_6 FDI_{it-2} + e_{it} \quad (1)
\]

The explanation of the variables used is as follows:

² Recently, Seguino (2007) for a sample of 37 countries and Vijaya and Kaltani (2007) for a sample of 19 countries tested the wage bargaining approach and find evidence that more FDI presence in a host country would lower wages.
The model uses four labor income measures: the average wage, the minimum wage, the labor income share, and the relative wage as the dependent variable. Previous sections explained underlying theories how FDI can affect the wage level in a host country. We use the statutory minimum wage level in addition to the average wage level. Although the statutory minimum wage level might be less dependent on economic fundamentals compared to average wage due to high government intervention, the use of it might give insights about the impact of FDI on the minimum wage earners (Kohl and Platzer, 2007). In terms of skill-level, it is acknowledged that the minimum wage earners are less skilled than the average wage earners (Brosnan, 2003). Therefore, the use of the minimum wage level would help us to understand the effect of FDI on less skilled or disadvantaged workers in host countries. The use of labor income as share of GDP as a dependent variable would provide information on how FDI affects the total labor income in host countries from a broader perspective. Finally, the relative wage variable is used to measure the effect of FDI on labor income inequality.

On the right hand side, the model uses both FDI and its lagged values as the independent variables. Lagged values of FDI are included to capture a possible lagged wage spillover effect of FDI (Driffield and Taylor, 2000). Since the model includes the lagged values of dependent variable as the explanatory variables, it is sometimes called a distributed-lag model (Gujarati, 2003, p. 656). Labor productivity is included in order not to omit a theoretically relevant variable. Trade openness is added as a regressor to investigate how trade openness affects wages along with FDI. The share of FDI and trade in output considered together as two key globalization indices in the literature (e.g. Majid, 2004; Driffield and Taylor, 2000). Also it is suggested to include proxies for both productivity and trade in a wage equation such as in Feenstra and Hanson (1995), Autor et al. (1998), and Blonigen and Slaughter (2001). Finally, by following Onaran and Stockhammer (2008, 2009) we consider the employment rate as a potential regressor that might affect labor income measures.

By estimating the model, we expect to see positive coefficients for all independent variables. Although there might be some negative effects, as discussed above, it is expected that

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3 The statutory minimum wage earners constitute 3 to 15 percent of total labor force in OECD countries. For example in the US, 1.8 million workers earned exactly the prevailing federal minimum wage of $7.25 per hour which represents about 3 percent of the total labor force in 2010 (BLS, 2010).
the positive effects of FDI on labor income would dominate and generate a positive coefficient for the FDI variable. Especially, in existence of productivity spillovers to domestic firms, the overall productivity and wage level would rise with FDI in a host country (Javorcik, 2004). As discussed in the theory section, higher labor productivity associates with a high labor income and therefore its coefficient would be positive.

As host countries become more open to trade, they can attract more productive foreign investors which will increase the labor income. Import competing firms in a country more open to trade might try to increase their productivity. Furthermore, more openness might lead to more employment and would improve labor income due to increased total demand. However, more trade openness would also imply less employment. Domestic firms might not compete with foreign goods in a more competitive open economy or they might find that importing is more profitable. Thus, they will either exit from the domestic market or shrink capacity which will lower the labor income (Krugman et al., 2012). In sum, theoretically the effect of trade openness on wages is ambiguous and some empirical evidence supports this, such as Co (2001) or Majid (2004).

Finally, a higher employment rate in a host country might give a larger room to labor representatives in wage negotiations. The coefficient of the employment rate might capture such an effect. In other words, an increase in the employment rate might generate a positive pressure on labor income thus we expect a positive coefficient for the employment rate variable.

4. Data

This section first presents the sources and description of datasets. Then, it provides a statistical analysis of data with the help of a correlation matrix and scatter diagrams to explore the labor income effect of FDI.

4.1 Description of Data

We gathered the data of the variables for a sample of 14 OECD countries over the period 1990-2010. Data limitations forced us to work with 14 OECD countries instead of all 34 OECD member countries.

OECD countries constitute a plausible panel to analyze the labor income effect of FDI for several reasons. First, they have relatively developed institutions that might increase the dissemination of productivity spillovers from multinationals to domestic firms. Second, labor markets function relatively well in OECD countries, although they are not perfect (OECD, 2008). Third, the share of informal economy and informal employment are low in OECD countries. Fourth, the technology gap is not as high as to prevent dissemination of spillovers inside OECD countries (Hanousek et al., 2011). Finally, in OECD countries the statutory minimum wage level law is applied strictly due to wider practice of ILO labor laws and regulations (OECD, 2008). To this end, a panel of OECD countries is a good group to assess the effect of FDI on labor income, especially in such a study which considers the minimum wage earners.

Variables

The average annual wage data gathered from the OECD database, which are in 2010 US$ (PPP) constant prices. The average annual wages data provided by the OECD is the wage of per full-time and full-year equivalent employee in the total economy. For the minimum wage variable,
we gathered real statutory hourly minimum wage level data from the OECD. The data are in 2005 US$ on the database and converted to 2010 US$ by us. Then we collected the annual average working hours for each country from the OECD. We multiplied the annual average working hours with the statutory hourly minimum wage level to calculate and use the statutory annual minimum wage level in the estimations. Finally, the annual labor income share data gathered from the OECD database. The labor income share is calculated by dividing the total labor costs (related to labor income) by the nominal output. The division of total labor costs by the nominal output is sometimes also referred to as a real unit labor cost (OECD, 2008).

FDI data gathered from the UNCTAD-FDI database in the form of the inward FDI stock as a percentage of GDP for the FDI variable. We use the inward FDI stock variable instead of inflows since stock data are less volatile. Moreover, it is acknowledged in the literature that the use of the inward FDI stock data provides more accurate results than inflows data and also it is better in capturing the sustaining effect of FDI on labor income (Neuhaus, 2006, p. 98).

Labor productivity (output per employed person) is used as the productivity variable in our analysis. Data for labor productivity are derived from the Conference Board-Total Economy Database, which are in 2010 US$ (PPP).

Openness data are gathered from World Development Indicators (WDI) database. It is calculated by dividing total trade volume (exports + imports) with GDP.

Employment rate data collected from the OECD database. It is calculated by dividing number of employed workers with total labor force. Table 1 summarizes the data sources and presents the expected signs of the coefficients.

Table 1. Variables and Expected Signs

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Data Source</th>
<th>Unit or Scale</th>
<th>Symbol</th>
<th>Expected Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real annual average wage</td>
<td>OECD</td>
<td>2010 US$</td>
<td>AW</td>
<td></td>
</tr>
<tr>
<td>Real annual statutory minimum wage</td>
<td>OECD</td>
<td>2010 US$</td>
<td>MW</td>
<td></td>
</tr>
<tr>
<td>Labor income as a share of GDP</td>
<td>OECD</td>
<td>%</td>
<td>LIS</td>
<td></td>
</tr>
<tr>
<td>FDI inward stock as a share of GDP</td>
<td>UNCTAD</td>
<td>%</td>
<td>FDI</td>
<td>+</td>
</tr>
<tr>
<td>Labor productivity (output per person employed)</td>
<td>TED</td>
<td>2010 US$</td>
<td>LP</td>
<td>+</td>
</tr>
<tr>
<td>Openness [(Exports + Imports)/GDP]</td>
<td>WDI</td>
<td>%</td>
<td>OPEN</td>
<td>+/-</td>
</tr>
<tr>
<td>Employment rate</td>
<td>OECD</td>
<td>%</td>
<td>EMP</td>
<td>+</td>
</tr>
</tbody>
</table>

4 “FDI stock is the value of the share of their capital and reserves (including retained profits) attributable to the parent enterprise, plus the net indebtedness of affiliates to the parent enterprises” (UNCTAD, 2009).
4.2 Data Analysis

The correlation matrix of the variables used in the model provides a preliminary indication of direction and power of relations between variables. As expected, there is a meaningful positive correlation between labor income variables (average wage, minimum wage and labor income share) and FDI. The coefficient of correlation lies between 0.20 and 0.27. The coefficient of correlation between the average and the minimum wage is 0.90. Such a high correlation is important from a theoretical point of view. The theories mainly designed for the average wage can be used for the minimum wage variable as well.

There is a strong and positive correlation between labor productivity and labor income variables which confirms that labor income is dependent on its marginal product. It is 0.93 for the average wage and 0.90 for the minimum wage variable. A negative correlation is identified between trade openness and labor income variables. The coefficient of correlation varies between -0.17 and -0.01. However, between two globalization variables, trade openness and FDI, a strong positive correlation (0.72) is found. It might imply that trade and FDI are complements rather than substitutes in OECD countries (Amiti and Wakelin, 2003). Finally, as expected, a positive correlation between employment rate and labor income measures is identified. It varies between 0.13 and 0.09.

Table 2. Correlation Matrix of the Variables

<table>
<thead>
<tr>
<th></th>
<th>lnAW</th>
<th>lnMW</th>
<th>lnLIS</th>
<th>FDI</th>
<th>lnLP</th>
<th>OPEN</th>
<th>EMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnAW</td>
<td>1.00</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>lnMW</td>
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<td>lnLIS</td>
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<tr>
<td>FDI</td>
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<td>0.22</td>
<td>0.27</td>
<td>1.00</td>
<td></td>
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<tr>
<td>lnLP</td>
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<td>0.90</td>
<td>0.39</td>
<td>0.32</td>
<td>1.00</td>
<td></td>
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<tr>
<td>OPEN</td>
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<td>-0.19</td>
<td>-0.01</td>
<td>0.72</td>
<td>-0.09</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>EMP</td>
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<td>0.07</td>
<td>0.09</td>
<td>0.16</td>
<td>0.08</td>
<td>0.25</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Two scatter diagrams are drawn by using the mean values of the 14 OECD countries in Figure 2 and 3. The scatter diagrams illustrate the two-way relationship between FDI and labor income variables visually. In the scatter diagrams, a positive relationship is identified which suggests that an increase in FDI is associated with an increase in the average wage and the minimum wage in the host OECD countries. This observation is consistent with the results of the correlation matrix.

By doing a statistical and visual analysis, we get a preliminary result that FDI is related to labor income in a positive way in 14 OECD countries. In the next section, we conduct a panel regression analysis to assess whether and to what extent this finding is significant and robust.
We run the model by using the panel ordinary least squares (OLS) with fixed effects. We correct standard errors with the White heteroscedasticity consistent standard errors method. The panel OLS method is the application of the usual OLS method to panel data series. A panel series dataset has both a time-unit dimension (T) and a cross-unit dimension (N). Our unbalanced panel dataset has a 21-year time span (T) from 1990 to 2010 and 14 cross-section units (N). Therefore, totally we have 294 observations.

Neither cross-section nor time-series estimators of OLS method can generate unbiased results with panel data. In this respect, panel OLS estimators take both time and cross-section units into consideration in the estimation process. However, there can be cross-country differences within time-series that can lead to endogeneity problems (Aghion and Howitt, 2009, p. 452). Hence, estimation results without taking cross-country differences into consideration might lead to misinferences about coefficients. To deal with this problem, “the fixed effect estimators of panel data is developed, which captures the omitted variables that are present in each country and that are constant over time” (Aghion and Howitt, 2009, p. 453). On the other hand, “the random-effect estimation assumes that the intercept of an individual unit is a random draw from a much larger population with a constant mean value” (Gujarati, 2003, p. 652). In the literature, a formal and common way to choose between fixed and random effects is the Hausman specification test, which tests the null of random effects versus fixed effects (Hausman, 1978). According to the Hausman test results, we use the fixed effects in our estimations.

5.1 Estimation Results

Table 3 presents the estimation results of the model for the first three dependent variables: the average wage, the minimum wage and the labor income share. Two separate specifications are reported in Table 3 for each dependent variable. Specification 1 excludes the lagged values of the FDI variable. Specification 2 includes both the current and the lagged values of the FDI variable.

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5 See Plumper and Troeger (2007), Baltagi et al. (2003), and Wooldridge (2002) for a review of fixed effects.

6 The Hausman test results are available upon request.
According the estimation results of specification 1 in which we use the average annual wage as the dependent variable, all variables have the expected positive sign and they are statistically significant at conventional significance levels except the employment variable. It implies that FDI, labor productivity, and openness affect average wage in a positive way in 14 OECD countries. All else equal, a 10 percentage-point increase in FDI leads to a 0.01 percent increase in average wage in the same year. Labor productivity variable has the biggest impact on average wage that a 10 percent increase in LP results in a 6.5 percent increase in average wage. For the openness variable, a 10 percentage-point increase leads to a 0.014 percent increase in average wage in the same year.

When we run model 1 by using the statutory annual minimum wage as the dependent variable, we get the following results for specification 1. All independent variables are estimated with the expected positive sign except the employment variable. The coefficient of FDI shows that a 10 percentage-point increase in FDI leads to a 0.004 percent increase in minimum wage in the same year. It is statistically significant at the 10 percent significance level. Labor productivity has the biggest impact on minimum wage that a 10 percent increase in labor productivity results in a 8.3 percent increase in minimum wage. The coefficient of openness variable is not found as statistically significant, although it is positive. Finally, the coefficient of employment does not have the expected sign and it is statistically insignificant.

When we run model 1 by using the labor income share as the dependent variable, we get the following results for specification 1. All independent variables have a positive sign and are statistically significant except the openness variable. All else equal, a 10 percentage-point increase in FDI leads to a 0.054 percentage-point increase in labor income share in the same year. Labor productivity variable has the biggest impact on labor income share as in the estimations with average and minimum wage that a 10 percent increase in labor productivity corresponds to a 8.1 percentage-point increase in labor income share. The coefficient of openness variable is found as negative and statistically insignificant. Finally, employment affects labor income share in a positive way that a 10 percentage-point increase in employment leads to a 0.019 percent increase in labor income share, which is statistically significant at the 10 percent significance level.

Running the model with the panel OLS-fixed effects generates considerably a high explanatory power and a statistically significant F statistics in all cases. It implies that the model works well. In other words, the variation in labor income measures can be explained well by the variation in labor productivity, FDI, openness and employment.

Specification 2 shows the estimation results with the lagged FDI variables. We chose to use only two lags with an ad-hoc lag approach in which including more than two lags generated inconsistent results. As in specification 1, specification 2 generates a high explanatory power and a statistically significant F statistics in all cases. When we add the lagged values of FDI into the specification 2, the results remain almost the same for all variables except FDI. The inclusion of lagged FDI terms leads to a decline in the coefficient of the current FDI term. However, this decline is compensated by the positive coefficients of FDI(-1) and FDI(-2) variables which identifies that there is a positive distributed-lag effect of FDI on labor income. For instance, the statistically significant and positive coefficients of the current and the lagged FDI variables show that an increase in FDI in the current year \( (t) \) has a positive effect on the average wage both in the current year and in the next two years.

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7 See Gujarati (2003, p. 664-665) for a discussion on ad-hoc estimation method of distributed-lag models.
The cumulative effect of the current and the lagged FDI terms on the average wage, the minimum wage and the labor income share are illustrated in Figure 4 and 5 by using time on x-axis and the cumulative effect of FDI on y-axis. According to Figure 4 and 5, the cumulative effect of FDI on labor income is positive and grows over time. The implication of such a finding is that a full wage spillover effect of FDI would need some time for absorption and necessary labor market adjustments (Javorcik, 2004; Onaran and Stockhammer, 2008).

### Table 3. Estimation Results of the Model

<table>
<thead>
<tr>
<th></th>
<th>Specification 1</th>
<th>Specification 2</th>
<th>Specification 1</th>
<th>Specification 2</th>
<th>Specification 1</th>
<th>Specification 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.8947***</td>
<td>2.4379***</td>
<td>0.1876***</td>
<td>0.4845***</td>
<td>4.5758***</td>
<td>4.7058***</td>
</tr>
<tr>
<td>FDI</td>
<td>0.0010***</td>
<td>0.0004***</td>
<td>0.0004*</td>
<td>0.0005**</td>
<td>0.0054***</td>
<td>0.0014</td>
</tr>
<tr>
<td>In LP</td>
<td>0.6499***</td>
<td>0.6969***</td>
<td>0.8382***</td>
<td>1.1308***</td>
<td>0.8148***</td>
<td>0.8286***</td>
</tr>
<tr>
<td>OPEN</td>
<td>0.0014**</td>
<td>0.0002*</td>
<td>0.0007</td>
<td>0.0005</td>
<td>-0.0020</td>
<td>-0.0048</td>
</tr>
<tr>
<td>EMP</td>
<td>0.0007</td>
<td>0.0003</td>
<td>-0.0002</td>
<td>-0.0001</td>
<td>0.0019*</td>
<td>0.0017**</td>
</tr>
<tr>
<td>FDI (-1)</td>
<td>0.0004***</td>
<td>0.0004**</td>
<td>0.0004**</td>
<td>0.0014</td>
<td>0.0037*</td>
<td>0.00717</td>
</tr>
<tr>
<td>FDI (-2)</td>
<td>0.0006***</td>
<td>0.0003**</td>
<td>0.0003**</td>
<td>0.0026</td>
<td>0.0037**</td>
<td>0.0013</td>
</tr>
<tr>
<td>F-statistic</td>
<td>1629***</td>
<td>1740***</td>
<td>887***</td>
<td>800***</td>
<td>17.404***</td>
<td>17.680***</td>
</tr>
<tr>
<td>Adj. Rsq.</td>
<td>0.9902</td>
<td>0.9925</td>
<td>0.9848</td>
<td>0.9864</td>
<td>0.5361</td>
<td>0.5956</td>
</tr>
</tbody>
</table>

Notes: p-values are in parentheses. (*) Significant at 10%; (**) Significant at 5%; (***) Significant at 1%.

In sum, the estimation results of the model with two specifications show that:

- An increase in FDI in the current year \((t)\) increases the average wage level. The lagged impact of FDI grows over time that both in the short and medium run the positive effect of FDI on the average wage level continues (Onaran and Stockhammer, 2009).
- An increase in FDI in the current year \((t)\) associates with an increase in the minimum wage level in year \(t\). The positive effect of FDI on the minimum wage goes on in the next two years.
- An increase in FDI in the current year \((t)\) leads to an increase in the labor income share. The lagged effects of FDI remain positive and statistically significant for the labor income share as for the average wage and the minimum wage variables.
- The cumulative effect of FDI on the average wage and the minimum wage earners can be different in the current year \((t)\) and the next year \((t+1)\). However, at the end of two years \((t+2)\), the size of the cumulative effect for the average and the minimum wage earners is converging, which is shown in Figure 4.
Unlike the findings of Gopinath and Chen (2003), Driffield and Taylor (2000), the results show that FDI does not make a negative effect on the labor income of the average and the minimum wage earners. On the contrary, both the average and the minimum wage earners benefit from FDI. Our findings are in line with Conyon et al. (2002), Aitken et al. (1996) that they found FDI increases labor productivity and wages for both skilled and unskilled workers due to the productivity spillovers from foreigners to domestic companies. Especially, the well-functioning labor markets, relatively developed institutions and strict labor market regulations might help spreading over spillovers stemming from FDI inside the OECD countries (OECD, 2008; Majid, 2004).
5.2 The Effect of FDI on Relative Wage and Inequality

To identify the effect of FDI on the relative wage and the inequality we build up and use one additional dependent variable: the relative wage (minimum wage/average wage). This variable helps us to analyze whether FDI leads to a significant positive or negative effect on the relative labor income of the minimum wage earners versus the average wage earners. If our main findings are robust, an increase in FDI would make a negative effect on the relative wage variable at the end of a two-year period. Because the calculated cumulative effect of a 10 percentage-point increase in FDI is 0.014 for the average wage earners and is 0.012 for the minimum wage earners. Although FDI makes a positive effect on both sides, the relative wage index, which is calculated by dividing the minimum wage with the average wage, would decrease with FDI. All else equal, since the denominator increases more than the nominator, the relative wage index would become smaller. Therefore, the expected sign for the FDI variable is negative in the regression in Table 5.

According to the estimation results of specification 1, as expected, FDI affects the relative wage negatively and the coefficient of FDI is statistically significant at the 5 percent level. A 10 percentage-point increase in FDI results in a 0.018 percent decrease in the relative wage that the wage gap between the minimum and the average wage earners widens due to FDI, all else equal. There are can be several reasons behind this result but two of them are worth mentioning:

1) The relatively low skills of the minimum wage earners can limit their absorption capacity. Therefore, the degree of productivity spillovers from multinationals would be limited.

2) Even when there is some degree of absorption and spillovers which ultimately increase the marginal product of the minimum wage earners, the influence and intervention of governments on the minimum wage level can limit such a positive effect. As usual, government interventions would lead to market imperfections which delimit the full reflection of a wage spillover effect on the minimum wage earners (Brosnan, 2003; Kohl and Platzer, 2007).

In specification 2 of Table 5, with the inclusion of the lagged FDI terms the coefficient of the current FDI variable becomes statistically insignificant. However, the lagged FDI terms have negative coefficients and they are statistically significant at the 5 and 10 percent significance levels. In both specifications, labor productivity has a significant and positive coefficient whereas openness and employment do not seem to make a statistically significant effect on the relative wage variable. In sum, the results confirm that FDI makes a small contribution to the wage inequality between the minimum and the average wage earners by increasing the income of the average wage earners to a higher extent. The results also support the findings in the previous section that there is a positive difference between the size of the cumulative effect of FDI on the average wage earners and the minimum wage earners. In a similar vein, Krugman et al. (2012, p. 218) conclude that “there are aggregate gains from increased multinational activity, but also changes in income distribution that leaves some people (relatively) worse off”.

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8 Gopinath and Chen (2003) find a similar result that FDI increases the wage inequality between skilled and unskilled labor by using a panel of 26 countries.
Table 5. The Effect of FDI on Relative Wage

<table>
<thead>
<tr>
<th>Specification 1</th>
<th>Specification 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant</td>
<td>-5.7177***</td>
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<td></td>
<td>(0.0000)</td>
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<tr>
<td>FDI</td>
<td>-0.0018**</td>
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<tr>
<td></td>
<td>(0.0031)</td>
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<tr>
<td>In Labor Productivity</td>
<td>0.4417***</td>
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<tr>
<td></td>
<td>(0.0000)</td>
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<tr>
<td>Openness</td>
<td>-0.0007</td>
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<tr>
<td></td>
<td>(0.2964)</td>
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<tr>
<td>Employment</td>
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<tr>
<td></td>
<td>(0.5519)</td>
</tr>
<tr>
<td>FDI (-1)</td>
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<td>FDI (-2)</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>24.022***</td>
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<tr>
<td></td>
<td>(0.0000)</td>
</tr>
<tr>
<td>Ad. R-sq.</td>
<td>0.6184</td>
</tr>
</tbody>
</table>

Notes: p-values are in parentheses. (*) Significant at 10%; (**) Significant at 5%; (***) Significant at 1%.

5.3 Robustness Checks

We applied several additional robustness measures to check the robustness of the main findings. We replaced the estimation method with GMM and tried some additional independent variables such as labor union density, value of exports and imports. When we added these variables into the regressions separately and together, the results again remained mixed for the effect of trade on labor income measures and generated insignificant results for labor union density.

Apart from trade variables, we replaced two other main independent variables (FDI and labor productivity per person) with their substitutes. First, we run regressions by replacing the inward FDI stock with FDI inflows and observed a positive effect of FDI on labor income measures. Nevertheless, in this case the effect became relatively smaller. Second, we used labor productivity per hour instead of labor productivity per person in estimating the models. Third, we replaced the employment rate with the unemployment rate. In all these cases, we get similar results to the main findings that confirmed FDI and labor productivity affect labor income measures in a positive way whereas the unemployment rate does not seem to make a significant effect. In sum, the results of all robustness checks suggest that main findings of the study are robust to the changes in the estimation method and the replacement of independent variables with their substitutes.

6. Discussion and Conclusions

The study examined the effect of FDI on labor income in OECD countries with a panel approach by using four labor income measures: the average annual wage, the statutory annual minimum wage, the labor income share and the relative wage. The study used the panel OLS method with fixed effects in estimating the empirical model in which we took a possible lagged effect of FDI on labor income measures into consideration.
As discussed in the theory section, there are competing effects of FDI on labor income. Productivity and wage spillovers channels suggest a robust and positive effect of FDI on labor income measures. However, the wage bargaining approach suggests that multinationals would lead to a decrease in wage levels by using their size and international power in wage bargaining in host countries. Also with the entry of foreign investors into host countries there can be some temporary negative effects on labor markets such as an increase in the frictional unemployment rate. Over time, the labor market would reach to a new equilibrium in where the average wage and the minimum wage are higher than pre-FDI case. A preliminary analysis of data with scatter diagrams and a correlation matrix confirm that there is a positive relation between FDI and labor income measures rather than a negative one. It implies that the positive effects of FDI on labor income measures seem to outweigh the negative ones mainly by generating spillovers from multinationals to domestic companies.

The regression analysis of panel data for 14 OECD countries over the 1990-2010 period revealed that FDI makes a contribution to labor income in OECD countries. Unlike the findings of several scholars (e.g. Stehrer and Woerz, 2009; Seguino, 2007) it is found that FDI does not hurt neither the average wage earners (skilled labor) nor the minimum wage earners (unskilled labor). Moreover, a small and statistically significant positive impact of FDI on labor income is identified. And the cumulative effect of FDI on labor income is increasing over time owing to the positive lagged effects of FDI. A first implication of this finding is that the effect of FDI on labor income would need some time to be fully absorbed by the labor force. A second implication of this finding is that apart from other contributions of FDI to productivity level and economic growth, FDI helps labor in host the OECD countries by improving their payoff.

The regression results further showed that the positive effect of FDI on labor income is unevenly distributed between the average and the minimum wage earners. Although FDI improves the minimum wage earners’ labor income, it makes some negative effect on their relative wage. Due to a relatively smaller cumulative effect of FDI on the minimum wage earners, the minimum wage earners might feel that FDI harms their real income in fact it does not. In other words, labor force with some level of education (i.e. the average wage earners) might enjoy the benefit of FDI on their income to a higher extent. In this regard, labor training and education policies to increase the absorption capacity; and reforms to increase labor market efficiency would help disadvantaged workers. These policy measures not only would increase the marginal product of labor but also would improve labor-skills-match in labor markets.

In the study, apart from FDI three other explanatory variables (labor productivity, international trade and employment rate) are considered in the regressions. The results confirm the prediction of economic theory that labor productivity affects the average wage, the minimum wage, and the labor income share positively. The effect of international trade on labor income examined with the trade openness variable. The estimation results stayed mixed as in Majid (2004), Onaran and Stockhammer (2008) for the trade openness variable that we cannot make a clear-cut prediction. It seems to be that the competing effects of international trade on labor income, which are discussed in the theory section, are in force that neither a positive nor a negative effect could dominate in the OECD countries.

In sum, the study showed that FDI improves labor income. Therefore, pro-FDI policies followed by host countries would associate with higher labor income. Due to the existence of uneven distribution of the positive effect of FDI on different groups of labor, policy makers might build some measures to improve the conditions of relatively disadvantaged groups such as the minimum wage earners and to mitigate an increase in the labor income inequality. These
measures would cover both *monetary measures* such as indexation of minimum wage level to FDI inflows, if FDI inflows exceed a certain threshold in a given year; and *non-monetary* measures such as free labor trainings co-organized by government agencies and multinationals for the minimum wage earners which would improve their skills and income. Such activities would also be important for public relations that would help improving the *image* of multinationals in the eye of labor.
References


