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Kamal Lamichhane and Takayuki Watanabe

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JICA Research Institute
10-5 Ichigaya Honmura-cho
Shinjuku-ku
Tokyo 162-8433 JAPAN
TEL: +81-3-3269-3374
FAX: +81-3-3269-2054

The Effect of Disability and Gender on Returns to the Investment in Education: A Case from Metro Manilla of the Philippines

Kamal Lamichhane[*] and Takayuki Watanabe[†]

Abstract

In this paper, we investigate the effect of gender on returns to the investment in education for men and women with disabilities in Metro Manila of the Philippines. Using the dataset of persons with hearing, physical and visual impairments, we employ three methodological strategies on earning functions, including continuous and discontinuous functions and quantile regression to reveal the effects of gender within disabilities. Our estimation suggests that women with disabilities face several disadvantages in the labor markets of the Philippines where gender equality in general is observed for women without disabilities. After controlling for a sample selection to account for endogenous labor participation, as well as endogeneity of schooling decisions, the estimated rate of returns to education is very high, ranging from 24.9 to 38.4%. However, when classifying each disability dummy variable for each gender, the effect of double disadvantage (gender and disability) is observable. Additionally, checking the possibility of nonlinear schooling returns, we also find that the effect of disability for women is more severe than for their male counterparts. From these findings, we cannot reject the possibility that obtaining a diploma serves signaling as their ability level for women with disabilities.

Keywords: disability; gender; returns to education; labor market participation; earning functions; Philippines.

[*] Associate professor of Disability Studies and Education, Center for research on international cooperation in educational development (CRICED).Faculty of human sciences,University of Tsukuba. 1-1-1 Tennodai, Tsukuba-shi, Ibaraki 305-8572, Japan. Tel: +81-29853-7285 and +81-29853-6714. Fax: +81-29853-7288. E-mail: kamal@criced.tsukuba.ac.jp.

[†] Research assistant,JICA Research Institute, Japan International Cooperation Agency (JICA).

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1. Introduction

Numerous studies have shown the association between disability and poverty (Filmer 2008; WHO and World Bank 2011; Lamichhane et al. 2014). At the same time, literature in both developed and developing countries has shown that better-educated individuals earn higher wages, experience less unemployment, and work in better occupations than their less-educated counterparts (Card 1999). Though studies on the economic value of education for people with disabilities, particularly in developing countries, are rare, some studies have found education to be crucial not only in increasing the employability of this group but also in improving their occupational options—for example, by providing the opportunity to obtain white-collar or full-time jobs (Lamichhane and Okubo 2014). However, the value of education for people with disabilities is not widely recognized, especially in many developing countries. The prevailing belief is still that even if people with disabilities are educated they will be less likely to make use of their education, or will not be useful in the workforce.

One of the major obstacles to challenging this notion is the limited number of empirical studies on disability and the nexus between education and labor market participation resulting mainly from the lack of credible data. This is particularly the case for low- and middle-income countries. These countries have indeed significantly limited information on the socioeconomic status of people with disabilities (Braithwaite and Mont 2009). On the other hand, returns to investment in education have been quantified for nondisabled people since the late 1950s (Card 1999, 2001; Heckman et al. 2006; Psacharopoulos and Patrinos 2004). There have also been numerous studies showing the link between education and employment for women. Psacharoupoulos and Tzannatos (1989) observed that, compared to their male counterparts, women's participation in the labor market appears to depend much on the social environment. This implies that for disadvantaged or marginalized groups such as people with disabilities, ethnic minorities, women, or even migrants, labor force participation is not only determined by levels of

education, but is also influenced by discrimination and the support they receive in their direct environment.

While there are many causes of poverty among people with disabilities in developing countries, poor access to education or employment stands out as one of the major factors. There are some studies on the employment situation in the context of disability. For example, Filmer (2008) stated that young people with disabilities are less likely to start school, and in some countries have lower transition rates resulting in lower attainment. This study went on to observe that disability status has a stronger effect on school enrolment and participation than do gender and other socio-economic statuses. Likewise, Mitra and Sambamoorthi (2008) compared wage disparities between men with and without disabilities in Tamil Nadu in India. Their study suggested that differences in education across disability statuses or labor market discrimination were among the factors accounting for the employment gap between men with and without disabilities. The authors also examined the magnitude and determinants of a wage differential by disability status in the context of an agrarian labor market in India (Mitra and Sambamoorthi 2009). As cross-country analysis, Mizunoya and Mitra (2013) examined differences in employment rates between persons with and without disabilities in 15 developing countries and show people with disabilities have lower employment rates than persons without disabilities in nine countries. Thus, the growing literature has shed light on many aspects of disability, education and employment in developing world; it has not examined the situation for women with disabilities whose participation in the labor market is in fact considered more vulnerable due to the possible double disadvantage they face, first as women and then as persons with disabilities.

There have been several significant studies examining the returns to investment in education for people with disabilities; Hollenbeck and Kimmel (2008) performed studies in the US, Lamichhane and Sawada (2013) for Nepal, and Albert et al. (2010) for the Philippines. Stern (1989) examined the problems of measurement and endogeneity when creating a definition of disabilities for census-taking purposes, while DeLaire (2000, 2001) and Hotchkiss (2003) investigated

employer discrimination in the labor market. The study by Lamichhane and Sawada (2013) provides evidence on the returns to education for persons with disabilities ranging from 19.3 to 25.6 percent. The return in Lamichhane and Sawada (2013) is significantly higher than that of their non-disabled counterparts (Psacharopoulos and Patrinos 2004), but none of the studies have considered gender and disability in estimating the returns to education.

Therefore, this paper aims to at least partially fill this gap in existing knowledge by comparing the estimates for the wage returns to education for males and females with disabilities in the Philippines. The central research question posed in this paper thus is empirical: Does gender have any effect on the returns to the investment in education for persons with disabilities? We believe that the empirical work in this paper will help governments and other concerned authorities to design policies to mitigate poverty among women with disabilities who are regarded as facing double disadvantage, first as women and then persons with disabilities.

There are some important features to this study. To begin with, we use unique data from persons with hearing, physical, or visual impairments living in Metro Manila in the Philippines. The dataset was jointly collected by the Institute of Developing Economies (IDE) and the Philippine Institute for Development Studies (PIDS), using carefully structured questionnaires.

Next, to carefully check the dual effects of gender and disability on the returns to the investment in education, various methods of estimation are utilized. First estimations are done with (i) standard ordinary lest squares (OLS), and (ii) Type-1 Tobit, where education is defined as a continuous variable and interaction variables with sex and each disability are also included. Second, redefining education as a discrete variable, we examine the role of the signaling effect in the returns to education. Similarly, we employ quantile regression for each conditional quantile wage group, rather than the mean regression analysis, which enables us to address the more detailed relationship between schooling and wage, and in particular to check whether schooling would have an impact on within-levels wage inequality or not.

Beyond these methodological aspects, the topic of this study itself can be regarded as important. When the international community works towards inclusive and sustainable development beyond 2015, building of human capital for women with disabilities should be given equal footing with other central development goals. From this perspective, this study is also timely in contributing to the post-2015 development goals by providing important new insights regarding the role of education in the labor market participation of women with disabilities. The structure of this paper is as follows: Section 2 provides the study context in the Philippines; Section 3 provides a review of empirical literature on wage-earning functions used in our estimation; Section 4 presents the dataset from the Philippines; Section 5 describes the empirical strategy; the results and findings are discussed in Section 6; and finally, in Section 7 concluding remarks are presented.

2. Study context in the Philippines

The Philippines is a member of ASEAN (The Association of South East Asian Nations) and is a lower middle-income country (World development report 2012; World Bank 2011). The Philippines is ranked 114th in human development and is behind in many of the human development indices but surprisingly the situation of women in general is favorable, even compared to other developed countries. According to The Global Gender Gap Report by The World Economic Forum (2013), the Philippines is among the top five countries in the world for women's rates of participation in economic activities, women's educational attainment, political empowerment, and access to other opportunities. The Philippines has kept a higher rate of participation by women in the labor market than that of other countries in Asia. Due to this unique situation for women in this country, there are several studies on women's educational attainment and labor market participation. Empirical studies by Estudillo et al. (2001a, 2001b) showed that higher levels of educational attainment for women in rural areas of the Philippines are explained by the unequal customs for inheritance for sons and

daughters in an agrarian society. In this agrarian setting, sons are more likely than daughters to inherit farmland, prompting parents to invest in their girls with additional years of school.

Additionally, Yamauchi and Tiongco (2013) investigated the case that women are more progressive on education than man but still suffer from lower wages in the labor market, caused by wage penalty in labor markets, means that education is of relatively large importance as a determinant of their earnings. Furthermore, several studies have accounted for the situation in the Philippines in terms of the bilateral family system typical of the cultures of South East Asian countries in which sons and daughters have an equal role in caring for their parents. Moreover, the link between daughters and their parents has been observed in the Philippines, leading to a more common preference for daughters over sons (Agree et al. 2002; Fuse 2010).

3. Literature on wage earning functions and disadvantage in the labor market

While the previous section reviewed the literature on the status of women in the Philippines, here we look at empirical literature which shares our methods for examining workers' disadvantages in the labor market. On inequality in the labor market, the issue of gender has been analyzed as a central question for policy makers and researchers. Many existing studies tested whether the rewards to females are less than those to males and examined whether they still suffer from lower wages in the labor market

3.1 Continuous earning function and gender differences in the returns to schooling

Evidence shows that some disadvantages for women in education and the labor market have been observed worldwide, but the gender differences in the returns to schooling are not so large in developed countries (Blau and Kahn 1992, 2001). Recent evidence from developing countries, gathered from the current available data, reveals mixed conclusions about gender inequality in educational returns. Some studies, such as Behrman and Wolfe (1984), which examined Nicaragua

and Schultz (1993), which studied several developing countries, found that returns to schooling do not differ significantly by gender. Others discovered lower returns to women's schooling in India (Kingdon 1998), and higher returns in Indonesia (Behrman and Deolalikar 1995) and Bangladesh (Asadullah 2006).

3.2 Discontinuous earning function and the signaling effect

A diploma or a certificate of the completion of a school may serve as a signal of status, and the correlation between returns and this signal is possibly observed. Recent research also addresses the relationship between the signaling effect and disadvantage by modifying earning function as discontinuity. Belman and Heywood (1991) examined the signaling effect for women and minorities. In their study, the overall pattern of the results revealed that the signaling effect associated with elementary and high school completion are smaller for women and minorities than those estimated for white males, whereas the discontinuities associated with college and graduate school are larger than those for white males. Jaeger and Page (1996) also tested for differences in the signaling effect among white males, white females, black males, and black females and found little evidence of statistically significant differences between minorities and whites or between males and females. The only study we are aware of that examined the relationship between schooling returns and the signaling effect in the Philippines is by Schady (2003), who provided empirical evidence of a clear signaling effect with graduation from lower to higher educational levels for Filipino men, although their study compared among only males and was not intended to addressed issues of women's disadvantage.

3.3 Quantile regression and returns on education

In line with previous findings above, which examine both continuous and discontinuous schooling returns, a quantile regression approach has also been employed to address returns to education, especially the wage inequality on the conditional distribution. Martins and Pereira (2004) showed

that individuals who receive higher wages conditional on their characteristics enjoy higher education-related earnings growth in fifteen European countries. For example, studying the US, Buchinsky (1994) employed quantile regressions and found that returns to education in the US is higher at the higher quantiles of the conditional distribution of wages. However, these studies do not specifically examine differences between men and women.

In the context of developing countries and using the quantile regression approach, Tansel and Bircan (2012) showed that the returns to education have declined, and that wage inequality declined at the bottom end of the wage distribution spectrum and increased at the top end of the spectrum in Turkey from 1994 to 2002, and González and Miles (2001) analyzed the increase in wage inequality observed in the Uruguayan labor market during the last decade. Asadullah (2009) documented returns to Private and Public Education in Bangladesh and Pakistan for private and public school at different quantiles of the wage distribution.

However, there are no studies examining whether gender among persons with disabilities participating in the labor market has any effect on obtaining wage returns to the investment in education. While it is generally accepted that women with disabilities face a double disadvantage, first as women and then as persons with disabilities, the higher rate of women's participation in the Philippines's labor market indicates that there is no negative effect of gender for the general population. In this context, it is therefore important to examine whether disability has any negative effect on women's labor market outcome. We hypothesize that the higher rate of labor market participation by Filipino women is not mirrored by women with disabilities. It is plausible that, due to the impairments, parents put less faith in their children with disabilities and thus give them a lower priority for education compared to their children without disabilities. Consequently, women with disabilities suffer from fewer years of schooling, which may result in the lower wage returns to education compared to their male counterparts with disabilities. Studies such as (Lamichhane, 2013) have shown that parents' positive understanding of their children's disability is correlated to the longer years of education.

4. Dataset from Metro Manila in the Philippines

We use the unique dataset on disability collected jointly by IDE in Japan and PIDS. The field survey was conducted in Metro Manila in the Philippines in August 2008. Metro Manila is the capital of the Philippines which is composed of units of seventeen cities called Local Government Units (LGUs). Among the seventeen LGUs, Makati, Pasay, Quezon, and Valenzuela were selected for the survey. The Philippines do not have full-covered registers of persons with disabilities; the primary source of official statistics on disabilities is the Census of Population and Housing (CPH). As a sampling frame, the initial list of persons with disabilities was prepared by the National Statistics Office (NSO), using the 2000 CPH, and was verified by the LGU partners with the help of the research staff from PIDS. The survey team decided to utilize the verified NSO list, supplemented by the LGU lists. Moreover, both Makati and Passy City possess a comprehensive list of persons with disabilities, and Passay City maintains a Community-Based Monitoring System database that includes disability-related indicators.[1]

Makati contains the richest quarter in the Philippines; thus, its fiscal affluence is outstanding among the seventeen LGUs. Persons with disabilities living in ordinary residential districts of Makati benefit from large amounts of revenue. Quezon makes up 20 percent of Metro Manila in terms of both area and population. It is known as an educational district where several famous universities are located. Pasay and Valenzuela are as poor as other LGUs of Metro Manila. While Pasay is adjacent to Makati, Valenzuela is considered to be on the periphery of Metro Manila. It is assumed that an intensive study of these four cities sheds light on various aspects of the livelihood of persons with disabilities living in Metro Manila (Albert et al. 2010).

The dataset captured information on different impairment groups—for example, those with hearing, physical, visual, and multiple impairments.[2] The survey also included a variety of

[1] The other detailed aspects of the survey, such as sampling flame, respondents selection and survey operation, are introduced in Mori et al. (2014)

[2] The impairment questions are available at http://www.ide.go.jp/English/Publish/Download/Dp/259.html, last accessed on March 10, 2015 at 11:20 AM.

information on education and employment status, together with other socio-demographic information. Hence, we use this dataset to estimate the returns to the investment in education for women with disabilities. Out of 403 participants, we use information on 366 respondents with hearing, physical, and visual impairments, to clearly investigate the differences in the effects of each impairment type. We have excluded some participants from our analysis on the basis that the data was missing information about them. Those excluded participants had cognitive, mental, or multiple impairments.

Table 1 shows the descriptive statistics. Of the total of 366, participants ranged in age from 15 years to 67 years, with an average age of 37.78 years. The majority of the respondents (61 percent) were male and the remaining 39 percent were female. The disabilities of the participants were classified into three categories: hearing, physical, and visual impairments. Among the respondents, 29, 38, and 33 percent had hearing, physical, and visual impairments, respectively. Participants completed an average of 8.39 years of schooling, and men with disabilities on average completed more schooling than women: 8.43 and 7.9 years, respectively. Irrespective of the type of impairments, only a small percentage of participants (9 percent) completed their college level of education. Our results highlight the difference between women with disabilities and women without disabilities: women with disabilities are less likely to attain more education than without disabilities who are shown to have equal levels of education to their male counterparts in the Philippines (Yamauchi and Tiongco 2013). The data also collected information on the age of onset for the three types of impairment, revealing that the average age of onset of physical and visual impairments is 24.06 and 27.21 years, respectively. Hearing impairments were categorized according to the linguistic approach, i.e., born deaf (60%), before 3-years-old (24%), or after 3-years-old (15%). The survey also reveals that 33, 30, 18 and 19 percent of the respondents were from Makati, Quezon, Valenzuela, and Pasay, respectively. Furthermore, 50 percent of the total respondents were currently participating

in the labor market, and among these labor market participants 38 percent were full-time workers and the majority, 62 percent, were part-time workers.

5. Empirical strategies

5.1 Mincerian wage equation with continuous education

To establish the empirical settings, the returns to education are estimated, as we define education, firstly, as a continuous variable (grades of schooling completed) by the following equation to regress log earnings on years of schoolings.

$$\log W_i = \alpha + \rho S_i + \beta X_i + \delta_k Y_{ik} + \varepsilon_i \quad (1)$$

The equation (1) is a standard Mincerian wage equation used by the existing studies (Card 1999, 2001; Heckman et al. 2006) with an underlining assumption that the return on schooling is the same for different attainment levels. Starting with the OLS model of earning functions for male and female respondents, a linear relationship is specified in equation (1), where $\log W_i$ is the log of individuals' earning and α is the intercept This equation is added to S_i, years of schooling. ρ represents the returns to education, i.e., how much the wage rate increases in response to an additional year of schooling. X_i is a set of covariates for each person; β is its coefficient to be estimated and ε is an error term. Using these specifications, we obtain baseline estimations. However, one of the potential econometric problems is that the cross-sectional correlation between education and earnings may differ from the causal effect of education, owing to the correlation between the years of education and the error term that involves unobserved factors such as abilities. In order to mitigate endogenous concerns in the context with gender and disability, we employ following steps.

First, three main disability-specific dummy variables for each gender—visual, hearing and physical impairments—are included to carefully identify disparities between males and females

with disabilities. Y_{ik} (k = 1…5) is a set of dummy variables with males with visual impairments as the baseline, and Y_{i1} and Y_{i2} representing hearing and physical impairments in males, respectively. $Y_{i3,}$ $Y_{i4,}$ and Y_{i5} represent visual, hearing, and physical impairments for females, respectively. Second, as establishing schooling effect is difficult and the existing studies have shown the possibility of inconsistent parameter estimation due to schooling years, which may be endogenous, the use of instrumental variables is preferable for credibility (Angrist and Krueger 1991; Angrist et al. 1996; Card 2001). In examining returns to education, there are several candidate instruments. For example, using family background variables is one of credible instruments. Trostel et al. (2002) and Söderbom et al. (2006) used parents' educational levels. For disability and returns to education, the age at which the individual became impaired can be utilized as an instrumental variable. Lamichhane and Sawada (2013) controlled for endogenous bias arising from years of schooling and decisions by employing this novel instrument. We use parents' years of education as family background in our IV estimation.[3] Another econometric consideration is that of sample selection bias. Since many people with disabilities are unemployed in the Philippines, we cannot ignore the endogeneity problem arising from labor market participation decisions. In order to control for the sample selection bias, we employ Amemiya's (1985) Type 1 Tobit model with endogenous regressors.

5.2 Discontinuous wage earnings and the signaling effect

The returns to education do not necessarily increase in a continuous, linear fashion; there is a possibility of discontinuous increases or decreases in wages. We also define another equation that is different from the Mincerian earning function described in Section 5.1, as the model relaxes the assumption of the linear returns to additional years of education. In this analysis, we also check the

[3] In our IV strategy, we do not use the age at which the individual became impaired, because in this dataset the onset year for those with hearing impairments is classified as birth, before 3-years-old, and after 3-years-old, and thus the age at which being impaired is not obtained. This classification is based on linguistics and is important to understand hearing impairment in infants. However, this classification is not suitable for our analysis.

signaling effect in the returns to education, and determine whether the possibility of obtaining a diploma serves as a signal of productivity or not. The signaling model (Spence 1973; Arrow 1973; Stiglitz 1975) suggests that being certified as having completed an educational course is likely to reveal more to an employer about a worker's ability and productivity than a record of how many years the person attended classes. The studies mentioned in Section 3, above, have clarified the signaling effect. A smaller body of literature compares the signaling effect for persons under double disadvantage. Some of them have focused on the socially disadvantaged people mentioned in Section 3.2.

However, to the best of the authors' knowledge, none of the papers have examined the signaling effect focusing on double disadvantage arising from gender and disability, especially in developing countries. The analysis in this section provides another insight, which is different from Section 5.1. If the general model of signaling is reasonably linked with the difference in finding jobs, earning wages or promotions, it is expected that the return for women with disabilities becomes higher if they obtain diplomas rather than drop out, while men with disabilities, who are still considered to be favorable by the labor market, may enjoy a constant level of return even if they drop out. Thus, we also check whether obtaining diplomas has a different effect on wages for males and females with disabilities.

Hungerford and Solon (1987) proposed two earning factions to be formulated in order to capture any possible signaling effects. First choice is spline function, which assumes that log earnings for any given amount of schooling grow linearly, while the inclination of the earning rates depends on the level of education completed, i.e., elementary school, high school, or university. The other choice is the use of step function that treats log earnings as a function of years of education, with a separate step for each year without specifying particular function forms. For more flexibility, setting a step function for our analysis, we fist classify each educational level to check the possibility of nonlinear schooling returns for respondents. Then we classify 10 groups according to the educational attainment for each gender to address the extent to which the returns change

discontinuously based on the categories below: 1. individuals with no education; 2. individuals who do not complete either elementary or high school (this indicator represents lower educational certificate dummy); 3. individuals who graduate from elementary or high school and obtain either diploma; 4. individuals who do not complete higher education, such as college, university, or graduate school; and 5. individuals who graduate from college, university, or graduate schools.

Using the above classification, we add this new specification D_{is} (s=1,..9) designating women with no education as the baseline and use educational level dummy variables to measure the effect of both higher and lower levels of education in equation (2), below:

$$\log W_i = \alpha + \phi_s D_{is} + \beta X_i + \gamma_k I_{ik} + \varepsilon_i \quad (2)$$

where the dependent variable is the natural logarithm of annual earnings, and the data on highest qualifications enables the dummy variables to be defined for both men and women. Of particular interest for us is whether there exists any difference between the effects of lower/ higher certificate dummies and not completed dummies.

Unlike most studies, the signaling effect in our analysis is not estimated indirectly from nonlinear wage returns to years of schooling that correspond to the usual time taken to complete a qualification, as such methods are likely to be biased by measurement errors (Jaeger and Page 1996). The carefully structured questionnaires used by this papers directly ask respondents whether or not they completed schools, and if so the levels from which they graduated, which enables us to directly search the signaling effect. φ_s coefficients estimate the marginal effect of each level of education, as based on the excluded group that has no school qualifications. The effects of disabilities are classified as follows: with γ_k (k=1..3), γ_1 is for visual impairments, γ_2 for hearing impairments, and γ_3 for physical impairments. If empirical findings result in showing the signaling effect, we may conclude that there possibly exists imperfect information between employers and employees with disabilities.

5.3 Quantile regression

Finally, the last part of our analysis deals with wage inequity separately among males and females with disabilities. While estimating how school resources on average affect educational outcomes yields straightforward interpretations, this study investigates wage dispersions by employing the quantile regression approach. Since the quantile regression approach analyzes the relationship between the conditional distribution of the response variable and the set of covariates, it offers more detailed insights into the effects of these countermeasures than the mean regression model; it could be the case that these dispersions vary across educational levels, which results in an impact of schooling upon the wage distribution, through is within-levels channel. Following Martins and Pereira (2004), the quantile regression model is written as equation (3):

$$\log W_i = \beta_\theta X_i + u_{\theta i} \quad \text{with} \quad Quant_\theta(\log W_i \mid X_i) = \beta_\theta X_i \quad (3)$$

where X_i is the vector of exogenous variables and β_θ is the vector of parameters. $Quant_\theta(\log W_i|X)$ denotes the θth conditional quantile of $\log W_i$ given X_i. The θth regression quantile, $0 < \theta < 1$, is defined as a solution to the problem:

$$\min_{\beta \in R^k} \sum_i \rho_\theta(\log W_i - \beta_\theta X_i) \quad (4)$$

where $\rho_\theta(\varepsilon)$ is the check function defined as$\rho_\theta(\varepsilon)=\theta_\varepsilon$ if $\varepsilon \geqq 0$ or $\rho_\theta(\varepsilon)=(1-\theta_\varepsilon)$ if $\varepsilon \leqq 0$. This can be solved by linear programming and standard errors are calculated by bootstrap methods (Wooldridge 2010). We obtain the estimates for different quantiles by setting first quantiles as 0.25, second as 0.5, and third as 0.75.

The empirical results are obtained by replacing the coefficient equation (1), (2) as the coefficient defined in equation (3), above—e.g., the standard Mincerian wage equation is replaced by the following:

$$\log W_i = \alpha_\vartheta + \rho_\theta S_i + \beta_\theta X_i + \delta_\theta Y_{ik} + \varepsilon_i \quad (5)$$

where θ=0.25, 0.5, 0.75 are the quantile for our analysis. Unlike OLS, the quantile regression model allows for a full characterization of the conditional distribution of the dependent variable.

6. Results and findings

6.1 The results for the Mincerian wage equation on continuous education

Table 2 summarizes our estimated results of wage earnings equations modeled by Section 5.1, with the first specification based on OLS estimates. Column 1 of Table 2 (specification (1)) shows a 24.9 percent rate of returns to education, which is relatively higher than those for persons without disabilities, as was explained in previous studies such as Psacharopoulos and Patrinos (2004). However, these returns are consistent with the returns for persons with disabilities, as shown in developing countries (Lamichhane and Sawada 2013) and one developed country (Hollenbeck and Kimmel 2008).

While controlling for the endogenous sample selection bias using the Tobit model (specification (2)), the estimated returns to education become slightly higher. In addition, the range for IV OLS and IV Tobit become slightly high (specification (3) & (4), respectively). In the test of endogeneity, Durbin-Wu-Hausman test shows the possibility of schooling years being endogenous. The Sargan test has been used for over-identification and we do not thus reject the over-identifying restrictions, although partial R squared is 0.0806 and this casts concern over the strength of the instruments. F statistic over 10 suggests instruments are strong. Next, to estimate the effect of double disadvantages (i.e., gender and disability), we categorize each impairment type for male and female and classify the dummy variables for both male and female respondents with visual, hearing, or physical impairments We provide the point estimate of these dummy coefficients in Table 2, as males' visual impairment is used as a base outcome. A comparison of the coefficients of different dummy variables among the different estimations in OLS imply that females with physical

impairments are most seriously and negatively affected in the labor markets. The second most severely affected are females with hearing impairments, while coefficients of both males and females with visual impairments are not statistically significant. This is consistent with the casual observation that there exist a lot of barriers in the labor market in developing world. Lamichhane (2013) showed that students with disabilities face problems such as inadequately available materials on sign language or Braille, or, in the case of those with physical impairments, inaccessible buildings. Lamichhane and Okubo (2014) further discussed the labor market participation of people with disabilities in Nepal and the role of education, and found that people with physical impairments have lower levels of labor market participation than their visually impaired counterparts, and argued that disabling barriers were the most serious constraints for these people.

Our findings in the Philippines suggest the situation is likely the same. As long as disabling barriers are not removed, through the provision of facilities for communication including sign language and other supports based on the reasonable accommodations outlined in the Convention on the Rights of Persons with Disabilities, education alone may not be sufficient particularly for those who are with severe impairments (United Nations 2006).

On the other hand, our findings observe the decreased likelihood of persons with visual impairments getting a job regardless of gender status. This finding is different from those reported by Lamichhane and Okubo (2014) and Lamichhane (2012) in Nepal, where teaching has been promoted by the government's affirmative action plans as a main job for educated individuals with visual impairments. This study indicates that some kinds of jobs that are promoted by the government's affirmative policies may not be available for this group in the Philippines. From the questionnaires for this survey on the particular job distribution for each respondent with impairments, we find that a large portion of participants with visual impairments work in the massage and acupuncture sectors. The findings are that around 65 percent of persons with visual impairment work as masseurs, while persons with hearing and physical impairments were unable to find any particular jobs. A similar situation is reported in the Country Report of Philippines, which

identifies massage as a dominant source of employment for people with visual impairments (Layton & MacPhail 2013).

6.2 The results for discontinuous wage earnings and the signaling effect

The findings of discontinuous wage earnings in the returns to education are shown in Table 3.As defined in Section 5, we relax the assumption of linear educational returns and categorize each educational level in order to check the possibility of nonlinear schooling returns for whole respondents. Subsequently, we use the lower and higher educational diplomas dummy variables, when they graduated and obtain diplomas and not completed dummy variables—e.g., when a person leaves school during lower or higher educational stage before obtaining a diploma for both male and female.

Table 3 compares different characteristics of the level educational specifications and several points, emphasizing the results. In each educational level setting, we observe the clear difference of educational returns (specification (1)). Next, we check the differences using higher educational diplomas dummy and not completed dummy variables (specification (2)). Based on females with no education, the coefficients on levels of education for females are only positive and statistically significant at least when their educational attainment is either a lower or higher diploma (2.41 and 3.57 for lower and higher, respectively). If they do not complete these educational levels, the same result cannot be obtained. Second, the coefficients on levels of educations for males are always positive and statistically significant even if they drop out before obtaining a diploma (2.09, 1.90, 2.81, and 4.58 for lower not completing, lower diploma, higher dropout, and higher diploma, respectively). Third, the increasing of educational returns indicates a convex relationship between education and wages. Moreover, coefficients at all education levels are still significantly higher for males than females except at the lower diploma level. When the Tobit model is employed (specification (3)), the equivalent results are obtained alike. Considering all of these findings, it can be argued that the disadvantage might be profound for women with disabilities as it is observed that

obtaining a diploma may reduce asymmetric information, while not completing school does reduce earnings for only females, which may be a barrier that excludes women with disabilities from participating in the labor market.

Furthermore, the result for males with disabilities in our analysis (i.e., finding increasing convexity in the earnings function is consistent with the existing literature), as Schady (2003) found the convexity and the signaling effect in earning function for Filipino men (male without disabilities). These findings lead to further questions about the possibility for Filipino women (females without disabilities): this is important to address, because the Philippines represents a unique case in which women receive more schooling than men.

6.3 The results for quantile regression

We present the results of the quantile regression on Subsections 5.1 and 5.2 for the models of continuous educational returns and the other model of educational attainment levels, which relax the assumption of a linear increase in wages. In Table 4, we show the regression results of the specified quantiles—i.e., 0.25, 0.50, and 0.75. The findings of our analysis provide several characteristics of returns to education and the effect of gender in disabilities on conditional wage distribution, which appear in the quantile regression.

We first show the estimations of quantile regression without any disability dummies to check the possibility of inequality within levels. The estimation varies from 48 percent at 25 decile to 9.74 percent in quantile (1). Then, we present the results of the coefficients of quantile regression estimates corresponding to equation (1) in Section 5.1. As reported above in Section 5.1, the average estimated educational return is 20.4 percent, whereas the return at 0.25 decile (first quantile) reaches 28.2 percent and 10.3 percent at 0.75 decile (third quantile). We observe that returns to educations are higher at lower points of the conditional wage distribution. This suggests that there is heterogeneity in the returns to education which are larger for individuals at the lower quantile of the conditional wage distribution. This result is not yet well explained by the existing literature, most of

which reports that schooling returns are higher for the more educated and more skilled individuals (Martins and Pereira 2004). From another angle, we would say that lower-wage workers get more educational returns. Another important finding regards the disparity of the coefficients on disabilities' dummies for men and women. Using the OLS as baseline, we see the huge difference between each quantile at different points of the wage distribution. At the lower end of the distribution, the most severe case is found for women with physical impairments, for whom the coefficient is statistically significant and which is below the estimate on average estimated returns in section 6.1, while the least severity is observed at the top of the conditional distribution. The similarity of findings is also consistent for the other impairment groups regardless of gender. Likewise, our analysis shows the coefficients of quantile regression estimates corresponded to the equation (2) in 5.2 as discontinuous wage earnings.

A remarkable finding is the coefficients of each educational level at the 0.25 quantile. The coefficients for men in each education level are relatively larger and significant for the bottom tail of the distribution than the estimates from 5.2; the coefficients for women are only larger and statistically significant when obtaining lower or higher diplomas. An implication of our results is that the signaling effect may appear for the lower part of the conditional distribution, which implies the effects of asymmetric information tends to increase in the lower conditional distribution.

7. Concluding remarks

In this paper, we investigate the effect of gender among persons with disabilities on returns to investment in education in the Philippines. Our estimation with three econometric models implies several disadvantages for women with disabilities in the Philippines. After controlling for sample selection to account for endogenous labor participation, as well as endogeneity of schooling decisions, the estimated rate of returns to education is very high, ranging from 24.9 to 38.4 percent.

However, after classifying each disability dummy variable for each gender, the effect of double disadvantage (gender and disability) is observable.

We also find, through an examination of the possibility of nonlinearly schooling returns, that the effects of disability for women are more severe than for their male counterparts. Based on these findings, we cannot reject the possibility of disadvantage and the signaling effect for women with disabilities. Furthermore, disability and gender wage disadvantage is very unevenly distributed within the population, as it is observed that returns to education are higher at lower points, but the severity of the coefficients on disability dummies for women is higher at the lower end of the distribution. The policies of the government of Philipines need to focus their efforts not just on increasing educational opportunities, but also employment opportunities as well, especially for women with disabilities. Together with the equal opportunity provisions, provisions such as antidiscrimination, broadening the quota system to increase employment opportunities, addressing accessibility issues and subsidizing private sector employment are suggested as some of the possible strategies to increase the labor market participation by women with disabilities.

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Table 1. Descriptive Statistics

Variable names	(1) N (If Dummy = 1)	(2) mean	(3) sd	(4) min	(5) max
Dummy = 1 if female	366(141)	0.3852	0.487	0	1
Years of schooling	366	8.434	4.190	0	16
Years of schooling (female)	141	7.901	4.445	0	16
Years of schooling (male)	225	8.769	3.997	0	16
Age	366	37.78	12.56	15	67
Age (female)	141	38.24	13.17	15	67
Age (male)	225	37.48	12.17	15	61
Dummy = 1 if physically impaired	366(121)	0.331	0.471	0	1
Dummy = 1 if hearing impaired	366(105)	0.287	0.453	0	1
Dummy = 1 if visually impaired	366(140)	0.383	0.487	0	1
Dummy = 1 if physically impaired and female	366(39)	0.107	0.309	0	1
Dummy = 1 if hearing impaired*female	366(50)	0.137	0.344	0	1
Dummy = 1 if visually impaired*female	366(52)	0.142	0.350	0	1
Dummy = 1 if physically impaired*male	366(82)	0.224	0.418	0	1
Dummy = 1 if hearing impaired*male	366(55)	0.150	0.358	0	1
Dummy = 1 if visually impaired*male	366(88)	0.240	0.428	0	1
Dummy = 1 if hearing impaired since born	99(60)	0.606	0.491	0	1
Dummy = 1 if hearing impaired before 3 years old	99(24)	0.242	0.431	0	1
Dummy = 1 if hearing impaired after 3 years old	99(15)	0.152	0.360	0	1
Average onset age for physically impaired	114	24.06	16.22	1	54
Average onset age for visually impaired	136	27.21	14.16	1	58
Dummy = 1 if Makati area resident	366(121)	0.331	0.471	0	1
Dummy = 1 if Quezon area resident	366(108)	0.295	0.457	0	1
Dummy = 1 if Valenzuela area resident	366(67)	0.183	0.387	0	1
Dummy = 1 if Pasay area	366(70)	0.191	0.394	0	1

Note: Onset information on disability is not answered by some persons. Thus the numbers for these categories are below the total number. * in the variable names represents interactions

Table 2. Estimation Results of Earnings Regression with Continuous Education. Dependent Variable: Log Hourly Wage

Variable names	(1) OLS	(2) Tobit	(3) IV-OLS	(4) IV-Tobit	(5) First-Stage
Years of schooling	0.249***	0.301***	0.337*	0.384*	
	(0.0500)	(0.0630)	(0.178)	(0.211)	
Age	0.297**	0.361**	0.228*	0.282*	0.366***
	(0.116)	(0.144)	(0.132)	(0.162)	(0.119)
Age squared	-0.00346**	-0.00421**	-0.00262	-0.00326	-0.00422***
	(0.00149)	(0.00184)	(0.00171)	(0.00208)	(0.00157)
Dummy = 1 if physically impaired*female	-3.059***	-3.709***	-2.604***	-3.031***	-0.762
	(0.914)	(1.151)	(0.925)	(1.128)	(0.819)
Dummy = 1 if hearing impaired*female	-2.113***	-2.415***	-2.778***	-3.214***	-1.910**
	(0.661)	(0.814)	(0.783)	(0.963)	(0.784)
Dummy = 1 if visually impaired*female	-0.446	-0.482	-1.125	-1.250	-0.0297
	(0.650)	(0.755)	(0.709)	(0.823)	(0.796)
Dummy = 1 if physically impaired*male	-1.795***	-2.042***	-2.188***	-2.462***	0.705
	(0.585)	(0.690)	(0.581)	(0.688)	(0.606)
Dummy = 1 if hearing impaired*male	-0.864	-0.911	-1.329**	-1.416*	-0.336
	(0.668)	(0.797)	(0.650)	(0.769)	(0.719)
Dummy = 1 if Makati area	-2.111***	-2.477***	-2.293***	-2.616***	0.644
	(0.595)	(0.711)	(0.654)	(0.771)	(0.616)
Dummy = 1 if Quezon area	-1.294**	-1.451**	-1.643***	-1.841***	-0.949
	(0.561)	(0.655)	(0.584)	(0.680)	(0.654)
Dummy = 1 if Valenzuela area	-1.794***	-2.055**	-2.025***	-2.293***	-0.555
	(0.682)	(0.818)	(0.717)	(0.854)	(0.732)
Years of schooling (Mother)					0.0851
					(0.0690)
Years of schooling (Father)					0.235***
					(0.0680)
Constant	3.389	1.699	4.514*	3.163	-0.368
	(2.227)	(2.806)	(2.352)	(2.938)	(2.370)
Observations	366	366	301	301	301
First-stage *F* statistic for excluded instruments (*P - value*)			15.05 (0.000)		
Sargan statistic test			0.000039		
			0.9950		
R-squared	0.182		0.187		

Note: The figures in parentheses are heteroscedasticity-robust standard error. The coefficients with ***, ** and * are statistically significant at respectively, the .01, .05, and .10 levels of probability (*** p<0.01, ** p<0.05, * p<0.1). Specifications (3) and (4) are based on the first-stage regression (5). The default category: Dummy = 1 if visually impaired & male, and Dummy = 1 if Pasay area in specification (1) – (5). * in the variable names represents interactions

Table 3. Estimation Results of Discontinuous Wage Earnings and Signaling Effect. Dependent Variable: Log Hourly Wage

Variable Names	(1)	(2)	(3)
Age	0.262**	0.321***	0.387***
	(0.119)	(0.117)	(0.145)
Age squared	-0.00307**	-0.00381**	-0.00460**
	(0.00154)	(0.00149)	(0.00183)
Kindergarten/preparatory school	-4.684***		
	(1.202)		
Elementary grade I to V	-0.371		
	(1.048)		
Elementary graduate	2.100*		
	(1.095)		
1st to 3rd year high school	2.564**		
	(0.998)		
High school graduate	1.863*		
	(0.988)		
Vocational school	2.591**		
	(1.109)		
Post-secondary	5.554***		
	(1.002)		
College level	1.863*		
	(0.987)		
College or university graduate	4.151***		
	(0.893)		
Master or higher	3.406***		
	(1.113)		
Not completed lower education (female)		-0.271	-0.0435
		(1.343)	(1.799)
Completed lower education (female)		2.417*	3.222*
		(1.303)	(1.709)
Not Completed higher education (female)		1.482	2.085
		(1.405)	(1.828)
Completed higher education (female)		3.577***	4.591***
		(1.234)	(1.629)
No grade completed (male)		0.613	1.168
		(1.640)	(2.102)
Not completed lower education (male)		2.090*	2.864*
		(1.237)	(1.647)
Completed lower education (male)		1.902	2.596
		(1.256)	(1.657)
Not Completed higher education (male)		2.807**	3.626**
		(1.217)	(1.618)
Completed higher education (male)		4.582***	5.602***
		(1.160)	(1.570)
Dummy = 1 if physically impaired	-2.031***	-1.936***	-2.268***
	(0.533)	(0.527)	(0.632)
Dummy = 1 if hearing impaired	-1.100**	-1.150**	-1.285*
	(0.549)	(0.560)	(0.667)
Dummy = 1 if Makati area	-2.104***	-1.946***	-2.262***
	(0.610)	(0.591)	(0.701)
Dummy = 1 if Quezon area	-1.017*	-1.182**	-1.292**
	(0.588)	(0.562)	(0.654)
Dummy = 1 if Valenzuela area	-1.572**	-1.865***	-2.175***
	(0.664)	(0.677)	(0.809)

Constant	4.113*	2.882	0.894
	(2.372)	(2.454)	(3.137)
Observations	366	366	366
R-squared	0.202	0.185	

Note: The figures in parentheses are heteroscedasticity-robust standard error. The coefficients with ***, ** and * are statistically significant at respectively, the .01, .05, and .10 levels of probability (*** p<0.01, ** p<0.05, * p<0.1). The default category: Dummy = 1 if No grade completed, Dummy = 1 if visually impaired & Dummy = 1 if Pasay area in specification (1) and Dummy = 1 if No grade completed for female, Dummy = 1 if visually impaired & Dummy = 1 if Pasay area in specification (2) & (3)

Table 4. Estimation Results of Quantile Regressions. Dependent Variable: Log Hourly Wage

Variable names	(1)			(2)			(3)		
	q25	q50	q75	q25	q50	q75	q25	q50	q75
Years of schooling	0.480***	0.150***	0.0974***	0.283*	0.143***	0.103***			
	(0.183)	(0.0396)	(0.0206)	(0.155)	(0.0335)	(0.0171)			
Age	0.495	0.138	0.134***	0.517**	0.180**	0.103**	0.251	0.194**	0.134***
	(0.374)	(0.0931)	(0.0454)	(0.249)	(0.0857)	(0.0475)	(0.268)	(0.0844)	(0.0488)
Age squared	-0.00582	-0.00145	-0.00152***	-0.00606*	-0.00199*	-0.00111**	-0.00306	-0.00226**	-0.00160***
	(0.00471)	(0.00114)	(0.000584)	(0.00308)	(0.00104)	(0.000553)	(0.00324)	(0.000987)	(0.000612)
Not completed lower education (female)							-0.521	-0.722	-0.933***
							(2.502)	(3.624)	(0.311)
Completed lower education (female)							6.878*	0.882	0.363
							(3.555)	(3.406)	(0.289)
Not Completed higher education (female)							5.048	0.631	0.579
							(4.329)	(3.823)	(0.405)
Completed higher education (female)							7.233**	0.748	0.908
							(3.140)	(3.435)	(0.586)
No grade completed (male)							5.954*	-0.787	-0.594
							(3.565)	(3.490)	(0.668)
Not completed lower education (male)							6.762**	0.343	0.175
							(2.929)	(3.392)	(0.343)
Completed lower education (male)							5.780*	0.431	0.570
							(3.276)	(3.368)	(0.397)
Not Completed higher education (male)							7.333**	0.701	0.650*
							(3.410)	(3.468)	(0.356)
Completed higher education (male)							8.650***	1.571	1.261***
							(3.023)	(3.455)	(0.279)
Dummy = 1 if physically impaired							-2.430	-0.887***	-0.607***
							(1.731)	(0.263)	(0.168)
Dummy = 1 if hearing impaired							-1.502	-0.955***	-0.574**
							(1.307)	(0.357)	(0.256)
Dummy = 1 if Makati area	-3.324***	-1.289***	-0.958***	-1.990**	-1.322***	-0.977***	-1.907	-1.058**	-0.666**
	(1.241)	(0.415)	(0.219)	(0.898)	(0.336)	(0.249)	(1.279)	(0.481)	(0.269)
Dummy = 1 if Quezon area	-1.885***	-0.568*	-0.264	-1.095*	-0.698	-0.777***	-1.175	-0.984**	-0.591*
	(0.708)	(0.295)	(0.193)	(0.596)	(0.423)	(0.233)	(0.986)	(0.399)	(0.320)

Dummy = 1 if Valenzuela area	-2.565	-0.777***	-0.846***	-1.046	-0.992**	-1.035***	-1.177	-1.026**	-0.908***
	(1.871)	(0.269)	(0.175)	(1.897)	(0.414)	(0.332)	(1.564)	(0.438)	(0.298)
Dummy = 1 if physically impaired*female				-8.091***	-0.576	-0.636**			
				(2.612)	(1.914)	(0.284)			
Dummy = 1 if hearing impaired*female				-3.429**	-1.814***	-1.409***			
				(1.577)	(0.532)	(0.402)			
Dummy = 1 if visually impaired*female				-1.067	-0.120	-0.0349			
				(0.656)	(0.361)	(0.285)			
Dummy = 1 if physically impaired*male				-2.160	-0.732	-0.585**			
				(2.842)	(0.458)	(0.266)			
Dummy = 1 if hearing impaired*male				-1.486	-0.287	-0.503*			
				(1.661)	(0.510)	(0.258)			
Constant	-4.229	6.873***	8.227***	-1.822	6.695***	9.263***	-0.443	7.523*	9.126***
	(5.432)	(1.842)	(0.841)	(4.977)	(1.737)	(0.945)	(4.928)	(4.173)	(0.989)
Observations	366	366	366	366	366	366	366	366	366

Note: The figures in parentheses are heteroscedasticity-robust standard error. The coefficients with ***, ** and * are statistically significant at respectively, the .01, .05, and .10 levels of probability (*** p<0.01, ** p<0.05, * p<0.1) The default category: Dummy = 1 if Pasay area in specification (1), Dummy = 1 if visually impaired & male, and Dummy = 1 if Pasay area in specification (2), and Dummy = 1 if No grade completed for female, Dummy = 1 if visually impaired & Dummy = 1 if Pasay area in specification (3). * in the variable names represents interactions

Abstract (in Japanese)

要約

本論文はフィリピン・マニラ首都圏の障害者の教育投資における収益におけるジェンダーの影響を分析する。障害者間でのジェンダーの影響を明らかにするために、マニラ首都圏で収集された肢体不自由、聴覚障害、視覚障害をもつ障害者の調査データを用い、賃金関数の連続性、非連続性、また分位点回帰の計量経済学的な３つの推計方法を行った。実証分析の推定の結果、健常者の間ではジェンダー平等が観察されるフィリピンにおける労働市場でも障害をもつ女性は不利な立場に直面していることが示唆された。進学の決定、労働市場への参加への内生性の原因となるサンプルセレクションをコントロールし、教育収益率は 24.9%から 38.4%の範囲と推定された。しかしながら、それぞれの障害を男女間に分類したダミー変数を用いると、ジェンダーと障害両方からの二重の不利な側面が観察された。さらに非連続的な教育収益率を考慮することにより、女性が障害を持つことが男性よりも影響を与え、学業証書を持つことが労働市場におけるシグナリングの機能の役目をしている可能性を示唆している。