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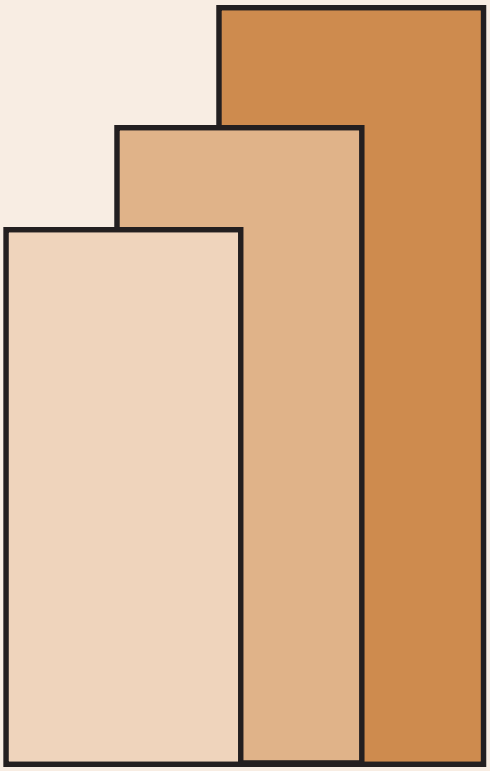
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Employment Choices of Persons with Disability (PWDs) in Metro Manila

Christian D. Mina

DISCUSSION PAPER SERIES NO. 2010-29



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Employment choices of persons with disability (PWDs) in Metro Manila

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Suggested running head: PWD employment

Abstract

This paper examined how PWDs in the Philippines make a living and determined the factors that influenced them to select a particular labor market status and/or a source of personal income. It also analyzed the different types of work these PWDs engage in and their association with levels of educational. Using dataset from the pioneering survey on socioeconomic conditions of PWDs in selected cities in Metro Manila, Philippines conducted in 2008, econometric analyses were conducted. The paper then presented some insights that could help the government craft better policy strategies in the provision of livelihood to, as well as empowerment of, PWDs.

Keywords: Disability; Philippines; Labor force participation; Employment; Occupation; Source of Income; Logistic regression; Principal component analysis; Multivariate adaptive regression splines; Correspondence analysis.

I. Introduction

In 2008, employment had already been included in the set of targets under the Millennium Development Goals (MDGs). The member-countries are now committed to monitor progress towards achievement of full and productive employment as well as decent work for all segments of the population, including persons with disabilities (PWDs). In the Philippines, various efforts have long been undertaken by the government in providing employment and livelihood supports to PWDs. One of those is the Magna Carta for Disabled Persons (MCDP), which ensures equal opportunities for suitable employment to PWDs as their able-bodied counterparts. Among the remarkable employment and livelihood programs of the government are the *Tulong Alalay sa Taong May Kapansanan* (TULAY) program, or Support services to persons with disabilities, of the Department of Labor and Employment (DOLE); Assistance package for PWDs of the Department of Trade and Industry (DTI); Philippine National Skills Competition for PWDs of the Technical, Education and Skills Development Authority (TESDA); and, Science and Technology Intervention for the Poor, the Vulnerable and PWDs of the Department of Science and Technology (DOST) (Mori et al. 2009; Purcil 2009; DRPI and KAMPI 2008).

In spite of the various efforts carried out by the government in providing full and productive employment to PWDs, it seems that employment opportunities for this segment of the population are still limited. Schelzig (2005) noted that out of more than 100,000 employable PWDs that are registered with the DOLE, only less than 10 percent are wage employed. A pioneering survey on the socioeconomic conditions of PWDs in selected cities in Metro Manila, which was conducted in August 2008 jointly by the Institute of Developing Economies (IDE) and the Philippine Institute for Development Studies (PIDS), revealed that slightly more than half of the PWD

respondents have income-generating job/business. Out of those with job/business, almost 50 percent engage themselves (either full-time or part-time) into other small-scale income-generating activities, which are usually under informal arrangements. Meanwhile, around 25 percent of the PWD respondents rely merely on supports from family members/friends, benefits from the government, or even from begging.

This paper thus aimed at examining how PWDs in the Philippines make a living and determine the factors, mainly their individual and household characteristics, which influenced them to select a particular labor market status and/or a source of personal income. It also analyzed the different types of work these PWDs engage in and their association with levels of education. Based on the insights drawn from econometric analyses, it presented some recommendations that can be of help to the government in crafting better policy strategies in the provision of livelihood to, as well as empowerment of, PWDs.

II. Review of Literature

A number of studies have been made on the factors affecting labor force participation and employment. Using census data on 2,825 households, Khan (2007) estimated a multinomial logit model and found significant individual, household and community-related factors affecting employment choices in rural northwest Pakistan. Some of these include household per capita income, age and education of household head, household size, number of working members in a household, and location.

In the Philippines, Alba and Esguerra (1998) estimated a mixed logit regression model using the matched files of the Family Income and Expenditure Survey and Annual Poverty Indicators Survey to find a set of determinants of labor force participation. Using around 20,876 working-age individuals, the following variables appeared significant: personal income; education; regional location; number of elderly in the household; interaction between region and urban/rural classification; interaction between age and education; and, interaction among sex, marital status and work experience.

There had also been studies particularly focused on labor force participation among the disabled. Kidd et al. (2000) found that education, marital status, race and location have significant effect on labor force participation of both able-bodied and disabled British males. Among the disabled, type of disability was noted to have significant effect on the probability of employment. The study employed probit analysis using the 1996 British Labour Force Survey.

A study by Scott and Mete (2008) also revealed that individual characteristics of PWDs in Uzbekistan such as age, sex and education were also found to have significant influence on the probability of being economically. As age of the disabled increases, he/she is more likely to participate in the labor market. Similarly, years of education increases the odds of being employed. On the other hand, being female decreases the probability of participating in the labor force. In addition to individual characteristics, household and some other characteristics like being head of a household, number of children aged 15 and below, number of pension-aged adults, and household size have significant relationship with employment probability. The first three factors were found to have significant positive relationship with labor force participation while the last one negatively influences the probability of being economically active. Location was also noted to be a significant factor of employment choice. Meanwhile, disability status was also found to have significant negative effect on labor force participation.

Park et al. (2007) also scouted for significant correlates of labor force participation among mobility-impaired in South Korea. In this study, gender came out be one of the most significant factors influencing employment. It also noted that having a less severe disability tends to increase the probability of being employed.

Using a pooled data from household and labor force surveys in Great Britain, Blackaby et al. (1999) analyzed the occupational and labor market statuses of disabled and non-disabled. One of the findings of the study is the U-shaped relationship between age and unemployment, implying that the unemployed are more likely to be either too young or too old relative to those in work. The study also found that ethnic background matters in the labor market status of the disabled.

Those who are white tend to have higher probability of being employed relative to those classified as an ethnic minority. Similar to findings in other studies, education also plays a significant role in increasing one's chance of being employed. Another interesting finding is that unemployment is highly probable among individuals who have not married yet. The presence of young children, on the other hand, was found to have significant positive relationship with being economically inactive. Meanwhile, probability of being unemployed is also being increased by the possible social deprivation and reduced geographical mobility associated with council housing.

III. Methodology

In order to answer the objectives of this study, various statistical analyses were conducted. To determine the factors affecting PWDs to participate in the labor market as well as those affecting them to depend on certain sources of income, econometric models were developed. A descriptive technique was also employed to examine the relationships among different types of occupation and levels of education of PWDs.

Scope and limitation of data

A pioneering survey on the socioeconomic conditions of PWDs in selected cities in Metro Manila was conducted in August 2008 by a team of PWD enumerators (representing the mobility-impaired, visually-impaired and hearing-impaired groups) and assisted by a research team from the PIDS. The selected cities were Makati, Quezon, Pasay, and Valenzuela, representing local government units (LGUs) with different income. The NSO list, which was based on the 2000 Census of Population, was supposed to be the sampling frame of the study. However, because the list contains many incorrect information, samples were also drawn from other sources: LGU list of program beneficiaries, member lists from different Disabled People Organizations (DPOs), and PWDs on-site. LGU list covers more or less lower-income PWDs because they are usually the beneficiaries of programs at the local level. DPO member lists, on the other hand, usually include PWDs at higher income deciles. Although the sample PWDs are in some sense representative of PWDs in the sampled areas, in terms of socioeconomic status, weighting of the sample respondents cannot be applied to yield unbiased estimates of parameters. Data analysis can thus only be carried out as though the sample generated is purposive (Mori et al. 2009).

A. Factors affecting PWDs' mode of labor force participation and major source of personal income

Variables

The dependent variables in this study are the following:

(1) Job/business indicator: 1 if a PWD had an income-generating job/business; 0, otherwise;

(2) Mode of labor force participation: 1 if a PWD was 'pseudo' fully employed; 2 if 'pseudo' underemployed; 3 if 'pseudo' unemployed; 4 if 'pseudo' economically inactive;

(3) Major source of personal income: 0 if no reported income; 1 if wage employment; 2 if entrepreneurial activities; 3 if transfers or receipts from family members/friends/others;

(4) Dummy variables of mode of labor force participation: (a) 'pseudo' fully employed; (b) 'pseudo' underemployed; (c) 'pseudo' unemployed; and, (d) 'pseudo' economically inactive;

(5) Dummy variables of major source of personal income: (a) wage income; (b) entrepreneurial income; (c) transfer income; and, (d) no income.

Job/business indicator provides the working status of a PWD; whether he/she was engaged in any income-generating job(s) or business(es), or not.

The mode of labor force participation further detail the working status of a PWD. Labor force concepts used in this study, however, do not fully conform to the official definitions of the ILO. Some items that are required to satisfy the official definition of modes of labor force participation are not present in the IDE-PIDS PWD survey. For instance, based on the official

definition of International Labour Organization (ILO), if a person worked for pay of profit for at least an hour during the reference period, provided that he/she is of working age (15-70), he/she is considered employed. However, because there was no question in the survey that asked the respondent if he/she wanted additional or longer working hours, but not necessarily additional job, he/she may not be considered as fully employed. Thus, those respondents who reported that they had a job/business but were not looking for work are tagged as 'pseudo' fully employed. Similarly, underemployed in this study is referred to as 'pseudo' underemployed. These are the respondents who reported having a job/business and were looking for work. It excludes, for instance, those who wanted only additional or longer working hours at their present job but not necessarily additional job. Unemployed and not in the labor force in this study are also termed as 'pseudo' unemployed and 'pseudo' economically inactive, respectively. Unemployed is defined as those who had no job/business but was looking for work while economically inactive is defined as those who had no job/business and not looking for work. The ILO definition requires additional 'screening' questions on the person's availability for work (whether he/she, although currently not looking for work, is available for work for the next two weeks from the reference period) and on his/her reasons for not looking for work.

A PWD respondent may have more than one job or business. In order to determine his/her major source of income, all incomes from various sources were aggregated and then the share of each source to total was estimated. The source with the highest percentage share was then picked as the major source of personal income of the respondent. These sources of income were then grouped into major categories, namely: wage income, entrepreneurial income and transfer income. Paid employment income such as wages and salaries, including cash gifts and bonuses

received, is defined here as wage income. Entrepreneurial income here combines profits from businesses and rent for buildings/rooms/lands. A few respondents who are renting their rooms/houses to others consider this as business and income from it as profits. Transfer income here includes receipts from family members (who are usually overseas Filipino workers or OFWs) and friends. It also includes pension income and benefits/allowances from the government. For the purpose of this study, receipts from institutions such as church or federations, and even from begging, were also included under this category.

Because the dependent variables are somehow related to each other, only one set of explanatory variables were used in all of the models. Most of these explanatory variables were selected based on what were identified in the literature. These include the following: dummy variable for location (Makati City and others); age, sex, marital status, and education of the PWD respondent; household head indicator (whether the respondent is a household head or not); household size; ownership of household assets (proxy for household income[1]); presence of OFWs in the household; membership in a Disability Self-Help Organization (DSHO); availability and necessity of a personal assistant (PA) at home and when going out of the house as well as the number of assistive devices (proxy for physical functioning[2]); and, dummy variables for the three major types of impairment (mobility, visual, hearing) and for multiple impairments.

Note that two of the explanatory variables were indices generated using Principal Component Analysis (PCA), namely: asset index and functioning index. Asset index was generated using the variables on ownership of household assets (tenure status of house and lot, housing type and ownership of durable assets). Functioning index was generated using the variables on the availability and perceived necessity of PA at home and when going out as well as possession of assistive

devices. Because there are only a limited number of sample observations in this study, explanatory variables entered in the model should be maintained at a lower number. Instead of including all of the relevant variables in the model, PCA performs some statistical computations to come up with a composite index that would represent all of these variables as one explanatory variable in the model. This is also one of the statistical techniques used to address the multicollinearity problem in model estimation. (Refer to Table 1 for the complete list and definition of the variables used in model estimation.)

Meanwhile, it would have been better if the numbers of children and elderly in the household were included as explanatory variables but the survey data did not permit the generation of these potential variables. Age of each of the household members was not asked in the survey.

Models to be fitted

Two classes of models were estimated in this study, namely: logistic regression (LR; both multinomial, or MLR, and binary, or BLR) and multivariate adaptive regression splines (MARS). The general specification of the models used in this study can be written as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1i} + \beta_{2j}X_{2i} + \cdots + \beta_{nj}X_{ni} + \varepsilon_{ij}$$

where: Y_{ij} = dependent variable, i = 1, 2, …,403 (total number of sample PWDs);

j = 1, 2, …, n; n = total number of explanatory variables

β = estimated coefficient of the model

X = explanatory variable, or the potential factor affecting the choice of the PWD

ε_{ij} = stochastic error

If the model to be estimated is LR, $Y_{ij} = logit(p_{ij}) = \ln\left(\frac{p_{ij}}{1-p_{ij}}\right)$, where: $p_{ij} = P(Y = 1)$ is the probability that the *i*th individual PWD will favor the *j*th choice. On the other hand, if the model to be fitted is MARS, the following is the function approximation: $Y = a_0 + \sum_{m=1}^{M} a_m B_m^{(q)}(\mathbf{x})$, such that: a_0 is the coefficient of the constant basis function (or the constant term); $\{a_m\}_1^M$ is the vector of coefficients of the non-constant basis functions (m = 1, 2, …, M); $B_m^{(q)}(\mathbf{x}) = \prod_{k=1}^{K_m}\left[s_{km} \cdot \left(x_{v(k,m)} - t_{km}\right)\right]_+^q$ is the vector of non-constant (truncated) basis functions (or the *tensor product spline basis*); where: m is the number of non-constant basis functions (1, 2, …, M); q is the power to which the spline is raised in order to control for the degree of smoothness of the resultant function estimate (which in this case is equal to 1); (+) denotes that only positive results of the right-hand side of the equation are considered (otherwise, the functions evaluate to 0; thus, the term truncated); s_{km} indicates the (left/right) sense of truncation that assumes only 2 values (i.e., ± 1, representing the standard basis function and its mirror image[3]); $x_{v(k,m)}$ refers to the value of the predictor; $v(k,m)$ refers to the label of the predictor ($1 \leq v(k,m) \leq n$); n is the number of predictors; t_{km} is the "knot" location on the corresponding predictor space or region (or the value that defines an inflection point along the range of the predictor); and, k is the maximum level or order of interaction (or the number of factors) in the mth basis function (1, 2, …, K_m).

LR is a better alternative to multiple linear regression under the following conditions: (i) the dependent variable is categorical; (ii) the independent variables are a mixture of continuous and categorical variables, with the latter dominating the model, and; (iii) the independent variables

do not satisfy the multivariate normality assumption, especially when the total number of observations is very few. On the other hand, MARS[4] is a nonparametric method for fitting adaptive regression that uses piecewise basis functions to define relationships between a dependent variable and a set of predictors. Basis functions are a set of functions used to represent the information contained in one or more variables. Like principal components, basis functions re-express the relationship of the predictors with the dependent variable. Unlike any other spline-based techniques, MARS uses the so-called truncated power (multivariate) spline basis functions with q=1 to estimate a simple linear function, similar to that of the linear regression.

B. Association between types of occupations and levels of education

Variables

Current occupations reported by employed PWD respondents were used in this analysis. Major groups of these occupations, classified based on the Philippine Standard Occupational Classification (PSOC), were also used. Meanwhile, the original categories of the variable on educational attainment (i.e., from no grade completed to postgraduate) were also used in this analysis.

Statistical technique used

Instead of the simple two-way tabulations, a Correspondence Analysis (CA) was carried out to be able to highlight all of the important patterns in the two-way tabulations of occupations and educational attainment of PWDs. A biplot was then displayed to graphically show the statistical association of certain types of occupations with certain levels of education attained by PWDs.

IV. Empirical Results

Diagnostic Checking

Before proceeding to model estimation, some diagnostic checks were performed. Pairwise correlation matrix revealed that the strongest correlation, which exists between age and marital status at -0.5167, did not reach the 0.70 threshold. This implies that multicollinearity should not be a problem in model estimation. Both correlation tests and univariate regression analyses, on the other hand, provided idea on the hypothesized relationships of the dependent variables with the identified explanatory variables (Tables 2 and 3).

All LR models satisfied the Hosmer-Lemeshow's goodness-of-fit and specification link tests.[5]. Interestingly, all of them have relatively good predictive ability since they were able to predict the dependent variable correctly more than 75 percent of the time.

A. Factors affecting PWDs' mode of labor force participation and major source of personal income

Results of LR analyses

Based on the findings from the multinomial and binary LR analyses, the three most significant factors that differentiate the PWDs across mode of labor force participation and major source of personal income are household head indicator, membership in a DSHO and functioning index (Refer to Tables 4-8). Being a household head increases the probability of being employed and of sourcing most of his/her personal income from wage employment. Similarly, being a member

of a DSHO also increases the odds of being wage employed. Members of DSHO are also less likely to depend on transfer income and, although some of them are unemployed, they tend to look for work. Meanwhile, having access to PA and assistive devices and viewing PA's help as necessary increases the probability of being economically inactive. This segment of PWD samples also tends to have no personal income and if they have, majority of their income are sourced from receipts from family members/friends/others.

Some other factors were also found to have significant effect on labor market status and income source of PWDs. Most of the visually-impaired in the sample were found to be wage employed, although some of them still look for other jobs. There is thus a very low probability of finding a visually-impaired individual with no personal income or who is dependent on transfer income. Also, many of the PWDs with more assets are employed and source most of their income from transfers from other people. Those who are at least high school graduate are economically active, although not usually under full employment, and primarily depend on wage income. On the other hand, PWDs living in a household with at least one OFW are economically inactive and are dependent on transfer income. Moreover, female PWDs and those residing in Makati City are more likely to be economically inactive and either have no reported income or dependent on transfer income.

Results of MARS analyses

Examining interactions between and among the explanatory variables might uncover some more interesting patterns in the data. Through the estimated MARS models, factors that were not found significant in LR models became significant when they were allowed to interact with other

factors (Tables 9-17). One of the findings from the MARS analyses is that male PWDs who are heads of their households have higher probability of being employed. In addition, heads that are aged 53 and below and are visually-impaired tend to be in wage employment. Meanwhile, heads that are not single and have lesser access to PA and/or assistive devices are more likely to be employed, although still looking for other income-generating activities.

On the other hand, PWDs who are not heads in relatively smaller households (below 5 members) that have at least one OFW member are less likely to have an income-generating job/business. PWDs who are not household heads, below 32 years old and not high school graduate tend to be underemployed. However, those who are in the mid-30's and above were found to have no job/business. PWDs who are just members of relatively poorer households (owning fewer assets) have higher probability of not participating in the labor force. From this group, those who have never been married did not even report any personal income.

Membership in a DSHO increases a PWD's chance of being employed. In fact, although many of the visually-impaired are employed, if he/she is not a member of a DSHO, there is a high probability that he/she is not fully employed. Among the visually-impaired PWDs who are DSHO members, many are in wage employment, particularly those who belong to non-OFW households. However, not all members of a DSHO for the blind have wage employment as their major source of personal income. If he/she did not even finish secondary education, he/she has lower probability of being wage employed. Meanwhile, those who are visually-impaired and are not DSHO members but do not depend much on PAs and/or assistive devices have higher probability of being wage employed.

Moreover, PWDs who are not members of DSHO and are aged 21 and above are more likely to be economically inactive. Those who are not members of any DSHO and are highly dependent on PAs and/or assistive devices have relatively lower probability of being employed.

Higher functioning index was generally found to have negative effect on the probability of being employed. This is particularly true among visually-impaired PWDs who belong to a two-member household. Also, PWDs who are either mobility- or hearing-impaired with higher functioning index were not in the labor force. Those who are either visually- or mobility-impaired with higher functioning index and are aged 46 and below have lower probability of engaging in entrepreneurial activities. On the other hand, PWDs who have lower functioning index and members of OFW households tend to fully employed.

Interestingly, visually-impaired PWDs aged 44 and above and members of households with relatively more assets are usually fully employed. Female PWDs belonging to a relatively wealthier household and are either mobility- or hearing-impaired often have personal income, either from employment or transfers.

PWDs who are at least high school graduate usually participate in the labor force. It is thus not surprising to find out that those who did not finish secondary education and are either mobility- or hearing-impaired are more likely to have no job/business, especially those who are 30 years old and older. They usually depend on transfer income, rather than income from wage employment or entrepreneurial activities. However, not all PWDs who have lower educational

attainment have no job/business. The survey data also revealed that PWDs who are not visually-impaired, did not finish high school and members of non-OFW households either engage in income-generating activities or are looking for work.

B. Association between types of occupation and levels of education

The results of the CA suggest that some types of occupation are significantly associated with some levels of education. Using the original categories of the occupation variable, it can be deduced from the results of the CA and its biplot (shown in Figure 1) that having a master's or any post-graduate degree is closely associated with teaching as the primary occupation. Being an office clerk seems to be the most common occupation of PWDs with post-secondary degrees. A lot of the sample PWDs which took up diploma and certificate courses might have acquired jobs related to office or clerical works. Having finished a vocational degree is closely associated with getting jobs such as store keeper/manager as well as artist/musician. ICT-related workers have been significantly associated with PWDs who have vocational degrees and college/university degrees. PWDs who are owners of small-scale businesses, electricians, launderers/pressers, and drivers usually have vocational and/or tertiary education. Moreover, many of those who had no formal education or have only reached elementary education end up with occupations such as masseurs, street and market vendors, buy and sell agents, and helpers (either in private households or establishments).

Associating the major groups of occupations (based on PSOC) with educational attainment, Figure 2 suggests that PWDs who have pursued post-graduate degrees are more likely to be

among the pool of professionals. PWDs with college, vocational or other post-secondary degrees tend to become clerks. Those who have pursued vocational education end up being among those trades and related workers. Lower level of education and no formal education are more likely associated with being an agricultural worker and having no job/business. Ironically, many of the laborers and unskilled workers reached tertiary level education. Meanwhile, other groups of occupations such as officials, technicians and associate professionals, service and shop and market sales workers, and plant and machine operators seem to have finished college or vocational education.

V. Concluding Remarks

Notwithstanding the limited sample size in this study, some insights can be drawn from econometric and descriptive analyses. The findings suggest that certain groups of PWDs possessing different individual and household characteristics need specific types of interventions from the government. For instance, being a household head seems to put additional pressure for a PWD to seek employment. This is particularly true among those who are male, have their own families, have relatively small number of assets, and cannot afford and/or does not urgently need assistance from PAs and/or any special devices. Apparently, these PWDs belong to relatively poorer households as evidenced by ownership of fewer assets and lesser access to PAs and/or assistive devices. Thus, the government might want to provide special assistance to this particular group of PWDs through provision of additional source of livelihood to their families.

Another important factor is membership in a DSHO. It seems that DSHOs play a significant role in providing livelihood to and empowering their members. The government, through the LGUs, might want to implement programs and activities that are similar to those conducted by DSHOs for the benefit of their members. Alternatively, the government might want to work in partnership with DSHOs in providing livelihood to PWDs.

Higher access to PAs and/or assistive devices may imply higher degree of disability (or limited physical functioning) or higher household wealth. Many PWDs who belong to any of these groups tend to have no job/business. Rehabilitation and livelihood assistance may be provided by the government to these PWDs, not only to make earnings for themselves, but also to let them feel their worth and get empowered in the long-run.

Moreover, education can be considered as a critical factor in gaining employment. The government might offer scholarships to school-aged PWDs who cannot attend school because of financial constraints. Alternative learning sessions might also be conducted (on a regular basis and free of charge) to PWDs who are already beyond the school-age but do not have high school diploma (which is usually the minimum qualification set by employers). Special sessions might also be catered to hearing-impaired who do not know sign language (especially those in far-flung areas where deaf schools are inaccessible) and are not knowledgeable with Filipino (since English is the medium of instruction in deaf schools). The government might also allocate additional funds for programs and activities related to skills training and livelihood assistance to older PWDs with lower educational attainment.

Meanwhile, this study may be further improved by employing some sophisticated statistical techniques such as the nonparametric counterpart of the Heckman correction to correct for the possible problem of endogeneity. In addition, better insights might be drawn if the labor supply equation would be correctly identified by taking into account the income and substitution effects in the model selection stage.

References

Alba, M.M. and E.F. Esguerra, 1998, A mixed logit model of modes of labor force participation. *MIMAP Research Paper* No. 32. Makati City, Philippines: MIMAP Project, Policy and Development Foundation, Inc.

Blackaby, D., K. Clark, S. Drinkwater, D. Leslie, P. Murphy, and N. O'Leary, 1999, Earnings and employment opportunities of disabled people: secondary analysis of the General Household Survey and the Labour Force Survey. *Research Report* No. 133. Norwich: The Crown Copyright.

Disability Rights Promotion International (DRPI) and Katipunan ng May Kapansanan sa Pilipinas, Inc. (KAMPI), 2008, Monitoring the individual human rights experiences of persons with disabilities in the Philippines.

Friedman, J.H., 1991, Multivariate additive regression splines. *Ann. of Stat.,* **19**(1), pp. 1-67.

Friedman, J.H. and C. Roosen, 1995, An introduction to MARS. *Statistical Methods in Medical Research*, **4**, pp. 197-217.

Khan, M.A., 2007, Factors affecting employment choices in rural northwest Pakistan. Paper presented during the Conference on International Agricultural Research for Development, University of Göttingen, 9-11 October 2007.

Kidd, M.P., P.J. Sloane and I. Ferko, 2000, Disability and the labour market: an analysis of British males. *Journal of Health Economics*, **19**, pp. 961-981.

Leathwick, J.R., J. Elith and T. Hastie, 2006, Comparative performance of generalized additive models and multivariate adaptive regression splines for statistical modeling of species distributions. *Ecological Modeling*, **199**, pp. 188-196.

Mori, S., C. Reyes and T. Yamagata, 2009, Poverty reduction for the disabled in the Philippines: Livelihood analysis from the data of PWDs in Metro Manila. *Joint Research Program Series* No. 151. Chiba, Japan: Institute of Developing Economies.

Purcil, L., 2009, Monitoring the human rights of persons with disabilities: laws, policies and programs in the Philippines. Ontario, Canada: Disability Rights Promotion International.

Schelzig, K., 2005, Poverty in the Philippines: income, assets, and access. Mandaluyong City, Philippines: Asian Development Bank.

Scott, K. and C. Mete, 2008, Measurement of disability and linkages with welfare, employment, and schooling: the case of Uzbekistan. In: *Economic implications of chronic illness and disability in Eastern Europe and the former Soviet Union*. Washington, D.C.: The World Bank.

Table 1. Variable definition

Variable	Definition
Dependent variables	
Model 1: Job/business indicator	Job/business indicator: 1 - has a job/business; 0 - otherwise
Model 2: Mode of labor force participation	Mode of labor force participation: 1 - 'pseudo' fully employed; 2 - 'pseudo' underemployed; 3 - 'pseudo' unemployed; 4 - 'pseudo' economically inactive
Model 3: Major source of personal income	Major source of personal income: 0 - no reported income; 1 - wage income; 2 - entrepreneurial income; 3 - transfer income
Model 4: 'Pseudo' fully employed	Dummy for 'pseudo' fully employed: 1 - 'pseudo' fully employed; 0 - otherwise
Model 5: 'Pseudo' underemployed	Dummy for 'pseudo' underemployed: 1 - 'pseudo' underemployed; 0 - otherwise
Model 6: 'Pseudo' unemployed	Dummy for 'pseudo' unemployed: 1 - 'pseudo' unemployed; 0 - otherwise
Model 7: 'Pseudo' economically inactive	Dummy for 'pseudo' economically inactive: 1 - 'pseudo' economically inactive; 0 - otherwise
Model 8: Wage income	Dummy for wage income: 1 - major source of personal income is wage employment; 0 - otherwise
Model 9: Entrepreneurial income	Dummy for entrepreneurial income: 1 - major source of personal income is entrepreneurial activities; 0 - otherwise
Model 10: Transfer income	Dummy for transfer income: 1 - major source of personal income is transfers or receipts from family members/friends/others; 0 - otherwise
Model 11: No income	Dummy for no income: 1 - no reported income; 0 - otherwise
Independent variables	
All models:	
Makati	Dummy for Makati City: 1 - resides in Makati City; 0 - otherwise
Age (squared)	Squared age of the respondent (standardized)
Female	Sex of the respondent: 1 - female; 0 - male
Single	Marital status of the respondent: 1 - never been married; 0 - otherwise
At least high school graduate	Highest educational attainment of the respondent: 1 - at least high school graduate; 0 - otherwise
Household head	Household head indicator: 1 - household head; 0 - otherwise
Household size	Total number of members in a household
Asset index	Index for household assets (tenure status of house and lot, housing type and ownership of durable assets); generated using Principal Component Analysis
OFW	OFW indicator: 1 - if there is an OFW in a household; 0 - otherwise
DSHO member	Membership in a Disability Self-Help Organization: 1 - member; 0 - otherwise
Functioning index	Index for the availability and necessity of PA at home and when going out, and possession of assistive devices; generated using Principal Component Analysis
Impairment dummies:	
Mobility	Dummy for Mobility: 1 - mobility-impaired only; 0 - otherwise
Visual	Dummy for Visual: 1 - visually-impaired only; 0 - otherwise
Hearing	Dummy for Hearing: 1 - hearing-impaired only; 0 - otherwise
Multiple (*base category*)	Dummy for Multiple: 1 - has more than one impairment; 0 - either mobility-, visually- or hearing-impaired

Table 2. Results of correlation tests

Dependent / Independent	Job/business indicator	'Pseudo' fully employed	'Pseudo' under-employed	'Pseudo' unemployed	'Pseudo' econ'ly inactive	Wage income	Entrep'l income	Transfer income	No income
Makati	-0.1062 **	-0.1253 **	0.0174	0.0163	0.1057 **	-0.0711	-0.0364	0.0218	0.0891 *
Age (squared)	0.0105	0.0901 *	-0.0760	-0.0146	0.0028	-0.0466	0.0592	0.0122	-0.0321
Female	-0.1108 **	-0.0002	-0.1067 **	0.0296	0.0975 *	-0.1087 **	0.0192	0.0258	0.0616
Single	-0.0331	0.0552	-0.0844 *	0.0371	0.0002	0.0234	-0.0281	-0.0415	0.0522
At least high school graduate	0.0349	-0.0450	0.0765	0.1054 **	-0.1466 ***	0.0801	-0.0461	-0.0012	-0.0286
Household head	0.1944 ***	0.0993 **	0.0957 *	-0.0917 *	-0.1329 ***	0.1031 **	0.0411	0.0235	-0.1735 ***
Household size	0.0298	0.0506	-0.0195	-0.0677	0.0349	-0.0554	0.0432	-0.0036	0.0118
Asset index	0.0997 **	0.0652	0.0344	-0.0151	-0.0994 **	-0.0570	0.0425	0.1632 ***	-0.1650 ***
OFW	-0.1264 **	-0.0630	-0.0626	0.0505	0.0945 *	-0.0711	-0.0503	0.1397 ***	-0.0232
DSHO member	0.1967 ***	0.1454 ***	0.0533	-0.0327	-0.1936 ***	0.1351 ***	0.0554	-0.1252 **	-0.0645
Functioning index	-0.1559 ***	-0.1375 ***	-0.0198	-0.0264	0.2040 ***	-0.0493	-0.1292 **	0.0771	0.1118 **
Mobility-impaired	0.0268	0.0065	0.0197	0.0437	-0.0752	-0.0537	0.0523	-0.0221	0.0198
Visually-impaired	0.1313 ***	0.0654	0.0652	-0.0145	-0.1363 ***	0.1071 **	0.0471	-0.1174 **	-0.0348
Hearing-impaired	-0.0222	-0.0293	0.0065	0.0463	-0.0218	0.0299	-0.0268	0.0057	-0.0064

Note: Reported figures are partial correlation coefficients and estimated coefficients from the correlation tests and univariate regression analyses, respectively.
Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 3. Results of univariate logistic regression

Dependent / Independent	Job/business indicator	'Pseudo' fully employed	'Pseudo' under-employed	'Pseudo' unemployed	'Pseudo' econ'ly inactive	Wage income	Entrep'l income	Transfer income	No income
Makati	-0.1847	-0.3538	0.1028	0.2777	0.0100	-0.3537	-0.0112	0.0724	0.2905
Age (squared)	0.1405	0.1778	-0.0071	-0.1853	-0.0371	-0.1240	0.2307 **	0.0632	-0.2193
Female	-0.7257 ***	-0.1969	-0.6720 ***	0.2958	0.7192 ***	-0.6292 **	-0.0480	0.0627	0.6183 **
Single	-0.6620 ***	-0.2403	-0.5372 **	0.4945 *	0.4762 **	-0.1520	-0.4613 **	-0.0012	0.6921 ***
At least high school graduate	0.4717 **	-0.0350	0.5750 ***	0.4447 *	-1.0372 ***	0.3418	-0.0315	0.1343	-0.4937 **
Household head	1.5870 ***	0.7546 ***	0.8592 ***	-0.8624 ***	-1.6302 ***	0.9594 ***	0.4759 **	-0.3445	-1.6253 ***
Household size	-0.0398	-0.0102	-0.0374	-0.0099	0.0594 *	-0.0936 *	0.0021	0.0490	0.0258
Asset index	-0.0300	-0.0325	-0.0044	0.0779	-0.0270	-0.1483 **	-0.0276	0.2622 ***	-0.1346 **
OFW	-0.6463 **	-0.4743	-0.3556	0.4064	0.4887 *	-0.7421 **	-0.3477	1.0481 ***	-0.3114
DSHO member	0.8965 ***	0.4955 **	0.5417 **	-0.1262	-1.1688 ***	0.8275 ***	0.1914	-0.6910 ***	-0.3096
Functioning index	-0.1127 *	-0.1423 *	-0.0115	-0.0639	0.1868 ***	-0.0258	-0.1708 **	0.0781	0.0967
Mobility-impaired	-0.1784	-0.1975	-0.0249	0.3792	-0.0922	-1.3052 ***	0.3698	0.3865	0.2549
Visually-impaired	1.4494 ***	0.8689 ***	0.6558 ***	-0.8458 ***	-1.3917 ***	1.4406 ***	0.3828 *	-1.4510 ***	-0.6609 **
Hearing-impaired	-1.0395 ***	-0.7699 ***	-0.5806 **	0.4977 *	0.8997 ***	-0.3483	-0.8225 ***	0.6970 ***	0.3211

Note: Reported figures are partial correlation coefficients and estimated coefficients from the correlation tests and univariate regression analyses, respectively.
Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 4. Estimated logistic regression model for job/business indicator

Dependent variable: Job/business indicator

Independent variables	Coefficient	
Intercept	-0.6002	
	(0.6204)	
Makati	-0.8062	**
	(0.3159)	
Age (squared)	0.0185	
	(0.1546)	
Female	-0.6155	**
	(0.2701)	
Single	-0.1863	
	(0.2938)	
At least high school graduate	0.1571	
	(0.2631)	
Household head	1.3292	***
	(0.3324)	
Household size	0.0327	
	(0.0357)	
Asset index	0.1370	**
	(0.0664)	
OFW	-0.8011	**
	(0.3206)	
DSHO member	1.2889	***
	(0.3094)	
Functioning index	-0.2255	***
	(0.0726)	
Impairment dummies (*base category* : Multiple)		
Mobility	0.1803	
	(0.4527)	
Visual	1.2977	***
	(0.4661)	
Hearing	-0.2160	
	(0.4839)	

Note: Reported figures are the estimated coefficients. Those in parentheses are robust standard errors. Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 5. Estimated multinomial logistic regression model for mode of labor force participation

Dependent variable: Mode of labor force participation
(*base category* : 'Pseudo' economically inactive)

Independent variables	'Pseudo' fully employed		'Pseudo' underemployed		'Pseudo' unemployed	
Intercept	-1.5112		-0.4740		-0.8925	
	(0.9163)		(0.8640)		(0.9941)	
Makati	-1.5189	***	-0.8863	**	-0.6341	
	(0.4888)		(0.4370)		(0.4759)	
Age (squared)	0.1478		-0.1837		-0.0911	
	(0.2178)		(0.2125)		(0.2225)	
Female	-0.5517		-0.9262	***	-0.2852	
	(0.3824)		(0.3580)		(0.3653)	
Single	0.1905		-0.3232		0.1713	
	(0.4199)		(0.3758)		(0.3878)	
At least high school graduate	0.5112		0.9169	***	1.0937	***
	(0.3620)		(0.3490)		(0.3776)	
Household head	1.7681	***	1.6877	***	0.6841	
	(0.5294)		(0.4899)		(0.5174)	
Household size	0.0300		-0.0144		-0.0546	
	(0.0488)		(0.0523)		(0.0495)	
Asset index	0.2192	**	0.1888	**	0.1127	
	(0.0980)		(0.0915)		(0.1008)	
OFW	-0.9418	**	-0.9205	**	-0.2360	
	(0.4533)		(0.4297)		(0.3956)	
DSHO member	2.1030	***	1.6783	***	1.0453	**
	(0.4516)		(0.4227)		(0.4671)	
Functioning index	-0.4569	***	-0.3011	***	-0.2756	***
	(0.1281)		(0.0869)		(0.0977)	
Impairment dummies (*base category* : Multiple)						
Mobility	0.3610		0.4724		0.6021	
	(0.6734)		(0.6208)		(0.6994)	
Visual	1.6718	**	1.7029	***	0.8665	
	(0.6954)		(0.6391)		(0.7541)	
Hearing	-0.3236		0.0420		0.3409	
	(0.7287)		(0.6561)		(0.7155)	

Note: Reported figures are the estimated coefficients. Those in parentheses are robust standard errors
Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 6. Estimated multinomial logistic regression model for major source of personal income

Dependent variable: Major source of personal income
(*base category* : Wage income)

Independent variables	Entrepreneurial income	Transfer income	No income
Intercept	-0.1455	0.7397	0.4687
	(0.9263)	(0.9875)	(0.9797)
Makati	-0.0274	0.4113	0.8439 *
	(0.3753)	(0.4186)	(0.4751)
Age (squared)	0.2506	0.1426	0.0612
	(0.1908)	(0.2228)	(0.2216)
Female	0.5166	0.6317 *	0.7734 **
	(0.3403)	(0.3690)	(0.3817)
Single	-0.1880	-0.2705	0.2312
	(0.3710)	(0.4249)	(0.4160)
At least high school graduate	-0.5088	-0.3373	-0.4879
	(0.3142)	(0.3492)	(0.3666)
Household head	-0.2597	-0.4173	-1.7260 ***
	(0.3683)	(0.4362)	(0.4774)
Household size	0.0636	0.0415	0.0347
	(0.0557)	(0.0569)	(0.0587)
Asset index	0.0894	0.1932 **	-0.1621
	(0.0806)	(0.0816)	(0.1027)
OFW	0.2413	1.0123 **	0.3257
	(0.4959)	(0.4816)	(0.5391)
DSHO member	-0.2827	-1.2395 ***	-1.0733 **
	(0.3428)	(0.3973)	(0.4323)
Functioning index	-0.0788	0.1832 *	0.2387 **
	(0.0982)	(0.1066)	(0.1104)
Impairment dummies (*base category* : Multiple)			
Mobility	0.9608	0.4888	0.7310
	(0.7580)	(0.7539)	(0.7674)
Visual	-0.3801	-1.7484 **	-1.2006 *
	(0.6874)	(0.6838)	(0.7032)
Hearing	-0.5503	-0.2631	-0.3476
	(0.7657)	(0.7050)	(0.7488)

Note: Reported figures are the estimated coefficients. Those in parentheses are robust standard errors. Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 7. Estimated logistic regression models for each mode of labor force participation

Independent variables	Model 4 (Dependent variable: 'Pseudo' fully employed)		Model 5 (Dependent variable: 'Pseudo' underemployed)		Model 6 (Dependent variable: 'Pseudo' unemployed)		Model 7 (Dependent variable: 'Pseudo' economically inactive)	
Intercept	-2.3020		-0.8040		-1.6719		-0.2370	
	(0.6768)		(0.6674)		(0.7871)		(0.7775)	
Makati	-0.8062	**	0.1068		0.1752		0.9946	**
	(0.3325)		(0.2812)		(0.3387)		(0.4062)	
Age (squared)	0.2854	*	-0.2157		-0.0448		0.0572	
	(0.1526)		(0.1522)		(0.1734)		(0.1840)	
Female	0.0131		-0.5588	**	0.2082		0.5978	*
	(0.2768)		(0.2580)		(0.2944)		(0.3108)	
Single	0.3258		-0.4707	*	0.2617		0.0155	
	(0.3203)		(0.2821)		(0.3180)		(0.3282)	
At least high school graduate	-0.2294		0.3919		0.6430	**	-0.8563	***
	(0.2561)		(0.2464)		(0.3137)		(0.3068)	
Household head	0.5482	*	0.4887	*	-0.7198	**	-1.4456	***
	(0.3228)		(0.2839)		(0.3563)		(0.4533)	
Household size	0.0418		-0.0181		-0.0582		0.0171	
	(0.0375)		(0.0438)		(0.0395)		(0.0411)	
Asset index	0.0836		0.0412		-0.0283		-0.1735	**
	(0.0649)		(0.0594)		(0.0736)		(0.0843)	
OFW	-0.4291		-0.4111		0.3465		0.6635	*
	(0.3467)		(0.3216)		(0.3260)		(0.3492)	
DSHO member	0.8578	***	0.2814		-0.2692		-1.5942	***
	(0.2902)		(0.2719)		(0.3411)		(0.3838)	
Functioning index	-0.2379	**	-0.0299		-0.0512		0.3315	***
	(0.1057)		(0.0651)		(0.0806)		(0.0801)	
Impairment dummies (*base category* : Multiple)								
Mobility	0.1256		0.2609		0.4619		-0.4794	
	(0.5266)		(0.5089)		(0.5716)		(0.5418)	
Visual	0.6317		0.6624		-0.2691		-1.4748	***
	(0.5294)		(0.5069)		(0.6095)		(0.5731)	
Hearing	-0.3328		0.1208		0.4955		-0.0684	
	(0.5729)		(0.5395)		(0.5832)		(0.5648)	

Note: Reported figures are the estimated coefficients. Those in parentheses are robust standard errors. Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 8. Estimated logistic regression models for each major source of personal income

Independent variables	Model 8 (Dependent variable: Wage income)		Model 9 (Dependent variable: Entrepreneurial income)		Model 10 (Dependent variable: Transfer income)		Model 11 (Dependent variable: No income)	
Intercept	-1.5697		-1.8241		-0.6276		-1.0556	
	(0.8419)		(0.6446)		(0.6733)		(0.6852)	
Makati	-0.3143		-0.2499		0.1994		0.7080	*
	(0.3290)		(0.3022)		(0.3462)		(0.3843)	
Age (squared)	-0.1501		0.1952		0.0465		-0.0741	
	(0.1757)		(0.1468)		(0.1696)		(0.1714)	
Female	-0.6122	**	0.1081		0.1629		0.3646	
	(0.3069)		(0.2563)		(0.2775)		(0.2848)	
Single	0.1370		-0.1598		-0.2470		0.4213	
	(0.3426)		(0.2830)		(0.3216)		(0.3103)	
At least high school graduate	0.4805	*	-0.2364		0.0418		-0.1480	
	(0.2792)		(0.2580)		(0.2758)		(0.2909)	
Household head	0.5908	*	0.2270		0.1208		-1.5305	***
	(0.3398)		(0.2852)		(0.3537)		(0.4015)	
Household size	-0.0507		0.0345		0.0030		-0.0005	
	(0.0520)		(0.0370)		(0.0345)		(0.0379)	
Asset index	-0.0732		0.0558		0.2085	***	-0.2765	***
	(0.0699)		(0.0632)		(0.0645)		(0.0862)	
OFW	-0.5837		-0.3449		0.7714	**	-0.2424	
	(0.4355)		(0.3438)		(0.3073)		(0.3887)	
DSHO member	0.7533	***	0.3300		-0.8137	**	-0.5159	
	(0.2858)		(0.3002)		(0.3450)		(0.3724)	
Functioning index	-0.0912		-0.2159	***	0.1110		0.1749	**
	(0.0823)		(0.0769)		(0.0804)		(0.0822)	
Impairment dummies (*base category* : Multiple)								
Mobility	-0.6792		0.5406		-0.1483		0.2136	
	(0.6767)		(0.5055)		(0.4611)		(0.4909)	
Visual	1.0273	*	0.4976		-1.2644	**	-0.4709	
	(0.5868)		(0.5181)		(0.5002)		(0.5251)	
Hearing	0.4090		-0.3022		0.1005		-0.0204	
	(0.6360)		(0.5660)		(0.4724)		(0.5277)	

Note: Reported figures are the estimated coefficients. Those in parentheses are robust standard errors.
Coefficients with ***, ** and * are significant at 1%, 5% and 10% level, respectively.

Table 9. Estimated MARS model for job/business indicator

Dependent variable: Job/business indicator

Parameter	Est. coeff.	Std. error	p-value
Constant	0.711	0.034	0.0000
BF5	-0.181	0.035	0.0000
BF6	-0.961	0.144	0.0000
BF7	0.032	0.012	0.0060
BF11	-0.085	0.017	0.0000
BF13	-0.474	0.171	0.0060
BF20	0.250	0.049	0.0000
BF27	-0.211	0.065	0.0010

Final Model

Y = 0.711 - 0.181 * BF5 - 0.961 * BF6 + 0.032 * BF7 - 0.085 * BF11
- 0.474 * BF13 + 0.250 * BF20 - 0.211 * BF27

Basis Functions

BF1 = (HHEAD = 0)
BF2 = (HHEAD = 1)
BF3 = (VISUAL = 0)
BF5 = max(0, AGE_SQ - 0.841) * BF3
BF6 = max(0, 0.841 - AGE_SQ) * BF3
BF7 = max(0, ASSET_INDEX + 1.842) * BF5
BF9 = (DSHO = 0)
BF11 = max(0, FUNCTION_INDEX + 1.176) * BF9
BF13 = max(0, - 2.310 - ASSET_INDEX) * BF1
BF15 = (OFW = 1) * BF1
BF20 = (FEMALE = 0) * BF2
BF27 = max(0, 5.000 - HSIZE) * BF15

Table 10. Estimated MARS model for 'pseudo' fully employed

Dependent variable: 'Pseudo' fully employed

Parameter	Est. coeff.	Std. error	p-value
Constant	0.199	0.046	0.0000
BF3	0.038	0.011	0.0004
BF4	0.664	0.148	0.0000
BF6	-0.096	0.028	0.0006
BF9	0.258	0.082	0.0020
BF11	-0.388	0.106	0.0003
BF14	-0.244	0.067	0.0003
BF16	0.033	0.01	0.0008

Final Model

Y = 0.199 + 0.038 * BF3 + 0.664 * BF4 - 0.096 * BF6 + 0.258 * BF9
- 0.388 * BF11 - 0.244 * BF14 + 0.033 * BF16

Basis Functions

BF1 = (VISUAL = 0)
BF2 = (VISUAL = 1)
BF3 = max(0, HSIZE - 2.000) * BF2
BF4 = max(0, 2.000 - HSIZE) * BF2
BF6 = max(0, 2.601 - AGE_SQ) * BF1
BF7 = max(0, ASSET_INDEX - 0.540) * BF2
BF9 = max(0, AGE_SQ - 1.936) * BF7
BF11 = max(0, FUNCTION_INDEX + 1.176) * BF4
BF13 = max(0, 4.060 - FUNCTION_INDEX)
BF14 = (DSHO = 0) * BF2
BF16 = (OFW = 0) * BF13

Table 11. Estimated MARS model for 'pseudo' underemployed

Dependent variable: 'Pseudo' underemployed

Parameter	Est. coeff.	Std. error	p-value
Constant	0.650	0.054	0.0000
BF4	-0.145	0.035	0.0000
BF7	0.111	0.035	0.0010
BF9	0.066	0.023	0.0040
BF13	-0.507	0.071	0.0000
BF15	-0.344	0.068	0.0000
BF17	0.170	0.054	0.0020
BF21	-0.023	0.004	0.0000

Final Model

Y = 0.650 - 0.145 * BF4 + 0.111 * BF7 + 0.066 * BF9 - 0.507 * BF13
- 0.344 * BF15 + 0.170 * BF17 - 0.023 * BF21

Basis Functions

BF1 = (HHEAD = 0)
BF2 = (HHEAD = 1)
BF4 = max(0, 2.040 - FUNCTION_INDEX) * BF2
BF5 = max(0, AGE_SQ - 0.784)
BF7 = (SINGLE = 0) * BF4
BF9 = max(0, HSIZE - 12.000)
BF13 = (HIGHSCH = 0) * BF1
BF14 = (HIGHSCH = 1) * BF1
BF15 = (MAKATI = 0) * BF14
BF17 = max(0, AGE_SQ - 1.024) * BF13
BF21 = max(0, HSIZE - 1.000) * BF5

Table 12. Estimated MARS model for 'pseudo' unemployed

Dependent variable: 'Pseudo' unemployed

Parameter	Est. coeff.	Std. error	p-value
Constant	0.112	0.032	0.0004
BF1	0.531	0.097	0.0000
BF3	-1.096	0.267	0.0000
BF5	1.090	0.282	0.0001
BF19	-0.956	0.218	0.0000

Final Model

Y = 0.112 + 0.531 * BF1 - 1.096 * BF3 + 1.090 * BF5 - 0.956 * BF19

Basis Functions

BF1 = (VISUAL = 0)
BF3 = max(0, AGE_SQ - 0.441) * BF1
BF5 = max(0, AGE_SQ - 0.841) * BF1
BF6 = max(0, 0.841 - AGE_SQ) * BF1
BF19 = (HIGHSCH = 0) * BF6

Table 13. Estimated MARS model for 'pseudo' economically inactive

Dependent variable: 'Pseudo' economically inactive

Parameter	Est. coeff.	Std. error	p-value
Constant	-0.066	0.034	0.0530
BF2	2.242	0.495	0.0000
BF3	0.126	0.038	0.0010
BF5	0.128	0.020	0.0000
BF12	0.539	0.092	0.0000
BF14	-0.138	0.038	0.0004
BF15	-0.276	0.075	0.0003
BF17	0.064	0.012	0.0000
BF19	0.391	0.142	0.0060

Final Model

Y = -0.066 + 2.242 * BF2 + 0.126 * BF3 + 0.128 * BF5 + 0.539 * BF12
- 0.138 * BF14 - 0.276 * BF15 + 0.064 * BF17 + 0.391 * BF19

Basis Functions

BF1 = max(0, AGE_SQ - 0.441)
BF2 = max(0, 0.441 - AGE_SQ)
BF3 = (HHEAD = 0)
BF5 = (DSHO = 0) * BF1
BF10 = (VISUAL = 0)
BF12 = (HIGHSCH = 0) * BF10
BF14 = max(0, AGE_SQ - 0.225) * BF12
BF15 = (OFW = 0) * BF12
BF17 = max(0, FUNCTION_INDEX + 1.176) * BF10
BF19 = max(0, - 2.310 - ASSET_INDEX) * BF3

Table 14. Estimated MARS model for wage income

Dependent variable: Wage income

Parameter	Est. coeff.	Std. error	p-value
Constant	0.085	0.025	0.0008
BF6	0.153	0.045	0.0007
BF8	0.253	0.067	0.0002
BF12	0.478	0.108	0.0000
BF13	0.554	0.070	0.0000
BF15	-0.385	0.085	0.0000
BF20	-0.621	0.223	0.0060
BF24	1.668	0.609	0.0060
BF25	0.238	0.057	0.0000

Final Model

Y = 0.085 + 0.153 * BF6 + 0.253 * BF8 + 0.478 * BF12 + 0.554 * BF13
- 0.385 * BF15 - 0.621 * BF20 + 1.668 * BF24 + 0.238 * BF25

Basis Functions

BF1 = (VISUAL = 0)
BF2 = (VISUAL = 1)
BF4 = (HHEAD = 1) * BF2
BF6 = max(0, 2.809 - AGE_SQ) * BF4
BF8 = max(0, - 1.828 - ASSET_INDEX) * BF1
BF9 = (DSHO = 0) * BF2
BF10 = (DSHO = 1) * BF2
BF12 = max(0, - 0.507 - FUNCTION_INDEX) * BF9
BF13 = (OFW = 0) * BF10
BF15 = (HIGHSCH = 0) * BF10
BF20 = max(0, 0.625 - AGE_SQ) * BF1
BF21 = (HEARING = 0)
BF22 = (HEARING = 1)
BF24 = max(0, 0.529 - AGE_SQ) * BF21
BF25 = (FEMALE = 0) * BF22

Table 15. Estimated MARS model for entrepreneurial income

Dependent variable: Entrepreneurial income

Parameter	Est. coeff.	Std. error	p-value
Constant	0.320	0.031	0.0000
BF2	-0.156	0.039	0.0001
BF3	0.167	0.047	0.0005
BF5	-0.066	0.024	0.0070

Basis Functions

BF2 = max(0, 2.116 - AGE_SQ)
BF3 = (HEARING = 0) * BF2
BF5 = max(0, FUNCTION_INDEX - 0.315) * BF3

Final Model

Y = 0.320 - 0.156 * BF2 + 0.167 * BF3 - 0.066 * BF5

Table 16. Estimated MARS model for transfer income

Dependent variable: Transfer income

Parameter	Est. coeff.	Std. error	p-value
Constant	0.038	0.043	0.3790
BF3	0.075	0.011	0.0000
BF6	-0.066	0.012	0.0000
BF10	-0.045	0.015	0.0030
BF22	0.540	0.185	0.0040
BF23	0.124	0.028	0.0000
BF26	0.076	0.025	0.0020

Basis Functions

BF1 = (VISUAL = 0)
BF3 = max(0, ASSET_INDEX + 3.431)
BF4 = (DSHO = 0) * BF3
BF5 = (DSHO = 1) * BF3
BF6 = (OFW = 0) * BF5
BF10 = (HIGHSCH = 0) * BF4
BF20 = (HIGHSCH = 0) * BF1
BF21 = (HIGHSCH = 1) * BF1
BF22 = max(0, AGE_SQ - 2.916) * BF20
BF23 = max(0, 2.916 - AGE_SQ) * BF20
BF26 = max(0, AGE_SQ - 0.225) * BF21

Final Model

Y = 0.038 + 0.075 * BF3 - 0.066 * BF6 - 0.045 * BF10 + 0.540 * BF22
+ 0.124 * BF23 + 0.076 * BF26

Table 17. Estimated MARS model for no income

Dependent variable: No income

Parameter	Est. coeff.	Std. error	p-value
Constant	0.049	0.037	0.1890
BF7	0.354	0.089	0.0001
BF8	0.381	0.090	0.0000
BF10	-0.361	0.087	0.0000
BF12	-0.058	0.02	0.0040
BF21	0.486	0.114	0.0000
BF23	0.158	0.039	0.0001

Final Model

Y = 0.049 + 0.354 * BF7 + 0.381 * BF8 - 0.361 * BF10 - 0.058 * BF12
+ 0.486 * BF21 + 0.158 * BF23

Basis Functions

BF1 = (HHEAD = 0)
BF5 = (SINGLE = 1) * BF1
BF7 = max(0, - 1.484 - ASSET_INDEX) * BF5
BF8 = (VISUAL = 0)
BF10 = (FEMALE = 0) * BF8
BF11 = (FEMALE = 1) * BF8
BF12 = max(0, ASSET_INDEX + 3.431) * BF11
BF18 = max(0, 0.961 - AGE_SQ) * BF8
BF21 = (OFW = 0) * BF18
BF23 = (HEARING = 0) * BF1

Figure 1. Correspondence analysis biplot between types of occupation and levels of education

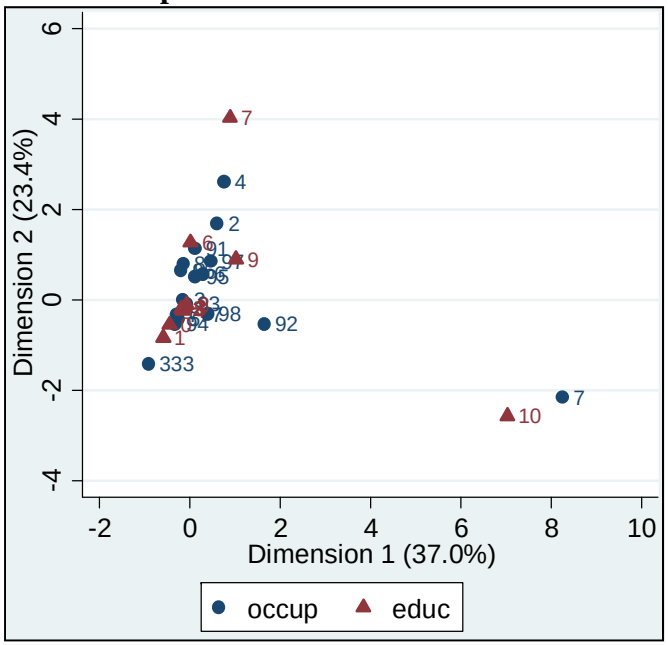
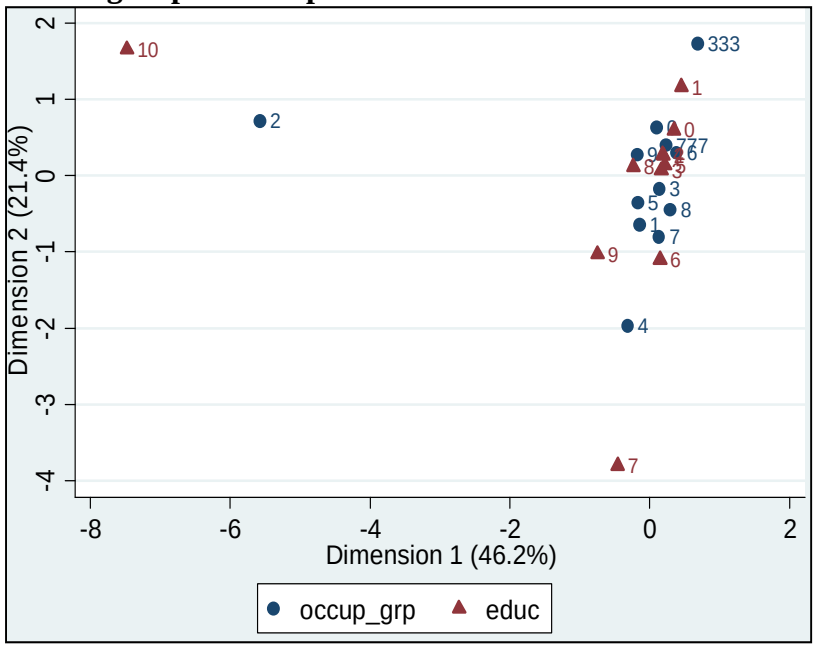


Figure 2. Correspondence analysis biplot between major groups of occupation and levels of education



End notes

[1] Since most of the PWD respondents had difficulty estimating their total household income, variable on household income was deemed unreliable. Thus, ownership of assets was used as a proxy variable to be able to measure the welfare of the household.

[2] In this study, availability and perceived necessity of a personal assistant, both at home and when going outside of the house, as well as presence of at least one assistive device were used to generate a composite index that will serve as proxy for physical functioning.

[3] For s_{km} equal to +1, the basis function will have a value x-t if $x>t$ and 0 if $x \leq t$. If it is -1, the basis function will have a value t-x when $x<t$, while 0 if $x \geq t$.

[4] Theoretical discussions presented here are based mostly on Friedman (1991), Friedman and Roosen (1995), and Leathwick et al. (2006).

[5] Hosmer-Lemeshow's goodness-of-fit test checks whether the model fits reasonably well by testing the null hypothesis that the dependent variable follows binomial distributions with probabilities specified by the logistic regression model. The Specification link test for single-equation models, on the other hand, tests the null hypothesis that the model is specified correctly.