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School-to-Work Transition in Peru: An Assessment of Search Time, Job Duration and Skill Mismatch on Youth Labor Market Integration.

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1) Introduction

This work aims to study the phenomenon of youth integration into the labor market in Peru, which is characterized by high rates of underemployment and unemployment. Nowadays, young people around the world have better access to education, but worst access to employment (Hopenhayn, 2004). This problem has many negative consequences for both young people and society as a whole, one of the worst being the negative consequences this has on youth's human development (Weller, 2007).

Besides the important aspects related to Human Development, the features of the youth integration process have important economic impacts. In the short run, an adequate integration improves the quality and availability of labor force. In the long run, the integration process will have effects on the accumulated experience along life and consequent income. Furthermore, youths' unemployment, underemployment or skill mismatch cause economic dependence of youths on their parents (Weller, 2007). This circumstance reduces both present and future income of families, which, in turn, increases the gap of inequality, one of the main drawbacks of Peru and Latin American countries.

The study of youth integration into labor market in Peru becomes more important when high youth unemployment rates around the world are taken into account. For example, Blázquez (2005) finds that young Spaniards spend around 28 months seeking for their first job, while this lasts only an average of 24 months. The perspectives for Latin America are not better: youths' situation got worst in both absolute and relative terms (Weller, 2007). Concerning Peru, the scenario is very similar: 17.94% of youths between 15 and 29 years old does not work or study (Málaga, Oré, & Tavera, 2014). All this reveals problems in the process of youth integration into the labor market.

The situation described above is at odds with the classical Labor Economics theories developed at the half of the 20th century. As mentioned by Becker (1975) in his seminal work, the growth of OECD countries cannot be explained if human capital development in those countries is ignored. As a consequence of such theoretical approach, it is expected that better educational levels lead to better incomes. However, we are in front of a paradox: young people have attained higher education levels, but their incomes are lower and their labor conditions

are worse. Consequently, many feasible explanations have been attempted, each one with its own pros and cons.

In order to explain the abovementioned facts, it is important to take into account various factors: demand, supply and market frictions. Concerning supply side, Hopenhayn (2004) mentions that young people have little information about skills and certifications required for diverse jobs. This leads them to offer little required skills. In addition, this problem is exacerbated by the slow-changing supply of educational programs offered in contrast with the fast-changing requirements of enterprises. Concerning demand side, one feature in Peruvian and Latin American Economies is important: informality. According to La Porta and Shleifer (2008), informal economies feature an important characteristic: duality. They show that informal firms remain in that condition and do not change along its life cycle. Indeed, they found that high productivity is concentrated in formalized big firms. Further, there is no difference among formal firms and small informal firms while difference among big and small enterprises are tangible. Considering the big informal sector in Peru, the aforementioned paradox unravels a little for Peru: Peruvian youths are better educated, but enterprises are mainly informal and do not generate enough vacancies. Furthermore, Tello (2015) mentions that this problem exacerbates in our country due to the dependency of our economy upon primary exportations, an industry intensive in capital.

Regarding market frictions, Lavado y Martinez (2014) found in their literature review three kinds of frictions: first, soft skills, positively correlated with wages, are not certifiable. Second, employers request documentation to employees as part of the signaling process. Often these documents are costly and hard to obtain. Third, psychosocial frictions related to race, religion and so on are part of the problem too. For example, Benavides, Torero and Valdivia (2006) observed a high rate of Afro-descendant Peruvians employed in personal services, mechanics and agriculture.

In the work we undertake, the study of integration process takes into account search time, job duration and skill mismatch in the first employment as descriptors of the integration process. Skill mismatch, while serving for describing integration process also accounts for supply side effects. Concerning demand side, unemployment and informality rates are included as covariates. Various dummies are used for controlling market frictions.

2) Previous research

School-to-work transition studies have tried to focus on different aspects of the integration process. Among these different views, Bratberg and Nilsen (2000) proposed to understand integration process by analyzing the relationship between job search duration, job duration

itself and the accepted wage. Blázquez (2005) extends this framework by allowing to use a mismatch variable between education and work instead of the accepted wage, assuming that better matches are related to higher wages. For a better understanding of each partial relationship between the aforementioned variables, it is necessary to look up for more detailed theories.

Scarring models focus on the relationship between job search duration and labor outcome by assuming a negative long-term effect that may be caused by unemployment on future labor market possibilities (Nilsen and Reise, 2011). This means that the time consumed on searching for a job leaves a "scar" on the individual. According to Van Belle et al. (2017), four theories can shed light upon it: 1) Signaling theory: by considering limited information among individuals, a longer job search duration can be understood as a signal for a lack of motivation (Luijkx and Wolbers, 2009) or a lack of intellectual and social capacity (Vishwanath, 1989); 2) Human capital theory: based on Becker (1975) and Acemoglu (1995), a longer period of unemployment before getting a job can be seen as a depreciation of human capital assets that might make employers refuse individuals with longer search times; 3) Queuing theory suggest that employers rank their candidates according to their perceived trainability assuming that a longer unemployment period leads to a lost on this capacity; lastly, 4) Rational herding theory considers that employers follow other agents' behavior as if they were on a herd (Banerjee, 1992)–this rationale is based on the consideration that longer unemployment periods are related with rejections from other employers.

Following this literature, Nilsen and Katrine (2011) investigated the presence of scarring on labor outcome and found that unemployment has a negative effect on later labor market outcomes, especially among young workers. Cockx and Picchio (2011) suggest a deeper effect on those who are already unemployed by a longer period, proposing a negative dependence of the unemployment status. Ghirelli (2015) considers also a similar methodology and finds a deeper effect among the low educated youth. In the Latin American context, Beccaria et al. (2016) evaluate the scarring effect in Argentina considering the presence of informal working. They suggest that experiencing unemployment elevates the likelihood of getting an informal job but without finding a negative relationship on wages.

Another aspect of school-to-work transition is based on the effects of skill mismatch over the other variables. Allen and van der Velden (2001) consider the skill mismatch to be an important cause of job dissatisfaction that might make the worker prone to look for other jobs more in line with their education; they also show that this effect presents an asymmetry: overeducation usually has a bigger impact than undereducation. These incentives can be seen through two

lenses: Assignment models (Sattinger, 1993) consider that returns in human capital investments depend partially on the match between the job and the worker so productivity increases will be restricted by mismatches. Following Allen and van der Velden (2011), the allocation of workers will be optimal if top-down criteria is used so the more productive will be assigned complex jobs while the least competent will be assigned the simplest jobs. In this context, mismatch appears when differences in the sharing of complex jobs differs from the sharing of productive workers. Another approach is based on the Search and Matching theory; according to this, temporary mismatches occurred in a context of imperfect information. Considering these theories, Atansovska et al. (2015) joint both mismatch and search time theories in order to investigate the impact of job search duration on skill mismatch in a developing country. Results suggest they are negatively related: a longer search period will reduce the likelihood of been properly used. Baert and Verhaest (2014) conducted a field experiment to evaluate unemployment and overeducation effects on real jobs. After sending several fictitious job applications to real places, they found evidence to conclude that unemployment produces more negative signal over employers in terms of the overeducation signals. Unemployment period produces worse outcome than an overeducation status.
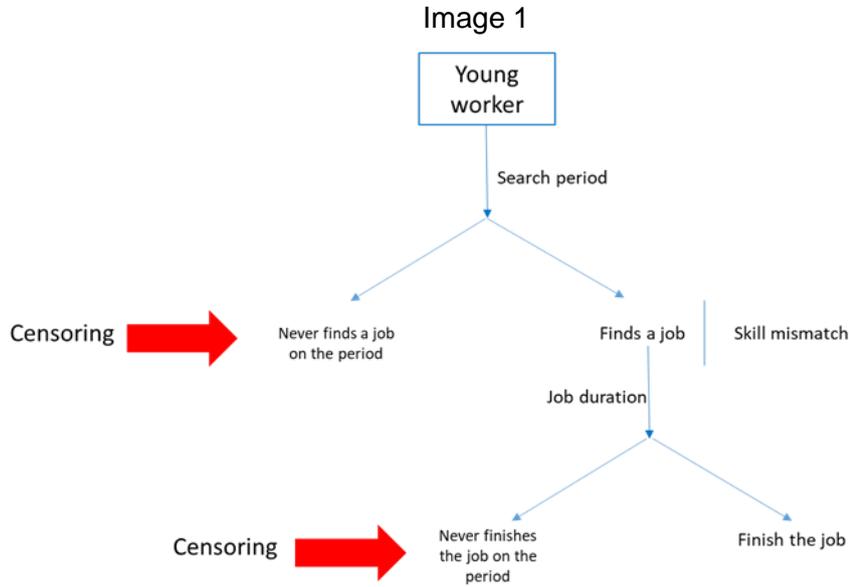
3) Model

- Model Motivation

After reviewing theses frameworks, we will follow Blázquez (2005) and Bratberg and Nilsen (2000) model. These authors consider a statistical analysis based on a connection between the search period, after completing of education, the following employment period and the type of skill mismatch in a simultaneous equation model.

- Model Specification

Considering the nested nature of the data (see Image 1), there is a need for a model that fits within these features and use all the information provided by the nested structure. According to Lee (1992) neither a nested logit model nor a Tobit model produces the wanted results, so he presents a nested Tobit model that makes full use of the information presented on these kind of information structure.

Image 1

The model used is based on a nested Tobit model proposed by Lee (1992) and follows the presentation of Blázquez (2005).

Let the hazard rate being define as:

$$\lambda(t,x) = \lim_{dt \to 0} \frac{\Pr(t \le T < t + dt | T \ge t; x)}{dt} = \frac{g(t;x)}{1 - G(t;x)} \qquad (1)$$

Where $T \sim G(t;x)$ be the time spent in some state, G the c.d.f of a density function g, and x a vector of covariates. The model should allow for simultaneous equations and possible right censoring on both search and job duration. Considering x_s, z_e and x_o as the vectors of covariates that affect search duration (t_s), job duration (t_e) and the probability of being overeducated ($over$); and β_s, δ_e and β_o the corresponding coefficient vectors. The equation to be estimated are the following:

$$lnt_s = \min(x_s'\beta_s + u_1, ln\tau_s) \qquad (2)$$

$$over = x_o'\beta_o + \eta lnt_s + u_2 \qquad (3)$$

$$lnt_e = \min(z_s'\delta_s + \gamma lnt_s + \alpha over + u_3, ln\tau_e) \qquad (4)$$

Where τ_s and τ_e are the censoring times of the search and job duration respectively. Assuming that the error term are jointly normal, we get:

$$u = \begin{pmatrix} u_1 \\ u_2 \\ u_3 \end{pmatrix} \sim N \left\{ \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}, \sum = \begin{pmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} \\ \sigma_{12} & \sigma_2^2 & \sigma_{23} \\ \sigma_{13} & \sigma_{23} & \sigma_3^2 \end{pmatrix} \right\} \tag{5}$$

Considering this, the likelihood of the system may easily be constructed by recognizing the three possibilities of censoring on the data. Firstly, search time does not has an end so t_s is censored letting the mismatch and the job duration being unobserved. Secondly, after considering that t_s is observable, t_e may be unobserved (censored). Finally, both t_s and t_e can be uncensored. These three scenarios generate three partial contributions to the likelihood.

In the first case, the likelihood is:

$$\Pr(t_{si} \geq \tau_{si}) = \Phi\left(\frac{x_s'\beta_s - lnt_s}{\sigma_1}\right) \tag{6}$$

Where $\Phi(.)$ denotes the c.d.f. of the standard normal distribution.

In the second case, let le the likelihood be:

$$\Pr(t_{ei} \geq \tau_{ei}, over_i, t_{si}) = \int_{\tau_e}^{\infty} f(lnt_{ei}, over_i, lnt_{si}) dlnt_{ei} \tag{7}$$

This can be expressed in terms of conditional probability, in the following way:

$$\Pr(t_{ei} \geq \tau_{ei}, over_i, t_{si})$$
$$= \Pr(t_{ei} \geq \tau_{ei} | over_i, t_{si})$$
$$= \Phi\left(\frac{x_{ei}'\beta_e - lnt_e + \Sigma_{21}\Sigma_{11}^{-1}y_i}{\sigma_{3.12}}\right)$$
$$\times (2\pi)^{-1}|\Sigma_{11}|^{-1/2} exp\left\{-\frac{1}{2}y_i'\Sigma_{11}^{-1}y_i\right\} \tag{8}$$

Where $x_{ei}'\beta_e \equiv z_{ei}'\delta_{ei} + \gamma lnt_{si} + \alpha over_i$, and:

$$\Sigma_{11} = \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{pmatrix}; \; \Sigma_{12} = \begin{pmatrix} \sigma_{13} \\ \sigma_{23} \end{pmatrix}; \; \Sigma_{21} = \Sigma_{12}'$$

$$y = \begin{pmatrix} lnt_s - x_{si}'\beta_s \\ over - x_o'\beta_o - \eta lnt_s \end{pmatrix} \tag{9}$$

$$\sigma_{3.12}^2 = \sigma_3^2 - \Sigma_{21}\Sigma_{11}^{-1}\Sigma_{12}$$

Finally, the contribution to be likelihood of those individuals with both search and job durations uncensored is given by:

$$f(lnt_{si}, over_i, lnt_{ei})$$

$$= (2\pi)^{-1}|\Sigma_{11}|^{-1/2}exp\left[-\frac{1}{2}(y_i, lnt_{ei}\right.$$

$$\left. - x'_{ei}\beta_e)\Sigma^{-1}(y_i, lnt_{ei} - x'_{ei}\beta_e)'\right] \tag{10}$$

Collecting all these results, taking natural logarithms of (6), (8) and (10), and summing over individuals, we obtain the following log-likelihood function:

$$L(\beta, \Sigma) = \sum_{i=1}^{N}(1 - d_{1i})ln\left\{\Phi\left(\frac{x'_s\beta_s - lnt_s}{\sigma_1}\right)\right\}$$

$$+ d_{1i}(1 - d_{2i})\left\{ln\left[\Phi\left(\frac{x'_{ei}\beta_e - lnt_e + \Sigma_{21}\Sigma_{11}^{-1}y_i}{\sigma_{3.12}}\right)\right] - ln(2\pi) - \frac{1}{2}ln(|\Sigma_{11}|)\right.$$

$$\left. - \frac{1}{2}y'_i\Sigma_{11}^{-1}y_i\right\}$$

$$- d_{1i}d_{2i}\frac{1}{2}\left\{3\ln(2\pi) + \ln(|\Sigma|)\right.$$

$$\left. + exp\left[-\frac{1}{2}(y_i, lnt_{ei} - x'_{ei}\beta_e)\Sigma^{-1}(y_i, lnt_{ei} - x'_{ei}\beta_e)'\right]\right\} \tag{11}$$

Where d_{1i} and d_{2i} define two indicator functions that allow us to distinguish between censored and uncensored observations of search and job duration, respectively. From this log-likelihood function, each parameter of β and Σ is identified separately. These parameters are then estimated iteratively using the Newton-Raphson method.

4) Data Description

The sample consist in 2464 surveyed in all the 25 regions in Peru, between the ages of 15 and 29. Expanded sample using expansion factor given by the database is 6,988,202. After dropping for observations that still attend to educational classes only 1840 observations remains on the sample with 5,010,081 observations using the expansion factor. Search time will be constructed using the differences between the date of finishing school and the date of signing a contract job. Both dates are included in chapter 400 of SWTS Job duration will be constructed using the differences between the date of signing a contract in the first job and the date of concluding the contract.

Mismatch variable will be constructed using question 529 of SWTS, where the surveyed is asked "¿Cree que su educación o formación es adecuada para el desempeño de su trabajo

actual?" with 4 posible answers: i)"Sí, es adecuada"; ii)"No, siento que estoy excesivamente calificado"; iii)"No, encuentro vacíos en mi conocimientos y preparación/ necesito formación adicional"; iv)"La pregunta no es relevante ya que todavía estoy estudiando".

The following Table presents the variables used during empirical estimation.

Table 1

Set of variables

Search time		Takes the value of the time used to find a job.
Skill Mismatch		This variables is recategorized from the survey generating a dummy equal to 1 if the person considers herself to be over educated and 0 otherwise.
Job duration		This variables takes the time of job duration after the person is hired.
Jefe		A dummy variable equals 1 if the person indicates herself as the "jefe de hogar".
Female		Dummy variable equals 1 if the person identifies as female.
Hijos		Indicates the number of children of the person.
Education Level	Inicial	Set of dummies variables that indicates educational level of every person. The analysis of these variables considers "Técnico Incompleta" as a base of the rest of dummies.
	Primaria Incompleta	
	Primaria Completa	
	Secundaria Incompleta	
	Secundaria Completa	
	Técnico Incompleta	
	Técnico Completa	
	Universitaria Incompleta	
	Universitaria Completa	
	Postgrado	

5) Empirical Results

Maximum likelihood estimates of equation (2) is reported in the Table 2

<div align="center">Table 2</div>

Variables	Coefficient
Jefe	-0.0821
Primaria Completa	0.1064
Secundaria Completa	0.0544
Técnico Completa	-0.0225
Universitario Incompleta	0.0146
Universitario Completa	-0.1769
Postgrado	-1.0199
Loglik(model)= -1421.8	
Loglik(intercept only)= -1434	
Joint Significance = 0.02	

Not significant variables are omitted

As presented, the order of coefficients are logic. The more educated, the less a person use her time searching for a job. An extreme situation can be seen when a person has a postgraduate degree. The interpretation of this coefficient cannot be trusted due to its extreme value with respect to the rest, this considering that all of them are change on percentage, but even considering a overestimation a postgraduate degree improves the use of time searching for a job. The rest of the significant variables follow this line. Complete university decreases the use of time while Technical education also present a reduction of time, but in a smaller magnitude. A person with only "Primaria Completa" needs 10% more time than those with "Técnico completa" and by completing "Secundaria" time exceeds in 5%. By having "Secundaria Incompleta" search time is increased in 1%. So far, getting and finishing any kind of post-secondary education results in a improvement on use of time.

Table 3 reports logit estimations of equation (3).

Table 3

Variables	Coefficient
Jefe	1.56298
Primaria Completa	-2.04347
Secundaria Completa	-1.60191
Técnico Completa	-0.06332
Universitario Incompleta	-0.61860
Universitario Completa	2.54144
Postgrado	-1.65165
Time Search	6.50642

Not significant variables are omitted

These results show that probabilities changes in a non monotonic way. There is a improve on mismatch probability up to university studies, when a person receives a undergraduate degree likelihood get worse, this can indicate a university system not adapted to market demand. Non monotonicity can be seen for the individual with "Postgrado", as they become more expert on a certain topic chances of mismatch reduces again. Time search affects positively the probability of skill mismatch, so the more time one uses to search for a job the more likely to be mismatch on it.

Lastly, Table 4 reports the estimations of equation (4).

Table 4

Variables	Coefficient
Jefe	0.267
Primaria Completa	-0.531
Secundaria Completa	0.216
Técnico Completa	0.271
Universitario Incompleta	0.318
Universitario Completa	-0.615
Postgrado	-1.249
Over Educated	0.290
Search time	-1.547

Loglik(model)= -3557.3

Loglik(intercept only)= -3583.1

10

Joint Significance = 1.3e-07

Not significant variables are omitted

Interpretation of these coefficients is done in the same way as Table 2. Search time affects negatively, so a marginal change reduces 1.5% the job duration. With respect to over education, being mismatch increases job duration in 0.2%. This results is not clear and can be taken as equal to zero. According to educational level coefficient, only under and after graduate level reduces the time of job duration. A mayor working mobility is expected from these range of labor force, the rest of coefficients indicates a positive effect with the exception of "Primaria Completa" that shows a negative results. The sign of this is not understand in the framework of analysis and can be produced by a non-identified problem.

6) Concluding remarks

These results try to presents some basic findings of youth's integration to labor market as the need for a more advanced debate is needed on the social and political field. Following this, simultaneous equations structure allow the study of a more complex relationship between all the factors involved on the transition from school-to-work. The findings can be interpreted as important features of the integration to labor market and its institutions.

Universities are found to not follow market needs with respect of teaching certain skills demand by the market, this may not be necessarily wrong because of the nature of universities as places of free research and study but gives a hint about what to re arranged in case there is a need for re organize the institution. On the other hand, technical education show a more close contact with skill needed by the market as their main target is to educate a more practical labor force. Having this on mind, over education situation is found to be non monotonic. The closer to a higher degree the more likely to be mismatch, monotonicity arrives in the cases of after graduates as these people seek for expertise in a very specific field of knowledge. Lastly, all these results produce bigger mobility of youth labor force during the first job as education gets higher.

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