

Functional Literacy and Job Opportunities

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ABSTRACT

The first time in which the International Adult Literacy Survey was carried out in a developing country was in 1998 in Chile. The survey measures the effective skills of the population over 15 years of age in the comprehension and processing of texts, documents and quantitative information on a continuous scale of performance. This paper analyses the relation between literacy and job opportunities for men between 15 and 65 years of age in Chile. The results suggest that there is a dynamic relation between the development and the use of this type of skills. Thus, it is shown that schooling as well as in-work experience contribute to the development of these skills. Moreover, higher literacy ability is linked to greater work productivity and higher incomes for low-trained workers. Amongst better educated workers, literacy ability has no effect on earnings, apart from the already internalised higher educational attainments that this would imply.

1.- Introduction

Globalization of markets and the transition to an information economy are dramatically changing the nature of work. In this context, knowing how to read and write is not enough to ensure adequate work performance; it's necessary to do so with ever increasing capacities (OECD, 2000).

The IALS Project (International Adult Literacy Survey) is an OECD initiative, whose purpose is to evaluate the literacy abilities of the population over 15 years of age. The development and administration of the survey is the responsibility of Statistics Canada and the Educational Testing Service of the United States.

The term literacy is used in this context not only to refer to the ability to read and write but rather to refer to a particular type of basic skill: the ability to understand and use written information in the context of home, community and work duties. The concept can be referred to as "functional literacy".

This survey was carried out in Chile in 1998, for the first time in a developing country. The results show that Chile falls far behind the required standards for an adequate insertion into the global economy, given that over half the adult population does not satisfy the requirements for understanding basic level information in written texts and documents (Bravo and Contreras, 2001).

Functional literacy relates to the quality of the insertion a person may have in the social and economic life of a country. Clearly, deficiencies in information comprehension and processing lead to low productivity levels and a deficient economic insertion. Equally, those individuals can expect to have disadvantages in their participation as political citizens and social actors.

The objective of this paper is to empirically estimate the relation between functional literacy and the job opportunities of men between 15 and 65 years of age in Chile, using the IALS data. To this end, the impact of the functional literacy level on earnings shall be calculated, as well as what effect using these skills in work has on their development. Women were not considered in this analysis in order to isolate the labor market participation decisions.

Literacy skills can be categorised as cognitive skills, and as such continue developing throughout ones life via a dynamic interaction between abilities and learning (Heckman, 1999). People with greater abilities learn more, while learning generates more abilities. We can identify three stages in this process: the first is pre-school education which depends largely on the family context; the second is the formal education stage; and the third is the work context learning which significantly contributes to the development of these abilities. Notwithstanding that, the most effective inputs occur in the earliest learning and ability development stages.

The relation between functional literacy and job oportunties has been the subject of several recent studies basing themselves on surveys that measure the literacy skills of the population.

The OECD and Statistics Canada (2000) study presents a comparative analysis between countries for the results from the second International Adult Literacy Test which was carried out in 1998. The study recognises the interdependence between job opportunities and functional literacy, though there is no clear view as to how these effects work.

For most of the countries (17 out of a total of 20) the schooling years are recognised as the principal determinant of literacy skills, even though great differences can be observed among people with the same education level among different countries. Peoples ages have an inverse relation with functional literacy, but the authors have not offered an interpretation for this result. Labor market participation, occupation type, the formal adult education and informal work based learning, show a statistical association with literacy skills in most of the countries. Moreover, it shows that the probability of unemployment is inversely related to the functional literacy level;

while salaries increase together with the skills level, after controlling for other variables in an amplified Mincer equation.

Pryor and Schalaffer (1999) established that schooling, gender, age and education of the mother, account for 46% of the variance of the results of the National Adult Literacy Test in the United States, with the years of education as the most important of those variables. The authors interpret this relation as a reduced form, since there is no theory to explain functional literacy. The study also analyses the relation between functional literacy and earnings, even though the causal direction between both variables is not discussed in detail. It is shown that an increase in a standard deviation in the functional literacy level is associated with an increase of 3.5% to 7.2% in the probability of being employed, as well as a 10% increase in the salaries of the workers.

Two more specific studies are those of Rivera-Batiz (1994), who studies the impact of functional literacy (quantitative) on the probabilities of being unemployed taking the case of young adults in the United States, and Denny, Harmon and Redmond (2000), who analyse the effect of functional literacy on earnings in Great Britain, Northern Ireland and the Republic of Ireland. The results of these studies are on line with the other aforementioned studies. A higher skill level is associated with a lower probability of unemployment and with higher earnings levels, once the schooling effect is taken into account as well as the other variables related to labour market outcomes.

All previous studies are based on cross section information which makes treating the relation between labour market outcomes and functional literacy difficult. Other evidence available come from data panel, which permit analysing the relation between cognitive abilities, measured early on, and the subsequent work performance.

Along these lines, Murnane, Willett and Levy (1995) studied the relation between basic cognitive abilities in the USA, measured through a basic maths test at 18 years of age, and salaries achieved at 24 years of age. The authors concluded that there is evidence of increasing returns on ability in that country, after comparing measurements over different years. They also found that the results of the test are an important predictor of subsequent educational

achievement, measured as college graduations, and that they reduce the returns on education by between 40% and 50% in a wage equation. This result is interpreted as arising from the inclusion of a previously omitted variable (ability).

Heckman and Vytlačil (2000) consider the difficulty in identifying the coefficients of education and abilities in a wage equation, given the strong correlation between both variables. This problem (“sorting bias”) antecedes the traditional problem of omitted variables for abilities in wage equations.

Another example in this line of research is the work of Cawley, Coneely, Heckman and Vytlačil (1996), who study the impact of ability on salaries using the National Longitudinal Young Survey. The authors consider the “g” factor or general intelligence as a measure of ability, defined as the first principal component of the ASVAB test results (Armed Services Vocational Aptitude Battery).¹ The results show a “g” impact on salaries, controlling for years of schooling and other variables, even when the magnitude of the effect is lower. The coefficient or “return on ability” varies by gender-race categories, after controlling for occupational choice, contrary to that postulated by the meritocratic hypothesis (salaries determined by ability and schooling, beyond race or gender).

In the Chilean case, information exists for only one point in time. As so defined, that makes difficult establishing a relationship between functional literacy and work performance. As such, for example, the data available does not allow a clear separation between the cohort effects and life-cycle effects; while identifying the effect of work experience on the development of literacy abilities requires assuming specific time patterns of the first variable.

Notwithstanding the aforementioned, it is possible to deduce important characteristics about the relation between functional literacy and job opportunities in the case of (non-student) males between 15 and 65 years of age. The data points to a dynamic relation between the development and the use of this type of basic skills, proving that schooling as well as work experience contributes to the development of this type of abilities. Meanwhile, higher literacy

¹ It includes 10 subtests, including arithmetic reasoning, vocabulary knowledge, text comprehension and mathematics knowledge.

skills increases labor productivity and income in the case of low skilled workers. In the case of skilled workers, those skills have no effect on income levels beyond the already internalized component of years of schooling.

This article is structured around four sections, apart from this introduction. The second section describes the IALS survey together with its main findings. The third section analyses the determination of the literacy skills on the base of a model of accumulation of the same through schooling and the use of the skills in work. The fourth section analyses the impact of literacy skills on earnings. The fifth section presents the conclusions.

2. - The International Adult Literacy Survey IALS

The IALS Survey treats literacy as a continuous variable instead of the traditional dichotomous concept. The concept is related to the literacy abilities which individuals require to operate in society. The basic skills are presented in three dimensions:

- *Prose*: the necessary knowledge and skills for understanding and using information contained in texts such as editorials, news stories and literary texts.
- *Document*: the basic knowledge and skills necessary in order to find and use information contained in documents such as charts, maps, graphics, indexes, etc.
- *Quantitative*: the basic knowledge and skills necessary to carry out arithmetic calculations in printed text, such as the calculations that may be necessary to fill in bank deposit slips, estimate time using timetables, etc.

The IALS survey uses the *Item-Response Theory* (see Murray et al, 1997) as much to evaluate the difficulty level of the questions as to give scores to the respondents. They are scored separately in the different areas on a range between 0 (lowest ability) and 500 (highest ability), classified into five levels.

The evaluation instruments used in the IALS are common to all participating countries, so it is necessary to be careful in the adaptation of the original English version to the other languages.

In the survey, each respondent must first answer a background questionnaire that gathers relevant socio-demographic data. Subsequently, a central booklet of tasks is given with six simple questions to complete associated with five assignments. If the respondent fails to correctly answer at least two of these questions, the interview is terminated. Otherwise, if more than two questions are correctly answered, a main booklet of tasks is given. There is no time limit in completing the test, so that the person may have all the time necessary to show their abilities.

First time round, the survey was carried out in 12 OECD countries. This was carried out between 1994 and 1996 (OECD, 1995 and OECD, 1997). The second version was carried out in 1998 and incorporated 10 other countries, including Chile.

In Chile, the survey was carried out in May and June 1998, and its implementation was the responsibility of the Department of Economics of the University of Chile. The survey has to satisfy demanding standards set by the ETS and Statistics Canada that ensure the statistical reliability and comparability of the information gathered among the participating countries.

The effective sample was 3,583 people, showing a relatively high response rate by international standards (74.4%). The survey holds on a national level and covers the population between 15 and 65 years of age.

Results

Table 1 presents the scores associated with different percentiles of the distribution for the prose, document and quantitative domains. Graph 1 shows the distribution of the results, considering the average of the three domains.

The mean score for the total population fluctuated between 222 in prose, 219 in document and 210 in the quantitative section. The median (percentile 50) presents similar levels, given that there is certain symmetry in the score distribution.

The official statistics in Chile show that only 4.6% of the population over 15 years of age declare themselves unable to read or write. However, over 50% of the population falls into level one of the IALS survey (below 225 points), indicating a very low level of written text comprehension.

Table 1
Chile: Distribution of literacy skills

	Prose	Document	Quantitative
Percentile			
5%	124.5	121.2	85.0
10%	145.6	142.5	111.5
25%	187.0	188.2	166.9
50%	225.9	223.9	215.7
75%	258.9	256.6	257.7
90%	286.1	283.3	292.5
95%	301.2	298.9	312.5
Average	221.5	219.4	209.8
Standard Deviation	53.4	53.6	67.7

Graph 1
Distribution of literacy skills, average three domains

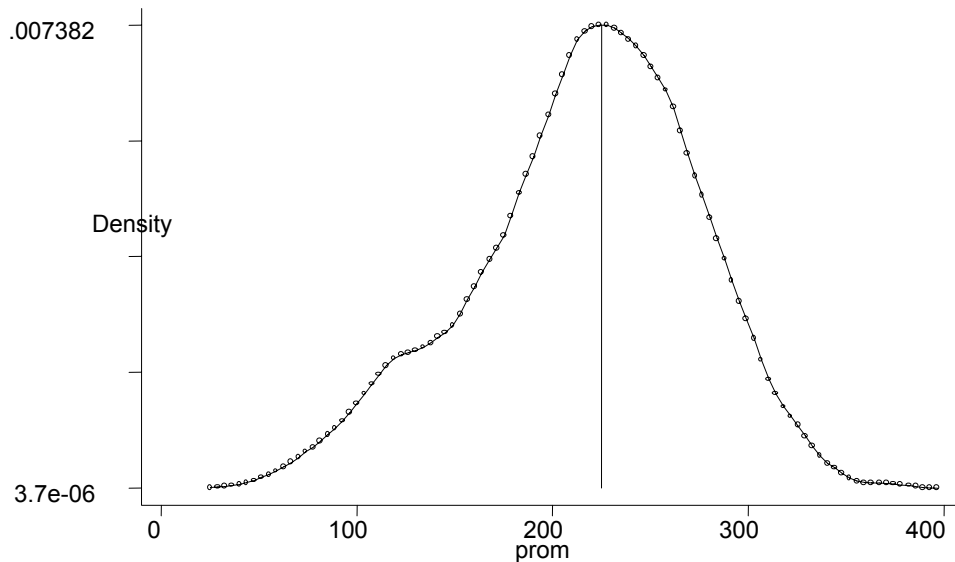


Table 2 shows that the average level of literacy skills depends on labor market participation.² People who participate in the labor market show a higher average level of skills relative to those who do not participate.³ This could indicate that those with higher earning potential have a higher probability of participation; on the other hand, it could indicate that using these skills in working activity helps develop those skills even further.

The article will analyze the relation between skills and work performance for men between 15 and 65 years of age (non-students). This allows us to control for labor market participation decisions. On the other hand, there is a high level of labor market non-participation amongst women; therefore including this group in the study would require making the participation decision endogenous.

² Henceforth the average results from the three components will be used. This is due to the high correlation coefficients that were found: 0.925 between prose and document; 0.924 between prose and quantitative; 0.945 between document and quantitative.

³ Throughout the text, labor market participation includes those who have had some job in the last 12 months.

**Table 2: Basic Skills and Labor Market Participation
People between 15 and 65 years old (non-students)**

Age	Men			Women		
	Literacy skills level		Participation rate	Literacy skills level		Participation rate
	Participation	Non participation		Participation	Non participation	
15-24	228.5	198.1	90.4	230.8	208.8	54.7
25-34	225.9	171.1	97.6	231.8	213.9	56.6
35-44	213.5	127.6	96.7	222.0	207.6	53.4
45-54	202.9	160.4	92.5	212.7	186.2	45.1
55-64	192.8	197.9	79.7	211.1	169.0	32.5

3.- Determinants of Basic Skills

There is no well developed theory for explaining the development of literacy skills. However, the previously cited empirical evidence identifies the learning obtained at home and in school as determinant, as well as the subsequent practice of those skills.

Thus, it is possible to postulate that the literacy skills rest on the notion of stock or accumulation over the course of time. The level of literacy skills that a person possesses in the present period (Y_t) depends on two types of processes. In the first place lies the development of these skills through education, as well as in the parental home. Secondly, once the formal education is finished, literacy skills can increase or decrease depending on the degree of use of those skills in their day-to-day activities.

Thus, the skill level of a person can be expressed as:

$$Y_t = \int_{t_0}^{t'} s_v(z_0) dv + \int_{t'}^t q_v(z_1) dv$$

The first integral corresponds to the accumulation of skills done in schooling system, which occurs in the time interval $v = [t_0, t']$. The s function (\cdot) denotes the transformation of schooling into skills, which, it is supposed depends on a vector of variables z_0 which includes the quality of the education, the educational atmosphere in the home, the abilities of the person, etc.

The second integral denotes the accumulation of skills after schooling is finished, corresponding to the time interval between the year of leaving school and the present period: $v = [t', t]$. In this case, the accumulation of skills occurs through function $q(\cdot)$, depending on a vector z_1 that includes variables related to the practice of these skills in work or at home (habit of reading, numerical calculations, etc).⁴

The previous expression should be interpreted as a reduced form. A more complete model should consider the possibility that the years of schooling as well as the work-based practice depend on cognitive abilities, which are in turn developed with education and work based practice.

Without practicing these skills deterioration over time can be expected, that is:

$$q_v(0) \leq 0$$

In the particular case that the functions $s(\cdot)$ and $q(\cdot)$ be invariant over time; that is $s_v(\cdot) = s(\cdot)$; $q_v(\cdot) = q(\cdot)$, the integral that denotes the accumulation of skills can be expressed as:

$$Y_i = S(z_0) + Q(z_1)$$

The skills depend on the years of schooling (S) and on the subsequent years after leaving formal education (Q), denominated here forth as “potential work experience”. The effect of these cycles on the accumulation of skills depends on the “z” factors cited above.

Empirical Evidence

The relation between literacy skills, schooling and age is examined in Table 3. There it is shown the average level of literacy skills for education-age groups, excluding current students. It

⁴ The assumption that schooling and the subsequent use of the skills occurs in consecutive time periods is only for analytical presentation convenience.

should be noted that working with education-age groups provides similar information to considering the potential experience variable instead of the age variable.⁵

The data shows a strong association between literacy skills and years of schooling, which goes for the different cohorts. This is in line with the empirical evidence from other countries (OECD, 2000; Prior and Schalaffer, 1999) that identifies education as the most important variable in determining literacy skills.

The data also shows a marked negative correlation between the literacy skills and the age of the people (Table 3, last column). This relation can be due to cohort or life cycle effects. To separate both types of variables it would be necessary to have more observations over time. However, the available evidence points to the predominance of effects linked to the working life cycle of people.

In this regard, consider that the cohort effect refers to factors that, affecting differently each cohort, relate to the development of literacy skills. Examples of this are the quality of the educational system and the information tools that the cohort possesses when young (written media, television, internet). On the other hand, the factors related to the life cycle relate to the use made by people of those skills throughout their work experience.

Table 3 shows that the relation between skills and age is significantly modified when schooling is taken into account. Thus, these skills drop with age only in the lower education levels, while the skill levels remain relatively constant at all ages for other education levels.

The different temporal trajectories shown by skills when considering years of schooling would reflect the greater importance of life cycle factors, even when one cannot exclude the possibility that cohort variables interact with variables related to years of schooling attained (for example, people with higher education have greater access to information means, which in turn change through generations).

⁵ In Table 3 there is not enough data available for the younger age group with lower education. See Table A-1 of the Annex.

Notwithstanding the aforementioned, the evidence on the use of the skills in work reinforces the effect linked to life cycles. To see this, consider that the IALS survey contains information on the use of literacy skills in the job, measured as frequency of “use of reading and information in work” and “practice of writing in work”. Working from this information, a variable is created that represents the degree of use of literacy practices in work, which fluctuates between 0 and 24 points, with an average value of 5.81 and a standard deviation of 6.13.

Table 4 shows that the intensity of the use literacy skills in work, as well as its evolution over time, are closely related to the level of schooling of the person, a variable that is, in turn a proxy of the level of skills that a person has when commencing their work cycle.

Thus, workers with low schooling demonstrate a minimal use of literacy skills in work, which would help explain the fall seen in their skills over time. As such, we would be looking at people who start working with low literacy levels and enter jobs that do not require the use of those skills, thus generating a situation that would lead to reduced literacy skills over time.

As schooling increases, the rate of use of literacy skills in work increases. Thus, the higher the initial skill level, the higher the probability of entering jobs that require the use of those skills. More interestingly, the use of these skills in work actually increases over time for these people, suggesting the existence of a dynamic relationship between skills level and the use of those skills in work.

**Table 3: Mean literacy skill level
Men who participate in the labor market**

Age groups	Years of Schooling					Total
	0-4	5-8	9-11	12	13 and over	
15-24	----	199.5	235.1	240.5	273.7	228.5
25-34	152.7	181.5	209.6	235.9	287.0	225.9
35-44	155.9	179.4	222.6	235.0	264.4	213.5
45-54	148.6	200.6	216.9	235.8	250.8	202.9
55-65	145.5	196.6	246.0	233.9	269.3	192.9
Total	151.1	189.1	220.6	236.3	271.3	

Source: calculations based on IALS survey

**Table 4: Index of the use of literacy skills in work
Men who participate in the labor market**

Age groups	Years of Schooling					Total
	0-4	5-8	9-11	12	13 and over	
15-24	----	1.88	4.74	7.57	10.21	5.24
25-34	1.16	2.61	5.09	7.62	11.22	6.47
35-44	0.72	2.62	5.09	8.89	10.55	5.84
45-54	0.91	2.94	5.89	6.11	13.44	5.59
55-65	0.79	4.77	7.76	8.02	13.71	4.87
Total	0.83	2.74	5.28	7.93	11.61	

Regression Analysis

The evidence presented is clear in order to outline the relation between literacy skill level, schooling, and the practice of those skills in work. Here we present a multivariable analysis to confirm if the previous results are robust to the inclusion of other controls related to literacy skills.

Table 5 presents the results obtained for regressions that incorporate the different factors associated with the dependent variable: the literacy skills level of the men who are participating in the labor force. These include schooling, quality of education (according to type of school attended) and educational level of the mother, a variable that shows the resources present in the parental home. To capture the effects of the work cycle and the use of the skills, the potential work based experience variable is included, the interaction between this variable and the index of the use of the skills, as well as the interaction between the previous variables and schooling level.

A potential problem in the regression is that the variable “use of the skills” is endogenous, given that the people whose work demands literacy skills could have been chosen for those jobs precisely because they had a higher initial skills level. Nevertheless, here we postulate that the variable is predetermined given that the past accumulation of skills is important, measured via the interaction between the potential experience and the use of those skills. The necessary assumption here is that, given that there are no panel data available, the use of the skills over time has some type of continuity. The data presented in Table 4 is consistent with this assumption.

The results of the regression identify years of schooling as the principal skills determinant. The marginal effect of the variable depends on the specification used, in a range that varies between 6.6 and 9.4 additional points in the literacy skills level for each additional year of schooling. If the specification (4) is considered, which is the preferred specification, every additional school year would increase the skill level in 7.5 points (equivalent to 12.8% of the standard deviation of the variable).

The specification (4) does not include the variables related to the formation of skills while at school, beyond simply the years of schooling. In this regard, it should be noted that the variables that distinguish between types of educational establishment give coefficients that are not significant (specification (5)). On the other hand, including the mother's educational level gives a positive and significant variable on the skills level (specification (6)). The problem in this case is that a relatively high percentage of observations without data for the variable exist (15.5%), which are distributed in a non random way by age and schooling.

Table 5
Literacy Skills Determinants. Men who participate in labor market
(OLS, robust, test t in parenthesis)

Dependent Variable: Literacy skills level	(1)	(2)	(3)	(4)	(5)	(6)
Schooling	9.37 (20.1)	8.78 (10.9)	7.75 (10.1)	7.46 (9.52)	7.27 (9.35)	6.60 (8.08)
(potential) work experience	-1.01 (2.72)	-1.17 (2.40)	-1.69 (3.50)	-1.89 (3.86)	-1.80 (3.63)	-1.79 (3.11)
(work experience) ²	0.016 (2.42)	0.019 (2.32)	0.023 (2.96)	0.025 (3.17)	0.023 (2.93)	0.021 (2.19)
work experience * D1		0.220 (0.45)	0.185 (0.38)	0.532 (1.04)	0.554 (1.08)	0.709 (1.27)
(work experience) ² * D1		0.002 (0.45)	-0.002 (0.18)	-0.003 (0.26)	-0.003 (0.30)	0.002 (0.18)
work experience * D2		1.87 (2.02)	1.93 (2.25)	2.20 (2.35)	2.28 (2.50)	3.10 (3.18)
(work experience) ² * D2		-0.063 (2.05)	-0.078 (2.86)	-0.083 (2.97)	-0.082 (2.99)	-0.093 (3.01)
work experience * Use of skills in work			0.074 (5.35)	0.117 (6.01)	0.117 (6.12)	0.147 (5.45)
work experience * use of skills in work*D1				-0.068 (2.53)	-0.072 (2.71)	-0.119 (3.67)
work experience * use of skills in work*D2				-0.040 (0.43)	-0.049 (1.15)	-0.113 (2.37)
Private schooling					10.03 (1.43)	8.50 (1.13)
Private subsidised schooling					4.68 (1.10)	6.34 (1.35)
Mother's educational level						1.18 (2.18)
Constant	135.9 (18.2)	140.2 (12.8)	152.4 (14.2)	155.9 (14.5)	155.2 (14.6)	153.9 (11.9)
Adjusted R ²	0.483	0.490	0.509	0.512	0.515	0.523
Number of observations	1301	1301	1301	1301	1301	1099

D1= 1 with secondary schooling; D2= 1 with higher education.

The relation between schooling and skills level is linear (see graphs 2 and 3).⁶ This is an important result given that in the Chilean case the relation between schooling and earnings is markedly convex, due to the high rates of return of higher education with respect to primary and secondary education. There is also recognition for those finishing secondary school in the labor market, connected to a credential effect if that attainment is a sign of attributes sought by employers but which are difficult to observe directly in applicants (responsibility, discipline, etc).

Nevertheless, the monotonous relation identified between years of schooling and literacy skills level vindicates to some extent the value of each additional year of education.

The relation between years of schooling and skills level could be contaminated by the omission of variables, such as unobserved genetic abilities. However, the graphs do not present any evident signals of discrete changes in those years of schooling (8, 12) which represent the final stages of education for lower ability students (conditional on socio-economic variables). That should occur to (mediate) important effects of unobserved abilities in the relation between schooling and basic skills.

A second important result is the dynamic presented by literacy skills levels after leaving formal education. For workers with primary and secondary education, the skills would tend to deteriorate over time in a concave relation (deteriorates at slower rates). On the other hand, workers with higher education show a tendency of higher skills levels over the course of the work cycle. These relations are modified according to the use of those skills in work.

The temporal dynamic of the basic skills is illustrated in graph 3. This shows the predicted trajectory of the basic skills in the period following formal education. To that effect, the coefficients estimated in the literacy skills regression are used (Table 5, fourth column). Different cases are shown, by years of schooling (4, 10 and 17 years) and by level of use of skills in work, considering people located in the 25 and 75 percentile of the distribution of that variable.

⁶ More flexible functional forms for the relation between schooling and skills were also proved.

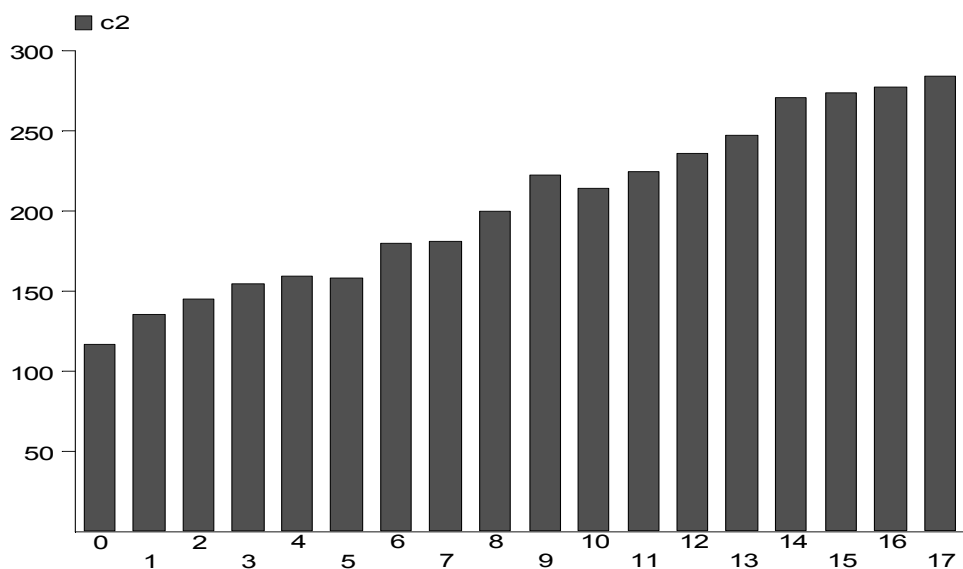
For people with four years of schooling, there is a significant drop in these skills over the course of their working cycle, from an already low initial level. Moreover, the degree of use of these skills in work has a lower effect on the trajectory of those skills over time. This shows that this group presents few differences in the use of the skills. These are people who do not typically enter jobs where these skills have to be used, as a consequence of the low levels that they have to begin with.

On the other hand, there are significant differences in the time trajectories of these skills for people with twelve years of schooling depending on the extent of their use in work. As such, a person in the percentile 25 in the use of these skills experiences a reduction of around 25 points in the skills between 20 and 55 years of age, while a person in the percentile 75 practically sees no deterioration in these skills levels over the course of their working cycle.

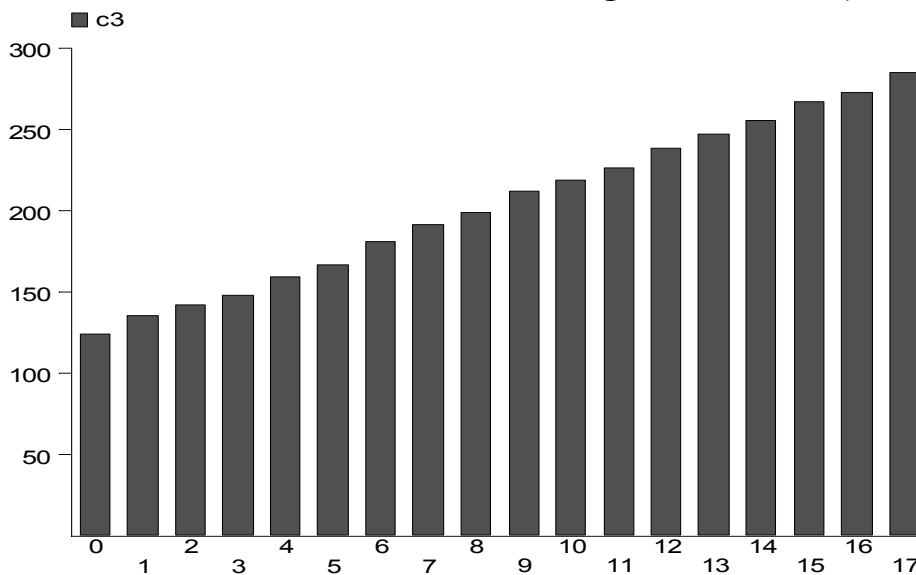
A similar situation occurs in the case of people with higher education. Those in the percentile 25 of the use of the skills in work experience deterioration in skills levels throughout their working cycle. On the other hand, the greater use of these skills (percentile 75) is associated with the preservation of these over time.

In general terms, the regression analysis confirms the conclusions derived from the previous analysis. The skills level is linked to the schooling level as well as to the use of these skills in work; this variable in turn depends on the initial skill level. The empirical evidence is consistent with a dynamic relation between the development and the use of these skills.

Graph 2
Literacy skills and years of schooling
(men in the labor force, non conditional effect)

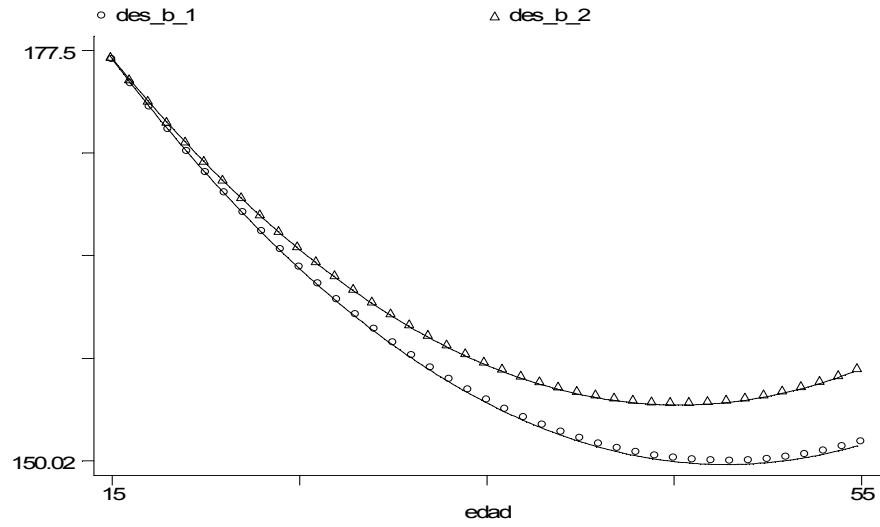


Graph 3
Literacy skills and years of schooling
(men in the labor force, conditional effect on regression 4, table 5)

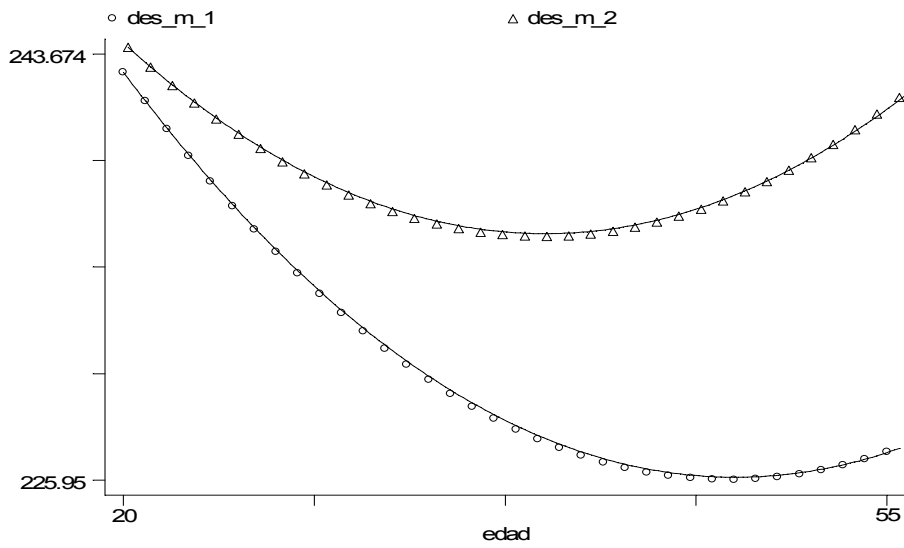


**Graph 2: Literacy skills over working cycle
(percentile 25 and 75, in use of skills in work distribution)**

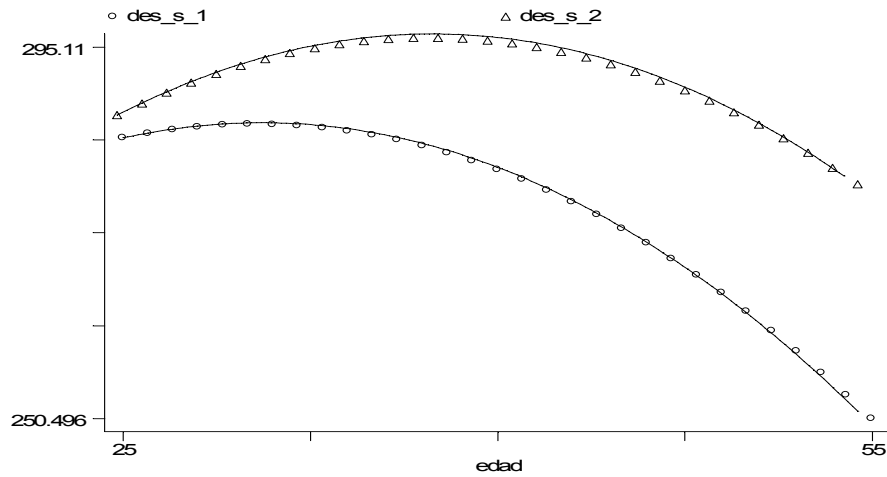
(i) 4 years of schooling



(ii) 12 years of schooling



(iii) 17 years of schooling



4.- Literacy Skills and Earnings

This section seeks to quantify the relation between literacy skills and earnings in the case of salaried men. In this respect, it is natural to postulate that the capacity available for understanding and processing the content of documents, instructions, forms and other written material would naturally be linked to the labor productivity of the workers, as well as with the choice of best work alternatives, the adaptation to new work environments, mastering new technologies, etc.

An important problem in this matter is differentiating the effect of the skills with respect to the years of schooling. This is because we know that education increases human capital and, through this, labor productivity and the associated earnings. It is obvious that literacy skills are part of the human capital that education “produces”. If there were a very close relation between both variables, then it would make no sense to study the impact of these skills on earnings, since the answer would already be given by the return on education.

Nevertheless, some factors exist that generate differences between both variables. Firstly, measuring education through years of schooling only partially captures the differences in the quality of the education, which can certainly be seen in educational outcome variables, such as what are the literacy skills at the moment of leaving school. Secondly, people can have abilities that are reflected in the literacy skills level, beyond the impact on years of schooling. Thus, within the cohort who enters the labor market after leaving secondary school, the differences in literacy skills would reflect to some extent differences in cognitive abilities. Thirdly, we have identified in the previous section that work practice also contributes to the formation of literacy skills, which introduces another gap between this variable and schooling.

Our empirical approximation follows two complementary paths. First, we examine the impact that these skills have on earnings through a Mincer equation, controlling for years of schooling and potential experience. Secondly, we work with the residue of a regression between literacy skills and their observable determinants, in order to discover if some systematic relation exists between earnings and that part of the skills not captured by schooling, work experience and other variables.

Basic skills and earnings

The effect of basic skills on earnings is looked at through a Mincer equation. Table 6 presents the results obtained, as much for the traditional specification as for that which permits estimating the return rates by level of schooling (“spline” regression type).

The results show a positive and significant effect of basic skills on earnings. Ten extra points in the IALS test are associated with a 3.2 percentage point increase in salaries, once one controls for schooling, potential experience and the other factors considered in the regressions.

The inclusion of the skills in the earnings equations makes the returns on education drop by three points. This can reflect an effect of omitted variable, given that the variable “literacy

skills” is positively related to years of schooling. Therefore, the schooling coefficient would be overestimated when there is no control for the variable “literacy skills”.

It is important to note that the premium for higher education *is not* affected by the incorporation of the literacy skills variable. In this manner, the factors that underlie the higher return rate associated with higher education would be different to those related to the literacy skills.

An underlying problem in the earnings equations is a certain degree of endogeneity in the variable “literacy skills”. That is, there may be common non-observables in the determination of the literacy skills and earnings. However, this same problem characterizes traditional earnings equations, given that there are non-observables that affect schooling as well as earnings. We do not possess instruments in the database that allow us to correct for eventual bias, therefore the results obtained must be interpreted with caution.

Another problem is caused by the strong correlation between schooling and literacy skills, which makes it difficult to identify the net impact of the skills on earnings. An alternative way of exploring the relation between earnings and literacy skills is via earnings equations conditional on levels of schooling. Table 7 presents this variant to salaried workers who have between 8 and 12 years of schooling, respectively. These represent thresholds of education for which there are an adequate quantity of observations in the sample.

The results for these regressions confirm the positive impact of literacy skills on earnings. Within an educational cohort, a higher level of literacy skills seems associated with higher earnings.

It is interesting to note that the impact of literacy skills is more important for people with 8 years of schooling. The variable coefficient is nearly three times higher than that show by salaried workers with 12 years of schooling. This evidence points in the same direction as that indicated by the effect of the skills on the returns to education: that the effect of the skills on earnings would be particularly relevant for workers with lower educational qualifications.

Table 6: Earnings Equations
Salaried workers aged between 15 and 65 (non students)

Dependent variable: log wage				
Years of schooling	0.107 (11.78)	0.075 (6.67)	0.072 (2.20)	0.039 (1.08)
Secondary education (spline)			0.017 (0.41)	0.017 (0.39)
Higher education (spline)			0.069 (2.08)	0.074 (2.24)
Literacy skills		0.0032 (4.57)		0.0032 (4.66)
Potential Experience	0.008 (0.96)	0.011 (1.33)	0.010 (1.19)	0.013 (1.60)
Potential Experience squared	0.0001 (0.42)	0.0000 (0.51)	-0.0004 (0.25)	-0.0001 (0.61)
Hours of work	0.028 (7.14)	0.028 (7.37)	0.028 (7.23)	0.028 (7.47)
Constant	11.67 (58.8)	11.28 (50.8)	11.90 (39.4)	11.51 (37.9)
Adjusted R ²	0.355	0.374	0.363	0.384
Number of observations	885	885	885	885

Note: T test are in parenthesis

Table 7
Earnings Equations conditional on schooling
Salaried workers aged between 15 and 65 (non students)

Dependent variable: log wage	8 years of schooling		12 years of schooling	
Literacy skills		0.0063 (3.35)		0.0022 (1.65)
Potential Experience	-0.008 (0.22)	-0.000 (0.02)	0.049 (2.50)	0.048 (2.45)
Potential Experience squared	-0.0002 (0.26)	0.000 (0.02)	-0.0008 (1.54)	-0.0007 (1.47)
Hours of Work	0.043 (3.57)	0.038 (3.96)	0.022 (3.47)	0.023 (3.62)
Constant	11.98 (32.3)	10.87 (22.7)	12.81 (34.6)	12.03 (22.5)
Adjusted R ²	0.370	0.477	0.265	0.276
Number of observations	113	113	169	169

“Residual Skills”

The impact of the skills on earnings gets confused the effect of schooling, work experience and other variables related to literacy skills. This section analyses the residuals of a regression between skills and its determinants, for which we consider the specification (4) of the regression presented in Table 5. The procedure is the same as supposing that the correlation between schooling and skills is totally attributed to the first variable, as would also be case for the other variables included in the regression. Thus, the residuals correspond to that part of the skills no related to those. The relation of the new variable with earnings represents a “floor” of the work impact of the skills.

To examine the relation of interest, quartiles of the distribution of the residuals are computed. In Table 8, the relation between earnings, periods of schooling and the aforementioned quartiles of the residual skills is presented.

The data presents a relatively clear pattern, delineating a positive relation between earnings and “residual” skills for workers with less than twelve years of schooling. On the other hand, the relation between earnings and residual skills dissipates for people with twelve years of education and over.

These results are consistent with the evidence from the earnings equations above. Moreover, they give robustness to those results, since in this occasion parameters that could have estimate biases are not used.

It follows that the type of abilities related to literacy skills would be more important for explaining different productivity levels in lower skilled jobs. On the other hand, they would be less significant for jobs taken by people with higher education, since another type of ability (professional) seems to dominate.

Table 9 relates schooling and the residual skill quartiles with the skill levels. Each cell contains the same people as the previous table (earnings). In this case, we can see substantial

variance in the literacy skills of the different schooling categories. Nevertheless, this only translates into earnings variations in the lower education levels. In the case of people with higher education, sharp literacy skill differences can be seen that do not relate to differences in earnings.

Table 8
Median salary by schooling and residuals

Residual quartiles	Years of Schooling				
	0-4	5-8	9-11	12	13 and over
1	770.0	900.0	1200.0	2160.0	2400.0
2	1080.0	1000.0	1500.0	1680.0	3000.0
3	1020.0	1152.0	1330.0	1700.0	2950.0
4	1400.0	1200.0	2400.0	2160.0	3000.0

Table 9
Average skills, by schooling and residuals

Residual quartiles	Years of Schooling				
	0-4	5-8	9-11	12	13 and over
1	101.5	129.3	166.9	188.3	222.2
2	133.6	177.3	207.8	223.4	258.2
3	164.8	207.1	231.7	250.7	286.1
4	207.8	243.9	272.6	286.9	313.7

The aforementioned conclusion continues to be valid after controlling for the other determinants of earnings (Table 10). Thus, the positive effect of “residual” skills on the earnings of low skilled workers is verified, and to a lesser extent for intermediate skilled workers. There are no effects for workers with higher education. When the sum of workers is considered the differential effects by level of education are not significant.

Table 10: Earnings Equations
Salaried workers aged between 15 and 65 (non students)

Dependent variable: log wage			
Schooling	0.106 (11.7)	0.104 (11.5)	0.105 (11.8)
Work Experience	0.011 (3.83)	0.10 (3.63)	0.011 (3.61)
Hours of Work	0.028 (7.25)	0.027 (7.45)	0.027 (7.52)
Residual skills		0.0026 (3.64)	0.0042 (4.09)
Skills * D1			-0.0027 * (1.92)
Skills * D2			-0.0043 * (1.81)
Constant	11.65 (58.8)	11.7 (59.7)	
Adjusted R ²	0.355	0.367	0.373
Number of observations	885	885	885

Note: D1 and D2 are dummy variables for schooling levels Secondary and tertiary, respectively

5.- Conclusion

Chile was the first developing country in which the international survey of adult literacy skills (IALS) was carried out back in 1998. This article explores the relation between literacy skills, defined as the capacity to understand and process information from written texts, and work performance of men (non students) between 15 and 65 years of age.

The paper has shown that a two-way relation exists between the literacy skills and the work performance, indicating the existence of a dynamic relation between the formation of skills and their use.

A principal determinant of the level of literacy skills is the years of schooling. The results indicate that each additional year of schooling increases the basic skill level. The linear relation between both contrasts with the relation between schooling and earnings which is heavily convex given the greater rates of return of higher education.

Schooling determines the initial skills level of people. This variable evolves over time depending on the work use of those skills. The resulting skill level reflects the interaction of schooling with the practice of those skills in the work context.

Thus, workers with low education enter jobs that do not require the use of literacy skills; this in turn helps explain the decline in those skills of that group over time. As schooling increases, the initial skill level also grows and its use in work also increases. Moreover, the use of these skills in work increases throughout the work cycle of this group, suggesting the existence of a dynamic relation between skill level and its use in work.

Additionally, a greater literacy skill level is associated with higher earnings, once schooling and other earnings related variables are taken into account. The type of abilities related to the literacy skills would be more important for explaining the different productivity levels of people with primary and secondary education. However, it would be less significant in jobs taken by people with higher education, where other types of abilities seem to explain the salary differences within this group.

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