The Developing Economies

IDE-JETRO

The Developing Economies 51, no. 1 (March 2013): 1–33

THE IMPACT OF COGNITIVE AND NONCOGNITIVE SKILLS ON PROFESSIONAL SALARIES IN AN EMERGING ECONOMY, CHILE

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First version received June 2011; final version accepted October 2012

Professional salaries in Chile are here explained on the basis not only of traditional human capital variables but also of variables indicative of other cognitive and noncognitive skills. As might be expected, college entrance scores (SAT), our measure of advanced cognitive skills, are found to impact strongly and nonlinearly on salaries. More surprisingly, ranking in one's high school graduation class raises one's salary 10 years later by the equivalent of one year of additional experience, suggesting that ranking stands for a more permanent noncognitive skill such as effort or self-discipline. As is typically found, women earn less than men, but, to our surprise, they also have lower asking salaries than men.

Keywords: Human capital; Salary wage differentials; Education; Emerging economy; Chile
JEL classification: J3

I. INTRODUCTION

It is a well known fact that salaries depend, among other things, on the level of education and experience. Moreover, some professions systematically pay more than others. Presumably, personal characteristics such as native talent and effort are also important, as well as factors related to social and family capital, contacts, and networking. Normally, however, the information available in household surveys refers to labor market outcomes in terms of years of experience and education, but we lack information on more advanced cognitive and noncognitive skills. Consequently, much of the differences in salaries that we attribute to experience, education, or profession might really be due to unmeasured cognitive and noncognitive skills, correlated with profession or education.

doi: 10.1111/deve.12000

This paper has attempted to overcome this problem by combining two independent databases[1] for Chilean professional salaries, one referring to labor market outcomes, the other to that same person's earlier educational performance and effort. Thanks to this new database, unique in Chile for professional salaries and to our knowledge, elsewhere as well, this paper is able to separate out that part of professional salary differentials due to traditional determinants such as experience, gender, and level of education, from that due to complex and advanced cognitive skills (SAT scores) and important noncognitive skills and behaviors such as self-discipline and effort (measured by one's ranking within one's own high school's graduating class).

The next section of this paper surveys the relevant literature on professional salary differentials within a more comprehensive human capital framework, including findings for Chile. Section III describes the database for this analysis, indicating its advantages as well as shortcomings, and explains the enhanced human capital framework we will use. Section IV presents the results for the Chilean labor market. The final section sets out our main conclusions.

II. LITERATURE REVIEW

A. *Review of the Literature*

The determinants of earnings are without a doubt multiple. It is, of course, relatively uncontroversial that prominent among these determinants is "human capital" (Becker 1964), understood as all those capacities of individuals, cognitive and noncognitive, which contribute to production. More controversial is what constitutes said capacities and how they are acquired.

In the simplest of models (Mincer 1974), the "Mincer equation," said capacities are said to be acquired through schooling (S) and on-the-job learning or the number of years of experience (E); and so earnings, typically the natural log of earnings (y), are a function of both as shown below:

$$y = aS + bE + cE^2 + v, \quad (1)$$

where the second term of E determines whether on-the-job learning is a constant or decreasing function of time or experience and v is the error term.

[1] The labor market data refer to all those professionals who use a major internet intermediary for finding work, Trabajando.com. The educational performance data were provided by the University of Chile's DEMRE, institution responsible for administering Chile's college entrance examinations and which includes test scores, high school grades, the type of high school one attended as well as information on parent's education. We are thankful to both institutions for their confidence and generosity in providing us with the hitherto confidential data which made this research possible.

This model has proven extraordinarily useful and robust in both developed and developing nations (Heckman, Lochner, and Todd 2001), despite, or possibly because of, its minimal information requirements: the number of years of schooling and the number of years of experience. This formulation consistently indicates that there is a solid rate of return to additional years of schooling—of the order of 10%, somewhat higher in developing countries, with experience having a significant impact on earnings, though decreasing over time (the coefficient of the squared value of experience, *c*, being negative).[2]

Yet, this model has been subject to challenges, especially concerning the impact of schooling on earnings. Among the many issues that have been raised, the question arises as to how much of these returns is due to schooling as such and how much is due to other factors, possibly associated with schooling (say, innate ability or parental input). Second, there is the issue of the quality of schooling; not all schools are the same, nor is one year of schooling necessarily equal to any other year—this certainly is the case with college education (prominent in our paper). Third, schooling is at best one of several ways of acquiring and developing cognitive skills. If we could measure cognitive skills directly and relate them to labor force performance—something that has only become possible in the last 20 years, then we could separate the specific contribution of schooling, if any, over and above the individual's measure of cognitive skills. Fourth, the individual's productivity depends not only on cognitive skills, but on noncognitive skills and behaviors, for example, perseverance, self-discipline, dependability, being a team player, which can be acquired and developed at home or at school or be given innately, and which impact later on earnings.

If we had a perfect measure of cognitive and noncognitive skills, earnings and productivity would be a simple function of said skills. Inasmuch as whatever measure of cognitive or noncognitive skills we have will be imperfect, earnings will likely be a function not only of said imperfect measure of cognitive and noncognitive skills, but also of key inputs to the acquisition of said skills, such as innate ability, schooling, experience, and family background.

It can thus be readily appreciated that the Mincer formulation is an incomplete specification of human capital, thus likely to understate the importance of human capital on earnings. Moreover, it is a biased estimate of the impact of schooling on earnings, likely to overestimate the importance of schooling, should other cognitive and noncognitive skills be correlated with schooling.

[2] In Chile, for example, Sapelli (2003) uses the Mincer framework to explain salary differentials. Moreover, he explores the convenience of modeling education by completed levels (completed grade school, high school, and university). On this basis he calculates the rates of return to different levels of educational attainment. He finds positive rates of return to all levels of education, but especially for university education. Moreover, there is a prize for completing the different levels (a "sheepskin" effect).

While measures of cognitive and even noncognitive skills have long been available during the person's schooling, typically these were not normally available for the same persons together with their subsequent labor force performance and earnings. Hence, given the readily available data on years of schooling as well as experience, the Mincer equation has long been used and still continues to be used as a first approximation to the determinants of earnings.

However, measures of cognitive skills over and beyond education along with labor market performance have been becoming increasingly available in recent years. A recent survey of such studies by Hanushek and Woessmann (2008, p.626) concludes: "Nonetheless, we return to one simple finding. Under a wide range of different labor conditions, modeling approaches, and samples of individuals, cognitive skills (as measured by test scores)[3] are directly related to individual earnings and, moreover, there is a consistency even in the point estimates."

A typical finding is that a one standard deviation improvement in test scores of basic skills increases earnings once in the labor market by some 10–12% in developed countries, and possibly more in developing countries. Interestingly, for our purposes, one of the studies based on the International Adult Literacy Survey (Hanushek and Zhang 2009) reports that the returns to a one standard deviation increase in test scores of basic skills for Chile was a 13% increase in earnings.[4] Nonetheless, the measures of cognitive skills were fairly basic tests of literacy and numeracy (IALS) or somewhat more advanced exams, such as the Armed Forces Qualifying Tests (AFQT) and the Armed Services Vocational Aptitude Battery (ASVAB). In none of the studies reported by Hanushek and Woessmann (2008) were earnings related to measures of complex and advanced cognitive skills, such as college entrance scores (SAT), as our study will use.

While the inclusion of a measure of cognitive skills reduces the impact of schooling on earnings, nonetheless schooling continues to have a significant impact on earnings. This no doubt reflects the fact that not all relevant cognitive skills are measured by these tests, thereby leaving schooling as a proxy of additional cognitive skills which such tests fail to pick up.

Finally, earnings depend not only on cognitive but also noncognitive skills and behaviors highly valued by firms in the labor market. Among these are perseverance, postponed gratification, dependability, cooperation, and initiative. The survey of this issue by Bowles, Gintis, and Osborne (2001) draws attention to the fact that the large unexplained variance in earnings not captured by the usual

[3] The parenthesis is our insertion for clarity's sake.

[4] This result was found and reported by Hanushek and Woessmann (2008). It is based on the International Adult Literacy Survey of a sample of 13 countries, including Chile, in 1994 and 1998, where basic skills in literacy and numeracy were tested, together with information on school attainment, experience and earnings.

measures of schooling, experience, and test scores of basic skills leaves ample room for explanations in terms of noncognitive skills and behaviors, such as the above. For example, they point to studies (in the sociological and psychological, not only economic literature) suggesting that individuals with higher incomes have lower rates of time preference and are self directed (versus fatalistic). Similarly, conscientiousness, sociability, perseverance, and leadership have all been found to be associated with higher earnings. Moreover, Heckman, Stixrud, and Urzua (2006) draw attention to the fact that schooling and occupational choice are themselves choice variables, in part dependent on latent cognitive as well as noncognitive skills. Such endogeneity means that much of the effect of cognitive and noncognitive skills on wages is indirect, through its impact on choice of occupation and length of schooling. Correcting for this endogeneity not only raises the impact of cognitive skills on earnings but also that of noncognitive skills, such as self-worth and control over one's life. Indeed, Heckman, Stixrud, and Urzua (2006) conclude that the impact on labor force outcomes of noncognitive skills can be as important as, if not more important than, that of cognitive skills.

In short, while the literature is clear that cognitive and noncognitive skills in the broadest sense should have an important impact on earnings, there is a serious problem in measuring such skills so that, in practice, studies tend to include measures both of such skills as well as of inputs important in the acquisition of said skills. Thus, more generally, one would expect that productive skills in the broadest sense be affected by the quality and quantity of schooling (S), experience (E), one's family (F), measures of cognitive skills (C), measures of noncognitive skills and behaviors (N), as well as other relevant factors (X), such as innate ability among others, as shown in equation (2).

$$y = aS + bE + cE^2 + dF + eC + fN + gX + v'. \qquad (2)$$

In addition the literature has often measured the impact of schooling and experience on earnings after controlling for parental education (a proxy for family inputs to cognitive and noncognitive skills and behaviors). Finally, the recent literature has advanced in identifying the importance of cognitive skills, but, as noted earlier, these have been limited to fairly basic levels of cognition; while the literature on noncognitive skills and behaviors, as indicated above, is suggestive but less definitive.

In the light of the above review of the literature, the potential "value added" in our study arises from the following.

i. Experience will be effective, not just presumed experience (typically estimated by Mincer as one's age less years of schooling less six).

ii. Schooling will not be measured in years, but rather will refer to qualitatively distinct levels of education: high school; postsecondary technician (1–2 years beyond high school); professionals (in Chile typically requiring 5 years of university); and graduate studies, because there is little reason to believe that one more year of schooling is worth the same as any other.

iii. We will distinguish between students' high schools, whether private or public, a potential measure of the quality of high school education (inasmuch as in Chile the expenditure per student in the former is five times that of the latter).

iv. There will be an additional measure of cognitive skills. In effect, we will include scores in the college entrance exams (SAT),[5] examinations that we consider measure more complex and advanced skills than those considered by most of the preceding literature, and the scores in which are thus likely to be a better indicator of future earnings.

v. As a primary measure of a noncognitive skill or behavior we will use the person's grade ranking in his or her own high school graduation class.[6] Our interpretation of this ranking is that it is indicative of a more permanent trait of the individual, such as effort, self-discipline, or perseverance, since (we will discover) it impacts on the labor market 10 years after graduating from high school.

vi. We will determine which of 21 specific professions or occupations[7] pay the most, and which the least, after controlling for the other explanatory variables.

Finally, as noted earlier, we believe that this study is unique in simultaneously combining measures both of advanced cognitive skills (SAT scores) together with noncognitive skills and behaviors (ranking in high school), while controlling for gender, experience, levels of schooling, public or private high schools, and occupation.

B. *Why Chile?*

The first reason why Chile is simply that this is one of the few databases, anywhere, where labor force performance data for postsecondary school educated

[5] The Chilean acronym is PSU, standing for "prueba de selección universitaria" (college entrance examination). However, we will use the English acronym, SAT, since this is better known to international readerships.

[6] Contreras, Gallegos, and Meneses (2009) examine how important high school grades are in Chile in explaining academic performance in the university. This is a suggestive study for they find that being among the better ranked in one's *own* high school is a significantly good predictor of better performance in the first year of university. However, unlike our study, they have no labor force data–earnings, especially with which to measure the impact of ranking in high school on subsequent earnings in the labor force. Similarly, Cohn *et al*. (2004) examine the importance of SAT scores and high school rank on grades in college but, once again, not for earnings, and just for a small sample of students of introductory economics.

[7] Rappoport, Benavente, and Meller (2004) confirm that not only years of study but the field of study or profession is an important determinant of income, some professions paying systematically more than others. As indicated, we will follow them in this regard. However, we will control for far more factors than they, most especially, by educational achievement (SAT) and effort (one's ranking in high school).

individuals, mostly professionals, exist together with measures of advanced cognitive and noncognitive skills, that is, their SAT scores and their relative standing in their high school graduation class. Thus, this database permits us to examine more precisely the role of advanced cognitive and specific noncognitive skills on earnings for an important group in the labor force, that of highly qualified human capital.

Moreover, Chile is of special interest for several substantive reasons.

i. Chile is often considered a "model" economy, in that its multiple reforms in the course of the last 40 years have broadly adhered to the lines of the so-called Washington Consensus:[8] liberalization, privatization, openness, both trade and financial, fiscal and macroeconomic stability, all within the aegis of a free market, private sector driven economy. Hence, its experience becomes all the more relevant for developing countries in the throes of adopting many of the recommendations of said consensus, which, after all, are the recommendations typically made by major international organizations such as the World Bank, the International Monetary Fund, the Inter-American Development Bank, and the Asian Development Bank.

ii. Chile is a middle income "emerging" economy, whose per capita income has tripled in the last 25 years. In this period, per capita growth rates were 2.5 times those for the 25 years before 1985 (4% versus 1.5% per year). Thus we could expect that the results be relevant for other emergent economies in the midst of take-off, especially as it concerns the importance of highly qualified human capital in development.

iii. Chile has experienced fairly stable growth over the course of these 25 years, with only two mild recessions (GNP falling less than 2%), during both the Asian Crisis as well as the recent Global Financial Crisis. Thus the measured returns to education are likely to have less "noise," reflecting long-term, more than cyclical, tendencies.

iv. During the last 25 years, the number of persons enrolled in institutions of higher education (postsecondary) has quintupled, from 200,000 a year in 1985 (or 12% of 18–24 year olds in 1985) to one million in 2010 (well over 40% of 18–24 year olds). Such a vast increase in supply might have been thought to lower the return to higher education, were it not that the stock of physical capital grew at a similarly impressive rate. Thus investments in physical and human capital have proven to be complementary.

[8] This is a crude simplification, for the democratic governments that replaced the Pinochet regime, and ruled from 1990–2010, were critical of its neo-liberal policies and skeptical of the merits of an unregulated economy. Hence, they pursued policies characterized by a more active role of the State, together with policies aimed at redressing income inequalities. All the same, it not unfair to say that they accepted the core of the Washington consensus, albeit a "social democratic" variant thereof.

v. Chile is unique for a bad reason. Its income inequality is inordinately high, the difference between the incomes of the richest 20% and the poorest 20% being of the order of 14 to 1 as compared to half that in the OECD.

Thus, while the results are specific to Chile, we see no reason why they are idiosyncratic to Chile. Rather we expect that similar results will be found in other emerging economies.

III. DATA AND METHODOLOGY

In this section we present our database as well as the methodological framework of the study. The database combines two separate and independent sources for each person, one referring to labor market variables, such as income, gender, and experience, the second to educational variables, such as SAT scores, ranking in high school, type of high school, and occupation. This makes it unique, because the normal household survey provides information solely on labor market behavior, with no information on educational achievement, be it high school grades, one's rank in one's high school or one's college entrance examination scores (SAT). This latter information can be found in scholastic achievement records, but cannot be linked to subsequent labor market behavior, as there is normally no possibility to relate one set of information to the other. However, because, in Chile all adults have a single universal identification (ID) number, we have been able to identify the individual's labor market information and academic record. Thus the uniqueness and richness of our database, although there are limitations (to be pointed out shortly).

Labor sector information is derived not from a household survey, which would not have the person's identification number, but from Trabajando.com, the principal internet labor market intermediary in Chile, which does carry the person's ID number. Such an internet intermediary is especially attractive to persons in their first years of work, with an average experience of 3–4 years; who are for the most part either technicians (one or two years of post high school education) or, even more importantly, professionals (which in Chile implies 4–7 years of university education, depending on the field), some with graduate degrees; and with a bias towards private sector activities (heavily under representing, though not excluding, professions such as medicine and teaching, where the public sector is an important employer). Thus, at any one time, it includes a sizeable proportion (some 13%) of higher level technicians and professionals between 25 and 30 years of age who are looking for work in the private sector.[9] While this dataset has several limitations, it

[9] Close to 170,000 technicians and professionals are to be found in the Chilean labor force's private sector in the age group 25–30. If at any one time one out of four is looking for work (this is a rough average of the rotation rate of the Chilean labor force), this means that some 43,000 are looking for work. Our sample contained some 5,500 higher level technicians and professionals in that age group, so that it means that about 13% of those looking for work were in our sample.

has the unique advantage of allowing us to link the person's labor market behavior to the information on scholastic achievement, the second database, which also has the person's ID number.

This labor market database was combined with the educational information provided by the University of Chile's DEMRE, the department responsible for administering the college entrance examinations to Chilean universities, with information on all those who took the exam between 1992 and 2008. Unfortunately, full datasets are not available for earlier years, so that in practice we are dealing with individuals who graduated from university from 1998 onwards, hence individuals early in their labor force experience. As a result, there is a suitability of match with the labor force sample of individuals applying for work through the electronic intermediary, Tabajando.com, for these are persons, for the most part, under 30 years of age, having entered university some 10–12 years ago.

It is to be noted that currently some 80% of Chilean high school graduates take the college entrance exam. Of these, some 60% (or roughly half of all high school graduates) go on to college. Admission to Chilean universities, and certainly the better ones, is based on a composite of college entrance exams and overall high school grades, the former weighed far more than the latter, normally some 60–70%. There has been a tendency for considerable grade inflation in the last two decades, so that only a national exam, such as the college entrance exams, can distinguish between a low grade from a good school and a high grade from a mediocre one.[10]

This second dataset, provided by DEMRE, thus includes the person's percentile score on the college admission test; the high school, whether private, public, or publicly subsidized;[11] high school grades;[12] and the parent's level of education.

[10] It goes without saying that this is the reason why we have ranked students' grades within their own school and graduating class rather than across schools and years.

[11] Chilean schools are normally separated into three groups: (1) publicly funded and run municipal schools, which educate some 45–50% of Chilean high school students; (2) another roughly 45–50% in publicly subsidized but privately run schools; and (3) privately funded and run schools, which educate some 7% of Chilean high school students. By and large the best schools are the privately run, privately funded schools, where tuition is subsidized to the order of five times what is provided by the government to publicly run or publicly subsidize, privately run schools. Chileans are free to choose among the latter two groups of schools (this is Chile's version of a "voucher" system); but obviously, only the very well to do can afford the privately funded, privately run schools.

[12] Knowing the person's grades as well as high school and year of graduation, we were able to determine the individual's rank in his or her graduation class (more strictly speaking, grade rank among those in both class and high school). Inasmuch as, typically, the better students are those who take the college admission exams, the ranking in one's class among those who take the college exams should be strongly correlated with the grade ranking of all one's classmates. It is to be noted that close to 80% of Chilean high school students normally take the college entrance exams each year.

(However, we decided not to use parental education—except for a footnote—because its inclusion would have lowered the number of observations with a complete data set by over 1,000).

We limited our analysis in the first instance to those who were looking for work in Trabajando.com in early 2009, while currently working "full time" (the normal Chilean work week is 45 hours), leaving out those who were not working, who were working part time,[13] or were still studying. The combination of both data sets provided us with a sample of nearly 7,000 persons (observations), with the full set of desired information, including, especially, current salaries as well as asking salaries. However, we found it interesting also to analyze—especially in the case of women—a group of persons (some 2,600) who had never worked, to see how their asking salaries behaved (a decision which would prove of interest).

Nonetheless, as indicated, our labor force data set has several limitations. It is largely drawn from relatively young persons, using labor market intermediation, initially, though not exclusively, electronically based. They are young persons (mostly under 30), 60% of whom have completed a college education, the rest with a simple high school certificate or one to two years of college. Thus it is especially skewed towards those in their first years of work and in professions largely demanded by the private sector. This latter fact we took as advantageous, because pay in the government is not necessarily in accordance with productivity (see Glewwe 2002).

Nevertheless, there are unknown biases in the type of person who uses such forms of intermediation.[14] Hence, the conclusions, suggestive as they might be, cannot be readily extrapolated to the labor force as a whole. Nevertheless, the possibility of identifying labor market characteristics with educational achievement scores together with rankings in high school makes it a unique combination,

[13] We did not have data on hours of work, so that we considered as not full time workers all those who worked for less than the minimum wage (some US$300 per month); and if they were college graduates, then those who worked for less than 1.6 minimum wages per month. We consider this a conservative assumption which means that in all likelihood we treated as working full time (and thus at very low salaries) some professionals who in fact were working part time, thus in all likelihood lowering the adjusted R^2 of our results.

[14] For example, it is likely that those with better family "contacts" use connections to land jobs, whereas those less favorably placed rely far more to impersonal mechanisms such as electronic intermediation. To the extent that the former tend to be those who attended private high schools—and these are significantly better—our sample would be biased towards the less well off. Similarly, family contacts and networking are especially important in a highly class conscious society such as Chile. Positions and professions that value not only "what you know" but "whom you know" will pay substantially higher salaries than average for such "traits." Thus our sample is likely to be truncated towards the more "meritocratic" positions and placements. To the extent that this was the only bias, our results would still be valid though the parameters would likely underestimate their true values.

certainly in Chile, and, to the best of our knowledge, elsewhere as well. Thus this is a beginning, hopefully an advance, in our knowledge of the determinants of salary differentials for highly qualified persons, but it is hardly definitive.

A. *Descriptive Statistics*

Appendix Table 1 summarizes our descriptive statistics. Some 95% of our sample has less than 30 years of age; 58% are males; 9% of the sample is married; 19% simply completed high school (be it general or technical);[15] 22% are technicians with one or two years of postsecondary education, and the remaining 60% are professionals; 4% with graduate degrees. About 23% of the sample graduated from a privately funded and run high school, not surprising given the preponderance of professionals in our study, and the rest dividing themselves more or less equally (as in the population at large) among publicly funded and run high schools and publicly funded but privately run high schools. The average person in the sample has 3.3 years of effective experience. Finally, not surprisingly (since most were admitted to the university and many graduated), 58% of those in our sample were in the better half of those who took the college admission exams (SAT).

Appendix Table 2 compares our sample with the Chilean labor force as a whole, and more relevantly, the Chilean labor force of 25–30 years of age, the group which makes up close to two-thirds of our sample. As noted, our sample is concentrated in higher level technicians and professionals, these constituting 22% and 60% of our sample, whereas they constitute 10% and 18% respectively of the whole Chilean labor force of 25–30 years of age, and much less of the Chilean labor force as a whole. As for the distribution by gender, our sample has 58% males, just a bit above the 57% of the labor force of 25–30 years of age.

Appendix Tables 3 and 4 indicate the mean, minimum, and maximum scores of all those who took the recent SAT exams in mathematics and language respectively, where 500 is the overall national median, with a standard deviation of 100 points, so that over 700 places one in the upper 2.5% and under 300 places one in the bottom 2.5% of those who took the exam each year. Since those who enter the university tend to have above median scores, the average entrance score in mathematics and language is naturally well above 500, of the order of 580. As can be noted, the highest entrance scores in mathematics are in engineering (civil, electrical, and industrial) and construction. Among the lowest exam scores in mathematics are those for students in public relations and social work. In language, the professions with the highest scores are law, civil engineering, and veterinary science; whereas the lowest scores are those of bachelors in computing and administration.

[15] It is to be noted that about 40% of Chilean students go to technical (vocational) high schools, the other 60% to general high schools.

B. *The Construction of Variables*

In order to render comparable college entrance examination scores from different years, these were transformed into a continuous ranking from 0 (the lowest) to 1 (the highest), where 1 is the highest ranked score in that year, 0.9 the upper 10%, and so on to 0, the lowest ranked score for the year, where the score is the straight average between the scores in the obligatory mathematics and language examinations.

High school grades are ranked, but not with respect to the whole sample, because given the great differences in the quality of high schools, grades are not comparable from one high school to another. Rather, persons' grades are ranked within those who graduated from that same high school that same year, 1 being the top ranked person, 0.9 being one who ranks in the 1st decile of high school, and so on down to 0, the lowest ranked in the graduating class (strictly speaking the rank of those who took the exam that year from that school).

In this way, we can compare individuals of different schools and years of graduation by their rank, either in their college admission scores or in their high school's graduating class. The former, SAT, since it derives from one and the same national exam, presumably is indicative of complex and advanced cognitive skills (due to schooling, innate ability, or parental education). The latter, *RR_HS*, since it ranks students within their own high school's graduating class, could be indicative of relative effort, a noncognitive skill, or of relative knowledge, a cognitive skill. However, once we compare students nationwide, relative knowledge in one's class will be dwarfed by the huge differences in quality between high schools. Hence, should ranking in one's high school prove significant, as in fact it will, this will suggest that ranking is indicative not of a cognitive but of a noncognitive skill, a more permanent trait of the individual, such as relative drive, effort, or self-discipline.

C. *Methodology*

We begin our analysis by replicating Mincer, initially explaining salary differentials simply as a function of experience and level of education. In the very first analysis we shall estimate experience as did Mincer, as age less years of education less six. Subsequently, we shall measure experience directly as reported by our job applicants. Obviously, given that we have effective experience, we shall prefer this latter measure. However, we shall begin with Mincer's measure because this is the typical measure used in most studies, since effective experience is not normally available (whereas it is provided in our database). Thus we will be able to determine the error introduced by this form of indirect measurement, error which is especially critical with young professionals, as in our sample, but which obviously becomes relatively insignificant with people with 20 or more years of experience.

The dependent variable is the natural logarithm of salary explained as a function of experience (*Exp*) as well as the square of experience (Exp^2) and the level of education (the latter disaggregated into five dummies ($D_{1i}Edu$), corresponding to general high school education, technical high school education, postsecondary technical, professional, and graduate studies). We will use the earnings of a technical high school education as our baseline level of earnings, so that the effect of all variables will be by how much they raise earnings above the baseline level.

In subsection IV.B we shall examine the importance of our unique database, that is, advanced cognitive skills (rank in college admissions' exam, $D_{3j}SAT$), and noncognitive skills (rank in graduating class in high school, $D_{4k}RR\_HS$). We shall do this by seeing how the results of the Mincer equation (experience and level of education) are modified and improved by the incorporation of our measures of cognitive and noncognitive skills. Moreover, we will do this after controlling for gender ($D_2Gender$), where 1 stands for males, because as is well known, female salaries—like levels of education and experience—tend to be considerably lower than those of men. Hence, in this section we shall be explaining salary differentials in terms of equation (3):

$$\ln Y = BExp + CExp^2 + D_{1i}Edu + D_2Gender + D_{3j}SAT + D_{4k}RR\_HS, \quad (3)$$

In subsection IV.C we will determine the return to 21 specific professions while controlling for gender and the normal Mincer variables, along with two other control variables: marital status ($D_5Marital$), where 1 stands for married; and the types of schools ($D_{6l}Depend$), where l stands for whether privately funded and run or publically funded and run, or whether publically funded but privately run. Occupations are disaggregated into 21 specific professions ($D_{7m}Profession$). Thus, in this section we will be testing equation (4) as follows:

$$\begin{aligned} \ln Y = {} & BExp + CExp^2 + D_{1i}Edu + D_2Gender + D_{3j}SAT + D_{4k}RR\_HS \\ & + D_5Marital + D_{6l}Depend + D_{7m}Profession, \end{aligned} \quad (4)$$

where $i = 1, \ldots 5$; $j = 1, \ldots 10$; $k = 1, \ldots 10$, $l = 1, \ldots 3$; $m = 1, \ldots 21$.

IV. RESULTS

A. *Difference in Experience: Estimated versus Effective*

One of the advantages of our data set is that experience is not estimated *a la* Mincer, as age less years of schooling less six, but is, in fact, taken as directly reported in the curriculum vitae of each person. This is important, for while the normal professional degree requires five years of full time study in

TABLE 1

Effective versus Estimated Experience (% of sample with given number of years of experience)

Years	Experience	
	Effective	Estimated
0	1.7	2.5
1	16.8	9.5
2	36.2	21.8
3	52.0	36.6
4	79.0	53.7
5	87.8	62.5
6	92.0	75.9
7	94.8	85.0
8	97.2	90.0
9	98.1	94.2
10	99.3	96.2
15	99.9	99.6
20	99.98	99.9
25	100	
26		100
Mean	3.5 years	4.8 years

Chile,[16] many actually take longer than that to complete their studies. Moreover, not everyone enters the labor market immediately upon graduation. As a result there is a significant discrepancy between effective and estimated experience, which will affect the estimates of returns to education and experience. This effect will, of course, be more important among young persons with little experience, as those in our sample.

As expected, and as shown in Table 1, the average experience of our sample as estimated by the Mincer formula is significantly larger, 4.8 years, whereas effective experience averages 3.5 years. This, of course, is due to the fact that many considered to be working according to the Mincer estimate, either took longer in their studies than the minimum time required, and/or took longer to enter the labor force and find work than the Mincer estimate allows. For example, whereas according to the Mincer estimate of experience less than 37% of our sample would have three years or less of experience, in point of fact close to 52% of the sample had three years or less of experience. While these differences will naturally become relatively less significant over one's entire

[16] In point of fact some professions (listed as bachelors) require four years, whereas others, such as the engineering professions, require six, and medicine (not listed, because physicians do not normally use this mechanism for finding work) require more than seven years.

TABLE 2

Simple (Mincer) Model of Return to Experience and Level of Education (Dependent variable is the natural log of salary; 6,997 observations)

Variables	Coefficients	
	Estimated Experience (a la Mincer)	Effective Experience (as reported)
Experience	0.06***	0.024***
Experience^2	-0.002***	NS
High school (general)†	NS	NS
Postsecondary technical†	0.12***	0.08***
Professional†	0.71***	0.63***
Post graduate†	0.99***	0.85***
Adj R^2	37%	34%

† The increases in salary due to educational level are all as compared to a technical high school education.
*** represents statistical significance at the 1% level.
NS = not significantly different from zero.

professional lifetime, they are significant in the beginning years, as can be observed in Table 1.

Hence, the use of Mincer's estimate of experience, that is, age less number of years of education less six in equation (1), naturally biases the results. As noted in Table 2, the regression of salary on experience and level of education using the Mincerian estimate of experience, while showing all of the correct signs for experience and level of education, overstates the importance of experience almost by a factor of two and a half, as compared to effective experience actually reported. In this simplest model, for example, the first year of experience increases earnings by 2.4% when we use effective experience, whereas according to the Mincer equation's estimate of experience, the first year of experience would increase earnings by 5.8% ($6\% - 1^2 * (0.002)$). Correspondingly, the use of the Mincer estimate of experience instead of reported experience affects significantly the importance of the variables concerning educational level, though, as we shall see immediately, they will continue to be statistically significant in the equation of effective experience.

As indicated, with our use of effective experience all of the variables have the expected signs (Table 2, column 2). But there are differences. Not only does the return to experience diminish, but it ceases to show diminishing returns (though in a fuller model, in subsection IV.C, it will exhibit diminishing returns—hence, we will not comment on it further in this section).

As for education, while the results between using estimated versus effective experience are similar, in all cases the returns to level of education[17] are somewhat lower when we use effective experience rather than by using Mincer's method of estimating experience. In neither case does a general high school education show any significant salary differential with that of a technical, that is, vocational, high school education. (It should be noted that all the results are measured against our baseline level of earnings, the salary of someone with a technical high school education.)[18] Thereafter, there are positive returns associated with postsecondary education, but the returns using effective experience are always somewhat lower. Thus, postsecondary education technicians earn 8% more than those with a high school education (as compared to 12% when we use Mincer's estimate of experiences). Professionals earn 63% more (as compared to 71%) and those with a graduate degree 85% (as compared to 99%) more than those with a simple technical high school education.

As a result, the use of effective experience rather than estimated experience not only lowered the returns to experience (markedly) and to education (somewhat) but it also lowered our R^2 from 37% to 34%. We confess to being somewhat surprised by this result, for we had expected the use of effective experience to improve our explanation of salary differentials. Whatever the reason for this result,[19] consistent with the precept that one must use the best data and not explain it away, the rest of this paper will use reported versus estimated experience.

[17] It is important to note that our sample is not fully representative of simple high school graduates. Rather it is of high school students who took the college entrance exams. Since 40% of those who only hold a high school diploma did not take the SATs, our sample of only high school graduates is likely truncated to the better high school students. As a result the returns it shows to professional and graduate degrees probably provides rates of return to professionals lower than the normal Mincer estimates, which includes in this group all persons in the labor force with only a high school degree. In point of fact, our estimate is probably closer to the real rate of return for those with the ability to go on to college but do not (what Mincer really should aim at measuring, but does not).

[18] Both general high school and technical (vocational) high school education last four years. Though it is normally considered that the technical high school diploma is inferior, if only in the sense that it tends to draw on scholastically less able students, our results show there to be no significant differences in earnings, if the high school degree is the terminal degree. Obviously, as is likely the case in Chile, if a general high school prepares one better for college, then a vocational degree might be inferior in that respect. However, we were unable to test this issue.

[19] One explanation might be that not all experience is similarly valued by employers, so that not all years of experience have the same value. In a sample of a few years of experience this different "quality" of experience may introduce much variance in salary differentials. A second reason is that people may choose to report only what they consider to be "relevant or favorably relevant experience" so that a lot of "noise" is introduced in reported experience, especially when dealing with a sample with relatively few years of experience. These are just starters. Readers, we are sure, will have additional explanations of their own.

B. *The Importance of Cognitive Skills (SAT Scores) and Noncognitive Skills (Ranking in High School)*

The most interesting part of our study, however, has to do with the relationship between salaries and cognitive and noncognitive skills, not just educational levels, because, to our knowledge, no studies, certainly none in Chile, have examined the combined effect on professional salaries, over and above experience and educational levels, of higher SAT scores (advanced cognitive skills) and one's ranking in high school (as we shall argue, a proxy for noncognitive skills). In our view, SAT scores are apt to measure different or more advanced aspects of cognitive skills than level of education as such or of basic measures of competency (such as IALS) used in studies cited earlier in this paper for Chile.

SAT scores may impact on earnings in at least three ways, the first two indirect, the last direct. First, higher SAT scores impact indirectly on earnings to the extent that admissions to study for the better paying professional degrees generally require higher SAT scores.[20] Indeed, there is a significant (37%) correlation between SAT scores and the economic return of the different professions, the average SAT scores of those in the better paying professions (as determined in the next section) being 0.4 standard deviations higher than the rest. Second, higher SAT scores are definitely required for entrance to the better universities, so that again higher SAT scores impact indirectly on earnings by allowing one to enter a better university, thus with prospects of earning considerably more upon graduation. Third, over and above these effects, higher SAT scores could impact on earnings directly to the extent that they indicate greater cognitive skills regardless of profession.

Second, we wish to determine if there is any impact on salaries due to one's high school grades. Given the large differences in quality between Chilean high schools and the wide variance in grading policies between schools, absolute grades mean little. Hence, we have ranked each student's grades within his or her own high school and graduating class, under the hypothesis that such a ranking might tell us something of significance about the person's relative effort or self-discipline. Were there to be such an effect in the labor market some 10 years after graduation from high school,[21] this would corroborate our hypothesis that ranking in one's high school class indicates some more permanent, normally unobservable, trait of the individual, such as relative effort, drive, or self-discipline. In short, one's ranking in one's high school graduating class would serve as a measure of an important *noncognitive* skill or behavior.

[20] Moreover, even where SAT scores are not formally required by a university for entrance, those professions with higher SAT scores are perceived as more difficult, thus scaring off those with lower SAT scores.

[21] Recall that the average person in our sample graduated from high school some 10 years ago.

Before running the test, we have decided to control for gender, an exogenous variable. It is well known that, in Chile as well as elsewhere, there are significant salary differentials between men and women of similar abilities. This is so for a variety of reasons, be they cultural in nature, a matter of choice, or outright discrimination. Hence, to facilitate comparisons with the Mincer equation we have first added gender to the Mincer equation's variables of experience and level of education; and then compare these results with those of equation (3), which add cognitive (SAT) and noncognitive skills (high school ranking), to see if these latter variables provide any additional impact not already picked up by level of education.

Inasmuch as women tend to be paid less for equal levels of education, as expected, the inclusion of gender in the Mincer equation improves the results, raising the overall adjusted R^2, from 34% to 36%. As seen in Table 3 (column1), consistent with studies in Chile[22] and elsewhere, men earn 15% more than women for the same level of education and experience (more on this later). The inclusion of gender in the Mincer equation not only improves the explanatory power of the model, but it mildly modifies the coefficients of experience and level of education. The contribution of each year of experience to salaries declines somewhat, from 0.024 to 0.021, whereas the returns to level of education remain virtually the same.

The inclusion of our measures of additional cognitive (ranking in SAT scores) and noncognitive skills (ranking in one's high school's graduation class) proves statistically significant, the explanatory power of our model increasing from 36% (Mincer and gender) to 40% (see Table 3, column 2). The coefficient of experience increases markedly, from 0.021 to 0.035 (more in line now with other studies in Chile); and experience now shows mildly, but significant, diminishing returns (the coefficient of Exp^2 is significant and equal to a negative 0.001, again in line with other studies in Chile and elsewhere). The returns to levels of education remain statistically significant, albeit with somewhat smaller coefficients.

SAT scores (it is a ranking) prove to be strongly significant, suggesting that these scores reflect a measure of cognitive skills not picked up by level of education. The coefficient indicates that the difference in salary due to being the top ranked versus the lowest ranked person on the SATs is 42%, an amount only somewhat less than that between being a professional and a simple high school graduate (52%).

In an effort to more closely ascertain the importance of one's SAT scores, that is, whether its impact was linear or exponential with rank, we tested equation (3) but using the different percentile ranks on the SAT. As can be observed (Table 3, column 3), income increases in nonlinear fashion: no significant effect is observed

[22] Almost all studies in Chile find that women, especially professionals, earn of the order of 10–15% less than men, after controlling for education and experience. See, for example, Fuentes, Palma, and Montero (2005) and Uribe-Echevarría (2008).

TABLE 3

The Impact of Additional Cognitve and Noncognitive Skills on the Mincer Equation Controlling for Gender (Dependent variable is the natural log of salary; 6,997 observations)

Variables	Coefficients		
	Mincer and Gender (1)	Mincer, Gender, SAT, and HS Ranking (2)	Mincer, Gender, SAT, and HS Ranking by Decile (3)
Mincer variables:			
Experience	0.021***	0.035***	0.037***
Experience^2	NS	–0.001***	–0.001***
High school (general)	NS	NS	NS
Postsecondary technicians	0.08***	0.07***	0.07***
Professionals	0.63***	0.52***	0.53***
Post graduate	0.84***	0.69***	0.68***
Gender:			
Male	0.15***	0.14***	0.14***
Cognitive and noncognitive skills:			
Relative ranking SAT		0.42***	
Relative ranking in high school		0.03**	
Rankings by decile (relative to 1st decile):			
2d and 3d decile SAT			NS
4th decile SAT			0.07***
5th decile SAT			0.10***
6th decile SAT			0.11***
7th decile SAT			0.15***
8th decile SAT			0.21***
9th decile SAT			0.30***
10th decile SAT			0.41***
10% decile HS ranking			0.03*
Adj R^2	36%	40%	40%

***, **, and * represent statistical significance at the 1%, 5%, and 6% level, respectively.
NS = not significantly different from zero.

among the lower three deciles; the 6th decile of SAT scores increases income by 11%; the 9th does so by another 19%; and the 10th decile alone increases income by another 11%, to 41%. In terms of standard deviations the first five deciles or somewhat over three standard deviations increase income by 10%; the next standard deviation above the average (3 1/3 deciles) increases earnings by about 14%; and the second standard deviation above the average increases earnings by some 17%, from about 24% to 41%. Thus the overall impact of SAT scores on earnings is sharply nonlinear, in contrast to the effect of about 13% per standard deviation found by the International Adult Literacy Survey study of 13 countries, including Chile, reported by Hanushek and Woessmann (2008). This difference in results is, of course, consistent with the hypothesis that SAT scores measure, as we have argued, fairly advanced and complex cognitive skills, whereas the former literature referred to the effect of fairly basic cognitive skills.

As noted, ranking in one's own high school graduation class also has a statistically significant, albeit modest, impact on salary, other things being equal, the difference in salary between the highest ranked and lowest ranked graduate of one's high school raises one's salary by 3%. This is an important finding, to our knowledge never before reported in the literature, which corroborates our hypothesis that ranking in one's own high school graduation class picks up a more permanent, noncognitive trait or behavior, such as self-discipline, perseverance, or drive, which is recognized by the market as an asset, and thus leads to a higher salary.

It goes without saying that the importance of ranking in high school has important implications for public policy. Admission to university and one's field of study is heavily dependent, at least in Chile, on one's scores in the SAT. The finding that rank in one's high school graduating class registers a relevant noncognitive trait suggests that university admissions' policies should also include one's ranking in high school.[23] Otherwise, very talented people are likely to be overlooked. This is especially important in strongly unequal societies, like Chile.

As earlier noted, the returns to level of education remain significant, though with somewhat smaller coefficients. Inasmuch as this equation includes SAT scores, this suggests that level of education includes cognitive skills not included in SAT scores (for example, knowledge of other disciplines or of a foreign language) or, as suggested by Bowles, Gintis, and Osborne (2001), education enhances noncognitive skills or behaviors valued by firms, for example, dependability, cooperation, self direction, and postponed gratification.

The return to professional education is high despite the opportunity cost in experience (5–6 years of study), raising professional salaries—other things being equal—by 52% (Table 3, column 2).[24] Moreover, it is to be kept in mind that these are young professionals, so that the gap in salaries is likely to widen considerably over the next 20 years of their professional lives as compared to its beginning. Similarly, postsecondary technical education raises salaries 7%, more than the opportunity cost in reduced experience of the one or two years of additional education these technicians require.

Finally, and not surprisingly, a graduate degree enhances one's salary significantly. Those possessing a graduate degree earn 69% more than high school

23 Indeed, the Chilean universities have recently decided to include such ranking as one of the criteria of admission as of 2013.

24 In effect, five years of education means five years less of work experience. Hence, one foregoes increased earnings due to experience of some 20%, well under the increased earnings of 52% that professionals earn.

graduates, 17 percentage points more than the average professional. Partly, this reflects that graduate education has an opportunity cost in experience. Nevertheless, this 17 point premium over the average professional degree suggests that there is a payoff well above the possibly two years of additional study required.

C. *The Returns to Education by Occupation*

To the extent that one's profession signifies acquiring a very specific set of complex cognitive skills, one's occupation may explain salary differentials over and above the advanced cognitive skills signified by SAT scores. Nevertheless, because occupation is a choice variable possibly correlated with unobserved attributes themselves related with earnings, one cannot unambiguously interpret the results of a regression of salaries on occupation and the earlier variables as the rate of return to the specific, advanced cognitive skills entailed by occupation. It could be the case that the higher or lower salary attached to an occupation is indicative not so much of more (less) complex and advanced cognitive skills as of greater (or lesser) intrinsic social or personal satisfaction (as may be the case with teaching or literature, design or architecture).

Nevertheless, a regression of salary on occupation can describe (not necessarily explain) the occupations that pay more or less than average. Given our data on 21 specific occupations, the regression we run will determine how much more or less than the average professional salary each of these occupations pays, controlling as well for marital status and the type of high school attended (whether private or not), as in equation (5) below.[25]

$$\begin{aligned} \ln Y = {} & BExp + CExp^2 + D_{1i}Edu + D_2Gender + D_{3j}SAT + D_{4k}RR\_HS \\ & + D_5Marital + D_{6l}Depend + D_{7m}Profession, \end{aligned} \quad (5)$$

where $i = 1, \ldots 5$; $j = 1, \ldots, 10$; $k = 1, \ldots 10$; $l = 1, \ldots 3$; $m = 1, \ldots 21$.

As can be observed in Table 4, the inclusion of this broader set of human capital variables raises the adjusted R^2 from 40% to 44%. Experience rebounds in importance, the first year of experience, at least at this early stage in life, increasing salaries by 3.9% (4.2% − $1^2*(0.0018)$), while experience manifests diminishing returns, the second term, Exp^2, being significant and negative, −0.0018.

[25] Parental education was also used as a control variable as a proxy for family inputs to the youngster's cognitive and noncognitive skills, not picked up by our measures of cognitive (SAT scores) and noncognitive skills (ranking in high school). We did not include it in the above regressions for it reduced the number of observations by over 1,000. In any case, for this somewhat smaller set of observations it proved to have a statistically significant, albeit slight (1%) impact on salaries. Since the remaining coefficients were only slightly affected, we chose to leave it out altogether in order to have a larger set of observations.

TABLE 4

The Return to Specific Professions in a Comprehensive Human Capital Model (Dependent variable is the natural log of salary; 6,997 observations)

Variables	Coefficients
Mincer and gender:	
Experience	0.042***
Experience^2	–0.0018***
High school	NS
Technical profesional	0.07***
Professionals	0.49***
Post graduate	0.65***
Male	0.11***
Controls:	
Married	0.09***
Graduate of privately funded and run high school	0.14***
Cognitive and noncognitive skills:	
1st through 3d decile SAT	NS
4th decile SAT	0.07***
5th decile SAT	0.10***
6th decile SAT	0.11***
7th decile SAT	0.13***
8th decile SAT	0.18***
9th decile SAT	0.24***
10th decile SAT	0.32***
10% best HS ranking	0.04***
Occupations:	
Accounting	NS
Agronomy	NS
Architecture	–0.10*
Bachelor in administration	NS
Bachelor in public relations	–0.09*
Bachelor in publicity	–0.09***
Business and economics	0.15***
Civil engineering	0.38***
Computing engineering	0.12*
Construction	0.24***
Design	–0.21***
Electrical engineering	0.22***
Engineering	0.12***
Industrial engineering	0.23***
Bachelor in informatics	0.17***
Journalism	–0.20***
Law	NS
Psychology	NS
Social work	–0.10*
Teacher	–0.22***
Veterinarian	–0.20***
Adj R^2	44%

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively. NS = not significantly different from zero.

The remaining variables, level of education, cognitive and noncognitive skills, and gender, remain statistically significant with very similar coefficients to those in equation (3) of Table 3, column 3. This suggests that, despite the fact that occupation is a choice variable, in all likelihood it largely reflects the acquisition of an even more advanced and complex set of cognitive skills that translate into higher earnings. While we favor this interpretation, which, if true, means that one could interpret the results of this section in causal terms—as the determinants of salary differentials, we proceed more conservatively, and treat the results of this section as simply descriptive of salary differentials.

As might be expected, there is a large dispersion in professional salaries (see Table 4).[26] A first group, including the engineering professions as well as business and economics, pays well above the average professional salary. A second group, including accounting, agronomy, law, and psychology, does not significantly differ from the average professional salary. Finally, a third group, including architecture, design, journalism, teaching, and social work, earns significantly less than the average professional salary.

By definition, there will always be dispersion about any average. What is more interesting is the fact that the professions in each group are largely what most people believe to be the case, as shown by the asking salaries (see Table 5). Moreover, the entrance requirements of the better paying professions are greater (as can be seen in Appendix Tables 3 and 4), where the correlation between entrance scores and pay is 0.37. This finding is certainly consistent with the belief that the better paying professions are more demanding and develop more specific, complex, and advanced skills (our favored interpretation). However, and alternatively, as suggested by Frank (2004), some professions, say teaching, may provide more intrinsic satisfaction than others (say, business), thus requiring less money to compensate. This is a matter left up in the air. For now, it is simply to be noted that there are very significant differences in the returns to education by profession, even after controlling for multiple factors, including SAT scores and ranking in one's own high school.

As for our other principal control variables, these are statistically significant and have the expected signs. First and sadly, but consistent with previous studies in Chile, gender discrimination is of significance: women earn less than men, some

[26] It is important to recall as noted earlier that while most professional careers take five years in Chile, some (engineering) require more, others (the bachelor's) less. Hence, because they require at least six years of study, the engineering professions should pay at least some 4% more (the opportunity cost of one year of experience) than normal professions. In point of fact, the two most important engineering careers in Chile, civil and industrial engineering, have salaries well above that of the average professional (38% and 21% respectively), whose degree normally requires five years of study.

TABLE 5

Differentials in Asking Salaries, Limited to Those Who Have NEVER Worked (Dependent variable is the natural log of asking salaries; 2,596 observations)

Variables	Coefficients
Mincer and gender:	
Experience	–
Experience^2	–
High school	–0.10**
Technical profesional	0.14***
Professionals	0.56***
Post graduate	0.82***
Male	0.07***
Controls:	
Married	0.17***
Graduate of privately funded and run high school	0.18***
Cognitive and noncognitive skills:	
2d through 7th decile SAT	NS
8th decile SAT	0.12*
9th decile SAT	0.15**
10th decile SAT	0.24***
10% best HS ranking	0.07**
Occupations:	
Accounting	NS
Agronomy	NS
Architecture	NS
Bachelor in administration	NS
Bachelor in public relations	NS
Bachelor in publicity	–0.39***
Business and economics	0.23***
Civil engineering	0.37***
Computing engineering	0.30**
Construction	NS
Design	–0.31***
Electrical engineering	0.44***
Engineering	NS
Industrial engineering	0.21***
Bachelor in informatics	–0.30**
Journalism	–0.21***
Law	NS
Psychology	–0.10*
Social work	NS
Teacher	–0.20**
Veterinarian	NS
Adj R^2	40%

***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.
NS = not significantly different from zero.

11% less (see Table 4 again). It has, of course, been suggested (Frank 2004) that part of the differential between the salaries of men and women is spurious, due to the fact that women choose professions (the so-called caring professions) that often pay lower salaries. Hence, what is especially striking with the above regression result is that this 11% salary differential due to gender holds even *after* controlling for 21 specific professions (Table 4).

Equally striking, and we believe this is the first time this result is reported in the literature, women's *asking* salaries or salary pretensions, and limited to women who have *never* worked,[27] again after controlling for the same variables as above, including the 21 specific professions, are significantly below those of men without experience, by some 7% (Table 5). Moreover, since few women technicians and professionals first entering the labor market will have children, we can discard as an explanation that they have lower asking salaries because they are asking for flexible hours to be able to better care for their children.[28]

Hence, this leads to three possible interpretations. First, women may be aware of wage discrimination against them and so fully adjust their asking salaries in acceptance of the "cruel reality." Second, their asking salaries may be based on what their friends are known to receive. To the extent that most of their closest friends are likely also women, their asking salaries thus adjust to labor market conditions as they perceive them, thereby indirectly adjusting to existing wage discrimination. Either of these first two interpretations would be associated with wage discrimination against women. The third is independent of wage discrimination. According to this third interpretation, the lower asking salaries of women who have never worked is due to the fact that women may be more risk averse than men, and so have lower salary pretensions in order to land the position.

Second, we have included marital status as a control variable. This could be relevant for any of a variety of reasons. For example, people may marry only after they achieve a certain minimum salary, in which case the (possibly) higher earnings of the married would not arise from their marital status, but simply be a case of endogeneity in our formulation. Alternatively, married persons, having greater family needs, may also feel more responsible, and so, work harder or be more dependable, and, importantly, such noncognitive skills or traits are known to be recognized and rewarded by their employers in the form of higher earnings. As the regression in Table 4 discloses, married persons earn more (9%) than those who are single.

27 We have chosen to limit asking salaries to those who have never worked, because, to the extent that asking salaries depend on current salaries, it would not be surprising that those who earned less (women) ask for less. Hence, by limiting the analysis to those who have never worked, we eliminate this possible explanation for lower asking salaries.

28 Indeed, as indicated earlier, other things being equal, the married ask for more than the single.

Buttressing the interpretation that being married is a proxy of a noncognitive behavioral trait, dependability or harder work, is the fact that married persons who have never worked have significantly higher *asking* salaries than the single, some 17% higher, other things equal (Table 5). In this case, it is not that they marry because they have a higher salary, for they have never worked. Rather, being married seems to be an exogenous variable that induces them to ask for, and expect to be paid, a higher salary. It thus seems more reasonable to believe that they consider that the market recognizes and values this likely greater dependability and effort on their part.

Third, a variable of importance to be considered in explaining salary differentials in Chile is the type of high school one attended. It is generally the case in Chile that privately funded and run high schools are much better than the rest, so that attendance at one increases one's cognitive skills. In effect, private schools[29] spend (and charge) some five times what publicly funded schools spend per student (roughly US$500 per month versus US$100 per month in publicly funded schools, be they privately or publicly run). As a result of this, only some 7% of the school age population attends privately funded and run schools. Nevertheless, given that our sample consists of highly qualified human capital, it is to be noted that close to 25% of our sample attended these schools. The other 93% of the population (75% of our sample) attend publicly funded but privately run high schools or publicly funded and run schools, normally considered of lesser quality.

The value of attending a better high school may already be incorporated in the complex cognitive skills (SAT scores), level of education, and occupation, which our study includes. Though a better high school education might be important in securing any of the above, it might not provide any further benefit. Nonetheless, the regression results presented in Table 4 indicate that, other things being equal, graduating from a privately funded and run high school increases one's salary by 14%, the equivalent of four years work experience.[30]

Inasmuch as SAT scores were included in this regression, the payoff to private schools, over and above higher SAT scores, would need to be attributed to some other factors, cognitive or otherwise, that enhanced earnings. For example, private schools might provide better foreign languages or communication skills, which

[29] The evidence for this is derived from the results on college entrance exams as well as the results of test scores on nationwide examinations of high school students by the Ministry of Education.

[30] Though not shown in the Table, we also find that there is no significant difference in earnings whether one attended a privately run or publicly run, publicly funded school. This is an important finding, for it is often considered in Chile that publicly funded but privately run schools are better than the publicly funded and run schools. Hence, parents undergo significant effort to place their children in these schools, at times contributing additionally (20–30%) to the public subsidy for their children's education. Our results would suggest that this does not translate into market measurable benefits.

increased one's human capital and salary beyond that shown by SAT scores. Moreover, attendance at private schools might provide a significant *networking* effort, which impacts on earnings. Hence, the result, though important, is open to different interpretations. In any case, it reveals dramatically one of the consequences of life in a highly unequal, class-ridden society.

It is interesting to note that attendance at private high schools, other things being equal, also leads to significantly higher *asking* salaries of those who have *never* worked[31] (Table 5), and of the same order of magnitude, 18%, as those already working. This suggests that persons are aware of the better skills or contacts that they possess because of attendance at a privately funded and run high school and so have higher asking salaries and expect to be rewarded accordingly.

Finally, it is interesting to note that higher SAT scores, at least in the upper three deciles, raise the *asking* salaries of those with the same occupation but who have never worked before (Table 5). This suggests that individuals are aware of their greater cognitive skills and incorporate them in their asking salaries; equally important, employers recognize at least the upper third of said scores (possibly reflected in higher rank in graduation from college, an observed variable for would-be employers) and reward these characteristics accordingly.

Similarly, other things being equal, the asking salaries of those in the top 10% of their high school graduating class but who have never worked before are 7% higher than for the rest. Once again, this suggests that being higher ranked in high school is a proxy for a noncognitive skill, such as self-discipline or drive, that tends to show up in better performance in college (possibly higher rank in ones' college graduating class) and so is rewarded by employers and incorporated in the asking salaries of its holders.

V. CONCLUSIONS

It is a well established fact that salaries vary in accordance with a person's human capital. However, most measures of human capital are limited to information derived from labor market or household surveys, normally referring to one's experience, level of educational attainment, and profession.

While this paper is fully in the human capital tradition, it is innovative in including enhanced measures of cognitive and noncognitive skills. SAT scores are considered indicative of advanced cognitive skills, whereas one's professional field *may* also be indicative of additional, specific, and even more complex cognitive skills.

[31] Once again we note that we have restricted this analysis to the asking salaries of those who have never worked to rule out that the greater asking salaries of graduates of private high schools is due to their having higher current salaries.

As for noncognitive skills, we interpret ranking in one's own high school graduation class as indicative of important noncognitive skills. Given the enormous differences in quality between different high schools as well as the grade inflation present within schools, grades by themselves mean little when comparing across all individuals. However, if the ranking in grades in one's high school graduation class, that is to say, when compared to one's fellow classmates in one's own high school, were to impact on earnings 10 years down the line, as proved to be the case, this would be indicative of a more permanent trait, a noncognitive skill, such as relative effort, drive, and/or self-discipline valued by firms in the market.

The results of this paper bear out both presumptions. Other things being equal, including being a professional, higher SAT scores lead to significantly higher salaries. Indeed, the effect is of the same order of magnitude as the difference between the salaries of professionals and high school graduates. The effect is markedly nonlinear, however. There is no significant salary difference among the lower 30% of SAT scores; the salary premium to an SAT score in the 6th decile is 11%; and that to the top decile is 41%. Yet in the final analysis, the finding that SAT scores measure advanced cognitive skills and as such are a significant determinant of salary differentials among professionals, while important and, to our knowledge, never before reported, is hardly surprising.

Equally important, but more surprising and, to our knowledge, never before reported in the literature, though hinted at, is our finding that, over and above the effect of cognitive skills on salaries, one's grade ranking in one's own high school has a positive impact on one's salary some ten years after graduation, suggesting that ranking in one's own high school is picking up a noncognitive skill or behavior of the person, such as relative effort, drive, or self-discipline. We find this salary premium to be 3–4% over and above that associated with level of education and advanced cognitive skills, or the equivalent of one year of additional experience.

The inclusion of these two variables, the one for cognitive skills, the other for a noncognitive skill or behavior, allows us to examine salary differentials among occupations within a more enhanced human capital framework. As in previous studies, salaries are found to be positively associated with experience, level of educational attainment, and profession. More specifically, the engineering professions, as well as business and economics, pay well above the average professional salary. Inversely, teachers and journalists among others earn significantly less than the average professional. Moreover, graduating from a privately funded and run high school has a high payoff, signalling the acute differences in the quality of high school education associated with differences in family incomes in Chile, as well as the possible networking effect that attendance at such schools provides.

Finally, other things being equal, controlling for a multiplicity of variables including the different composition of professions between the sexes, women earn 11–14% less than men. This simply corroborates the established fact that gender discrimination continues to exist in Chile. What is new and significant is the finding that the *asking* salaries of women, even of those who have never worked before, are also significantly less than those of men (by 7%), this after controlling for the same ample set of variables as before. However, whether this be a further consequence of gender discrimination in the labor market or whether it show women to be more risk averse than men remains an open question.

While these results need not be readily and immediately transferrable to other emerging economies, the relative stability of Chile's growth since the onset of the "Chilean miracle" 25 years ago means that the results are less subject to "noise" arising from economic and political instability. Hence, we would be surprised if most of the results did not hold elsewhere in the developing world. In any case, we would hope that these results invite others to replicate, modify or, indeed, refute them elsewhere. Such comparative studies would enrich our understanding of labor market performance in emerging economies.

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APPENDIX

APPENDIX TABLE 1

Descriptive Statistics

Variables	Observations	Mean	S.D.	Min.	Max.
Salary (monthly in Chilean pesos; Ch$500 ≅ US$1)	6,997	497,767	267,614	159,000	2,000,000
ln*Salary*	6,997	13.211	0.521	10.820	15.895
Experience effective (average years)	6,997	3.314	2.246	0	25
Experience estimated (average years)	6,997	4.753	3.217	0	26
High school	788	0.113			
High school (technical)	496	0.071			
Technical professional	1,533	0.219			
Professionals	3,905	0.558			
Postgraduate degree	275	0.039			
Married	598	0.085			
Men	4,077	0.583			
Graduate of publicly funded and run high school	2,519	0.360			
Graduate of publicly funded but privately run high school	2,812	0.403			
Graduate of privately funded and run high school	1,591	0.227			
Accounting	255	0.036			
Agronomy	75	0.011			
Architecture	52	0.007			
Bachelor in administration	139	0.020			
Bachelor in public relations	50	0.007			
Bachelor in publicity	80	0.011			
Business and economics	504	0.072			
Civil engineering	34	0.005			
Computing engineering	27	0.004			
Construction	70	0.010			
Design	88	0.013			
Electrical engineering	28	0.005			
Engineering	655	0.094			
Industrial engineering	108	0.015			
Bachelor in informatics	126	0.018			
Journalism	147	0.021			
Law	71	0.010			
Psychology	164	0.023			
Social work	50	0.084			
Teacher	53	0.008			
Veterinarian	35	0.005			
Relative ranking SAT	6,997	0.580	0.248	0.005	0.999
Relative ranking in high school	6,997	0.580	0.248	0.005	0.999

APPENDIX TABLE 2

Comparative Statistics: Our Sample and the Chilean Labor Force

Indicators	Chilean Labor Force (Ages 15–70)	Chilean Labor Force (Ages 25–30)	Our Sample (Largely Ages 25–30)
Less than high school completion	36%	23%	0%
Completed high school	44%	49%	18%
Completed superior technical education	8%	10%	22%
Completed university studies	12%	18%	60%
% male	60%	57%	58%

Sources: Our estimates for the Chilean labor force on the basis of information provided by the CASEN household survey of 2009 (CASEN survey stands for Encuesta de Caracterización Socio-Económico Nacional). Our sample values are, of course, hard data, not estimates.

APPENDIX TABLE 3

Scores on College Entrance Exam in Mathematics (500 is the median, with a standard deviation of 100)

Variables	Mathematics				
	Obs.	Mean	S.D.	Min.	Max.
Civil engineering	34	713.7	95.5	412	820
Electrical engineering	28	700.1	75.9	545	850
Industrial engineering	108	699.2	75.4	435	820
Construction	70	675.4	118.3	362	803
Architecture	52	660.1	89.6	371	778
Veterinarian	35	648.3	78.4	396	759
Computing engineering	27	643.0	101.8	404	786
Business and economics	504	641.7	98.5	338	820
Law	71	619.7	87.7	399	804
Engineering	655	615.0	110.3	328	820
Agronomy	75	609.8	104.2	317	795
Psychology	164	598.2	118.0	273	812
Journalism	147	577.3	113.7	316	803
Accounting	255	567.2	108.4	308	795
Teacher	53	556.4	98.1	353	737
Design	88	552.7	122.1	316	786
Bachelor in informatics	125	549.2	108.5	334	822
Bachelor in publicity	80	547.0	108.2	291	814
Bachelor in administration	139	514.8	99.3	258	759
Social work	63	490.4	94.3	319	754
Bachelor in public relations	50	467.9	96.7	301	726

APPENDIX TABLE 4

Scores on College Entrance Exam in Language (500 is the median, with a standard deviation of 100)

Variables	Language				
	Obs.	Mean	S.D.	Min.	Max.
Law	71	660.3	69.3	465	777
Civil engineering	34	645.0	77.8	448	782
Veterinarian	35	638.1	67.7	447	731
Electrical engineering	28	629.8	62.8	523	754
Architecture	52	619.8	84.4	368	767
Journalism	147	619.1	88.7	396	775
Psychology	164	615.0	98.0	314	799
Construction	70	598.6	91.1	387	746
Industrial engineering	108	596.3	85.3	362	754
Business and economics	504	591.0	87.7	314	825
Computing engineering	27	583.5	94.1	367	767
Agronomy	75	582.1	91.4	366	756
Teacher	53	572.9	95.6	314	804
Bachelor in publicity	80	559.3	93.3	296	744
Engineering	655	556.7	93.0	295	775
Social work	63	550.2	104.2	354	733
Design	88	549.2	101.0	322	763
Accounting	255	522.1	92.1	281	737
Bachelor in public relations	50	518.6	85.4	346	738
Bachelor in informatics	125	512.5	96.9	288	717
Bachelor in administration	139	508.5	88.5	339	746