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Working Papers / Documents de travail

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WP 2014 - Nr 29

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July 7, 2014

Abstract

We investigate the effect of height on earnings, occupational choices and a subjective measure of well-being among Indonesian men. We explore the extent to which height captures the effects of human capital endowments set before entry on the labor market. Cognitive skills, co-determined with stature early in life, do not explain much of the height earnings premium directly. Yet, human capital more broadly, including cognition, educational attainment and other factors related to parental investments and background characteristics, explains around half of the height premium and does so through occupational sorting. Indeed, taller workers tend to have more education, and educated workers tend to work in more lucrative occupations that require brain and social skills, not brawn. The unexplained share of the height earnings premium reflects other labor market advantages of taller workers, including psycho-social dimensions. We also find a height premium in happiness, half of which simply accounts for the educational and earnings advantages of taller workers.

Key Words : Height, cognitive skills, physical skills, childhood conditions, earnings, occupation, happiness.

JEL Classification : I15, J24, O15

* **Acknowledgements** : Bargain and Zeidan are affiliated to Aix-Marseille University (Aix-Marseille School of Economics), CNRS & EHESS; Bargain is also affiliated to IZA. We are grateful to Charles Lai Tong and Ali Zidane for their precious help. Usual disclaimers apply. Corresponding author: olivier.bargain@univ-amu.fr

1 Introduction

The past decade has witnessed a remarkable interest amongst epidemiologists and economists in exploring the association between socioeconomic conditions and height. Stature is considered by some authors as a proxy for the biological standards of living, indicating how well the human organism thrives in its socioeconomic and epidemiological environment primarily during childhood and adolescence (Komlos, 2003). Children who suffer from malnutrition and chronic health issues fall short of their growth potential and become shorter adults.[1] More generally, height is sometimes used as a proxy for the development level of a group, following the observation that citizens of more developed countries are on average taller (Hatton, 2013) or, within a country, that the rich are on average taller than the poor. Poor environmental conditions indeed reflect in a population's average stature, so that variation in height captures fundamental inequalities of opportunities between human beings.[2]

Importantly, it is often difficult to unpack the complex association between height and *adult* life outcomes such as earnings, occupational status and overall well-being. Childhood circumstances and environmental exposures not only determine final height but also strongly condition an adult's educational attainment, earnings potential, cognitive skills, physical and mental health (Currie 2009). Competing but complementary explanations on the precise channels through which height relates to later life outcomes have been set forth and usually involve "brawn" versus "brain" theories. Indeed, the association between height and earnings has traditionally been explained by a productive advantage of taller workers due to greater *strength* (and, more generally, a better health). Although this argument is especially persuasive in economies that rely on physical labor (Haddad and Bouis, 1991, on the Philippines, or Thomas and Strauss, 1997, for Brazil), it also holds in other contexts. For instance, a positive association has been established between stature and health status or strength among Swedish men (Lundborg et al., 2014, and Tuvemo et al., 1999). Alternatively, height may simply capture *cognitive skill* developments insofar as both body size and cognition are both determined by the same early life conditions (health, care, nutrition). The idea is that for a given genetic potential of height,

[1] Numerous essays in anthropometric history and cliometric research, exploring the secular changes in living standards, have suggested using biological measures like height as complements to conventional indicators of well-being (Baten and Komlos, 1998; Steckel, 1995, 2009). Some authors have even proposed to substitute the life expectancy component of the Human Development index (HDI) by height since information on life expectancy is often unavailable or of poor quality (Costa and Steckel, 1997; Crafts, 1997).

[2] This is well-documented in rich countries (Persico et al., 2004; Case and Paxson, 2011). Yet, height may even be a better indicator in developing countries because of greater variability in early life conditions (see Strauss and Thomas, 1998; Vogl 2014). See also another, independent study on Indonesia by LaFave and Thomas (2013).

those who reach a greater stature also tend to achieve higher cognition levels. This theory is well suited for developed countries, where lucrative occupations are rather associated with intellectual abilities, and supported by evidence from the UK and the US (Case and Paxson, 2008a, 2008b). Case and Paxson (2008a) show for instance that $30 - 50\%$ of the height premium can be attributed to cognitive ability measured in childhood and youth. In poor environments, this magnitude is likely to be smaller – yet cognitive skills may nonetheless play a role in determining income and income distribution as argued by Hanushek and Woessmann (2008) and demonstrated by Vogl (2014) or Behrmann et al. (2010) in the case of Mexico and Guatemala respectively. Early life conditions may lead to higher wages and better employment prospects through the way they affect cognitive capacities but also, indirectly, through its reinforcing effect on education, be cognitive skills and education complementary factors.[3]

This paper investigates the relationship between height and adult life outcomes in a relatively poor country, Indonesia. As argued above, there is, as yet, limited evidence on the role of cognitive skills, rather than physical skills, in explaining the height premium in developing countries. Our study consolidates existing knowledge by exploring the extent to which height captures the effects of endowments set before entry on the labor market, i.e. cognitive/physical skills, educational attainment and other factors related to early life conditions and parental investments. We focus on objective outcomes in adult life, such as earnings and occupational choices, as well as on a broader and more subjective index of well-being. Our analysis benefits from a wealth of information drawn from the Indonesia Family Life Survey (IFLS), including data on anthropometric measures, labor market outcomes (earnings and sector of occupation), health and mental well-being, parental characteristics and early life conditions (place of birth and sanitation in childhood dwelling). Moreover, the IFLS (fourth wave) is one of the rare datasets from a developing country to provide cognitive test scores (recall tests), as well as questions that allow us to proxy whether each worker's occupation requires cognitive, physical or social skills. This set of variables provides a unique chance to unveil the nature of the height premium and notably the role played, directly or through the mediation of occupational sorting, by cognitive/physical/social skills and human capital.

Our results can be summarized as follows. Focusing our analysis on adult working men, in order to avoid issues of selection into work, we find a height earnings premium of around 2% per centimeter of height. This is larger than estimates for developed countries (e.g., Case and Paxson, 2011), which is consistent with higher variability in childhood conditions in low income countries (see Strauss and Thomas, 1998; Vogl 2014). Early life

[3]Other explanations complete this picture and pertain to the labor market advantages of being taller (self-confidence, social skills, discrimination), as discussed below.

conditions, a common determinant of height and cognition, actually explain a quarter of the returns to height and a third of the returns to cognitive skills in earnings equations. We do not find that body size is a mere proxy for cognitive skills: cognition explains only a small share of the height wage premium directly (between 10% and 20% depending on the place of birth). This may be due to the limited role of cognitive skills in a poor economy, as conjectured above, or to the narrow scope of the measure we use (fluid intelligence). Cognitive skills and human capital more generally may in fact play a much greater role on earnings, yet indirectly through higher educational attainment and occupational sorting. Indeed, taller workers tend to have more education, and educated workers also tend to work in more lucrative occupations that require brain and social skills, not brawn. In fact, nearly half of the height premium in earnings is explained by occupational sorting, which itself is entirely (partly) mediated by human capital for entry in the governmental (formal private) sector. These results are strikingly similar to recent evidence on Mexico (Vogl, 2014) and suggest some regularities in the way cognitive skills and education shape the relationship between height and labor market outcomes, consolidating our knowledge of the mechanisms at work in developing countries. In addition, a direct, independent effect of height on earnings remains after all controls are included. This may reflect what data cannot control for and in particular labor market disadvantages of shorter workers (e.g., more exposure to discrimination). We also find a significant height premium in happiness. Half of it is explained by the earnings and educational advantages of taller workers, pointing to a more general role of human capital on human happiness than its mere contribution to labor market attainments. The remaining, unexplained part suggests a role for psycho-social aspects such as direct well-being effects of being tall on self-confidence and self-esteem.

The rest of the paper proceeds as follows. Section 2 reviews the determinants of height and the reasons behind observed correlations between height and various adult outcomes. Section 3 describes the data and the empirical approach. Section 4 investigates the association between height and labor market outcomes among Indonesian working men, focusing on earnings and occupational statuses, and the association between height and self-assessment of happiness. Section 5 concludes.

2 Background

2.1 Determinants of Height and Early Life Conditions

A great deal of variation in stature is genetic. The infant's size at birth is mainly the product of maternal genes whereas the rapid growth later is coded by paternal genes.

Nonetheless, reaching one's full potential of growth is much influenced by intra-uterine and early childhood conditions, with the perinatal periods being of a particular importance. Precisely, final body height is achieved as the result of a combination of genetics and a stock variable embodying environmental conditions and gene-environment interactions. In a widely cited review, Silventoinen (2003) shows that in modern Western societies, about 20% of the variation in adult height was due to environmental factors, whereas this proportion is probably larger in poorer countries, with lower heritability of body height and socioeconomic factors playing a greater role.

Environmental conditions thought to affect growth patterns include factors such as social class, parental education, birth weight, maternal smoking during pregnancy, and even family structure.[4] However, the most important early life factors that influence adult body height are nutrition and exposure to infections, with *synergistic* interaction between these two factors (Scrimshaw et al. 1968). As a matter of fact, the secular trend toward increased height observed in many countries was imputed to improvements in nutritional intakes and reduction in infection diseases during childhood (Cole, 2003).[5] An individual's stature reflects cumulative growth from birth to maturity, with particularly two major growth spurts: from birth to the age of three and during adolescence (see Beard and Blaser, 2002). Children's health and nutritional environment appear to be of particular importance in the first period. At this early point of the life course, nutritional needs are the greatest and the rate of human growth is faster than at any time therafter. Recent evidence shows that adult height is significantly influenced by contiguity to basic food sources such as grain, vegetables, milk and meat products, which explains much of the height advantage of rural communities (Baten and Murray, 2000; Baten, 2009). Similarly, gastrointestinal and respiratory infections can be recurrent and serious in infants and young children. In addition to restricting the body's ability to absorb nutrients, these diseases may also limit growth through other mechanisms such as triggering immune responses that are metabolically demanding or raising cortisol levels which impairs protein synthesis (Crimmins and Finch, 2006). Studies from UK birth cohorts have shown that severe illnesses during infancy can reduce adult height by as much as 1–2 cm (Kuh and Wadsworth, 1989; Power and Manor, 1995). At this stage, we can conclude that variation in adult height within a country is certainly a good indicator of unequal life conditions during childhood.

[4] Hatton and Martin (2010) find that sibship size reduced average height either directly through overcrowding or by diluting family income (and food consumption) per capita. They conclude that the falling family size was responsible for two-fifths of the increase in children's heights in the UK between 1906 and 1938.

[5] As regards Indonesia, Baten et al. (2010) show that average height growth after World War II is related to improvements in food supply and the disease environment, particularly hygiene and medical care.

2.2 Early Life, Height and Adult Human Capital

A burgeoning economic literature attests to the long-lasting effects of nutrition and health shocks that occur in utero or at the beginning of life, not only on physical growth but also on cognition, physical strength, human capital investment and other determinants of economic outcomes in adulthood.

Height and Cognitive Skills. Maccini and Yang (2009) find a positive impact of early-life rainfall on a range of adult outcomes in rural Indonesia. Women living in regions with above average rainfall during their early years have become taller adults, lived in wealthier households and attained higher schooling levels. The beneficial impact of rainfall on crop production, and therefore household income and food availability, has indeed translated in a greater ability for parent to provide their infants with nutrition and medical inputs. Similarly, Black et al. (2007) use variation between identical twins to identify the effects of birth weight, a measure of prenatal life conditions, on long-run outcomes in Norway. They find that a 10% advantage in birth weight is associated with an extra 0.6 centimeter in height by age 18, but also a 1 percentage point gain in the probability of high school completion and a premium in IQ scores by approximately one third of a standard deviation. Similar results are found for young British adults in Richards et al. (2002), confirming that height and cognitive development may share genetic, environmental and even chemical antecedents (attributed to thyroid and pituitary glands by their respective hormones, cf. Berger, 2001, and Richards et al., 2002).[6] Greater stature is found to be linked to higher test scores in children from diverse settings as evidenced in Ecuador (Paxson and Schady, 2007), the UK (Case and Paxson, 2008a), Peru (Berkman et al., 2002) and the Philippines (Mendez and Adair, 1999). This relationship also holds for adults (Abbott et al., 1998, Richards et al., 2002, Case and Paxson, 2008b, and Maurer, 2010).

[6] Previous research on the etiology of this correlation have used within and cross-twin correlations between fraternal and identical twin pairs to determine the relative importance of genetic attributes and shared environment. Beauchamp et al. (2011) found that the height-IQ correlation in Swedish twins was due to both shared environmental factors (explaining 59% of the association) and overlapping genetic effects (explaining 31% of the association). Similar partitions of the covariation of the height-IQ association were established in a sample of conscripted Norwegian twin males by Sundet et al. (2005). Nutrition is considered to be one of the key environmental conditions both affecting height and cognitive abilities in low-income populations. Growth-retarted children who had been provided with nutritional supplements performed better on test scores during the periods of supplementation (Grantham-McGregor, 2002; Walker et al., 2005). In Guatemala, nutrition supplements given to children during the first three years of life improved their height, test scores, and academic performance as opposed to those who did not receive supplements (Martorell et al., 2005).

Height, Strength and Health. There is less evidence relating physical strength and early life conditions. Some studies point to positive relationships between muscle strength and birthweight (Dodds et al., 2014). More studies address the returns to strength and their relation to height. In the introduction, we have argued that a positive association between height and physical strength (or health, more generally) in adulthood was more in line with the literature on developing countries, notably the often cited studies of Haddad and Bouis (1991) and Thomas and Strauss (1997) (for a slightly different anhtropometric endowment, i.e., body mass, see also Pitt et al., 2012). There is nonetheless some evidence of a height premium assigned to greater physical capacities of taller individuals also for developed countries. Lundborg et al. (2014) use data from the Swedish military enlistment register over the period 1984-1997 to estimate wage regressions on height, physical strength, cognitive and non-cognitive skills. They attribute 80% of the observed height premium in men to their physical capacities.
In Vogl (2014) for Mexico and Behrmann et al. (2010) for Guatemala, earnings advantages belong to workers with higher cognitive skills, who also tend to be taller, whereas the seminal study of Thomas and Strauss (1997) suggests this seems to be the case only in the market sector in Brazil while strength premium prevails among low-skilled, self-employed workers. As regard to health more generally, Batty et al. (2009) summarize the potential pathways relating adult health to stature and conclude to a mixed effect of height in this respect. In particular, while height is consistently inversely related to overall mortality risk and heart disease, the association between height and cancer is generally positive.

Height and Education. Given that environmental factors experienced around the time of birth that influence a person's height may also affect her intelligence, strength and health, it is not surprising that height is associated with a wide range of adult outcomes over the life course. In particular, taller individuals may achieve better labor market outcomes (like higher earnings or better job prospects) because of better cognitive abilities but also, indirectly, because of higher education levels. Indeed, enhanced cognition improves the returns to schooling and induces parents in investing more in child education. Higher educational attainments of taller people are observed in various contexts such as Brazil (Strauss and Thomas, 1998), India (Perkins et al., 2011), Sweden (Magnusson et al., 2006) and both the US and the UK (Case and Paxson, 2011). We shall see that this aspect is crucial in our empirical investigation on Indonesia. As summarized by Case and Paxon (2008a), poorly nourished children and those who suffer from diseases might not reach their full cognitive potential, which in turn may lead to deteriorated health and poorer educational attainment. Being taller when a teenager also means better appraisal of one's own worth, which is particularly important when acquiring non-cognitive skills (social adaptability and other abilities related to social interactions).

2.3 Height and Well-being

There is a growing literature on the association between stature, cognitive/physical skills and labor market outcomes both in industrialized countries (e.g. Lundborg et al., 2014, Lindqvist, 2012, on Sweden, Case and Paxon, 2008a/b, or Persico et al., 2004, on the UK and the US) and developing economies (e.g., Thomas and Strauss, 1997, on Brazil, and Haddad and Bouis, 1991, on the Philippines). In contrast, there is a relative paucity of research on the effect of height on more general measures of welfare and adult life achievements, including mental health and emotional well-being.

Rees et al. (2009) find a positive relationship between height and psychological well-being (fewer symptoms of depression) among US adolescents. With respect to adults, Deaton and Arora (2009) identify a more favorable life evaluation of taller persons using the Gallup-Healthways Well-Being Index daily poll of the US population. Taller people are less likely to experience sadness, more likely to report happiness and enjoyment, though they feel anger and stress more frequently. The literature has so far identified channels through which height may affect subjective well-being, yet evidence is mixed. Deaton and Arora (2009) assign the major part of the more favorable life evaluation to the higher education and earning levels of tall individuals. However, Montgomery et al. (2007) and Osika and Montgomery (2008) find a positive effect of height on individual mood, even after controlling for individual earnings. They actually suggest a more complex explanatory pattern which involves other factors, including the effects of early-life inputs on mental health and in particular the long-lasting effect of nutrition during childhood.

Height may also have direct effects on happiness related to social factors. Particularly, height has a bearing on the way others perceive us and may also influence how we regard ourselves (self-esteem is addressed by Judge and Cable, 2004). Tallness is often seen as a desirable physical trait, and studies show that physical appearance affects one's psychological adjustment just as "the halo that good looks might impart to a person independent of the effects of beauty on any market-related outcomes" (Hamermesh, 2011). Carriera and De Paola (2012) find that the well-being of younger Italian adults is positively affected by height after controlling for their economic and health circumstances. The authors attribute this result to the greater relevance of psycho-social aspects, notably the role of physical appearance in social interactions among younger people.[7] These aspects

[7] Shorter people may be penalized on the marriage/partnership market in societies where height is associated with a good look (Batty et al. 2006). This is particularly appropriate for men. Studies indeed

as much as indirect channels like education and earnings have rarely been studied in the context of developing countries. Different social norms and possibly different roles of the explanatory channels in this context warrant greater investigation and motivate our analysis hereafter.

3 Empirical Approach

3.1 Data

Our data comes from the Indonesia Family Life Survey (IFLS) conducted by RAND in collaboration with the University of Indonesia. IFLS was first fielded in 1993 by sampling approximately $22,000$ individuals of $7,224$ households living in 13 of the 26 provinces of Indonesia, which, in total, represent 83% of the Indonesian population. Latter waves were conducted in 1997, 2000 and late 2007, with a high re-contact rate of over 90.6% of the original IFLS1 households, including those relocated and the 'split-off' households (the longitudinal survey tracks a large fraction of household members who have moved out of their original households and re-interview them in their new households in the follow-up surveys). As a result, the IFLS has the appealing characteristic of having very low attrition rates compared to standard longitudinal datasets (see Thomas et al., 2001, about the first three waves and Strauss et al., 2009, about the fourth one). The analysis in this paper uses the latest wave for year 2007 (IFLS4), the only wave to provide individual data on all the life outcomes required for our investigation. Data from other waves is also used in order to construct variables in relation to childhood conditions and socio-economic background. Given the large rate of formal inactivity among women, we restrict our analysis to working men in order to avoid issues related to endogenous selection into labor market participation. The initial sample size consists of $13,820$ men. We also avoid selection into education or retirement by focusing on men aged 25-65 (which excludes 29.4% of the initial sample). We then take out men with no declared occupation, in education, disabled or in military service (5%). We also drop observations with missing or outliers for height measurement (2%), annual earnings (3%), as well as other missing dependent or independent variables (3%), which gives a working sample of $7,878$ observations (i.e. around 57% of the initial sample).

show men's tendency to prefer women who are shorter than themselves, while women tend to favor taller mates (Pawlowski et al., 2000), because height is associated with handsomeness or seen as a proxy for social status (Barber, 1995).

3.2 Empirical Approach

Our analysis consists in running a series of estimations that unveil the role of height in explaining adult labor market outcomes (earnings, occupations) and overall well-being. We disentangle the direct role of height, notably labor market advantages of taller workers, from the indirect channels captured by the height premium. Height may indeed capture the effect of human capital variables codetermined during childhood, like cognitive skills, or more generally reflect individual-specific background characteristics, early-life environment and parental investments in health, nutrition and education. These correlates of height may also affect earnings indirectly through occupational sorting and notably by determining an individual's selection into activities that require brain, brawn or social skills. We review here the different variables of interest for this analysis.

Outcomes: Earnings, Occupations and Subjective Well-being. Our choice of adult-life outcome variables is very much in line with other studies on the association between height and adult achievements in developing countries (essentially Vogl, 2014), namely earnings and occupations. The main income variable we use is the logarithm of individual annual earnings. In the employment module, respondents were asked about the characteristics of their primary and secondary jobs as well as the amount of annual salary they have received from these activities during the past year. In case of missing information, we refer to the survey module about family characteristics, where the household head is asked about the annual earnings of each family member. The combination of these elements provides an income variable with relatively few missing values. Annual earnings may reflect work effort, making it a choice variable. Hence, we replicate our regressions using hourly earnings, using information from the employment module on the number of weeks (per year) worked by an individual in his main job as well as the usual number of hours worked per week. Unfortunately, data regarding this information often contains outliers and missing elements, leading to a much smaller sample. For this reason, estimations based on log hourly earnings are simply used as a check of the validity of our main results on annual earnings hereafter.

As regard to occupations, subjects were asked which category best describes their job. We use answers to sort workers into four main categories: informal workers, entrepreneurs, public sector employees and private sector employees. We refer to the definition of informality used by the *Biro Pusat Statistik* (BPS, the National Statistic Bureau), which defines seven categories to distinguish formal from informal workers.[8] Those considered in informal employment are own account workers, employers assisted by temporary worker,

[8] Badan Pusat Statistik (2010): http://dds.bps.go.id/eng/

casual workers in agriculture or other sectors, and unpaid family workers. Formal workers are registered employees or employers assisted by permanent workers. Among the three categories of formal sector workers, the first one consists of the self-employed with permanent worker, which we extract and classify as entrepreneurs. The second one consists of all civil servants and workers in public firms. The third comprises all registered employees in the private sector. In addition, we recover questions that help to categorize the skill requirement of the job occupied by each worker in our data. Precisely, workers are asked whether their job requires "lots of physical effort" (physical ability), "intense concentration/to work with computers" (cognitive skills) or "skill in dealing with people" (social skills).

Apart from labor market outcomes, we consider other dimensions of adult life for which height may play a role. We focus on a broad measure of well-being using self-reported, subjective information from the data. Individual assessment of current happiness is derived from the question: "*Taken all things together, how would you say things are these days - would you say you were: 1.Very happy, 2.Happy, 3.Unhappy, 4.Very unhappy*". While labor market conditions seem to be an objective measure that allows assessing the direct and indirect effect of stature on adult life, this subjective question marks one of the most final outcome we may think of, human happiness. We test hereafter how height may directly affect individual happiness once codetermined factors (like cognitive skills), other correlates (education) and the effect of objective outcomes (earnings, occupation) are taken into account.

Height, Skills and Early Life Conditions. The main explanatory variable of interest in our study is height. The anthropometric record of the survey provides measurements of height recorded by specially trained members of the field team. These measures were collected for all adults selected for detailed interviews, following accepted international standards. Our variable "height" is continuous and measured in centimeters.

Cognition scores were computed using a word recall test, which measures episodic memory. In the test, respondents were read slowly a list of ten nouns and asked to repeat as many words as they could recall in any order, immediately and then with a delay (12 to 15 minutes later, after other, unrelated questions were asked). Four lists of words were used, which were randomized across individuals within the household, so that one person could not learn from another's experience. The average number of correctly recalled words over both attempts is a measure of cognition that ranks from 0 to 10. Episodic memory is "a very general measure of an important aspect of fluid intelligence since access to memory is basic to any type of cognitive ability" (McArdle et al., 2009).[9] This is a useful measure

[9] This is different from Vogl (2014) who uses the Raven's Colored Progressive Matrices (CPM) ques-

for our purpose, even if it does not capture very comprehensively all the dimensions of cognition.[10] This is indeed a short test leading to a possibly noisy measure of cognitive abilities. Moreover, it reflects early-life cognitive development but also schooling and possible cognitive reinforcement in adulthood, for instance from having an occupation that demands memory or cognition more generally. These potential caveats must be kept in mind when interpreting our results hereafter.

We explicitly account for the role of early-life conditions by using a fairly comprehensive set of socio-economic background factors. It includes the place of birth, parental education and sanitation in the childhood dwelling. More precisely, in the migration section of the individual questionnaire, all individuals were asked if they were born in a village, small town or a big city. This should capture access to public goods in urban environments but also pollution and many other aspects of the rural-urban divide. As regards to parental education, two sources were used to compute the corresponding variable. For individuals whose parents are living in the same household in at least one wave of the survey, we used available information on the highest level of education for the present parents. Other individuals were asked about the characteristics of their non-coresident parents, including their highest level of education. A categorical variable is constructed using the maximum of the father's and mother's highest education levels. A variable is used on the dwelling sanitary conditions where an individual has lived during childhood (a dummy equal to 1 if the dwelling was surrounded by either human and animal wastes, piles of trash, stagnant water or if the dwelling had no sufficient ventilation, 0 otherwise). However, the inclusion of this variable considerably reduces the number of observations because its construction requires that the person has lived during his childhood in the same residence as the current one for at least one of the four waves of the IFLS survey.

Other Explanatory Variables. We additionally control for usual individual characteristics such as age (in years), its squared value, dummies for province of residence and for different ethnic groups. Since health conditions may be a potential important determinant of earnings and well-being, and as it may also reflect childhood health environment that influences both adult height and adult life conditions, we control for the self-reported health status. The health section of the questionnaire asks people about their own health as being either "*1. Very healthy, 2. Somewhat healthy, 3. Somewhat unhealthy, 4. Un-*

tions. The latter evaluate an individual's ability to recognize patterns through identification of the missing elements that best match the incomplete patterns. The Raven test is available in the IFLS for individuals aged 7 to 24 only.

[10] For Indonesia, LaFave and Thomas (2013) nonetheless show that the variance in word recall scores explains 40% of the variance in Raven scores. They also show very similar correlations between both measures of intelligence and height.

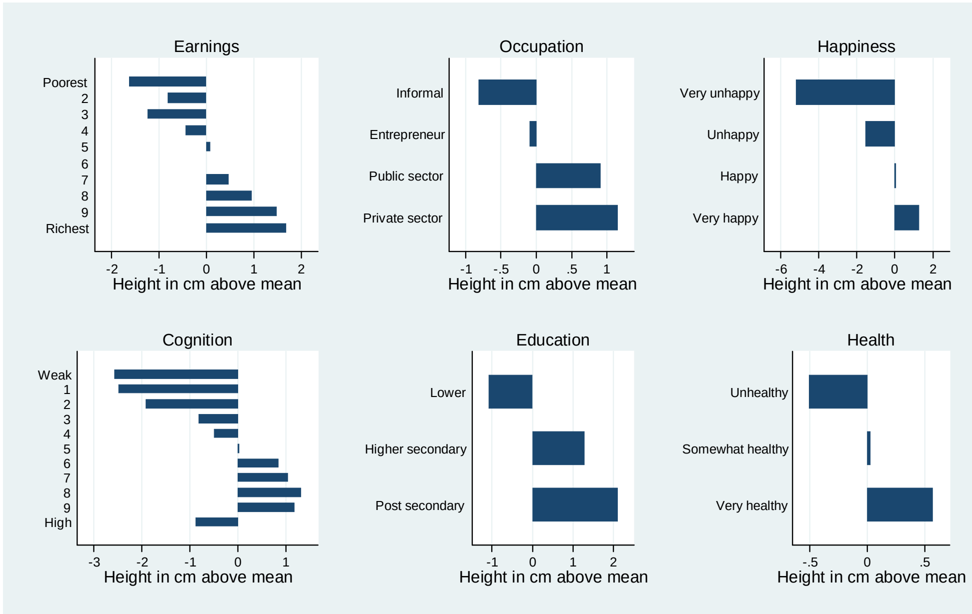
healthy".[11] We have also experimented with objective measures of health, namely dummies for different chronic illness, and results were broadly unchanged. Education is also a mixed variable, i.e. a variable that is shaped by the individual's environment and genetic characteristics but also influenced by household choices. The highest level of education attended is used to create a variable following the International Standard Classification of Education (ISCED 97). In the reference category, kindergarten, primary education and lower secondary education were grouped together. The second level, *higher secondary*, contains senior high school, Islamic high school and vocational education. Higher levels (college and university) were categorized as *post secondary*.

3.3 A Preliminary Look at the Data

Descriptive statistics are reported in the Appendix Table A.1. On average, workers in our selected sample are 39 years old, are 1.62 meter tall (standard deviation of 6.5 cm) and score 4.9 on the 10-point cognition scale. Average annual earnings is roughly $PPP 640, mean hourly wage is $PPP 0.6, and around 8% (6%) of the selected Indonesian males declare to be happy or very happy (very unhappy) in their life. A majority of workers are in the informal sector (55%) and a third in formal private employment. Around 63% of workers are in "brawn" occupations, characterized as requiring "lots of physical effort", while only 8% are in occupations that require to work with a computer.

Figure 1 illustrates the association between height and key variables, either adult life outcomes, like earnings and happiness, or codetermined human capital factors (cognitive skills, education and health). Occupation is somewhat intermediary as it is both an outcome of interest and a channel through which height or its correlates may affect earnings. The bar charts in the first row unveil a systematic advantage in favor of taller workers, who enjoy higher earnings, better jobs (governmental positions or formal sector employment) and more happiness. Precisely, men in the richest group are more than 1.7 cm taller than their peers while those in the lowest income decile are approximately 1.6 cm shorter than their peers (after adjusting for age). Men in the informal sector are 0.8 cm smaller than the mean (adjusted for age). Men who report being "very unhappy" are on average 5 cm smaller than the mean while the "very happy" are 0.7 cm taller. These results are much in line with the literature that associates individual height with labor market outcomes (e.g., Case and Paxson 2008a/b, Vogl, 2014) or happiness (e.g., Deaton and Arora, 2009), as extensively discussed in section 2. In the second row of Figure 1, we see that height is positively associated with cognition, education and health. The rest

[11] Due to the small proportion of people choosing the "unhealthy" answer (8 observations), we have aggregated categories 3 and 4 into a single "Unhealthy" category and recoded the answer as new categorical variable ranging from 1 "Unhealthy" to 3 "Very healthy".



Notes: the first graph presents the deviations of height by deciles of annual earnings. The remaining ones show deviations by occupation, happiness levels, cognition scores, education groups and health status. All graphs (except for happiness) were adjusted for age since height varies with age.

Figure 1: The Association Between Height and Various Outcomes.

of this study unpacks the height premium in adult life outcomes (earnings, occupation, happiness) by extracting the relative role of these human capital factors.

4 The Returns to Height

4.1 Height and Earnings

Estimations of the log individual annual earnings on height are reported in Table 1.[12] All regressions control for demographics including age, ethnic group and province of residence. Column 1 shows the coefficients from a regression with only the demographic controls whereas the remaining columns successively add height and other covariates of interest, including health, cognitive scores and background characteristics. The effect of height in column 2 is very significant and including height increases the R-squared by 21% compared to column 1. The coefficient on height indicates that each additional centimeter in height

[12]We focus on semi-elasticities by using a linear effect of height, as in Case and Paxson (2008a) and Persico et al. (2004) for industrialized countries or Vogl (2014) for Mexico. Very similar patterns are obtained with other specification including the log of height or a quadratic form. Linearity is convenient for interpretating how the height effect varies with the addition of codetermined variables like cognitive skills.

is associated with earnings gains of 2.5%. Appendix Table A.2 reports the same set of specifications with the estimates of the log hourly earnings instead of log annual earnings. As hinted at above, these additional results aim to account for possible differences in working time, yet estimations can be replicated only on a subset of observations for which worked hours and months were available. Despite a halved sample size, results point to the same direction as before, with each additional centimeter in height being associated with approximately 2% increase in hourly earnings. This shows that variation in working time across Indonesian men does affect our conclusions regarding the existence of a pay premium in height.

This height premium is larger than estimates obtained in more developed contexts such as the US and the UK (e.g., 0.8% per cm of height in Case and Paxon, 2008a). However, it is strikingly similar in magnitude to the height premium found in Mexico by Vogl (2014) or in the Philippines by Haddad and Bouis (1991). Such a regular pattern for poor and middle income countries consolidates our knowledge about height as a proxy for the level of development. In particular, Vogl (2014) suggests that the marked difference in the height effect between developed and developing countries may be attributed to the greater variance in early life experiences in developing countries, characterized by more unequal life conditions. Our results for Indonesia, a country with more homogenous life conditions than Mexico, seem to suggest the other, alternative explanation put forward by Vogl. That is, there may simply be larger returns to skill (as approximated by the returns to height) in poorer regions of the world.[13]

We add health assessment in the column 3 of Table 1. While health conditions are related to height in an ambiguous way, the coefficient on height appears not to be affected by this inclusion. More important for our demonstration, column 4 adds our cognitive test score, a variable codetermined with height during childhood. Cognition has a very significant effect and it increases the fit of the model very substantially (the R-squared increases by 36%, a similar improvement to that due to the inclusion of the Raven score in Vogl, 2014). A one standard deviation increase (resp. a 25% increase from the mean) in the word recall test score is related to a 24% (resp. 17%) earnings gain. Including our cognition measure leads to a 11% reduction in the height effect. This fall is tiny but significant at the 1% level according to a generalized Hausman test that allows for clustering. Even if this

[13] While this would explain differences between Indonesia/Mexico and Western countries, this may also reflect into heterogeneous patterns *within* a country. Again, while different returns to height between rural and urban areas (or different ethnic group) appear in Vogl (2014), these contrasts are less apparent in a more equal society like Indonesia. In effect, we replicate our estimations while interacting height with the place of birth. Results in Appendix Table A.3 show similar returns to height for adults born in cities and those born in rural areas or small towns.

result is indicative of the fact that height may be less of a proxy for cognition than in developing countries, as discussed above and in Vogl (2014), these results must be taken with caution. First, our single-valued measure from recall tests may be a relevant proxy for cognitive skills, yet it cannot capture the complex, multifaceted nature of cognition and, hence, may understate its impact in our estimations. Second, the test is taken in adulthood and may overstate the effect of early life conditions if early cognitive abilities have been endogenously reinforced over the lifecycle (i.e., if individuals with higher skills have further developed their abilities in "brainy" occupations). With the data at hand, it is not possible to quantify these opposite biases.

Table 1: Effect of Height, Cognitive skills and Childhood Conditions on Log Earnings

Dep. variable: log annual earnings	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Height (cm)		0.0254***	0.0251***	0.0223***	0.0209***	0.0190***	0.0142***
		(0.00203)	(0.00203)	(0.00200)	(0.00201)	(0.00198)	(0.00289)
Self-assessed Health (ref: unhealthy):							
somewhat healthy			0.207***	0.188***	0.195***	0.181***	0.142**
			(0.0421)	(0.0413)	(0.0414)	(0.0408)	(0.0596)
very healthy			0.296***	0.274***	0.281***	0.264***	0.241***
			(0.0560)	(0.0549)	(0.0551)	(0.0542)	(0.0781)
Cognitive abilities				0.137***		0.121***	0.103***
				(0.00761)		(0.00760)	(0.0111)
Background conditions:							
parental education					0.492***	0.418***	0.366***
					(0.0430)	(0.0426)	(0.0672)
born in small town (ref: village)					0.0773**	0.0609*	0.214***
					(0.0368)	(0.0360)	(0.0496)
born in big cities (ref: village)					0.127***	0.103**	0.289***
					(0.0486)	(0.0476)	(0.0732)
bad sanitation of childhood dwelling							-0.220***
							(0.0383)
Age /10	1.147***	1.161***	1.153***	1.171***	1.156***	1.171***	1.041***
	(0.101)	(0.0998)	(0.0996)	(0.0976)	(0.0980)	(0.0965)	(0.136)
Age squared /100	-0.138***	-0.136***	-0.135***	-0.130***	-0.132***	-0.128***	-0.116***
	(0.0119)	(0.0117)	(0.0117)	(0.0115)	(0.0115)	(0.0114)	(0.0161)
Observations	7,878	7,878	7,878	7,878	7,878	7,878	3,608
R-squared	0.080	0.098	0.101	0.137	0.131	0.158	0.151

Notes: all specifications control for ethnicity and province dummies. Standard errors in bracket; significance levels indicated by: *** p<0.01, ** p<0.05, * p<0.1

The next columns of Table 1 directly investigate the role of background characteristics. We include the set of individual variables related to early life conditions as previously discussed (parents' education, place of birth and sanitation in the dwelling during childhood). The coefficients on these childhood variables are jointly significant at the 1% level. We first include childhood conditions without sanitation, as missing observations on this variable reduce the sample by more than a half. The explanatory power of the model, a

R-squared of 0.16, is again surprisingly similar to findings by Vogl (2014) for Mexico in the complete specification. The inclusion of background characteristics alone (column 5) decreases the height premium by 16% compared to the baseline. Combined with cognitive skills (column 6), they explain up to a quarter of the premium. In the full model with sanitation and cognition (column 7), the height premium is roughly a half of its baseline estimate (around 0.013 compared to a baseline of 0.025) and again very close to Vogl's estimates (i.e., around 0.014 compared to a baseline of 0.023). The effect of cognitive skills is also reduced by 26% in the complete model. The inclusion of cognitive skills decreases the height premium by 9%, a similar magnitude to what we found above (11%) when early life conditions were not controlled for. Hence, the effect of height on earnings is not entirely conditioned by early life conditions or interpreted as a proxy for codetermined cognitive skills. At least half of it corresponds to an independent premium on earnings, possibly related to other labor market advantages provided by stature. In the context of industrialized countries, the latter often pertain to self-esteem (Freedman, 1979), social dominance (Hensley, 1993), authority (Lindqvist, 2012), self-confidence (Persico et al., 2004) and discrimination against small workers (Hamermesh and Biddle, 1994; Hamermesh, 2011; Loth, 1993). We conjecture that most of these factors may also have some relevance in the present context.[14]

We continue our investigation in Table 2 by exploring whether the height premium changes by education level or within occupational groups. Education and occupations may be partly determined by the individual's environment, family background and parents' choices. They also belong to individual choice sets so that our results can only be seen as indicative patterns in a mere accounting exercise. Compared to column 1, the estimated returns to height are cut by approximately 22% after accounting for employment categories (column 2), by 40% after inclusion of education variables (colum 3) and by 43% when both occupations and education levels are introduced in the model (column 4). These figures are 19%, 35% and 38% respectively in columns 6-7-8 when additionally controlling for cognitive scores (22%, 28% and 33% in Vogl, 2014, respectively). This is in line with the reasoning that a large part of the height benefit is imputable to the higher educational attainment of taller people or to their sorting into "better" jobs (higher-paying occupations like governmental jobs).[15] We now turn to the specific effect of height on

[14] Appendix Table A.3 explores the heterogeneity of these effects according to the place of birth. Returns to cognitive abilities are larger for those born in cities, yet a greater share of the height premium is explained by cognitive advantages in their case and consistently with results for more developed regions of the world (19% compare to 10% among those born in rural areas). Up to a third of the height premium is explained by cognitive skills and childhood conditions together for those born in urban environments.

[15] The slighly larger height premium for those born in cities in Table A.3 may simply reflect occupational sorting. When controlling for occupations (last column), we now observe smaller returns to height for adults born in cities. This may indicate greated individual variation in early-life conditions in rural

Table 2: Effect of Height, Education and Occupational Sorting on Log Earnings

Dep. variable: log annual earnings	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Height (cm)	0.0251***	0.0196***	0.0151***	0.0142***	0.0222***	0.0180***	0.0145***	0.0137***
	(0.00205)	(0.00192)	(0.00193)	(0.00188)	(0.00201)	(0.00191)	(0.00192)	(0.00187)
Occupation (ref: informal worker)								
Entrepreneur		1.109***		0.905***		1.039***		0.880***
		(0.0789)		(0.0769)		(0.0783)		(0.0766)
Public sector employee		1.218***		0.765***		1.120***		0.744***
		(0.0433)		(0.0464)		(0.0435)		(0.0463)
Private sector employee		0.544***		0.389***		0.507***		0.380***
		(0.0283)		(0.0283)		(0.0282)		(0.0282)
Education (ref: lower)								
Higher secondary			0.619***	0.455***			0.560***	0.409***
			(0.0285)	(0.0289)			(0.0291)	(0.0294)
Post secondary			1.233***	0.895***			1.134***	0.821***
			(0.0391)	(0.0421)			(0.0403)	(0.0430)
Cognitive abilities					0.138***	0.0964***	0.0698***	0.0591***
					(0.00769)	(0.00740)	(0.00762)	(0.00744)
Observations	7,878	7,878	7,878	7,878	7,878	7,878	7,878	7,878
R-squared	0.099	0.211	0.220	0.263	0.136	0.228	0.229	0.269

Notes: all specifications control for ethnicity, province dummies, age and age squared. Standard errors in bracket; significance levels indicated by: *** p<0.01, ** p<0.05, * p<0.1

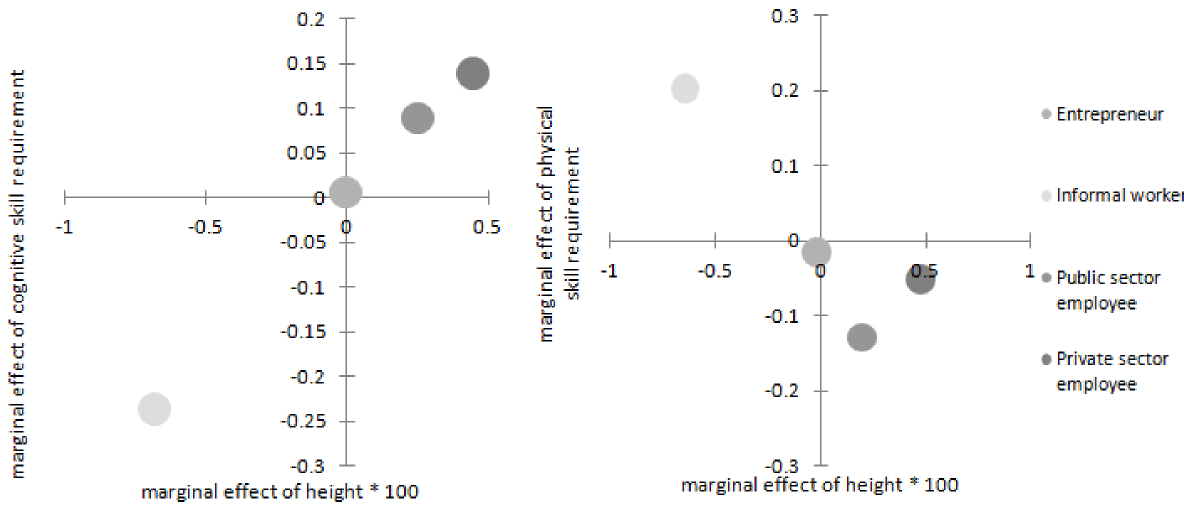
occupational choices.

4.2 Height and Occupations

We have just seen that occupational sorting does greatly contribute to the height premium in earnings. We now explicitly assess height-based selection into different types of occupation and its relation to job requirements in terms of cognitive, physical or social skills. Evidence from Western countries (e.g., Case and Paxson, 2008a/b, 2011) indicate that taller workers sort into occupations with larger demands in intellectual abilities and smaller strength requirements. We verify whether this pattern may somehow apply to poorer countries.

We first check whether taller men select into "good jobs", which are characterized in our simple classification by governmental jobs, entrepreneurship and, to a lesser extent, by formal sector private employment. Differences in earnings and access to health and pension benefits across sectors, as defined by the National Statistic Bureau, indeed suggest that these occupations are preferable to jobs in the informal sector (World Bank,

environments, as discussed above and in Vogl (2014). In the same vein, additional (unreported) regressions show greater returns to height for those with uneducated parents.



Notes. *The left (right) hand side graph plots the marginal effect of brain (brawn) skill requirements against the marginal effect of height for each occupation category. Marginal effects are obtained from probit regressions of each occupation on a dummy corresponding to the skill requirement as well as height and demographics.*

Figure 2: Height, Skill Requirements and Occupational Sorting

2010).[16] Informal sector employees also remain among the most vulnerable workers since they are often deprived of labor regulations and social protection. Informal workers range from street sellers to family farmers, casual agricultural laborers and unregistered contract labor. A large part of the Indonesian population work in these informal activities (55%) while around a third are in the formal private sector (39%) and a small fraction in entrepreneurship (2%) or the public sector (9%). We run probit regressions of each occupational category on usual covariates (height, age, age squared, ethnicity, provinces) as well as a dummy corresponding to skill requirements, i.e. brawn (using the "lots of physical skills" question) or brain (using the "intense concentration/to work with computers" question). In the left (resp. right) hand side graph of Figure 2, we plot the marginal effect of brain (resp. brawn) requirements against the marginal effect of height for each occupation type. These graphs clearly indicate that taller men select into occupations (formal work, either in the governmental or private sector) which also require more intelligence and less strength. Inversely, smaller men select into occupations (informal work) which demand less brain and more brawn. These results are not merely driven by ethnic or birthplace heterogeneity as we control for these variables. The pattern obtained here for Indonesia is once again surprisingly similar to occupational sorting patterns found by

[16] In the more recent figures from the World Bank, mean annual earnings were $PPP 765 in the informal sector compared to $PPP 2,382 for entrepreneurs, $PPP 2,036 for civil servants and $PPP 1,100 for formal private sector employees. In our data for year 2007, mean annual earnings for informal sector employees, civil servants and formal sector employees were 126, 1,690 and 869 $PPP respectively.

Vogl (2014) for Mexico. These consolidated results convey that the association between height and occupation requirements in these emerging economies is not fundamentally different from the situation of industrialized settings (Case and Paxson, 2008a/b).[17]

We also estimate a multinomial logit regression of occupation categories (omitted category is the informal sector) on height, usual controls (age, province and ethnicity) and cognitive skills. Marginal effects are reported in Table 3. They confirm that good jobs are also those where workers with high cognitive capacities select themselves into, i.e. column 4 shows that cognition increases the probability of entering the public sector, entrepreneurship and, to a lesser extent, the formal private sector rather than informality. More originally, we can investigate to which extent the height effect in occupational sorting reflects other human capital attributes. As already shown graphically, column 1 of Table 3 confirms that taller men are more likely to select into formal sector salary work, either private or public. Note that there is no significant height effect on entrepreneurship. Comparing the coefficient on height in columns 1 and 4, we conclude that height is not merely a proxy for codetermined cognitive skills, as the height effect only decreases a little after inclusion of cognitive abilities. In fact, occupational sorting is mainly explained by childhood conditions (column 2) and education (column 3). In particular, the educational investments of taller workers almost entirely explain their selection into governmental jobs while a third of the sorting into the formal private sector is explained by observable characteristics essentially related to childhood conditions. Combined with Table 2, we can conclude that nearly half of the height premium in earnings can be attributed to a broad measure of human capital, i.e. higher educational endowments and better background characteristics, either directly or through sorting into more lucrative and skill-intensive occupations.

We finally confirm that taller men are more likely to sort into occupations with cognitive and social skills requirements, and less likely to sort into occupations which are physically demanding. Table 4 reports marginal effects from probit regressions in which the dependent variable takes value 1 for jobs that require "brawn", "brain" or sociability. These are proxied by questions on whether the worker's primary job demands "much physical effort", "to work with computers" or "skills in dealing with people", as described in the data section. Results in Table 4 focus on the height coefficient (multiplied by 100), adding in each column a different set of covariates explaining how much of the height effect is associated with cognitive ability, education and childhood conditions. The proximity of

[17] A difference, obviously, is the nature of occupational types between rich and poorer countries. Given the high rate of informality and the key role of this sector in poverty analysis, we have constructed our occupation categorization along the formal/informal divide rather than trying to match more detailed occupation types according to Western standards as done in Vogl (2014).

Table 3: Height and Occupational Status

Dep. variable: occupations (ref: informal)	(1)	(2)	(3)	(4)	(5)	(6)
			Entrepreneur			
Height (cm) x 100	-0.0114	-0.0227	-0.0315	-0.0195	-0.0281	-0.0335
	(0.0272)	(0.0272)	(0.0272)	(0.0267)	(0.0269)	(0.0269)
Education (ref: lower)						
Higher secondary			0.0109***			0.00834**
			(0.00381)			(0.00389)
Post secondary			0.0221***			0.0180***
			(0.00418)			(0.00437)
Cognitive abilities				0.00419***	0.00380***	0.00307***
				(0.00109)	(0.00109)	(0.00114)
Background conditions:						
parental education		0.0135***			0.0113**	
		(0.00494)			(0.00495)	
born in small town (ref: village)		0.00807*			0.00712*	
		(0.00413)			(0.00414)	
born in big cities (ref: village)		0.00655			0.00528	
		(0.00601)			(0.00600)	
			Public sector employee			
Height (cm) x 100	0.288***	0.223***	0.017	0.220***	0.174***	0.0113
	(0.0546)	(0.0543)	(0.0488)	(0.0535)	(0.0533)	(0.0487)
Education (ref: lower)						
Higher secondary			0.129***			0.123***
			(0.00834)			(0.00848)
Post secondary			0.228***			0.218***
			(0.00801)			(0.00843)
Cognitive abilities				0.0263***	0.0239***	0.00627***
				(0.00207)	(0.00207)	(0.00195)
Background conditions:						
parental education		0.0875***			0.0723***	
		(0.00911)			(0.00902)	
born in small town (ref: village)		0.0213***			0.0144*	
		(0.00799)			(0.00790)	
born in big cities (ref: village)		0.0209*			0.0132	
		(0.0115)			(0.0113)	
			Private sector employee			
Height (cm) x 100	0.420***	0.284***	0.273***	0.390***	0.271***	0.268***
	(0.0821)	(0.0815)	(0.0816)	(0.082)	(0.0813)	(0.0815)
Education (ref: lower)						
Higher secondary			0.109***			0.105***
			(0.0107)			(0.0111)
Post secondary			0.160***			0.154***
			(0.0159)			(0.0165)
Cognitive abilities				0.0146***	0.00942***	0.00489
				(0.00306)	(0.00307)	(0.00319)
Background conditions:						
parental education		0.0918***			0.0853***	
		(0.0163)			(0.0164)	
born in small town (ref: village)		0.115***			0.112***	
		(0.0123)			(0.0123)	
born in big cities (ref: village)		0.144***			0.140***	
		(0.0174)			(0.0174)	

Notes: the sample includes 7,878 observations. Columns show the marginal effects from a multinomial logit regression of occupation on height. All specifications control for age, age squared and dummies for provinces and ethnic groups. The reference category is "informal sector employee". Standard errors in brackets. Significance levels indicated by: *, **, *** for the 10, 5 and 1 percent levels respectively.

Table 4: Height and Occupational Skill Requirements

Dep. var.: skill requirement	(1)	(2)	(3)	(4)	(5)	(6)
			Physical skills			
Height (cm) x 100	-0.689***	-0.537***	-0.344***	-0.614***	-0.487***	-0.333***
	(0.082)	(0.083)	(0.084)	(0.082)	(0.083)	(0.084)
Education (ref: lower)						
Higher secondary			-0.201***			-0.190***
			(0.0124)			(0.0128)
Post secondary			-0.456***			-0.440***
Cognitive abilities				-0.0364***	-0.0309***	-0.0126***
Background conditions:		-0.204***			-0.186***	
parental education		(0.0180)			(0.0181)	
born in small town (ref: village)		-0.0746***			-0.0672***	
		(0.0138)			(0.0138)	
born in big cities (ref: village)		-0.0647***			-0.0556***	
		(0.0197)			(0.0196)	
			Cognitive skills			
Height (cm)	0.434***	0.329***	0.189**	0.371***	0.285***	0.177**
	(0.084)	(0.085)	(0.085)	(0.084)	(0.085)	(0.085)
Education (ref: lower)						
Higher secondary			0.134***			0.122***
			(0.0116)			(0.0120)
Post secondary			0.280***			0.266***
			(0.0124)			(0.0133)
Cognitive abilities				0.0322***	0.0286***	0.0161***
				(0.00324)	(0.00327)	(0.00340)
Background conditions:		0.111***			0.0965***	
parental education		(0.0170)			(0.0174)	
		0.0712***			0.0651***	
born in small town (ref: village)		(0.0136)			(0.0137)	
		0.0795***			0.0722***	
born in big cities (ref: village)		(0.0193)			(0.0195)	
			Social skills			
Height (cm)	0.660***	0.511***	0.387***	0.597***	0.470***	0.376***
	(0.084)	(0.085)	(0.086)	(0.084)	(0.085)	(0.086)
Education (ref: lower)						
Higher secondary			0.180***			0.169***
			(0.0112)			(0.0116)
Post secondary			0.289***			0.278***
			(0.0117)			(0.0125)
Cognitive abilities				0.0333***	0.0278***	0.0144***
				(0.00323)	(0.00327)	(0.00339)
Background conditions:						
parental education		0.173***			0.160***	
		(0.0158)			(0.0163)	
born in small town (ref: village)		0.0978***			0.0925***	
		(0.0133)			(0.0134)	
born in big cities (ref: village)		0.109***			0.102***	
		(0.0186)			(0.0188)	

Notes: the sample includes 7,878 observations. Coefficients are marginal effects from probit estimations evaluated at the means of all independent variables. Dependent variable is the dummy equal to 1 if worker sorts into a job that requires physical, cognitive or social skills as proxied by the following questions respectively: "My job requires: lots of physical effort; to work with computers; skills in dealing with people". All regressions control for age, age squared, education, province, ethnicity dummies. Standard errors in bracket; significance levels indicated by: *** p<0.01, ** p<0.05, * p<0.1

results with Vogl (2014) is one more time very striking and suggests strong regularities in the way height is associated with sorting into "brain" versus "brawn" occupations in developing countries. The raw effect of height (column 1) in the first panel of Table 4 tells us than 1 extra centimeter of height decreases the probability of working in a "brawn" occupations by 0.689 percentage points (Vogl find 0.627). This association falls to 0.537 with the addition of childhood conditions (column 2), and further to 0.344 with the inclusion of education variables. Adding cognitive skills changes little to this pattern: background conditions and especially educational investments of smaller workers explain half of their selection into less skilled and less lucrative activities. This confirms our results above that much of the relationship between height and occupation choice in adulthood, here half of it, is set before labor market entry. The middle panel of Table 4 consolidates this picture: 1 extra centimeter increases chances of entering "brain" occupation by 0.434 percentage points, half of which are taken out when education and background conditions are controlled for.

The last panel of Table 4 brings another dimension to this characterization, i.e. the probability of entering occupations where social skills are required. Interestingly, this probability increases with cognitive skills and by the same magnitude as the positive (resp. negative) relationship between cognitive skills and the probability of entering "brain" (resp. "brawn") occupation. Turning back to height, we find that 1 extra centimeter of height increases the probability of working in a social occupation by 0.660 percentage points and that, once again, almost half of it disappears with the inclusion of early life conditions and especially educational attainment. It nonetheless confirms the role of social or "soft" skills and related attributes like self-confidence on occupational choices. This is consistent with previous evidence for developing countries (Loh, 1993; Persico et al., 2004).

4.3 Height and Well-being

We finally turn to a different outcome of adult life by exploring how height is related to happiness. Subjective well-being may well account for the relative positions of different workers in terms of professional achievement and, at the same time, for other dimensions left over in our exploration of the effect of height on earnings and occupation. In order to disentangle the channels through which height affects individuals' happiness, and test their respective influences on this association, we follow a similar method to that used by Deaton and Arora (2009). We introduce different sets of covariates gradually in a series of probit regressions in which the dependent variable takes value 1 if an individual declares himself as *happy* or *very happy*, and 0 otherwise. Table 5 reports probit marginal effects.

The baseline specification in column 1, controlling for age, provinces and ethnicity, shows that 1 additional centimeter of height increases the chances of being happy by 0.24%, a small but significant effect. Since height and partnership may be correlated, we account for an individual being married or in a relationship in column (2). The effect of height is hardly changed in this case, and so is it when including health variables (column 3). Nonetheless, the R-squared is greatly improved by adding marital status and health, two important determinants of individual well-being.

Table 5: Height and Happiness

Dep. var. : dummy=1 if happy	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Height (cm) x 100	0.242***	0.233***	0.224***	0.176***	0.158***	0.139***	0.136***	0.131***	0.132***	0.129***	0.139***
	(0.0421)	(0.0412)	(0.0405)	(0.0400)	(0.0394)	(0.0392)	(0.0393)	(0.0392)	(0.0390)	(0.0391)	(0.0392)
Height (cm): in % of baseline effect	100%	96%	93%	73%	65%	57%	56%	54%	55%	53%	57%
Height ref. group (cm) x 100											- 0.681*
											(0.353)
Married		0.0920***	0.0887***	0.0762***	0.0933***	0.0834***	0.0831***	0.0836***	0.0832***	0.0839***	0.0831***
		(0.0140)	(0.0137)	(0.0131)	(0.0139)	(0.0134)	(0.0134)	(0.0134)	(0.0134)	(0.0135)	(0.0134)
Self-assessed Health (ref: unhealthy)											
Somewhat healthy			0.0762***	0.0697***	0.0693***	0.0663***	0.0657***	0.0651***	0.0645***	0.0647***	0.0639***
			(0.0110)	(0.0107)	(0.0105)	(0.0104)	(0.0104)	(0.0103)	(0.0103)	(0.0103)	(0.0102)
Very healthy			0.0406***	0.0364***	0.0358***	0.0340***	0.0338***	0.0336***	0.0333***	0.0335***	0.0332***
			(0.00650)	(0.00664)	(0.00644)	(0.00652)	(0.00652)	(0.00648)	(0.00644)	(0.00646)	(0.00641)
Log earnings				0.0181***		0.0122***	0.0116***	0.0114***	0.0103***	0.0109***	0.00987***
				(0.00219)		(0.00228)	(0.00230)	(0.00229)	(0.00234)	(0.00229)	(0.00235)
Education (ref: lower educ.)											
Higher secondary					0.0373***	0.0305***	0.0280***	0.0253***	0.0233***	0.0240***	0.0211**
					(0.00527)	(0.00553)	(0.00570)	(0.00586)	(0.00600)	(0.00593)	(0.0106)
Post secondary					0.0562***	0.0482***	0.0460***	0.0415***	0.0384***	0.0388***	0.0315**
					(0.00470)	(0.00554)	(0.00583)	(0.00659)	(0.00728)	(0.00702)	(0.0143)
Cognitive skills							0.00376**	0.00369**	0.00352**	0.00362**	0.00347**
							(0.00160)	(0.00160)	(0.00159)	(0.00159)	(0.00158)
Background conditions:											
parental education								0.0212**	0.0211**	0.0207**	0.0216**
								(0.00903)	(0.00899)	(0.00907)	(0.00888)
born in small town (ref: village)								-0.000900	-0.00148	-0.00122	-0.000939
								(0.00713)	(0.00716)	(0.00714)	(0.00711)
born in big cities (ref: village)								0.00951	0.00915	0.00935	0.00912
								(0.0101)	(0.0101)	(0.0100)	(0.0100)
Occupational sorting (ref: informal)									0.0375***		0.0203
Entrepreneurs									(0.0113)		(0.0206)
									0.0133		-0.0138
Public sector employees									(0.0104)		(0.0231)
									0.00594		0.000770
Private sector employees									(0.00608)		(0.00949)
Job requires physical skills										-0.0116**	
(ref: cognitive/social)										(0.00576)	
Pseudo R2	0.049	0.065	0.080	0.100	0.101	0.110	0.111	0.112	0.113	0.113	0.112

Notes: The sample includes 7,878 observations. Figures are the marginal effects from a probit estimation of the happiness dummy, also controlling for age, age squared, province and ethnicity. The last column repots the effect of the mean height of a respondent's reference group. Standard errors in brackets, and significance levels indicated by *, **, *** for the 10, 5 and 1 percent levels respectively.

The most interesting effect comes from earnings and education variables (columns 4 and 5 respectively), which cut between a quarter and a third of the height premium on happiness.

When they are both included (column 6), the magnitude of the height effect is reduced to 57% of the baseline. Cognitive skills and background conditions (columns 7 and 8 respectively) have very little additional effect. This is an interesting finding that they matter for well-being only through the way they set the scene for adult life conditions, i.e. by determining educational investments and possibly other outcomes already accounted for (like marital status or health). Occupational choices, either in the form of occupation types (column 9) or skill requirements (10), do not further affect the height premium in happiness. This means that earnings is the main outcome of interest as far as labor market conditions are concerned. This conclusion is confirmed by a series of additional estimations with alternative orders of introduction of the different covariates. In money metric, 1 additional centimeter of height increases the probability of being happy by 0.13% in the comprehensive specification (column 9), which is roughly equivalent to a 0.13% increase in earnings. This is a modest but non-negligible addition to the actual earnings premium from height.

Notice that the absolute impact of height on well-being may be a misspecified representation of the effect of height if social comparisons matter. The residual height premium in column (9) may reflect social-psychological aspects which are, to some extent, related to social status and *relative* height. As emphasized by Carrieri and De Paola (2012), perceptions about the ideal height may be based on the average height of persons that belong to a reference group for the individual. We define such a reference group using people who live in the same province, belong to the same age group (four categories: 25-34, 35-44, 45-54 and 55-65 years old), have attained the same level of education and sort in the same type of occupation. Adding the average height of this reference group along with usual controls shows interesting results in column (11) of Table (5). Note that to avoid spurious correlation that may arise from potential correlation between the average height of the reference group and its wealth, we also include the mean income of all men in the reference group as an additional control. We observe a strong and significant negative effect of reference height on the probability of being happy. For a given height, a 1 cm increase compared to the reference group now corresponds to a 0.7% increase in earnings. In income equivalent terms, the well-being effect of relative height is therefore more important than absolute levels and confirms the importance of social comparisons (note that these mechanisms are often attributed to wealth comparison, e.g. Senik, 2009, rather than to physical attributes).

5 Conclusion

In this paper, we test the presence of a beneficial effect of height on different concepts of objective and subjective well-being among Indonesian men. It emerges from our analysis that taller men receive a wage premium due to the fact that they sort into better occupations, i.e. formal jobs in the governmental or private sector. While the direct effect of cognitive scores on earnings is modest, early-life conditions and educational attainments play a considerable role in explaining occupational sorting and, subsequently, earnings premiums. In addition, height is positively related to happiness. Neither marital nor health statuses are able to explain this outcome. Most of the height premium on happiness is due the fact that taller people are better educated and earn more. This is another perspective on the role of human capital, which determines objective measures of adult life achievement, like earnings and occupation, but also self-reported rating of emotional well-being.

These results also reflect the dynamics regarding the role of childhood environmental factors in physical growth and cognitive development that may play an instrumental role in the intergenerational transmission of economic status. The central role of human capital endowments of taller workers is related to parental investment in the early life (leading to better cognitive scores and a better health) or through childhood and adolescence (leading to higher educational attainment), which explain directly and through job sorting a substantial share of the height wage premium. These findings are in line with the recent trend in economic research that supports investments during early life and notably the role of early child interventions aimed at improving the capabilities of young individuals (see Currie & Vogl, 2012). Further work should use broader measures of cognitive and non-cognitive skills in order to better gauge the direct and indirect role of skills in forging adult outcomes. Exogenous variation in access to education during adolescence could also be used to disentangle the direct effect of cognitive endowment from indirect channels like the effect of cognitive abilities on the returns to education. This would help to better understand the role of parental investments at different points of the life course, i.e. nutrition and health in the early years versus education in later years, and assess how policies could support parents at the different stages.

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A Appendix

Table A.1: Summary Statistics (men aged 25-65)

	Mean	std.dev.		Mean	std.dev.
Main outcomes			*Explanatoy variables*		
Happiness:			Height (cm)	162.0	6.5
happy or very happy	0.08	0.27	Cognitive score	4.93	1.75
very unhappy	0.06	0.24	Self-assessed Health:		
Annual earnings (PPP USD)	637	1,145	Unhealthy	0.11	0.31
Hourly earnings (PPP USD)*	0.62	0.74	Somewhat healthy	0.78	0.41
			Very healthy	0.11	0.31
Occupations:			Education:		
Informal workers	0.55	0.50	Kindergarten	0.58	0.49
Entrepreneurs	0.02	0.16	Higher secondary	0.30	0.46
Public sector employees	0.09	0.29	Post secondary	0.12	0.33
Private sector employees	0.33	0.47	Age	39.3	10.3
Occupation skill requirements:			Married	0.91	0.29
Job requires lots of physical effort	0.63	0.48	Ethnicity (ref: others):		
Job requires physical skills in dealing with people	0.62	0.49	Javanese	0.44	0.50
Job requires to work with computers	0.08	0.27	Sundanese	0.13	0.33
			Bali	0.05	0.21
Background conditions			Batak	0.03	0.18
Place of birth:			Bugis	0.03	0.18
Village	0.72	0.45	Sasak	0.04	0.19
Small town	0.19	0.39	Minang	0.04	0.19
big city	0.09	0.28	Banjar	0.04	0.20
Parental higher education	0.10	0.30	Betawi	0.04	0.19
Bad sanitary conditions**	0.38	0.48	Southern Sumatra	0.04	0.19

Source: IFLS. Number of observations: 7,878, except for * hourly earnings (information available for 3,730 observations) and ** sanitation (3,608 observations).

Table A.2: Effect of Height, Cognitive skills and Childhood Conditions on Log Hourly Earnings

Dep. variable: log hourly earnings	(1)	(2)	(3)	(4)	(5)	(6)
Height (cm)		0.0202***	0.0201***	0.0175***	0.0168***	0.0149***
		(0.00237)	(0.00237)	(0.00231)	(0.00235)	(0.00230)
Self-assessed Health (ref: unhealthy):						
somewhat healthy			0.0863*	0.0834*	0.0769	0.0755
			(0.0519)	(0.0506)	(0.0510)	(0.0499)
very healthy			0.287***	0.264***	0.264***	0.246***
			(0.0659)	(0.0642)	(0.0648)	(0.0634)
Cognitive abilities				0.129***		0.117***
				(0.00913)		(0.00909)
Background conditions:						
parental education					0.459***	0.396***
					(0.0438)	(0.0431)
born in small town (ref: village)					0.0773**	0.0609*
					(0.0368)	(0.0360)
born in big cities (ref: village)					0.127***	0.103**
					(0.0486)	(0.0476)
Age /10	1.002***	1.001***	0.993***	0.972***	0.990***	0.972***
	(0.136)	(0.134)	(0.134)	(0.130)	(0.132)	(0.129)
Age squared /100	-0.111***	-0.107***	-0.106***	-0.0975***	-0.103***	-0.0960***
	(0.0167)	(0.0166)	(0.0165)	(0.0161)	(0.0163)	(0.0159)
Observations	3,730	3,730	3,730	3,730	3,730	3,730
R-squared	0.090	0.107	0.113	0.159	0.146	0.182

Notes: all specifications control for ethnicity and province dummies. Standard errors in bracket; significance levels indicated by: *** p<0.01, ** p<0.05, * p<0.1

Table A.3: Effect of Height, Cognitive skills and Childhood Conditions: Heterogeneity

Dep. variable: log annual earnings	(1)	(2)	(3)	(4)	(5)
Born in rural areas (mean height: 1.619 m)					
Height (cm)	0.0241***	0.0216***	0.0209***	0.0191***	0.0163***
	(0.00213)	(0.00209)	(0.00212)	(0.00209)	(0.00199)
Cognitive abilities		0.133***		0.120***	0.0849***
		(0.00796)		(0.00796)	(0.00770)
Background conditions:	No	No	Yes	Yes	Yes
Occupations:	No	No	No	No	Yes
Observations	7,177	7,177	7,177	7,177	7,177
R-squared	0.089	0.123	0.113	0.140	0.220
Born in cities (mean height: 1.638 m)					
Height (cm)	0.0277***	0.0224***	0.0230***	0.0188***	0.0140**
	(0.00685)	(0.00673)	(0.00679)	(0.00669)	(0.00638)
Cognitive abilities		0.161***		0.148***	0.125***
		(0.0268)		(0.0267)	(0.0254)
Background conditions:	No	No	Yes	Yes	Yes
Occupations:	No	No	No	No	Yes
Observations	701	701	701	701	701
R-squared	0.110	0.155	0.141	0.179	0.264

Notes: all specifications control for age, ethnicity and province dummies. Standard errors in bracket; significance levels indicated by: *** p<0.01, ** p<0.05, * p<0.1