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# Some Clarifications about the Use of the Relation between Height and Education as a Proxy for Social Inequalities: a Response to the Comments

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# Some clarifications about the use of the relation between height and education as a proxy for social inequalities

A response to the comments

*by* Simone Sarti

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## Introduction

I am very grateful for the detailed and stimulating comments received from K.Hakim, B. Harris and N. Herpin.

Some comments concern weaknesses in my work that are known to me, though I think they are objectively unsolvable since they are mainly due to the characteristics of the data available. If I had taken account of these limitations, I would not have been able to write the article. So I cannot answer these criticisms and I cannot solve some of the problems they raise.

In regard to the other comments, in what follows I try to give satisfactory replies.

I believe some of the most critical comments derive from a misunderstanding of the aims of my article. This is certainly my fault. My main purpose was to support a change of perspective in the study of social phenomena. For decades many social scientists hoped that sociology would take account of the advances made by the hard sciences, like neuroscience, social physics and, in particular, behavioural genetics. Many scholars, in both the past and recently, have urged a widening of the sociological horizon to include other disciplines [Freese 2008; Udry 1985; Plomin *et al.* 197+7 also in the journal that hosts us [Pisati 2007].

However, the objective of my work was simple. Even though I mentioned the scientific literature on the social and genetic determinants of height, my inquiry could not reproduce those studies. In my opinion the data available (survey cross-sectional

and self-declared information) do not allow full and correct estimation of the role of genetic inheritance on height. Moreover, this was not my concern. At the same time, my intent was not to deal with the problematic identification of the genetic determinants of social variables, but simply and usefully to describe the association over time between these variables (in particular educational attainment and stature).

My work did not (and could not) seek to explain the reasons for the change of the relationship between education and height in the Italian population, nor to explain what part of education is determined by social factors and what part by genetic factors. I limited my research questions to diachronic description of the height/education relation, associating this trend with traditional studies on educational inequalities. Considering limitations in the data and statistical models used, the resulting trend between stature and education is congruent with the empirical evidence already known: the decrease of educational inequalities in the decades after WWII and the stability thereafter. Thus my message to mainstream sociologists is this: “Social research can take variables of a different kind (biological or genetic ones) into account; or better, sociologists must take these variables into account!”. I also believe that the social sciences can grow only if they converse with the hard sciences. “It is time for sociology to pick up a wide-angle camera lens for analysing social reality and social trends,” wrote Catherine Hakim. I fully agree.

Two commentators wrote about the disadvantages for the tallest individuals in terms of higher chances of pathologies, and more frequent social discrimination. But my analysis concerned average differences in large groups, so that the weights of the extremes of the distributions are not really important in this perspective.

## **Reply to Catherine Hakim**

I thank C.Hakim for his insistence on the importance of biological/genetic factors in social phenomena; arguments of which I approve. However some caveats are necessary.

In my work I did not examine the topic of genetic determinants, preferring to define stature as a biological proxy, rather than as a genetic determinant. This terminological choice is criticised by C.Hakim, but I defend it. My study is limited to describing the relation between a social variable (education level) and a quantitative phenotype, complex and polygenetic, characterized by multifactorial inheritance (height). My analytical model is summarized in Figure R1; variables of interest have grey backgrounds, genes and genetic inheritance are excluded. Thus, in my opinion, stature is a biological variable (a biometric measure like blood pressure or weight)

proxying the interaction between genes and the environment. Hence I find it preferable to use the more general (but more correct) term “biological.”

Interaction between genetic determinants* and environmental characteristics	Biologic characteristics (biometric traits)	Social characteristics
GxE (unobserved variables)	Phenotype (observed variable)	Social position (observed variable)
Distal background	Height (proxy of distal background)	Educational attainment (proxy of social position)




FIG. R1. Analytical model

We assume that genetic determinants are constant across few generations

Then there are other reasons to make more cautious use of genetic concepts: hard sciences like physics or molecular biology have a reductionist approach, while the concept of genetic inheritance ( $b^2$ ) is a latent construct and is ontologically different from the genes and the genetic determinants.<sup>1</sup> For example, the genetic inheritance in height is estimated at about 75-80% in Western countries; but today the discovered genes that determine height explain only 10% of this heterogeneity [Allen *et al.* 2010]. Multifactorial inheritance in complex phenotypes is hard to establish: genome-wide association studies (GWAS) explain only a small proportion of the heritability [Gibson 2009].

Furthermore, the concept of genetic inheritance is mainly based on studies conducted on twins, implying strong assumptions which are often not adequately problematized [see Stenberg 2013]. Some scholars believe that the attention of social sciences in genetics should be focused mainly on the interaction between genes and environment (also not-linear), while it is less useful in distinguishing their effects [Seabrook and Avison 2010; Manski 2011].

In this regard, I find excellent the metaphor used by Avital and Jablonka [2000] and commented on by Heuveline [2004, 1502-1503]: “the authors describe the relationship of the phenotype to the genotype as that of the kite to its string (chap. 2). When the string is relatively short, the kite is easily controlled by specific controls being applied to the string. Likewise, fairly simple genotypes, such as eye color, are strongly influenced by specific genes. For more complex maneuvers, however, one

<sup>1</sup> See the considerations about reductionism and emergentism in Sawyer [2001].

must release more string, and the longer the string, the more the kite's movements are influenced by the wind and other environmental factors. When the string is very long, the kite can hardly be controlled by the string; if anything, the movements of the kite determine the movement of the string."

I would add that, without the simultaneous presence of string and wind, the kite cannot fly.

The hypothesis that in egalitarian societies the role of genetic determinants is less important, as in ancient times, is not paradoxical, and is not new: "I believe that the level of genetic influences has a U shape across the four historical stages [...] for some sociological outcomes (e.g. status attainment), starting high in the hunter-gatherer society, reaching the bottom in the agrarian society, and becoming more important in the industrial, especially the contemporary industrial democratic society" [Guo 2006, 146]. I agree. However, as well known, evolution and "social progress", as we want to define it, are not synonymous. Hence, monitoring, describing and searching for explanations of the social inequalities remain fundamental objectives of social studies. Today, genes weigh more than in the past in influencing the social destination of individuals. This is certainly true, but it has not always been so; it is not so in the same way in all the world and, especially, it may change in the future. Consequently, social inequalities *in se*, with the aim of mitigating them, remain a valid topic for investigation, considering or not DNA.

In the end, the definition of social inequalities refers to value attributes that go beyond the meaning of the genetic determinants. For example, if genes explain 50% of individual intelligence and the G has a Gaussian distribution, what should be the distribution of individual income (the main measure of success in the knowledge societies)? Must it also have the same distribution? Or can it be expressed according to a "power law"? Or must governments intervene to shape this distribution?

Summarizing, the relation between genetic determinants and inequalities should not be a taboo subject; rather, sociology should systemically integrate biological/genetic variables, developing knowledge and competence in behavioural genetics [see Lucchini *et al.* 2011]. But identification of the genetic determinants does not solve the fundamental questions about social inequalities: What are they? Why do they exist? How do they change over time? And, if there is the political will, what actions can be taken to alleviate them?

I think no serious scholar really doubts the major role of genetic determinants in social phenomena. But the problem is exact identification of their contribution; or better, the problem is this: "Is it possible to distinguish genetic factors from environmental characteristics, or we can study only their interactions, and so, this distinction is substantially significant?". These questions are really important and

complex, and answering them will also depend on future scientific discoveries in genetics.

### Reply to Nicolas Herpin

I thank N. Herpin for the rich references to the French case and those of other countries about the relation between height and an array of social characteristics. His comments are dense with stimuli for further study. In regard to Italy, it would be interesting to investigate the stature of partners and to determine if it has changed over time, and whether or not the relationship between physical stature and social status is valid for both genders. Moreover, Herpin refers to interesting studies and makes intriguing suggestions about the roles of biological/social factors like height in mating. For example, it would be very interesting to study the different fertility rate in Italy in association with height or other characteristics.

In the dataset that I used, the correlation in height between partners was circa 0.30, slightly higher in southern regions.

Put briefly, for exploratory purposes I considered in a regression model the sigma (the difference between male stature and female stature) as the dependent variable related to education level, for men and women, *ceteris paribus* age and geographical area. The results showed that higher education levels for both genders are associated with a greater sigma (see Table R1). Many ideas to work.

TAB. *Coefficients of regression (OLS) on the average difference (in centimetres) in height in the couple and the level of education of male and female controlled per age and geographical area. All effects are significant with  $p < 0.001$  except for the value 0.15 (N=180781 couples)*

		Education of female		
		High	Middle	Low
Education of male	High	2.19	1.77	0.42
	Middle	1.75	1.22	0.57
	Low	0.15	0.60	0*

\*Category of reference.

*Note:* The high level of education corresponds to tertiary and upper secondary, the middle level to lower secondary and the low level to primary school or less.

## Reply to Bernarde Harris

I am grateful to B. Harris for his technical comments.

I agree on the two hypotheses suggested by Harris concerning the decrease in the relationship between height and education. This may be due to either 1) improvement in the health of the least educated, or 2) the expansion of the school system, which has increased access to education for the most disadvantaged individuals. The data do not allow us to resolve this issue because they simply document a slight decrease in the relationship in the decades following the post-war period. On the basis of our knowledge about the evolution of Italy's educational system and socio-economic history, it seems likely that the decrease has been due to both factors. On the one hand, the improvement of general living conditions, access to basic necessities, the greater intake of protein foods (in particular their availability for the more disadvantaged groups) have improved health. On the other hand, the compulsory school system has allowed a relative increase in education for the lower classes with respect to other social classes. A more specific issue concerns the difference between men and women. This may be due to the massive entry of females into secondary education in the post-war decades [Cobalti and Schizzerotto 1993]. In this case, the hypothesis concerning the greater chances of accessing higher education may be more reasonable than the health improvement hypothesis.

It is probably true that using self-declared information on height with increasing age gives rise to biases. However, I applied consistency checks by selecting a narrower range of age. In a previous version of the study I considered individuals aged between 18 and 39, corresponding to the 1955-1992 cohort. The results were similar to the previous trend, but the confidence intervals of the estimates had become larger, and the old cohorts had decreased in size, so that they were not assessable. See Figure R2: in the 1950s and early 1960s all punctual estimates are greater than zero (9 on 10), while in 1970s and 1980s estimates are for the most part lower or close to zero (18 on 22).

Harris offers a great deal of advice. Unfortunately, without panel data combining biometric data and social characteristics, it is difficult to follow his advice. For several years, with some colleagues (Sarti *et al.* 2011), I have insisted on starting an Italian survey that follows the model of prestigious studies, such as the UK Longitudinal Household Study, in which biological information is collected.

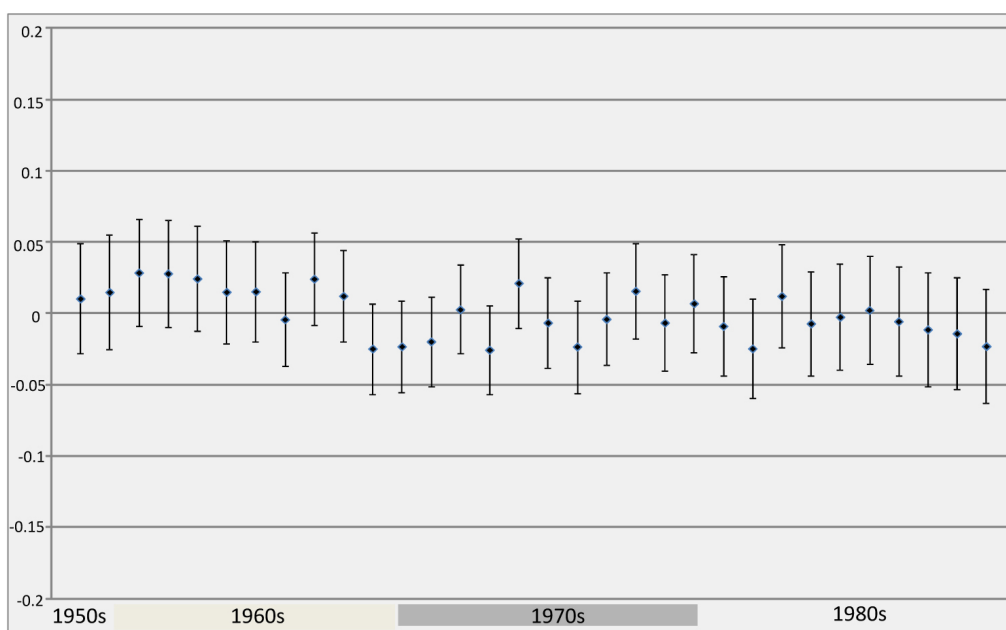


FIG. R2. Multilevel linear model for 1955-1992 cohort of males

Residuals on the intercept (average height) and residuals on the years of school attendance (controlled by geographic area)

A research dimension to be explored is that of the relationship between social class and height. Here the problem is that we do not have the working histories of the respondents, so that we do not know what their occupation was during young age. But it is also true that the last job, when available, may be a good proxy for the working career (especially in a rigid labour market like Italy's during the second half of the twentieth century).

Finally, I have deleted the reference to the association between obesity and height. There is an association, but it works in reverse. Obese persons are on average taller: "It has been suggested that childhood obesity is related to excess protein intake and, of course, overweight or obese children tend to be in the upper percentiles for height." [FAO/WHO 2003, 35]. Thank you for making the comment so that I could correct the error.

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## **Some clarifications about the use of the relation between height and education as a proxy for social inequalities**

A response to the comments

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Abstract: The response clarifies aims and limitations of the study. It describes the association over time between educational attainment (proxy of social position) and stature (distal proxy of bio-social disadvantage): it does not aim to investigate the genetic determinants of height. In addition, some caveats are mentioned about the role of the genetic inheritance on social characteristics and some robustness checks are added to the analysis.

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*Keywords: social inequalities, biological characteristic, height, genetic inheritance, educational inequalities*

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