HOW MUCH IS INCOME INFLUENCED BY HEIGHT AND SEX?

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The US Bureau of Labor Statistics (BLS) maintains a website (http://www.bls.gov/nls/) that provides data collected via two National Longitudinal Surveys of Youth (NLSY), one begun in 1979 and the other begun in 1997. Both collected a wide variety of data on employment, income, and personal characteristics from cohorts of people who were young at the time the surveys started—14 to 22 years old for NLSY79 and 12 to 17 years old for NLSY97. The latest data sets available are for the years 2008 for NLSY79, when the respondents were mostly in their late 40s, and 2009 for NLSY97, when the respondents were mostly in their mid to late 20s. Almost 13,000 people were enrolled in NLSY79 and about 9,000 in NLSY97. They have been interviewed annually since enrollment (biennially for NLSY79 after 1994).

I became aware of these resources around the year 2000, when I first started thinking about reports that tall people earned more than short people. At that time, I wondered to what extent height explained the difference in earnings between males and females. The data were not available then online, so I ordered a CD with the NLSY79 data through 1998. I extracted some 1998 data on sex, height, and earnings and analyzed them on an Excel spreadsheet. (The respondents were mostly in their mid to late 30s at that time.) Using the built-in linear regression feature of Excel, I found that earnings increased with height for both males and females, the regression lines were nearly equal in slope, and the average earnings for very short people were essentially the same for males and females. There was some suggestion that the height premium for males was greater than for females, so that a 6-foot male would earn about 15% more than a 6-foot female. But tall females earned more than short males.

Unfortunately, I have misplaced the document that recorded exactly what variables I used and exactly how I analyzed the data, even though I still have the spreadsheet. Accordingly, I decided to repeat the analyses with the latest data—2008 for NLSY79 and 2009 for NLSY97. The relevant data can be retrieved via the NLS Investigator tool provided by BLS at https://www.nlsinfo.org/investigator/pages/login.jsp . I logged in as a guest.

Let's look first at the data for NLSY97, when in 2009 the respondents had only been in the labor force a few years. In addition to the variable for sex (ID R05363.00) I extracted the variables specifying height in 2009 (T44946.00 giving the feet and T44847.00 giving the inches) and the total income in the past year (T44060.00—presumably 2008). The total height in inches for the person can be calculated from 12 times the feet variable plus the inches variable. Note that the income variable includes income from commissions and tips, but not from investments or self-employment. The question also excluded income from military service. Presumably to prevent identification of targets for charity appeals, etc., the BLS did not report individual incomes for the top 2% of earners but instead substituted the average for such individuals, in this case $121,993.

For various reasons, complete data were not available for all the original enrollees. Some of them were simply unavailable for interview. Others were unemployed, were in military service, or were institutionalized and had no civilian income. Some refused to answer one or more of the questions or said they didn't know. When I removed these persons from the analysis, I was left

with about 2700 females and 2900 males. In this cohort, I kept a very few people who reported 0 income; I don't know how these people differed from those who were excluded from reporting income.

After culling the dataset, I used the Excel linear regression tool for income vs. height separately for males and females. For males, average annual income is predicted with this model to increase by $547.39 for every inch of height, while for females, it is predicted to increase by $446.20. Both are about 1.65% of average per inch. In this cohort, females are at a slight income disadvantage over the entire range of normal height (I defined normal as between 55 inches and 80 inches.) Both of the associations are highly significant in the statistical sense; the P values are 0.0000744 for males and 0.000349 for females. But the difference in slopes between males and females is not very significant; it is less than the standard error for either regression. According to the model, males make about 10% more than females if they are short, but about 15% more if they are tall. Figure 1 shows the model results graphically, with the blue line being for males and the red line for females.

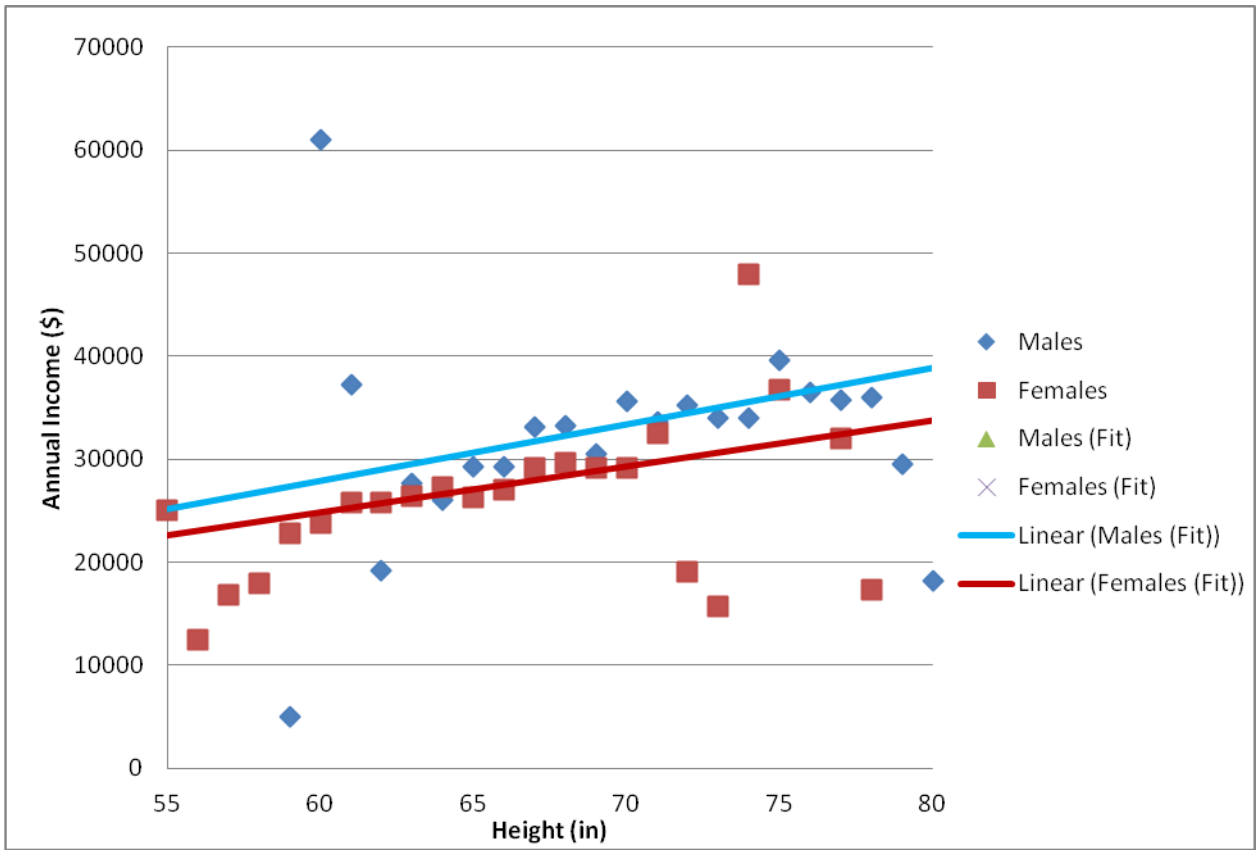

Figure 1. Income vs Height, NLSY97

There's reason to believe that the true relationship between height and income is not a simple linear one. To give some idea what other models might be better, I also calculated the average income for each one-inch increment of height, separately for males and females. These data are also plotted in Figure 1, with the blue diamonds for males and the red squares for females. One can see big departures from the trend (regression) line at the bottom and top of the height range, because only a few individuals are included in the average and individual incomes depend

strongly on factors other than height. There are a few individuals in the cohort with heights outside the plotted range, but whose data were included in the regression.

The data points suggest that income might be somewhat lower for both very short people and very tall people than the linear regression predicts. I speculate that if true, this behavior could be due to people who hire, review, and promote employees being somewhat uncomfortable with people who are not "normal" (meaning not in the expected range of characteristics).

Why is there a height premium? Certainly some jobs really do legitimately require and value physical size: professional athletics, public safety, physical labor. And some jobs clearly value height (e.g., fashion model), although the legitimacy might be challenged. How much of the height premium is due to such factors I haven't yet tried to isolate; perhaps a multifactorial study that included profession or employment sector might tease it out. I'm guessing that adjusting for obvious job requirements would flatten the slope of the regression line but not make it zero. Another explanation is that "height is positively associated with cognitive ability, and it is cognitive ability rather than height that is rewarded in the labor market."[i] And another is that shorter people lose self-confidence and social skills while teenagers and those are what is rewarded.[ii] My explanation is admittedly speculative and I'm not sure how it could be tested, but it seems almost intuitive to me: since humanity arose and undoubtedly much earlier, large, strong individuals tended to be the dominant members of society. So we humans probably have a hardwired assumption that tall people are better, more valuable, and more deserving of respect than shorter people. In other words, if an employer is looking for leadership, where better to look than among tall, respected people. And certainly leadership is rewarded financially. Undoubtedly, leadership has historically been seen to be a male trait as well, probably intertwined with the size/strength preference.

Although the analysis of the NLSY97 cohort seemed to be relatively consistent with what I could remember about my work in 2000, there seemed to be a few small differences, and I was curious what pattern the NLSY79 cohort would show. This time I retrieved data from the 2008 update, when the enrollees were coming into their peak earning years. The variables I used were height in 2008 (T20539.00 giving the feet and T20540.00 giving the inches) and the total income in the past year (T20767.00). Again, the total income for the top 2% of earners was shown as the average for that group, this time $307,823. I again culled the database of all entries for which data were incomplete. Of the nearly 12,700 original enrollees, data were complete for over 3600 males and over 3700 females. In this dataset, I noticed that the number of incomes reported as 0 was relatively much greater than in the NLSY97 cohort, enough to make me somewhat uncomfortable with the average income per one-inch height increment. I have not been able to discover what might have caused that difference. In any case, I decided to remove the zero-income entries, which brought the surviving population to slightly over 3000 males and slightly under 3000 females. Analyzing the database with and without the zero income reports made little difference in the slope of the trend line, but changed the intercepts and the averages for the height increments noticeably. For purposes of display, I chose the analysis with the zero incomes removed. The trends are even more significant than for the 1997 cohort: P values of 0.000000006 for males and 0.0000365 for females. The results are shown in Figure 2.

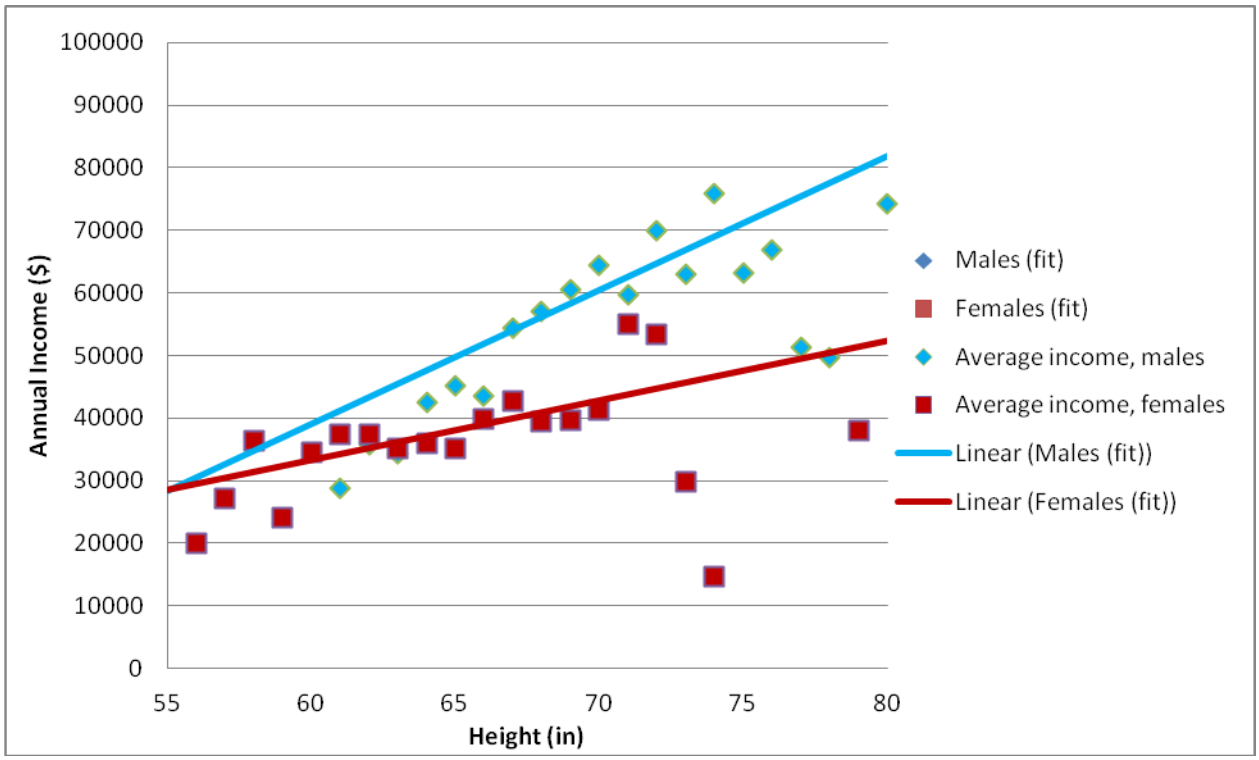

Figure 2. Income vs Height, NLSY79

While I expected to see higher incomes in this cohort and the general pattern shown, I was surprised to see that both slopes had increased (relative to average income) and that the slope for males had increased more than that for females. The premium for height with this model is $2,136.18 per inch for males and $955.28 for females. These represent a 2.55% per inch premium for females and a startling (at least to me) 3.47% per inch premium for males.

I think this finding is consistent with my hypothesis that taller people are seen as leadership material and preferentially promoted into such roles. In the younger cohort, most people of either sex had not reached the time when promotion opportunities would substantially affect their earnings. It is also more consistent than I had expected with the idea of a glass ceiling for females. However, I cannot tease out from these data the effect of childbearing and other gender roles on opportunities for promotion and compensation.

What are the implications of all this for social policy? If I am right about the underlying reason for height and sex income premiums, then one can debate whether the premiums are justified or not. Clearly, many jobs have no objective reason for a height premium whatsoever. But what about jobs where respect for perceived leadership abilities is paramount? Is it just human nature to prefer a tall male for a leadership role? If so, can policies to promote more equity in hires, raises, and promotions be very effective? If they fail, who should we blame? Is there a reason to have affirmative action for females but not for short people?

For the record, I am a short (5’ 5”) male who, being retired, can no longer benefit from affirmative action. I am a physicist by training, not a labor economist or statistician, so my analyses may contain flaws of which I am not aware. I am not providing an e-mail address here

to avoid spam and hate mail. However, you can write to Short Support (editor@shortsupport.org) and have your e-mail forwarded to me. Please forgive me in choosing not to write this piece in standard scientific paper format, which might have given it undue weight and would also obscure my argument.

Steve Brown

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[i] Case, Anne, and Christina Paxson, Stature and status: Height, ability, and labor market outcomes, Princeton University, February 2008 (http://www.princeton.edu/rpds/papers/pdfs/Case_and_Paxson_Stature_and_Status_Resubmission_MS32437_feb2008.pdf)

[ii] Persico, Nicola, Andrew Postlewaite, and Dan Silverman, The Effect of Adolescent Experience on Labor Market Outcomes: The Case of Height, NBER Working Paper No. 10522, May 2004 (http://www.nber.org/papers/w10522)