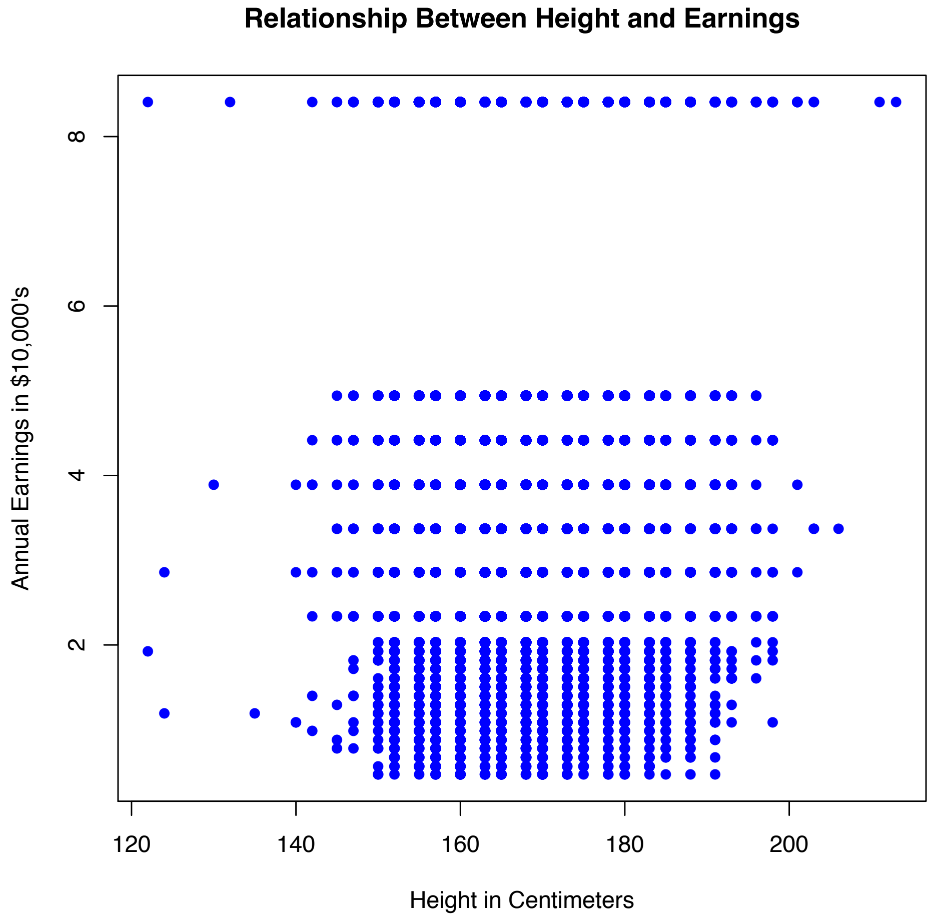
ECOM20001: Econometrics 1

Tutorial 5: Suggested Solutions

Presentation 1: Earnings and Height

1. Typical worker earns $46,875 per year, is 170 cm tall, 77 kilograms and is 41 years old. 44.2% of the workers in the sample are male.
2. The scatter plot does not immediately suggest a positive relationship between earnings and height.



3. Difference in means is $4605/year, two-sample t-test rejects the null of equal means with a t-statistic of 11.470 and p-value less than 2.2e-16. 95% CI is [$3818,$5392]. The results provide initial evidence that taller people in the top

half of the sample above the median height of 170cm have higher average income than people in the bottom half of the sample with height below 170cm.

4. Regression results:

$$\widehat{Earnings}_i = \underset{(0.338)}{-0.051} + \underset{(0.002)}{0.028} Height_i, \quad R^2 = 0.011, SER = 2.678$$

Increasing height by 1cm has a corresponding increase in annual earnings of $280. (<u>Note</u>: I am presenting regression results here that include standard errors for the regression coefficient estimates as prescribed later in Lecture note 5, for consistency in presentation of results).

5. Interpreting the results:

   - Average height is 170cm and the standard deviation of height 10.10cm. So increasing height from 170cm to 180.10cm would yield a corresponding increase in earnings of $10,000 x 0.028 x 10.10cm=$2,828/year. This compares to an average earnings of $46,875/year, implying an annual earnings increase that is 100 x 2828 / 46875 = 6.03% of the sample average. Given inflation tends to be in the 2 to 3% range, this implies a near doubling of income growth year-to-year relative to inflation, which could be interpreted as being economically meaningful, simply from being taller!.
   - This is a more meaningful interpretation than one based on a one-unit increase of 1 cm for a few reasons:
     - A 1-standard deviation increase is a “standard” degree of variation in height in the data relative to the mean so it is more typical in terms of the magnitude of variation in height across individuals than just a 1cm height increase from question 4.
     - Comparing the regression results relative to the mean of earnings provides a natural scaling of the results that can be used to get a sense of percentage impacts relative to the average person in the sample. Again, this permits an interpretation of the empirical results for a “typical” worker in the sample.
     - Therefore, interpretation of empirical results for regressions in terms of simple one-unit increases (1cm height increase) is not always desirable; it depends on the scale of the dependent and independent variables in a regression.

6. Regression results for males:

$$\widehat{Earnings}_i = \underset{(0.709)}{-4.337} + \underset{(0.004)}{0.052} Height_i, \quad R^2 = 0.021, SER = 2.667$$

Results for females:

$$\widehat{Earnings}_i = \underset{(0.630)}{1.245} + \underset{(0.004)}{0.020} Height_i, \quad R^2 = 0.003, SER = 2.680$$

Contrasting the results for males and females, there are two notable findings:

- The regression coefficient is more than double for males. This means, for example, a one-standard deviation increase in height of 10.10 cm implies a $10,000 x 0.052 x 10.10cm=$5,200/year income increase for males compared to a $10,000 x 0.020 x 10.10cm=$2,000/year increase for females.
- The R-Squared for the males regression of 0.021 is 7-times (!) larger than the R-Squared for the females regression of 0.003. That is, height has much more predictive power for earnings among males than females.

One possible economic explanation for this result is men tend to work in physical jobs like manufacturing or construction where there is a benefit from being taller.

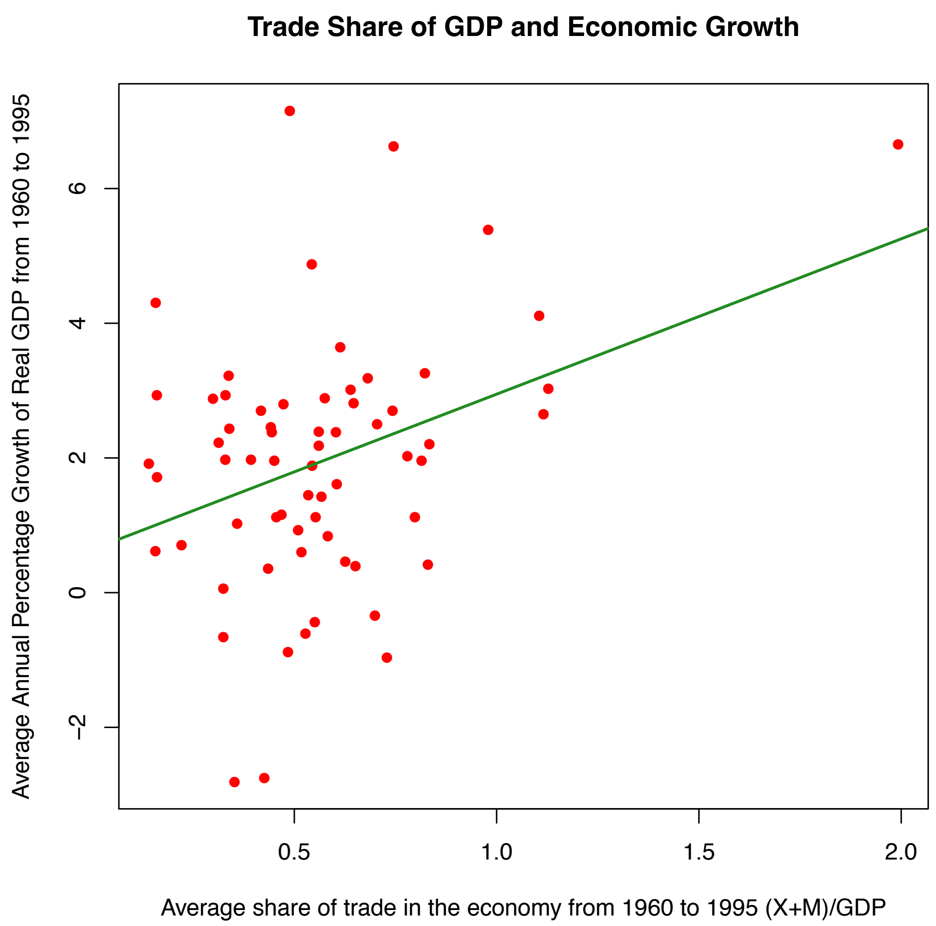
Another related possibility is that men historically work in more corporate jobs where being taller signals confidence and strength to other corporate types (or indeed being tall makes someone more confident because they are able to use it to their advantage in for example sports during their childhood), and that such signalling benefit tends to be more important for males in earning higher corporate income.

Note that the emerging gender shift in corporate jobs is substantial and these relationships may break down in the future as gender balance continues to improve in the corporate world.

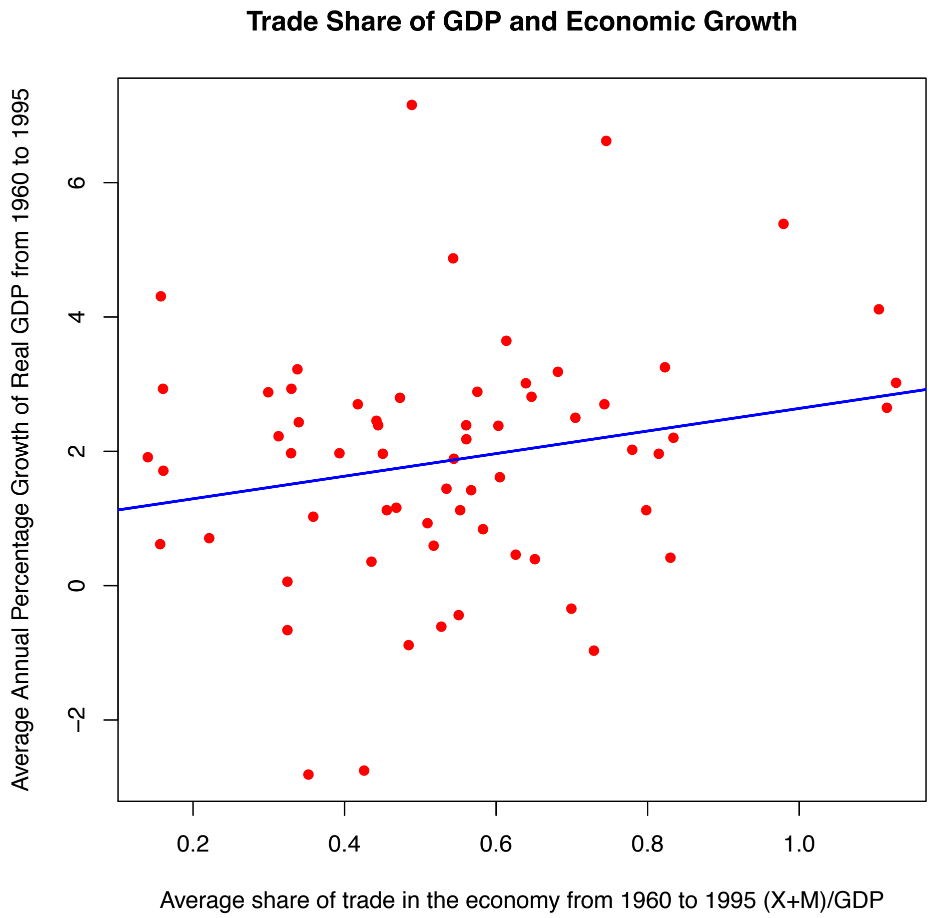
<u>Presentation 2: Trade and Growth</u>

1. Typical country has an average annual growth rate of 1.94%, real (1960=100) GDP of $3,104 per person, and a trade share of 56.47%. For the latter, this means the average country gross exports and imports together more than *half* of its annual GDP.

2. Scatter plot is presented below. There does appear visually to be a positive relationship between growth and trade. The data point for Malta in the top right hand corner is notable.



3. Scatter plot dropping Malta presented on the next page below. We immediately see that the growth-trade relationship weakens as the slope of the line of best fit flattens considerably. Given the influential impact of Malta on the results, we should drop it as an outlier in the sample.



4. Regression results for entire sample:

$$\widehat{Growth}_i = \underset{(0.490)}{0.640} + \underset{(0.774)}{2.306}\, TradeShare_i, \quad R^2 = 0.124, SER = 1.790$$

Regression results for sample dropping Malta

$$\widehat{Growth}_i = \underset{(0.580)}{0.957} + \underset{(0.987)}{1.681}\, TradeShare_i, \quad R^2 = 0.045, SER = 1.789$$

There is a substantial change in the regression coefficient estimate from dropping Malta from the sample. In the full sample, a 1 unit 100% increase in trade share has a corresponding 2.31% increase in average annual growth rate. With the sample that drops Malta, a 1 unit 100% increase in trade share has a corresponding 1.68% increase in average annual growth rate. Dropping Malta from the sample reduces this estimate by 100 x (2.31-1.68)/2.31 = 27.27%, a huge change in the results. Malta should be dropped as an outlier.

5. The average country has a trade share of 0.5647 and the standard deviation of trade share is 0.289. So increasing trade share from 0.5647 to 0.5647 +0.289=0.8537 has a corresponding increase in the GDP growth rate from the results dropping Malta of 1.681 x 0.289 = 0.486% increase.

    - This is a relatively large increase relative to the average GDP growth rate of 1.94 in the sample; the predicted change in GDP growth is 100 x 0.486 / 1.94 = 25% of the sample average.
    - One possible economic explanation for this is countries that are more engaged in trade as a share of the GDP are more connected to the world and are thus more rapidly able to learn about new technologies and policies that improve a country's well-being over time relative to countries that are less engaged in international trade and thus less exposed to international best practices among trading partners.
    - An alternative explanation is that countries that are more engaged in international trade are better at exploiting the economics of comparative advantage and are thus better at specialising in the production of some products, while relying on trading partners to trade with who separately specialise in the production of other products where they have comparative advantage. By exploiting production and trading relationships in this way, countries that are more engaged in international trade can use comparative advantage to grow the size of their "economic pie" or GDP relative to more isolated countries that do not exploit the production-enhancing benefits of comparative advantage and trade.