How do physical look impact wages?

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Abstract

This paper focuses on the effect physical look has on an individual's hourly income. This study employs data obtained from the BC dataset, bcbeauty, which contains consists of representative samples of 1260 Americans and their appearance ratings. This data is used to regress hourly income on different variables that can also influence an individual's income, for example, gender and years of education. These factors are used to adjust for the income differentials related to looks. Results confirmed that physical attractiveness slightly correlates positively with yearly income. And larger incomes are also associated with maleness and more education.

I. Introduction

An old saying in China suggests people with a better physical look always "win at birth," meaning their physical beauty is their key to any obstacles and ultimate success. It has been held as common sense for hundreds of years during whatever social progress and even nowadays looking good pays off in the labor market.

Multiple literature sources have pointed out that beauty indeed affects income. While those research pointed out how beauty affects income to different degrees, numerous questions remained, and no study has analyzed the relationship between physical appearance and income throughout years of education.

Section II summarizes the previous study regarding how people's physical look could impact their income. Section III presents the hypothesis and the description of variables in the dataset, bcbeauty. Section IV characterizes the data used to conduct this research. Section V shows and analyzes the results of our observations. Finally, section VI reveals our main conclusion of the research.

II. Literature Review

It has been generally agreed by economists and scholars that people with a better appearance tend to have more substantial pay. As the founding father of the Economics of Beauty, Professor Hammermesh developed a series of studies throughout his career about how better look people are getting better off in a great variety of fields. In one of his very early studies in 1994, he grouped surveyed people's appearance into three categories: below average, average, and above average. As a "plainness penalty" as he described, he found a person with

below-average looks tended to earn 9 percent less per hour. On the contrary, as a "beauty premium," a person with above-average looks tended to make 5 percent more than an average person. In his recent book published in 2015, he further demonstrates how our society favors beautiful people and how their appearance positively affects every positive of their life, from working more productively and profitably to a better chance of loan approval, even get more handsome and higher educated spouses.

When it comes to the effect of beauty, people might tend to think that the physical appearance of female values over the male. However, the results are really surprising. Only based on self-assessed measure of physical appearance, Michael French founded a beauty premium for female workers but not male workers. That could because females tend to think and emphasize more on how their appearance impacts their wages than it really is, and the standards of beauty vary from person to person. But more research based on other ways of judgment for beauty, either using scientific measurements or interviewer's ratings, actually pointed out and proved the opposite. For instance, Daiel Hamermesh and Jeff Biddle found "The penalty and premium may be higher for men." In the study conducted by Barry Harper, he actually found the "penalty for plainess" was 15 percent for men and only 11 percent for women. Besides, in a recent study conducted by John Schloz and Kamil Sicinski, a long-run correlation between facial attractiveness and income was analyzed, they found "a durable, persistent, and economically large correlation between the facial attractiveness of men and their earnings." These results actually pointed out, unlike what people normally think, men's physical look had an even greater impact than women.

III. Data Description

To answer our questions, we want to see whether appearance affect the wage income of the people. Wage (wage: hourly wage) is our dependent variable while appearance (looks: from 1 to 5) is our main explanatory. Of course, other factors like and genders (female: =1 if female) and years of education (educ: years of schooling) can affect the income wages and may differ by different appearances. Therefore we will also include variables like years of education and genders.

Wage represents how much an individual earned as wages per hour. As the data shows in Table 1, the minimum hourly wage and maximum hourly wage have a very large difference. On average, however, individuals earn approximately 6.3 dollars/hour.

Table 1: Summary statistics for wage, looks, and years of education

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	1,260	6.30669	4.660639	1.02	77.72
looks	1,260	3.185714	.6848774	1	5
educ	1,260	12.56349	2.624489	5	17

In Table 2, it is clearly shown that the median income is 5.3 dollars, which is about 20% lower than the average income. This is most likely due to outliers who earn much higher wage income than the rest of the people. According to the table, we can clearly see that a small percent of these workers can earn more than 24.73 dollars which is almost 5 times as much the average income we found in Table 1. So we decided to eliminate the observations with income above or

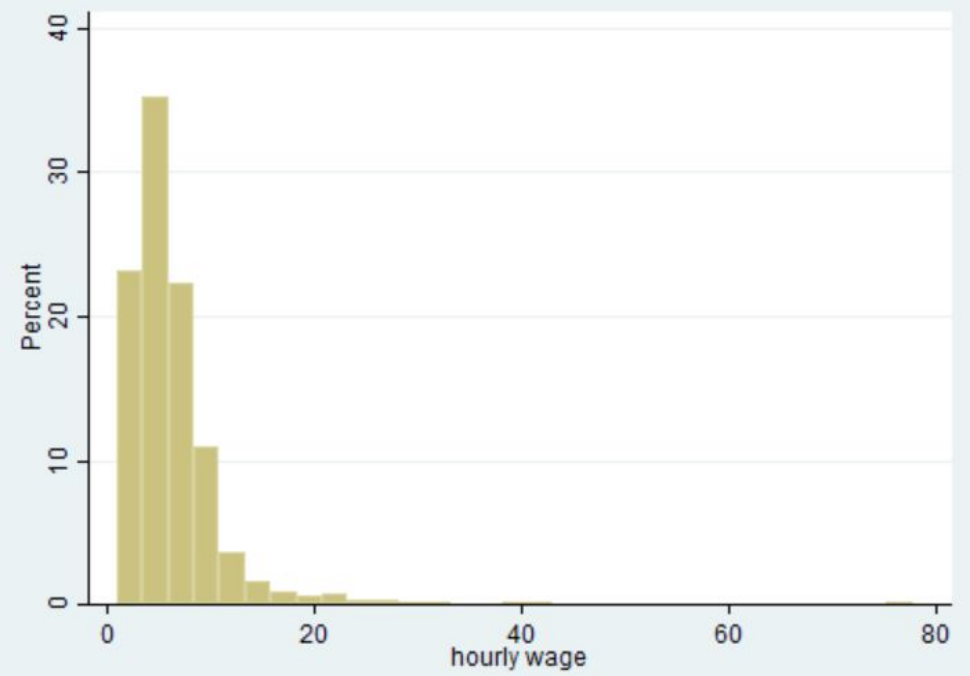
equal to 25 dollars. As shown in Figure 1, the distribution of income wages has a skewness to the right.

Table 2: Median Hourly Wage

hourly wage

	Percentiles	Smallest		
1%	1.27	1.02		
5%	1.98	1.05		
10%	2.31	1.09	Obs	1,260
25%	3.705	1.16	Sum of Wgt.	1,260
50%	5.3		Mean	6.30669
		Largest	Std. Dev.	4.660639
75%	7.7	32.79		
90%	10.295	38.86	Variance	21.72156
95%	13.25	41.67	Skewness	4.813466
99%	24.73	77.72	Kurtosis	54.01341

Figure 1: Histogram of Hourly Wage



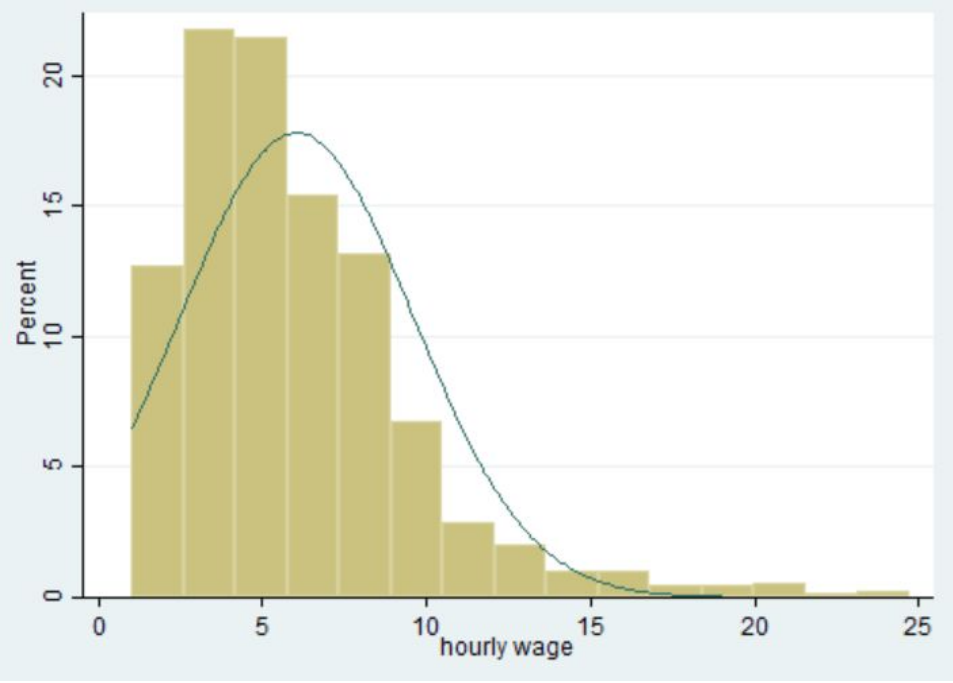
After we eliminated the outliers, as shown in Table 3, we found a new mean income wage of 6.04 dollars, which is closer than the previous data. Besides that, the graph shows that hourly wages are not distributed normally.

Table 3: Median wage (When Hourly Wage is less or equal than 25)

```
. summarize wage if wage<=25
```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	1,248	6.040144	3.541089	1.02	24.73

Figure 2: Histogram of Hourly Wage (When Hourly Wage is less or equal than 25)



From Figure 3 and Table 4, we find a correlation between wage and looks. They tell us that when looks increase by one unit, hourly wage on average increases by $0.65.

Figure 3: Scatter Plot of Wage and Looks

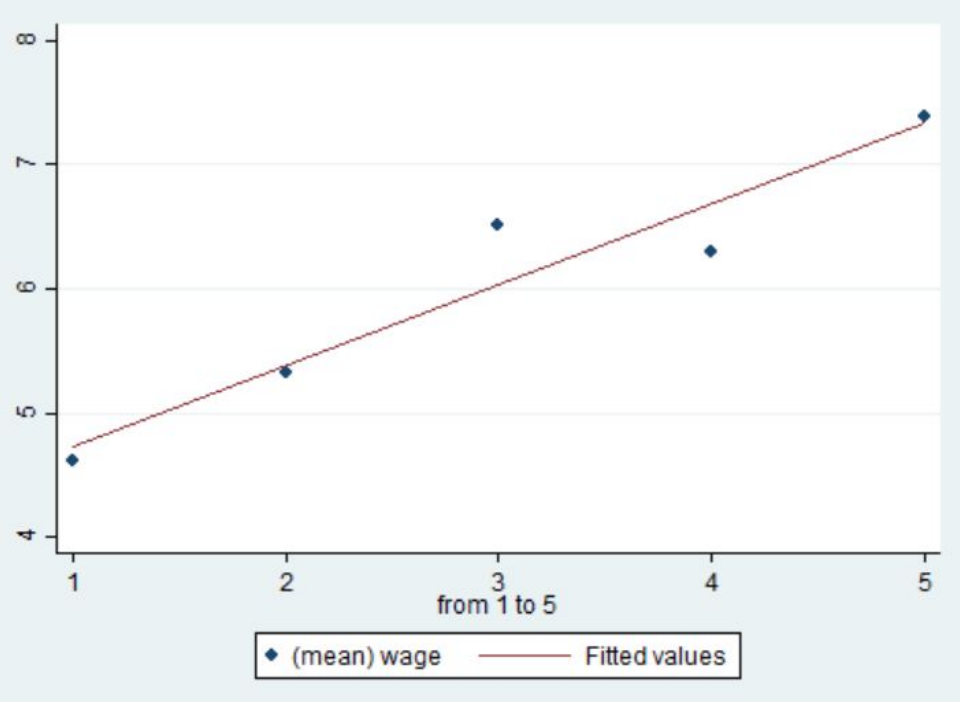


Table 4: Regression of Wages and Looks

wage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
looks	.6504303	.0585302	11.11	0.002	.464161	.8366996
_cons	4.077249	.1773967	22.98	0.000	3.512694	4.641805

With further analysis of the correlation between the two variables, we have a better insight into how appearances can affect the wages of workers. As shown in Table 5, the correlation between looks and wages is 0.0560. That is, as the only variable here, better looks can only contribute to higher wages on a very limited scale.

Table 5: Correlation between Hourly Wage and Looks

```
. corr wage looks if wage<=25
(obs=1,248)

             |     wage    looks
-------------+------------------
        wage |   1.0000
       looks |   0.0560   1.0000
```

IV. Empirical Strategy

To give an accurate answer about whether appearance can truly affect income, we decide to examine the correlation between wages and looks under different circumstances. To test our hypothesis that looks have the largest impact on wages for women employees without a higher education background. We decide to first review the correlation between looks and wages in general. After that, we will further examine the correlation by taking other important factors like years of education and genders into account.

In Table 6, we divided the samples into two groups by how good-looking they are. We separate the samples with looks >= 3 from those samples with looks < 3, and examine them

separately. For now, we can find that those workers with better lookings have higher average incomes.

Table 6: Hourly Wage by Looks

```
. summarize wage if looks>=3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |      1,094    6.167797    3.578357        1.02      24.73

. summarize wage if looks<3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        154    5.133312    3.127551        1.09      20.99
```

To take variables like genders and years of education into account, we decided to introduce them as two binomial variables. We set a new binary variable, higher_education. If interviewees received higher education, higher_education is equal to one. If they received high school education or below, higher_education is equal to zero. Table 7 shows how these two variables are distributed among these samples.

Table 7: Conditional Probability of Education Background and Gender

Key
frequency *row percentage*

=1 if female	higher_education 0	1	Total
0	460 56.58	353 43.42	813 100.00
1	246 56.55	189 43.45	435 100.00
Total	706 56.57	542 43.43	1,248 100.00

As we take more variables into account, from Table 8, we find that the looks of workers can affect income wages differently under different circumstances.

Table 8 Hourly Wages under Different Education Backgrounds and Genders

```
. summarize wage if female==1 & higher_education==0 & looks>=3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        215    3.595907    1.556025       1.16      10.12

. summarize wage if female==1 & higher_education==0 & looks<3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |         31    2.997097    1.281154       1.09       6.67

. summarize wage if female==0 & higher_education==0 & looks>=3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        396    6.649343    3.490103       1.05      24.73

. summarize wage if female==0 & higher_education==0 & looks<3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |         64    5.255469     2.81252       1.17      18.74

. summarize wage if female==1 & higher_education==1 & looks>=3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        161    5.007081    2.446603       1.02      12.12

. summarize wage if female==1 & higher_education==1 & looks<3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |         28    4.451071    2.334061       1.65        9.1

. summarize wage if female==0 & higher_education==1 & looks>=3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        322    7.873199    3.962751        1.8      23.32

. summarize wage if female==0 & higher_education==1 & looks<3 & wage<=25

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |         31    7.633548    3.884419       3.08      20.99
```

When workers have not accepted higher education, income wages are generally lower. Under such circumstances, looks are likely to have a bigger effect on wages. Such an effect will be further enhanced if the workers are male. When we examine workers with no higher education, good-looking male workers are likely to earn 26.52% more than poor-looking male workers. On the other hand, female workers with no education but have good appearances earn only 19.98% more than female workers with no education and have poor appearances.

When workers have accepted higher education, income wages are generally higher. Under such circumstances, looks are likely to have a smaller effect on wages. However, under such a circumstance, looks tend to have a larger effect on wages for female workers than male workers. When we examine workers with higher education, looks have a lower effect on both male and female workers. The increasing rate from poor-looking men and women who had higher education to good-looking men and women who had higher education are only 6.61% and 12.49%.

According to our analysis above, we can conclude that our original hypothesis should be rejected. The realistic situation is that the wage of male workers with low education level is affected the most by their looks.

V. Results and Analysis

We introduce new variables "diff," the difference between the bad-looking group and good-looking group, and "good_look," good_look==1 if looks>=3. To start out a hypothesis test, we set our null hypothesis H0: diff=0 and alternative hypothesis Ha≠0.

Applying the hypothesis to female and male workers with higher education, from Table 9 and 10, we found that at a confidence level of 95%, diff=0 is still located in the confidence interval, therefore we can't reject the null hypothesis for these two groups of workers. In other words, we can't guarantee that appearance will affect wages.

Table 9 T-test for female with higher education

```
. ttest wage if wage<=25 & female==1 & higher_education==1, by(good_look)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	28	4.451071	.441096	2.334061	3.546017	5.356126
1	161	5.007081	.1928194	2.446603	4.626281	5.38788
combined	189	4.924709	.1769223	2.432279	4.575701	5.273717
diff		-.5560093	.4976981		-1.537834	.4258152

```
    diff = mean(0) - mean(1)                                      t =  -1.1172
Ho: diff = 0                     degrees of freedom =      187

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1327         Pr(|T| > |t|) = 0.2654          Pr(T > t) = 0.8673
```

Table 10 T-test for male with higher education

```
. ttest wage if wage<=25 & female==0 & higher_education==1, by(good_look)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	31	7.633548	.6976622	3.884419	6.208732	9.058365
1	322	7.873199	.2208355	3.962751	7.438731	8.307666
combined	353	7.852153	.2102946	3.951077	7.438561	8.265745
diff		-.2396504	.7439567		-1.702824	1.223523

```
    diff = mean(0) - mean(1)                                      t =  -0.3221
Ho: diff = 0                     degrees of freedom =      351

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3738         Pr(|T| > |t|) = 0.7475          Pr(T > t) = 0.6262
```

However, when we apply the hypothesis test to female workers with lower education at a confidence level at 95%, we find that diff=0 doesn't lay within the confidence interval anymore. That is, we can reject our null hypothesis and conclude that a good look does have a positive effect on female workers with lower education, as we are 95% confident the population average difference is between -1.17 and -0.02.

Table 11 T-test for female without higher education

```
. ttest wage if wage<=25 & female==1 & higher_education==0, by(good_look)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      31    2.997097    .230102    1.281154    2.527166    3.467028
       1 |     215    3.595907     .10612    1.556025    3.386733    3.805081
---------+--------------------------------------------------------------------
combined |     246    3.520447   .0978528    1.534761    3.327707    3.713187
---------+--------------------------------------------------------------------
    diff |           -.5988102    .292961               -1.175865   -.021755
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.0440
Ho: diff = 0                                     degrees of freedom =      244

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0210         Pr(|T| > |t|) = 0.0420          Pr(T > t) = 0.9790
```

Furthermore, we apply this hypothesis test to male workers with higher education. For the same reason in the previous paragraph, we can also conclude that good look also affect less-educated male workers' wage positively. To be more specific, since the 95% confidence interval (-2.29 to -0.49) for less-educated male workers lays further away to the left than the confidence interval of less-educated female workers does, we can tell that appearance has the bigger effect on male workers with lower education.

Table 12 T-test for male without higher educatio

```
. ttest wage if wage<=25 & female==0 & higher_education==0, by(good_look)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	64	5.255469	.3515649	2.81252	4.552922	5.958015
1	396	6.649343	.1753843	3.490103	6.30454	6.994147
combined	460	6.455413	.160172	3.435307	6.140652	6.770174
diff		-1.393875	.4587187		-2.295329	-.4924205

```
    diff = mean(0) - mean(1)                                      t =  -3.0386
Ho: diff = 0                                     degrees of freedom =      458

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0013         Pr(|T| > |t|) = 0.0025          Pr(T > t) = 0.9987
```

To begin with our regression analysis, we utilize variables, wage and good_look. Applying this analysis to female workers with higher_education, we get the equation：

wage=4.45+0.56*good_look

This equation tells us that for female workers with higher education, those are considered good-looking may earn 0.56 dollars per hour more than those are considered bad-looking. However, our coefficient=0 is within the 95% confidence interval (-0.38 to 1.50). Therefore, we can not conclude that there is a positive correlation between income and appearances for female workers with higher education.

Table 13 Regression analysis for female with higher education

```
. regress wage good_look if female==1 & higher_education==1 & wage<=25, robust

Linear regression                               Number of obs     =        189
                                                F(1, 187)         =       1.36
                                                Prob > F          =     0.2447
                                                R-squared         =     0.0066
                                                Root MSE          =     2.4307
```

wage	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
good_look	.5560093	.4764106	1.17	0.245	-.3838207	1.495839
_cons	4.451071	.4354578	10.22	0.000	3.59203	5.310113

Applying this analysis to female workers without higher_education, we get the equation

wage=3.00+0.60*good_look

This equation tells us that for female workers without higher education, those are considered good-looking may earn 0.60 dollars per hour more than those are considered bad-looking. Furthermore, our coefficient=0 is within the 95% confidence interval (0.10 to 1.09). Therefore, we can conclude that there is a positive correlation between income and appearances for female workers with higher education.

Table 14 Regression analysis for female without higher education

```
. regress wage good_look if female==1 & higher_education==0 & wage<=25, robust

Linear regression                               Number of obs     =        246
                                                F(1, 244)         =       5.70
                                                Prob > F          =     0.0178
                                                R-squared         =     0.0168
                                                Root MSE          =     1.5249

------------------------------------------------------------------------------
             |               Robust
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   good_look |   .5988102   .2509181     2.39   0.018     .1045682    1.093052
       _cons |   2.997097   .2272861    13.19   0.000     2.549404     3.44479
------------------------------------------------------------------------------
```

Applying this analysis to male workers with higher_education, we get the equation：

wage=7.63+0.24*good_look

This equation tells us that for male workers with higher education, those are considered good-looking may earn 0.24 dollars per hour more than those are considered bad-looking.

However, our coefficient=0 is within the 95% confidence interval (-1.18 to 1.66). Therefore, we can not conclude that there is a positive correlation between income and appearances for female workers with higher education.

Table 15 Regression analysis for male with higher education

```
. regress wage good_look if female==0 & higher_education==1 & wage<=25, robust

Linear regression                               Number of obs     =        353
                                                F(1, 351)         =       0.11
                                                Prob > F          =     0.7405
                                                R-squared         =     0.0003
                                                Root MSE          =     3.9561

------------------------------------------------------------------------------
             |               Robust
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   good_look |   .2396504   .7229172     0.33   0.740    -1.182144    1.661445
       _cons |   7.633548   .6882699    11.09   0.000     6.279897      8.9872
------------------------------------------------------------------------------
```

Applying this analysis to female workers without higher_education, we get the equation

wage=5.26+1.40*good_look

This equation tells us that for male workers without higher education, those are considered good-looking may earn 1.40 dollars per hour more than those are considered bad-looking. Furthermore, our coefficient=0 is within the 95% confidence interval (0.63 to 2.19). Therefore, we can conclude that there is a positive correlation between income and appearances for female workers with higher education. Last but not least, since the confidence interval for the coefficient of male workers without higher education lays further away to the left than all the

other confidence intervals of coefficient. That is, we can say looking has the biggest positive impact on male workers without higher education.

Table 16 Regression analysis for male without higher education

```
. regress wage good_look if female==0 & higher_education==0 & wage<=25, robust

Linear regression                               Number of obs     =        460
                                                F(1, 458)         =      12.70
                                                Prob > F          =     0.0004
                                                R-squared         =     0.0198
                                                Root MSE          =     3.4049

------------------------------------------------------------------------------
             |               Robust
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   good_look |   1.393875     .39117     3.56   0.000     .6251643    2.162585
       _cons |   5.255469   .3495683    15.03   0.000     4.568512    5.942425
------------------------------------------------------------------------------
```

The R-squared value tells us what percentage of the variation in income is explained by variation inexperience. In our regression analyses, it is worth to notice that the R-squared values are pretty low. Partly, it is because our independent variable, good_look, is binomial and discontinuous variable. However, we also need to consider that other factors like race may also affect wages.

VI. Conclusions

The main purpose of this paper was to determine whether there is a positive relationship between physical appearance and wages. The results of our research based on the dataset bcbeauty suggest that good looks indeed have a positive effect on wages. However, as the only

variable, better looks can only contribute to higher wages on a very limited scale because the correlation between looks and wages is just 0.0560. This result is consistent with early studies(e.g. Hamermesh and Biddle, 1994; French, 2002; Engemann and Owyang, 2005), suggesting there is a positive correlation between looks and beauty.

It should be noted that this positive effect can vary depending on other factors like gender and education backgrounds. From our dataset, we find that good looks actually have the largest impact on male employees without higher education, while its effects on male and female employees with higher education can be ambiguous. With higher education, it seems that looks are less important for wages.

Although our research shows that there is a positive correlation between looks and wages, we cannot be so sure that there is a causal relationship between looks and wages, as other factors like race may also affect wages. In our future research, we may also take race into considerations and examine the effects of good looks on wages under different races.

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