

The Effect of Introversion on Income

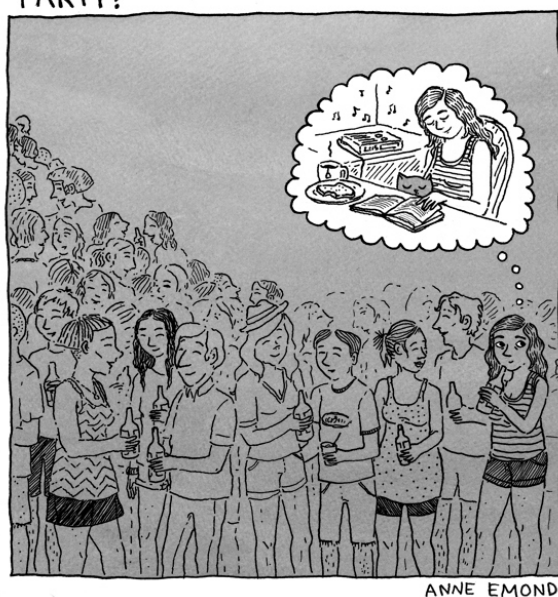
Olivia Larsen (orl1), Robin Park (yp1), Jacob Watt-Morse (jww2)

Introverts have been lauded by popular literature and online culture in recent years. Claims circulate that introverts are more economically valuable than extroverts because of traits associated with introversion, such as thoughtfulness and peacefulness. This paper seeks to explore this claim and investigate the relationship between introversion and labor market value. We use free time spent alone in hours as a measure of introversion and wages as a measure of labor market value. Our results showed that free time spent alone did not have an economically or statistically significant effect on wages, implying that introversion does not have a significant effect on income.

I. Introduction

The internet loves introverts. In recent years, online entertainment websites like BuzzFeed have begun to see introversion as a quality that positively affects an individual's value and labor market potential. BuzzFeed used the following Anne Emond comic in an article titled "11 Comics Every Introvert Will Understand" to laud introverts (Ringerud 2014).

1. There's always just one thing on your mind at every party you go to.
PARTY!



This comic shows an introvert at a party, presumably full of extroverts. She imagines herself at home, alone, with a book, music, and a cat. This shows the introvert as the more cultured, intellectual personality type, which implies that she will be a better, more productive employee than the nearby extroverts who seem to be hedonistically enjoying their party. In her best-selling book *Quiet: The Power of Introverts in a World that Can't Stop Talking*, Susan Cain says of introverts:

They prefer to devote their social energies to close friends, colleagues, and family. They listen more than they talk, think before they speak, and often feel as if they express themselves better in writing than in conversation. They tend to dislike conflict. Many have a horror of small talk, but enjoy deep discussions (Cain 2012).

Using the introvert/extrovert categorization system to classify individuals and make such quality assessments, Cain implies that because introverts are more thoughtful, articulate, deep, and peaceful than extroverts, they are more valuable than extroverts.

This growing trend in popular culture has economic implications. Because introverts possess these qualities, many argue that introverts are more valuable than extroverts, in the context of the labor market. In this paper, we seek to investigate the connection between introversion and income. Do introverts make better employees, if they possess superior traits listed by Cain and BuzzFeed? Do these traits make them more productive or valuable than extroverts? We tackle these questions by focusing on the most visible indicator of labor quality, which is worker compensation. Broadly, we examine whether introversion affects income, with a narrower question: does daily free time spent alone affect hourly wages?

II. Background

Much of the existing literature on productivity or performance based on personality type utilize self-reported surveys, asking participants about whether or not they liked to be around

people and similar questions, to categorize individuals as introverts or extroverts. Zieger and Sullivan (1999) used the Myers-Briggs personality test, which categorizes individuals using four different personality binaries (including an introvert/extrovert classification) to investigate gender gaps in economics. Results showed that “in general, regardless of the performance measure employed, introverts outperform extroverts [in the study of economics]” (Ziegert and Sullivan 1999). Monahan, Shah, and Jochum (2013) used an author-written survey as indicator of introversion to examine the relationship between personality type and job-seeking after college. They found that extroverts *expected* to earn more money than did introverts (Monahan, Shah, and Jochum 2013).

Other papers of interest used the “Big Five” personality characteristics (extroversion, agreeableness, conscientiousness, agreeableness, and openness to experience) and their effect on wages. Lenton (2014) found that “males are rewarded for extroversion” in the labor market but that extroversion is negatively associated with educational attainment for males (Lenton 2014). Mueller and Plug (2006) found that extroversion has statistically significant effects for both males and females, showing a wage penalty for extroverted females and a near-zero effect on male wages. Using European data sets, Nyhus and Pons (2005) found that “extraversion and agreeableness are negatively associated with wage in both the total and the female samples.”

Rather than investigating the effect of an individual’s holistic ‘personality’ on his or her income, our study focuses on and seeks to isolate the effects of the introversion/extroversion personality trait on income. We use a quantifiable measure (free time spent alone in a given day) for introversion, with hopes that it will reduce subjectivity and self-reporting bias that may result from self-reported surveys, such as those used in previous research. While it is possible for

individuals to make subjective and possibly inaccurate judgments of their levels of extroversion, the amount of time spent alone in a given day is an objective quantification, which is favorable for our purposes. Moreover, because time spent alone is a continuous variable, it allows for variation between different *levels* of introversion, as opposed to a simple categorization. The unique characteristics of this variable allows us to offer a look into the effect of introversion as a scale as opposed to a dichotomy, and reduce the subjectivity of an individual's self-analysis by instead observing introverted *behavior* and income.

However, the measures we use are not completely removed from subjectivity. Individuals still self-report how they spend their time, which is still subject to falsification or erroneous reporting. In addition, the researchers who compiled the American Time Use Survey (ATUS), the data set we use, must then decide what activities during a given time qualify as time spent alone (for example, is videochatting with a friend time truly spent alone?). We must also consider the possibility that wages may not be an accurate measure of labor market value. Cain and popular literature suggest that introverts are paid less in the labor market than they are worth. Contrary to such claims, we argue that these factors are not significantly correlated with the introversion/extroversion trait. Because labor market value is a subjective scale, there is no way to accurately verify either assumption. However we believe that on average, individuals are compensated for their quality of work rather than personality type. Moreover, there is a variety of factors that might influence wages more significantly than personality type, from technical factors such as job location or company budget to more nebulous factors such as social or negotiation skills. Since our sample was collected randomly, we can assume these errors will average to zero across the sample.

III. Methods

Our investigation of introversion on income uses an Ordinary Least Squares (OLS) regression to estimate the effect of non work-related time spent alone on wages. To better isolate this effect, we include presence of household spouse or partner, total average hours spent working per week, hours spent alone at work, presence and number of children, age, age-squared, highest education level attained, and gender as control variables. We include the effect of presence and number of children in separate regressions.

We base our regression on the following **population model**:

$$lwage = \beta_0 + \beta_1 a + \beta_2 p + \beta_3 h + \beta_4 a^{work} + \beta_5 hs + \beta_6 ad + \beta_7 bd + \beta_8 c + \beta_9 g + \beta_{10} g^2 + \beta_{11} s + u$$

where *lwage* is log of hourly wage; *a* is hours spent alone per day; *p* is presence of spouse or partner in household; *h* is hours worked per week; *a^{work}* is time spent alone at work; *c* is either presence or number of children in household; *g* is age; *g²* is age squared; and *hs*, *ad*, and *bd* are dummy variables which represent an individual's highest level of academic achievement, where *hs* is high school, *ad* is associate's degree, and *bd* is bachelor's degree; and *s* is sex. We also regress men and women separately; since wage determinants are different for men and women, we investigate whether or not introversion has a different effect on wages for men and women.

We chose to use time spent alone outside of work as a proxy for introversion, since a predominant trait of introverts, as compared to extroverts, is voluntarily spending time alone. To make this assumption, we argue that individuals have mostly complete control of time spent alone, outside of the familial unit. By controlling for presence of kids and partners, we believe that we are effectually controlling for time outside of work that individuals spend with others that they may otherwise choose to spend differently.

We must also assume that other unobserved factors—such as traits that are frequently linked to introversion—have no effect on wages, as this would create a bias. Social skills is an example of a factor that might potentially be correlated with both free time spent alone and wages. But because these are unquantifiable in their entirety, it is not possible for us to include and control for them in our regression model. However, we control for characteristics related to social skills, such as presence of spouse or children in the household, which we believe will serve as elementary proxies for social skills. We argue that the inclusion of these variables diminishes the bias caused by variation in social skills so that it has minimal effect on our regression.

We attempt to control for type of occupation by number of hours respondents spend alone at work, rather than controlling for distinct occupation codes. We also include total number of hours worked per week, so that we can interpret free time spent alone proportionately to the amount of time spent working. Yet even with these controls, some issues remain. For instance, introversion may be correlated with certain job types (such as those with greater number of hours spent alone), which is correlated with wages. In this case, we may be overcontrolling for time spent alone at work, since job type is a mechanism by which introversion affects wages in this case. Moreover, different job types have different wages, even if the number of hours spent alone at the workplace is comparable. However, we hope to identify a general trend in the labor market than an isolated effect on more specific occupation types, so with the assumption that the error terms are uncorrelated among job types, we hope that our regression model will reflect this broader trend.

We must also assume that the standard assumptions for linear regressions hold. The American Time Use Survey (ATUS) samples randomly selected individuals “from a subset of households that have completed their eighth and final month of interviews for the Current Population Survey (CPS)” (American Time Use Survey 2010). The CPS survey is a highly credible data source, so we can assume that the survey was distributed randomly. Though the survey was given to a randomly selected sample, the demographics of respondents and the days on which they responded were skewed. To compensate, the ATUS survey includes weights that adjust for both of these biases. We use these weights (*pweights*) to make the sample more representative of the true population.

In addition, we must also assume that the population parameters are linear in order for our regression model to be a correct representation of the population. We create logged versions of wage to represent the general trend of this variable. We also square the age variable in our regressions because the effect of age on wage normally follows a quadratic trend; therefore, by including age squared, we are better estimating the effect of age on wage. We also use the robust standard errors to account for the heteroskedasticity of data for dummy variables. Given these adjustments, we can assume that our overall model is linear in parameters.

IV. Data

We use data from the 2010 ATUS but limit the sample to American adults (between the ages of 18 and 64) who were in the paid labor market in 2010 in order to remove potential bias that unemployment and/or unreported income might create in our regression.

The ATUS is a joint effort between the U.S. Census Department and the Bureau of Labor Statistics. Households are randomly selected from those who finished the Current Population

Survey and individuals are asked about their use of time in the previous calendar day as well as demographic questions (i.e income, race, gender). From this data set, we use variables such as number of nonwork-related hours individuals spent alone the previous day, number of hours respondents usually work per week, the number of children in the household, and a binary variable which indicates if there are children in the house and the respondents age and gender. We also create new variables that represent the log of weekly earnings, binary variables for highest level of education completed (high school, associate, bachelor), if the respondent lived with a partner or spouse, and how many hours the respondent spent alone at work.

From the initial data, which had 6654 observations, we reduced the sample to include only those who recorded responses for each of the variables we use in our regressions, were employed, and between the ages of 18 and 64. This reduced our sample size to 3381 observations. As noted previously, the data was skewed by responses which overrepresented demographics and days of the week. We apply weights provided by ATUS to counteract this effect. The addition of weights showed that individuals in our sample were more likely to respond if they earned a higher wage, spent less time alone, were older, educated, and had fewer kids.

Table 1: Weighted Summary Statistics

Weighted Summary Statistics						
Variable	Obs	Weight	Mean	Std. Dev	Min	Max
log of hourly wage	3381	2.3522e+10	2.637	.522	0	4.605
hours per day spent alone	3381	2.3522e+10	3.992	3.408	0	21
total hours usually worked per week	3381	2.3522e+10	37.291	11.567	0	100
minutes per day spent alone at work	3381	2.3522e+10	56.117	152.248	0	990
1 if high school degree is highest educational attainment	3381	2.3522e+10	.582	.493	0	1
1 if associate's degree is highest educational attainment	3381	2.3522e+10	.108	.310	0	1
1 if received bachelor's degree or higher	3381	2.3522e+10	.196	.397	0	1
1 if male	3381	2.3522e+10	.503	.500	0	1
1 if partner or spouse is in household	3381	2.3522e+10	.551	.497	0	1
number of children in household	3381	2.3522e+10	.844	1.166	0	10
1 if child is in household	3381	2.3522e+10	.448	.497	0	1
Age	3381	2.3522e+10	38.330	12.935	18	64
Age squared	3381	2.3522e+10	1636.432	1031.212	324	4096

Our weighted sample shows that on average, individuals spend roughly 4 hours a day alone. Respondents work slightly less than full time; on average, they work a little over 37 hours a week. This result may be skewed by those who only work a few hours a week. We include them in our regression because we assume their wage is unaffected by the number of hours they work. Slightly less than half of respondents had children in the house and slightly more than half were living with a partner. The summary table shows that our data represents both sexes equally; almost exactly half of respondents were male. The average age of respondents was 38.3 and the respondents participation initially increases as age increases, but eventually decreases. The mean age in the labor force is around middle age and workforce participation typically decreases as age increases (after the ages associated with labor force entry), so believe that our sample is a fairly accurate representation of the labor market.

V. Results

We first ran our regressions without controlling for age. The results of the weighted regression (Regression 1, Table 1) show that introversion has a positive and significant effect on

wages. This suggests that introverts have an inherent advantage over extroverts in the labor market, when age is disregarded.

However, when we include a control for age and age squared, the coefficient on time spent alone becomes economically and statistically insignificant (2). The result still holds when we regress men and women separately, although the coefficient on time spent alone is negative for females (3) and positive for males (4).

Table 1: Regressions

Variables (all weighted)	(1) log of wage	(2) log of wage	(3) log of wage female	(4) log of wage male
Daily nonwork hours spent alone	.0107*** (.00306)	.00197 (.00304)	-.000916 (.00435)	.00469 (.00426)
Weekly hours worked	0.00994*** (0.00103)	0.00760*** (0.00104)	0.00682*** (0.00164)	0.00799*** (0.00129)
Daily minutes spent alone at work	0.000121* (6.64e-05)	6.30e-05 (7.22e-05)	6.82e-05 (8.79e-05)	7.69e-05 (0.000102)
Age		0.0384*** (0.00534)	0.0396*** (0.00747)	0.0381*** (0.00770)
Age squared		-0.000360*** (6.46e-05)	-0.000373*** (9.00e-05)	-0.000355*** (9.47e-05)
Highest education is high school dummy	0.209*** (0.0258)	0.213*** (0.0257)	0.197*** (0.0355)	0.230*** (0.0359)
Highest education is associate's degree dummy	0.402*** (0.0402)	0.376*** (0.0399)	0.430*** (0.0491)	0.306*** (0.0652)
Highest education is bachelor's degree dummy	0.605*** (0.0361)	0.609*** (0.0358)	0.656*** (0.0473)	0.557*** (0.0523)
Male dummy	0.0810*** (0.0212)	0.105*** (0.0209)		
Dummy for presence of spouse or partner	0.206*** (0.0228)	0.0820*** (0.0242)	0.0551* (0.0316)	0.0962*** (0.0369)
Number of children	-0.0169* (0.00950)			
Dummy for presence of children	2 2	0.00815 (0.0228)	-0.0338 (0.0342)	0.0408 (0.0310)
Constant	1.793*** (0.0489)	1.073*** (0.103)	1.115*** (0.153)	1.136*** (0.135)
Observations	3,381	3,381	1,886	1,495
R-squared	0.247	0.299	0.314	0.284

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Age and the other control coefficients conform to our expectations. The coefficient on age is positive and the coefficient on age squared is negative, which accurately represents the quadratic relationship between age and wages. The coefficient on male shows that men earn a larger wage than women. Lastly, the coefficients on our education dummies are significant, positive, and increase in magnitude as the level of education increases.

Therefore, our results suggest that much of the effect of free time spent alone on wage is actually a result of behavioral and income changes due to aging. Because there is a positive correlation between age and wages and because including the age reduces the coefficient of the time spent alone variable, we can see that there is a positive relationship between age and time spent alone. Older individuals in the labor market also typically earn higher wages, due to factors like experience.

Our results might be interpreted in several different ways. It could be that what determines productivity, job skills or wage negotiating has little to no relationship with introversion. Other factors, such as ability or job preparedness, could have large enough effects that they dwarf the effect of introversion. It is also possible that introverts and extroverts have different skill sets, which have negating effects on wages. For instance, if introverts work as more innovative thinkers and are thus better suited for jobs like arts or research, while extroverts are more suitable for jobs which require more person to person interaction, like business or sales, the difference in their wages within those fields may cancel out. These characteristics may be beneficial for different jobs but they may equal benefits on the macro level.

VI. Conclusion

We find that introversion does not affect wages in a statistically or economically significant way. Our findings suggest that introverts do not have an inherent advantage over extroverts in the labor market, controlling for level of education, age, sex, family characteristics, and amount of time worked.

However, our results must be interpreted with limitations in mind. By using time spent alone outside of work as a proxy for introversion, we assumed that individuals have the ability to choose, and do choose to spend their time outside of work in ways that they would like. If their time outside of work was occupied with other obligations (apart from family characteristics, for which we control), time spent alone outside of work would not be a plausible measure of introversion, since it does not reflect an individual's personality characteristic rather than a measure of their involvement in other activities. However, we assume that people can choose their obligations. Moreover, there may be another factor which is correlated with both introversion and wages, such as the level of education an individual might attain. For example, if an individual with trait introversion is less likely to pursue higher education, then education is a mechanism by which introversion affects wages negatively, in which we might be overcontrolling by including education as a control variable.

In addition, there may be another trait specific to introverts that affects wages which we might be failing to acknowledge because of our limited definition and estimate of trait introversion. A plausible example is the ability to negotiate. If introverts are worth more in the labor market but are worse at negotiating for salaries than extroverts, their wages may not accurately reflect their human capital. In this case, wages would be a poor measure of value in

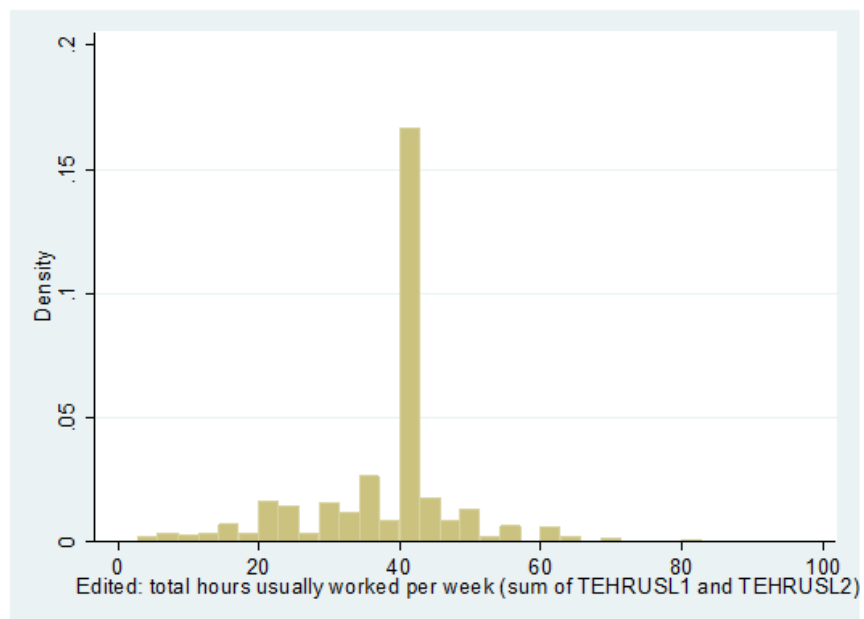
the labor market as it does not reflect their value in the labor market as much as their poor negotiation skills.

Stories of interview candidates with less than glowing resumes leaving an interview with a \$30,000 raise in starting salary still percolate throughout the job market. It would be valuable to further examine wage disparities as a function of specific personality traits or skills, apart from measurable characteristics such as GPA or test scores. Collaborative skills, strong leadership, confidence, and ability to negotiate are all characteristics emphasized by recruiters and advisors. With the rise of digital technology and rapid globalization, computer skills and experience with languages are also considered valuable traits. A deeper investigation examining the different factors that may boost an individual's labor market value would be beneficial for both those within and looking to join the labor force—to increase their human capital and career outcomes through personal developments.

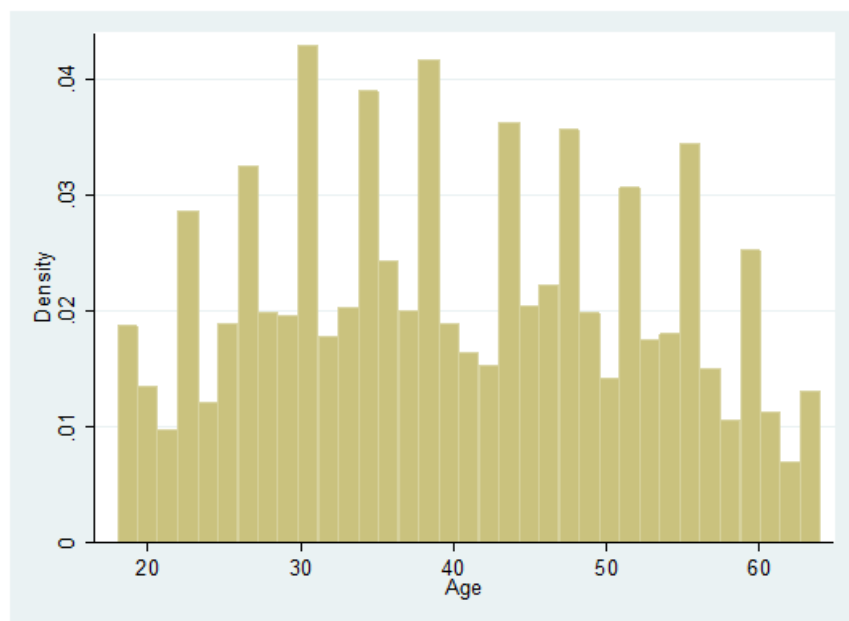
VII. Appendix

Appendix 1, Histograms for Variables

Graph 1: Hours worked per Week



Graph 2: Age



Appendix 2: Additional Regressions

Variables	(1) log of wage (unweighted)	(2) log of wage (weighted)	(3) log of wage (weighted)
Daily nonwork hours spent alone	.0111*** (.00243)	.00229 (.00304)	.00158 (.00303)
Weekly hours worked	0.00788*** (0.000815)	0.00842*** (0.00102)	0.00757*** (0.00104)
Daily minutes spent alone at work	5.25e-05 (5.55e-05)	7.01e-05 (7.14e-05)	6.21e-05 (7.19e-05)
Age		0.00959*** (0.000949)	0.0395*** (0.00538)
Age squared			-0.000376*** (6.53e-05)
Highest education is high school dummy	0.216*** (0.0232)	0.214*** (0.0254)	0.208*** (0.0260)
Highest education is associate's degree dummy	0.435*** (0.0323)	0.388*** (0.0398)	0.372*** (0.0400)
Highest education is bachelor's degree dummy	0.626*** (0.0303)	0.623*** (0.0357)	0.602*** (0.0362)
Male dummy	0.114*** (0.0167)	0.105*** (0.0208)	0.104*** (0.0207)
Dummy for presence of spouse or partner	0.157*** (0.0170)	0.107*** (0.0243)	0.0868*** (0.0241)
Number of children	-0.00728 (0.00745)	0.00622 (0.0102)	-0.00556 (0.00972)
Constant	1.896*** (0.0385)	1.537*** (0.0559)	1.073*** (0.102)
Observations	3,381	3,381	3,381
R-squared	0.215	0.290	0.299

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 2 shows additional regressions. We see that excluding weights on the regression that does not include wage has no effect on the significance of our coefficients (1). Excluding age squared and using number of children instead of the dummy for presence of children also have no noteworthy impact on our findings.

VIII. Sources

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