Three Essays in Labor Economics

by

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Abstract

The three present essays approach education, human capital signaling, and wage theories, and as such, fit squarely in the field of labor economics. Labor, as one of the three factors of production, has unique and important characteristics. Laborers may seek training and education to change or add to their skill sets to achieve favorable job market outcomes, and employers may seek such laborers via some signal. There has been much debate in the economics literature about the effects of so-called human capital accumulation versus the mere signal of accumulated human capital. The first essay exploits an opportunity to verify the accuracy of one such signal, self-reporting academic performance. There are errors, and it is revealed that the errors are in fact dependent on certain personal characteristics, meaning the self-reported data is a biased measure of actual school performance. The second essay interprets the same error in self-reported academic performance as a measure of academic self-appraisal and uses this measure as a predictor of college outcomes. A pattern of misreporting academic performance and realized college outcomes like applying, acceptance, attendance, and achieving degrees is shown. Finally, the third essay walks through modern interpretations and models of the wages fund doctrine, the history of which extends back to the Classical economists. A synthesized model, based on models and ideas from authors writing after the marginalist revolution in economics is offered.

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Chapter 1: Measurement Error in Self-Reported Grades

Abstract

Survey data are especially vulnerable to measurement error through human error in self-reporting. The opportunity to detect such error is given by the 1997 National Longitudinal Survey of Youth (NLSY97) in that it contains both self-reported grades as a survey item and actual grades from the respondents' transcripts. We find that such errors are in fact dependent on certain personal characteristics, meaning the self-reported data is a biased measure of actual school performance. We also uncover an interesting pattern between characteristics of the respondent's peer group and the propensity of survey responses to deviate from the corresponding transcript data. One interpretation of our findings is that individuals misreport their grades in a self-image and peer-group conforming way, whether or not the error is intentional.

I. Introduction

The majority of empirical research in the social sciences uses survey data. These surveys require individuals to self-report information. Consequently, these data may contain errors due to misreports. Recent research comparing self-reports to administrative records, Kreiner, Lassen, and Leth-Petersen (2011) and Koijen, Nieuwerburgh, and Vestman (2013) showed that individuals erroneously report their incomes and consumption expenditures in Denmark and Sweden, respectively. The present paper similarly "fact checks" survey respondents, but with school performance as the measure instead of income or consumption measures.

Several factors may lead individuals to misreport. First, errors in self-reports could be intentional. A series of experimental studies on lying demonstrates that individuals do lie when doing so is beneficial to them (Childs, 2012; Dreber and Johannesson, 2008; Cappelen, et al., 2013; Gylfasona, et al., 2013; Erat and Gneezy, 2012; Friesen and Gangadharan, 2012; Roig and Caso, 2005; Mensch and Kandel, 1988; Utikal and Fischbacher, 2013). Alternatively, misreports could be unintentional, reflecting poor recall or understanding of the survey question. A standard result in the cognitive psychology literature demonstrates that individuals are worse at recalling information in the more distant past.[1]

Regardless of its source, measurement error has serious consequences in econometric analysis. Hausman (2001) shows that control variables which exhibit classical measurement error bias least squares estimates towards zero. In the non-classical case, where the measurement error is correlated with the explanatory variables, the direction of the bias is unknown. Therefore, learning the determinants of measurement error in self-reported data may help us understand the severity of bias. This is the central task of the present study.

[1] See Medin (2004) for a thorough review of such literature.

Grade point averages (GPAs) are widely used and regarded as accurate measures of school performance. High school GPAs are therefore a critical correlate of personal characteristics and an important predictor of various outcomes, including college acceptance, college degree attainment, and labor market outcomes like income and employment. Sometimes, the collection of actual transcripts can be difficult, which leads many researchers to settle for self-reported grades or GPAs (Kuncel, Crede, and Thomas, 2005, p. 63). Unfortunately, self-reported data always run the risk of error.

We analyze the determinants of error in self-reported high school grades with data from the National Longitudinal Survey of Youth 1997 (NLSY97). We investigate whether the high school grades reported by individuals are different from the grades listed in their official transcripts. A significant number of NLSY97 respondents misreported their grades. Secondly, we show that probability of over and under-reporting is correlated with characteristics of the respondent's peer group, parents' expectations, personality measures and basic demographic data. Specifically, we show that individuals who report inaccurately associate themselves with lower achieving peers who smoke, use drugs, participate in gangs, cut class, or do not plan to go to college. We also show that under-reporting high school grades is a determinant of collegiate outcomes, and a plausible interpretation of these results is given.

II. Literature Review

Error in self-reported data could be intentional and deceptive, or unintentional and based on poor recall or understanding of the survey question. Previous research on deception has been almost exclusively experiment-based and focused on marginal propensities to lie by varying monetary payoffs. Childs (2012), Dreber and Johannesson (2008), Cappelen, et al. (2013), Gylfasona, et al. (2013) and Erat and Gneezy (2012) point to personal characteristics like gender,

race, aptitude, and personality as possible predictors of lying behavior using a similar sender-receiver game experiment design. Although Dreber and Johanesson (2008), Erat and Gneezy (2012), Friesen and Gangadharan (2012) and others find that men are more likely to respond to increasing monetary incentives to lie, other studies hint that women may respond to different incentives like self-image and outward appearances (Roig and Caso, 2005; Mensch and Kandel, 1988; Utikal and Fischbacher, 2013). Erat and Gneezy (2012) also suggest that women respond to others' payoffs in an other-caring way more than men.

Laboratory settings are ideal for controlling payoff incentives, harm or benefit to self or others, and other considerations, but are found lacking when compared to the wealth of personal characteristics and large sample sizes offered by longitudinal surveys. Survey data are difficult to validate due to the fact that survey items are almost exclusively self-reported and anonymous, with no opportunity to "fact check" responses. Nevertheless, Kuncel, Credé, and Thomas (2005) present a large meta-analysis and literature review on the validity of self-reported academic data like GPAs, class ranks, and test scores.

Kuncel, Credé, and Thomas (2005) cite multiple papers that show GPA as an excellent predictor of various outcomes, including college grades, graduate school performance, and employment (Ramist, 1984; Willingham & Breland, 1982; Kuncel, Hezlett, & Ones, 2001; Kuncel, Credé, Thomas, Klieger, Seiler, & Woo, 2005; Kuncel, Credé, & Thomas, 2004; Linn & Hastings, 1984; Albrecht, Carpenter, and Sivo, 1994). But, the authors note that actual academic transcripts can be difficult to obtain and so researchers must rely on self-reported grades much of the time. Errors in self-reported grades led the authors to two questions on the construct validity of these grades: "The first is, To what extent are self-reported grades accurate measures of actual earned grades? The second is, To what extent do self-reported grades reflect the learning, ability,

persistence, achievement, and whatever else we believe (or perhaps hope) that actual grades reflect?" (p. 64).

Of course, errors may be random or non-random. Random, white noise errors pose only small issues for statistical analysis. Non-random errors, in which the size or the direction of an error is systematically related to the construct, covariates, or unobserved characteristics, are more serious. Kuncel, Credé, and Thomas (2005) note that, interestingly, "despite any observed inaccuracy in the relationship between self-reported grades and actual grades, it is possible that self-reported grades possess superior construct validity as a measure of other constructs, including learning, motivation, ability, and achievement" (p. 65). The authors admit, though, that errors in self-reports may also represent "intentional deception" which may be negatively correlated with school performance.

Lying about one's own grades may be considered fraudulent and therefore comparable to cheating in an academic context. Bunn, Caudill, and Gropper (1992) find that cheating in school is negatively associated with a student's self-reported GPA (p. 197). The authors follow Becker (1968) by treating cheating the same way Becker approached crime as rational behavior—criminals weigh costs and benefits, too. Bunn, Caudill, and Gropper (1992) explain the GPA-cheating relationship by saying that students with higher GPAs have more to lose than students with lower GPAs.

Schuhmann et al (2012) find similar results to the Bunn, Caudill, and Gropper (1992) paper, but also to the present chapter. In fact, there is little variance in the literature on academic cheating when it comes to pinpointing and determining the direction of the effects of various determinants. They find cheating at the university level associated with lower GPAs, alcohol consumption, and fraternity/sorority membership. The present chapter similarly focuses on

personal and peer characteristics as determinants of possibly fraudulent behavior. Schuhmann (2012) and Bunn, Caudill, and Gropper (1992), however, have relied on self-reported grades in their studies on cheating, meaning that we must implicitly trust the subjects of their studies even when asking them to report their own lying/cheating/fraudulent behavior or assume, like Kuncel, Credé, and Thomas (2005), that the self-reports are construct valid even with errors.

III. Data

The 1997 National Longitudinal Study of Youth

The NLSY97 is a large longitudinal survey given to 12-16 year olds as of the first year of the survey, 1997. Survey items cover a wide range of topics from personal attitudes to detailed earnings from jobs and IQ measures to drug use. The survey items relevant to the present paper include self-reported grades, transcript data, peer group characteristics, parents' expectations (from the parent survey), and personality/aptitude measures, among other demographic and personal characteristics.

Self-Reported Grades

The NLSY97 contains self-reported grades and actual grades for most of the respondents. One survey item asked respondents "Overall, what grades did you receive in high school?" with response choices "Mostly below Ds", "Mostly Ds", "About half Cs and half Ds", "Mostly Cs", "About half Bs and half Cs", "Mostly Bs", "About half As and Bs", and "Mostly As". If a respondent could not decide on one of those categories, the interviewers were to probe the respondent for an average grade and the interviewer would accordingly code their response into one of the existing categories.

The self-reported grades were coded as GPAs (where "Mostly As" was coded as a GPA of 4.0, "About half As and Bs" was coded as a GPA of 3.5, etc.). The resulting distribution

(mean=2.76, SD=0.817) of 8,521 self-reported grades is bimodal—but similar to the distribution of actual GPAs—with one mode at 2.5, "About half Bs and half Cs", and another at 3.5, "About half As and Bs" [Figure 1].

Actual Grades

NLSY97 researchers retrieved the high school transcripts of 6,232 of the respondents over the course of two "waves", with the permission of the survey respondents. Overall high school GPAs were calculated and credit-weighted by NLSY97 researchers for every respondent, so between school variation in the way GPA is calculated is eliminated. Actual GPAs approximated a normal bell curve with mean 2.81 and standard deviation .622 [Figure 2]. According to the Topical Guide to the Data,

> In 1999-2000, transcripts were obtained and processed for 1,417 youths who had graduated from high school or had reached age 18 and were no longer attending high school. A second wave of transcripts was collected in 2004 for 4,815 youths. School registrars provided a copy of the transcript that the high school maintained, a course catalog (if available), and indicated whether the student was designated for such programs as bilingual education, special education, or gifted/talented programming.

Difference in Self-Reported and Actual GPAs

Despite the fact that the self-reported GPA sample mean is slightly lower than the actual GPA sample mean, the mean of respondent-level differences is statistically indistinguishable from zero. About 68 percent of the respondents reported grades within a half of a letter grade window, while about 15 percent over-reported their grades and about 16 percent under-reported. If the benefit of the doubt is expanded to a whole letter grade, 92 percent of the self-reported GPAs fall within the window, while the other 8 percent is split in half between over- and under-

reporters. Self-report data is discrete, and actual transcript data is continuous, but the distribution of differences between the two is shown in Figure 3. Note that this is just an illustration of the direction and size of differences between the self-reported and actual GPA data, and it is not used in any of the following statistical analyses.

Peer Group Characteristics

Respondents were asked about what percent of their peers are engaged in various activities, from volunteering to getting drunk regularly. Responses were limited to these five choices: <10%, 25%, 50%, 75%, and >90%. The distributions of responses are depicted in Figures 4-11. In regressions, these variables were simplified to a dummy indicating that half or more of the respondent's peers are engaged in the activity.

IV. Econometric Model

We estimate the following general equation with several separate identifications:

$$(1)\ P(Error)_i = \alpha + \beta IQ_i + \gamma PC_i + \delta Time\ difference_i + \varepsilon_i$$

where the dependent variables are the respective probabilities individual i over-reports their grades, reports them honestly, or under-reports them. IQ_i is individual i's IQ percentile rank. PC_i is a vector of individual i's personal characteristics like gender, race, ethnicity, and age. Peer group characteristics are added in separate sets of equations.

Over-, under-, and accurate reporting are each binary measures, and we estimate each equation with different thresholds for the dependent variable. The strictest threshold is a half of a letter grade, while the most lenient threshold gives respondents one and a quarter letter grades worth of leeway in reporting their own grades. We also estimate thresholds of quarter grade increments between these extremes for a total of four different, increasing levels of benefit of the doubt.

IV. Results

A first set of probit regressions of error probabilities on IQ, demographic, and personal characteristics yield significant results up to the one and a quarter letter grade threshold (see Table 1). At the half of a letter grade threshold, being older, female, or in a higher ASVAB percentile were associated with accurate reporting, while having children and having a larger time interval between self-reporting and seeing your last transcript were associated with inaccurate reporting. The estimate on children suggests a large and positive effect on over-reporting by at least a half a letter grade—having just one child increased the probability of over-reporting by 6.5% and decreased the probability of accurate reporting by 7.5% ($p<0.01$ for both). The time difference between ending high school and self-reporting had a positive and symmetric effect on over- and under-reporting by at least a half of a letter grade. At the three quarters of a letter grade threshold, the time difference effect is less symmetric, with a larger effect on under-reporting. The magnitude of this effect diminishes up to the one and a quarter letter grade threshold, but the sign of the effect does not change. Full results are presented in Table 1.

A similar set of results is found when the interviewer's judgment of the respondent's neighborhood is included as a variable (Table 2.1). Respondents from good neighborhoods were 4% more likely to report accurately ($p<0.01$) and 2.7% less likely to under-report ($p<0.05$) at the half a letter grade threshold. These signs hold up to the largest threshold, and at the largest threshold, respondents from a good neighborhood were less likely to over-report.

Peer Effects

An individual's probability of over-, under-, or accurate reporting significantly depends on certain peer characteristics. If a respondent's peers volunteer regularly, are active in extra-curricular activities, or plan to go to college, the respondent is less likely to under-report (plan to

go to college) or more likely to over-report (volunteer, active in extra-curricular activities). These "good" peer characteristics were not significantly associated with more accurate reporting at any threshold. These results are shown in Tables 3-5.[2]

Other peer characteristics, like gang participation, cutting class, and illicit drug use are associated with a decreased probability of accurate grade reporting and an increased probability of under-reporting grades. If a respondent indicated that more than half of his or her peers participate in gangs, the respondent was 4.3% less likely to report accurately at the three-quarter letter grade threshold ($p<0.05$) and 2.5% more likely to under-report at the same threshold ($p<0.05$) (Table 6). If a respondent indicated that more than half of his or her peers cut class, the respondent was 4.5% less likely to report accurately at the half a letter grade threshold ($p<0.01$) and 2.9% more likely to under-report at the same threshold ($p<0.01$). However, past the half a letter grade threshold, the tendency to under-report loses significance and magnitude to over-reporting (Table 7). At the three-quarter letter grade threshold, having peers who cut class makes a respondent 2% more likely to over-report ($p<0.05$). If a respondent indicated that more than half of his or her peers use illicit drugs, the respondent was 7.7% less likely to report accurately at the half a letter grade threshold ($p<0.01$), 4.9% more likely to under-report at the same threshold ($p<0.01$), and 2.2% more likely to over-report at the same threshold ($p<0.10$) (Table 8). The magnitudes for over- and under-reporting diminish and equalize at larger thresholds.

Peer characteristics involving other, more "legal", substance use/abuse are associated with an increased probability of over-reporting and a decreased probability of accurate reporting. If a respondent indicated that more than half of his or her peers get drunk regularly, the respondent was 2.8% less likely to report accurately at the three-quarter letter grade threshold

[2] Only one threshold (3/4 of a letter grade) is reported in the tables per peer characteristic.

($p<0.05$) and 1.6% more likely to over-report at the same threshold ($p<0.10$) (Table 9). If a respondent indicated that more than half of his or her peers smoke, the respondent was 3.6% less likely to report accurately at the three-quarter letter grade threshold ($p<0.01$) and 2.9% more likely to over-report at the same threshold ($p<0.01$) (Table 10). Having peers who smoke was associated with a 1.9% increase in the probability of under-reporting, but only at the half a letter grade threshold ($p<0.10$).

VI. Discussion

Based on these results, at least three main discussions may follow: (1) the differences in self-reported grades and actual grades are associated with personal characteristics, meaning that self-reported grades are a biased measure of actual grades; (2) an interesting pattern is discovered when peer characteristics are included as determinants of over-, under-, or accurate reporting of high school grades; and, as a direction for further research, (3) what might self-reported grades, or the difference in self-reported grades and actual grades, measure if not actual school performance?

Self-Reports are a Biased Measure of Actual Grades

Personal characteristics accounted for both the size and direction of errors in self-reports. Gender, age, IQ, having children, and employment status were correlated with over- or under-reporting. This means that the errors are non-random and therefore self-reported grades in the NLSY97 are a biased measure of actual school performance.

Unemployed respondents were 1.1% more likely to over-report at the largest threshold: 1.75 letter grades (Table 1.4). A regression that estimates employment status using self-reported grades as an explanatory variable would under-estimate the impact of high school grades on

unemployment compared to the same regression but with actual grades as an explanatory variable.

"It's Cool to be Dumb" and other Peer Effects

"Good" peer characteristics like volunteering and planning for college were associated with an increased probability of over-reporting or a decreased probability of under-reporting, meaning that respondents with such peers may be intentionally or unintentionally misreporting in a direction that conforms to their peer group. "Bad" peer characteristics were associated with various directions of misreporting grades, but in general, the more illegal the activity, like gang participation or illicit drug use, the more likely the respondent was to under-report. "More legal" peer group activities (but still considered "bad") like smoking (underage, most likely) or getting drunk regularly (also probably under the legal drinking age) were associated with an increased probability of over-reporting. Both types of "bad" peer characteristics were associated with less accurate reporting. It seems, then, that respondents with "friends in low places" may also misreport in a peer group-conforming way, especially for respondents with peers engaged in more serious crimes like gang activity or illicit drug use.

This phenomenon roughly aligns with the reference group theory of Akerlof (1982), but instead of social norms affecting wages or workers' effort, the present results suggest that social norms may affect the signaling of human capital. What is most interesting is that such peer effects may affect signaling in a self-detrimental way, i.e., being affected by a certain peer group in high school may decrease future wages or employment by way of under-reported grades or other measures of human capital attainment, especially if the under-reporting is unintentional. Future research could single out the partial effects of peers, controlling for individual behavior. The present results do not account for the admittedly probable case that the respondent's peer

characteristics are also his or her own, i.e., having peers who smoke, do drugs, plan to go to college, etc. may mean the individual is also engaged in the same activities. If this is the case, the "peer effects" presented here may be confounded with the same personal characteristics.

Under-Reporting as a Measure of Low Self-Appraisement

Kuncel, Credé, and Thomas (2005) note in their discussion that "self-reported grades generally predict outcomes to a similar extent as actual grades" (p. 76), and that self-reported grades are a great predictor of future grades (citing Baird, 1976). It seems that if self-reports themselves can be used as a measure to predict future academic outcomes, then the difference between the self-report and the actual GPA could also provide interesting results.

Of the two possible directions to misreport high school grades, under-reporting is the more intriguing. Why would individuals report lower grades than they actually attained in high school? If intentional, there is not much more to say except that the respondent is willingly communicating a self-deprecating lie. The reasons for such behavior might include a desire to conform to a certain social group, or overblown humility (which seems even more far-fetched given the survey environment). If unintentional, but dependent on certain personal characteristics (not from classical or random error), we might say such self-reports represent low self-appraisement, or low judgments of one's own abilities and achievements. This line will be explored in the following chapter.

Figure 1

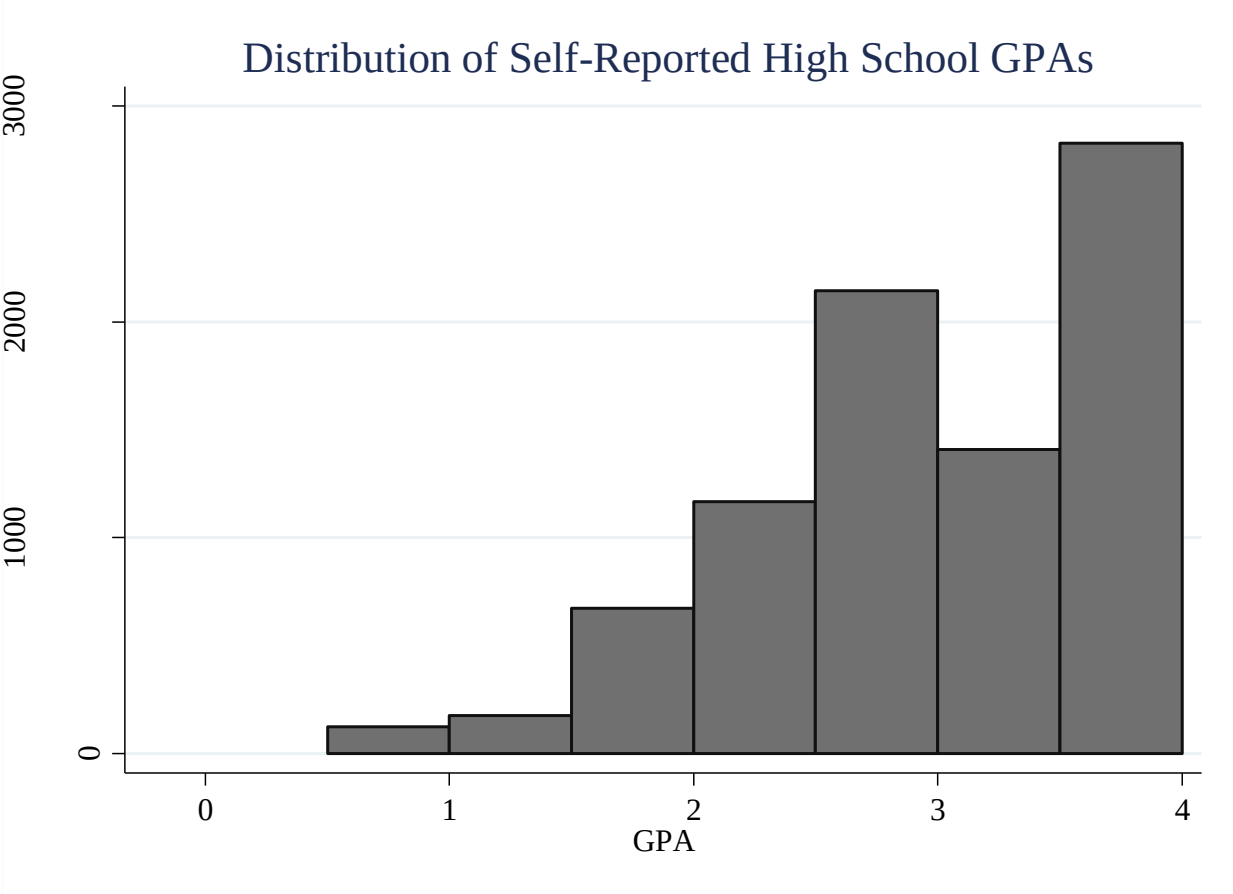
Distribution of Self-Reported High School GPAs
3000
2000
1000
0
0
1
2
3
4
GPA

Figure 2

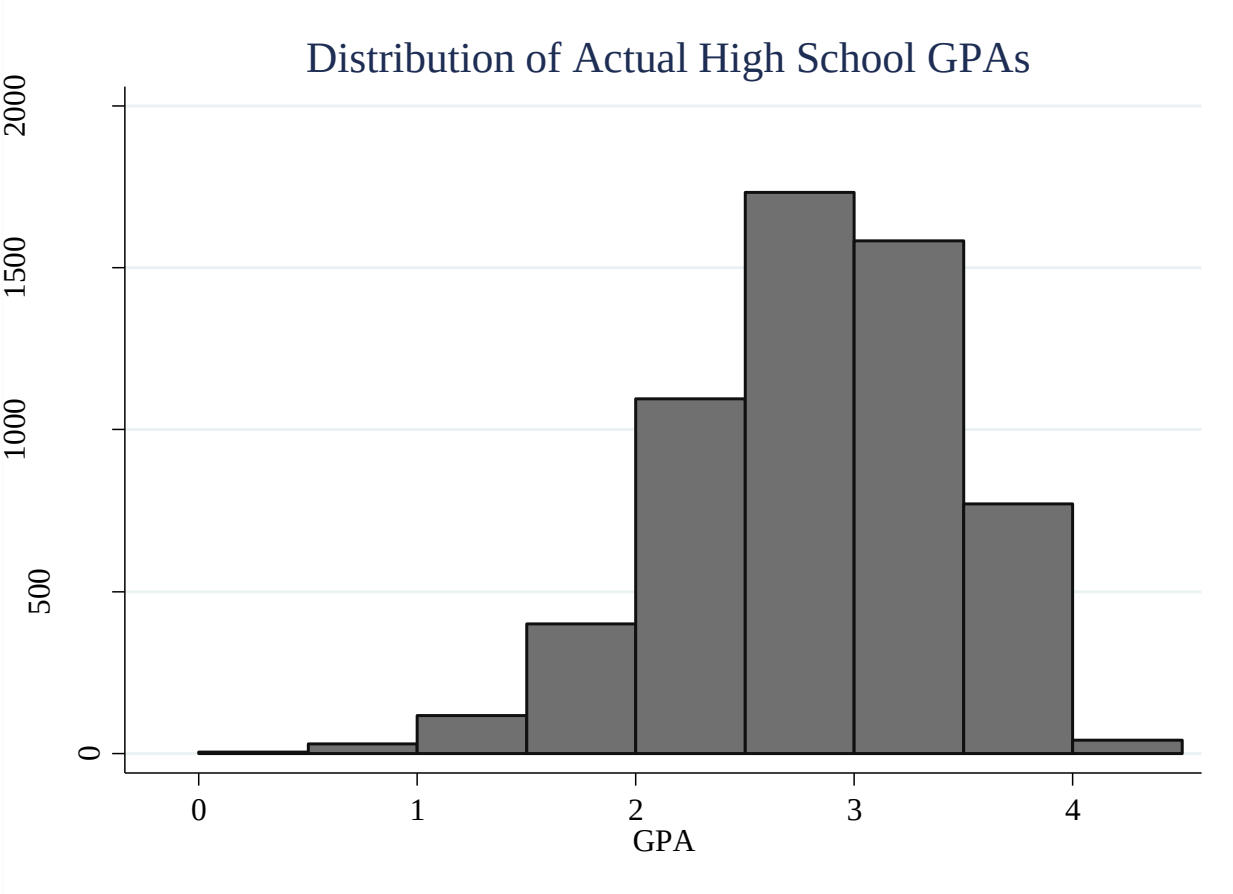
Distribution of Actual High School GPAs
2000
1500
1000
500
0
0
1
2
3
4
GPA

Figure 3

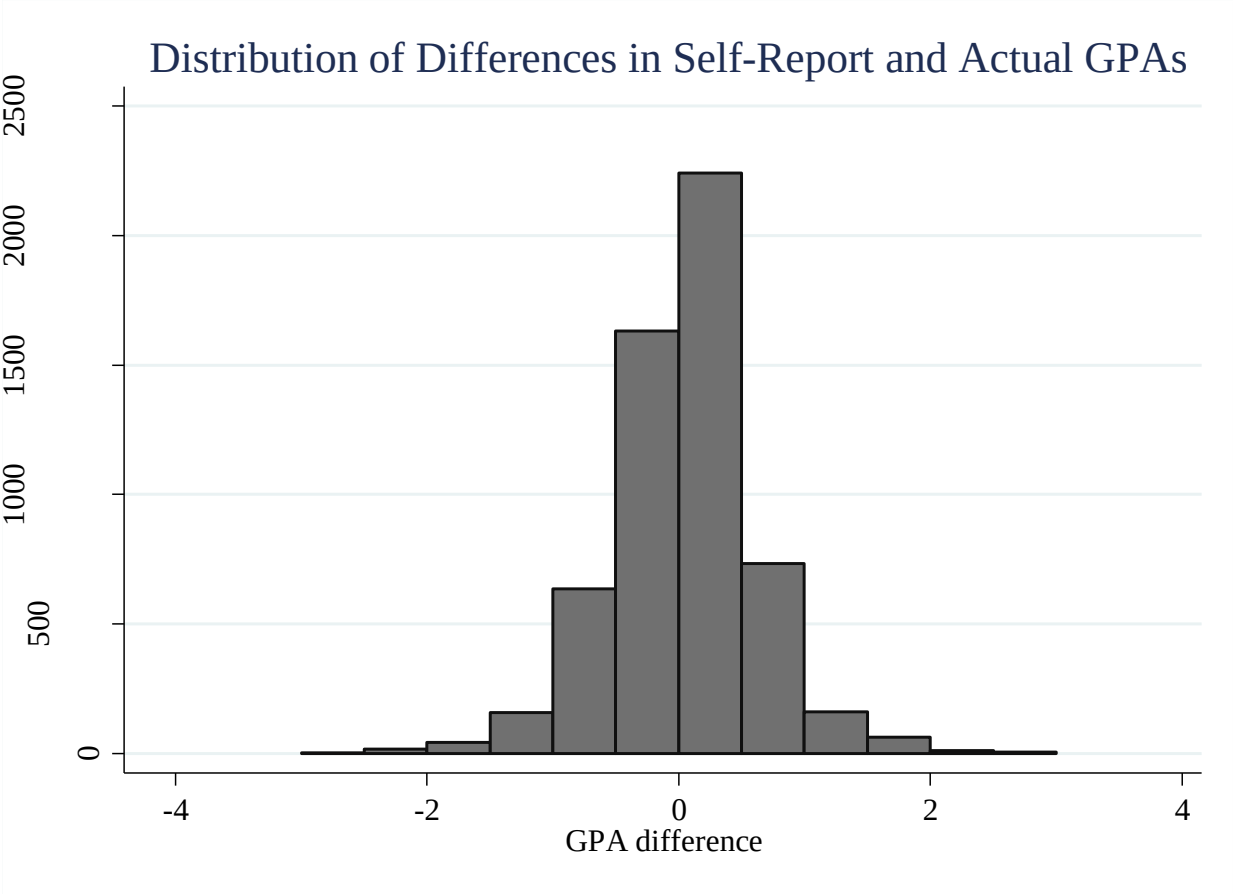
Distribution of Differences in Self-Report and Actual GPAs
0
500
1000
1500
2000
2500
-4
-2
0
2
4
GPA difference

Figure 4

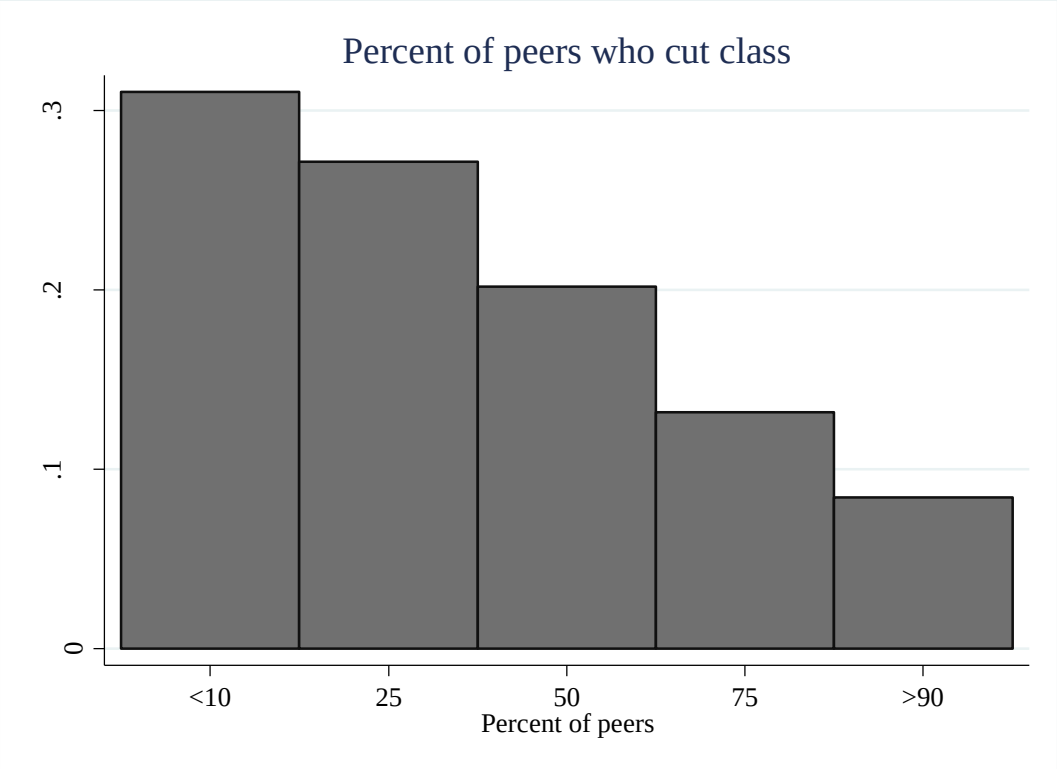
Percent of peers who cut class
0
.1
.2
.3
<10
25
50
75
>90
Percent of peers

Figure 5

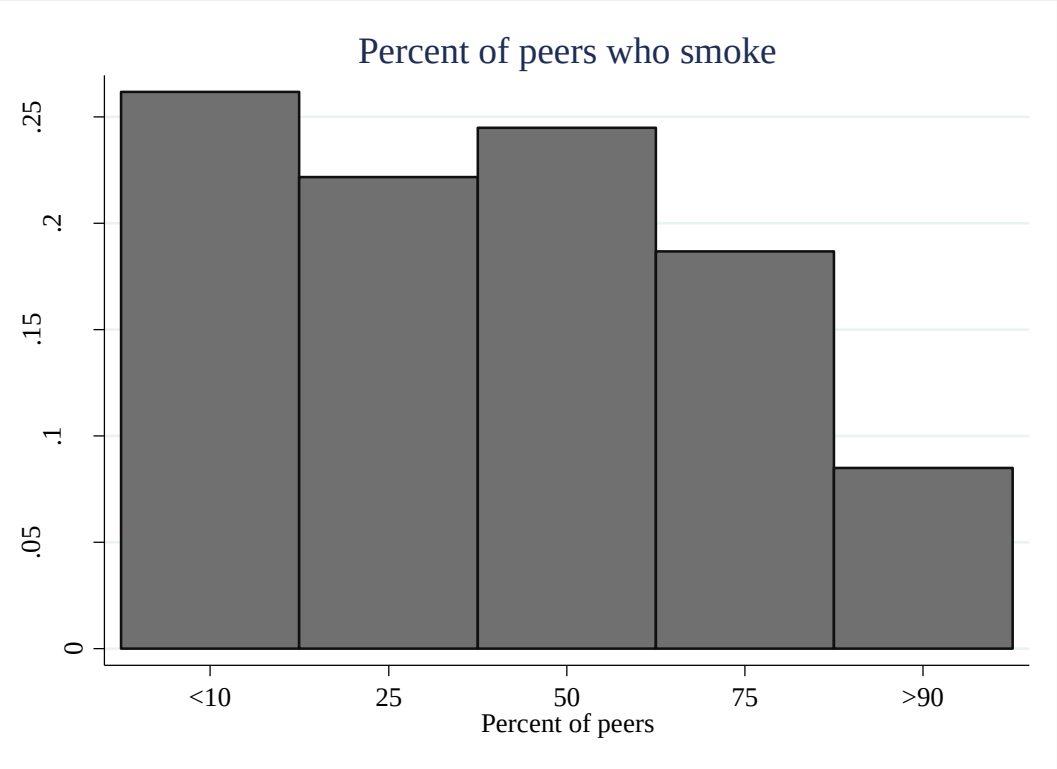
Percent of peers who smoke
0
.05
.1
.15
.2
.25
<10
25
50
75
>90
Percent of peers

Figure 6

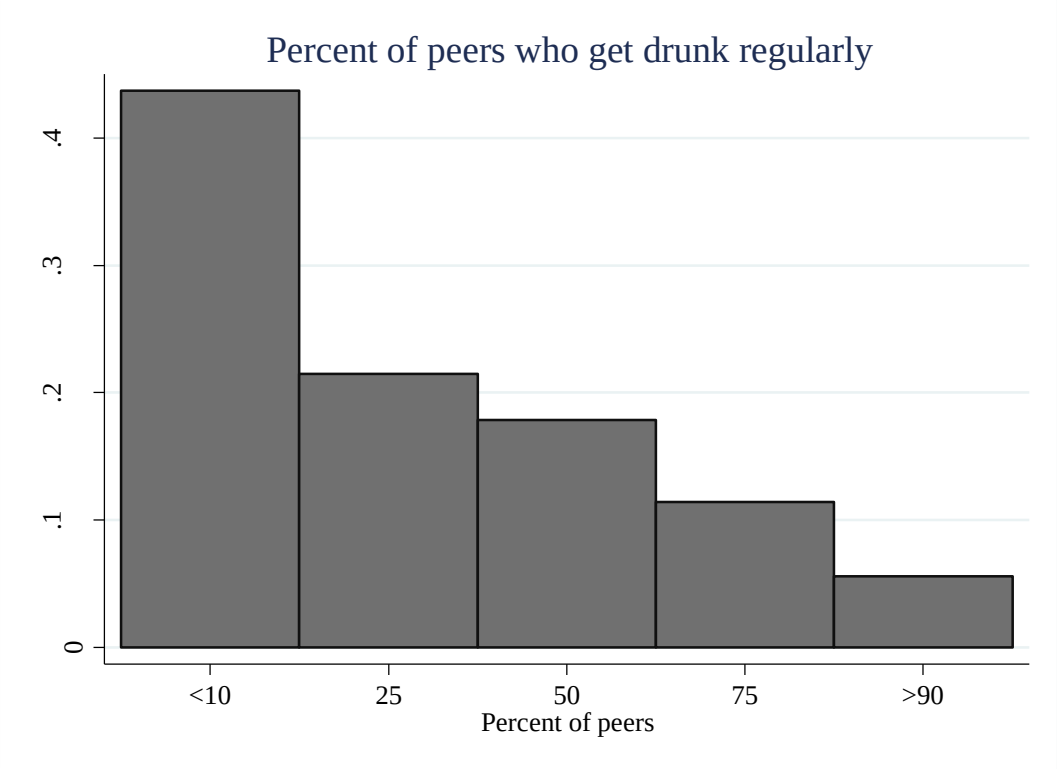
Percent of peers who get drunk regularly
0
.1
.2
.3
.4
<10
25
50
75
>90
Percent of peers

Figure 7

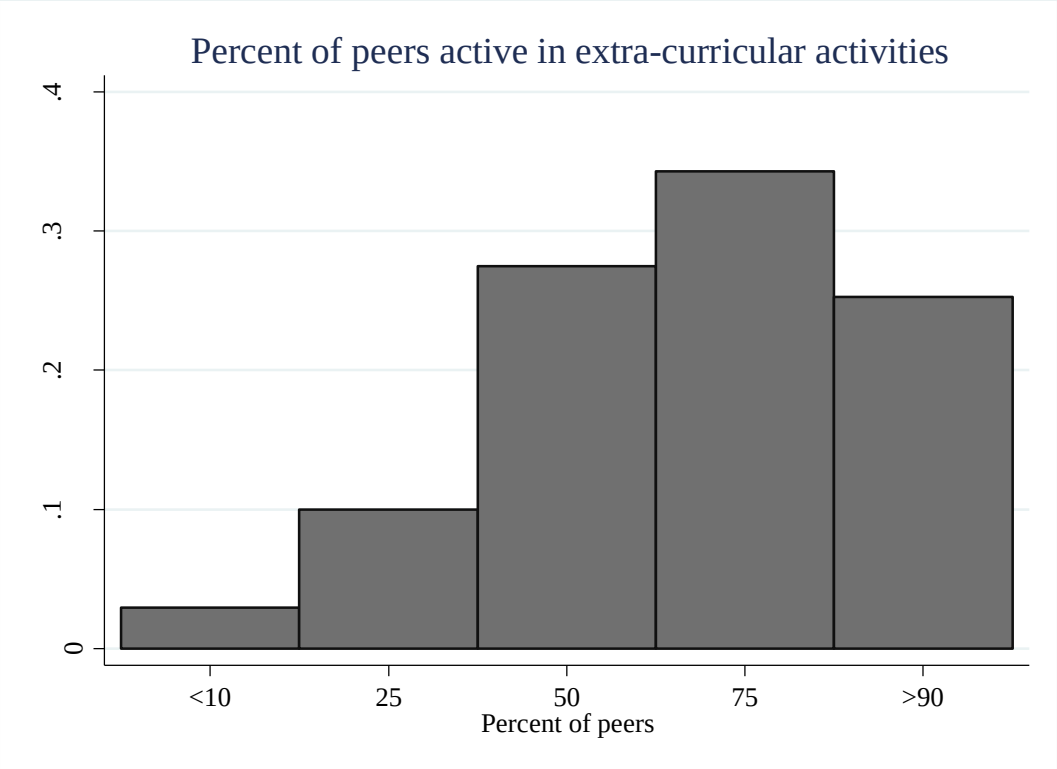
Percent of peers active in extra-curricular activities
0
.1
.2
.3
.4
<10
25
50
75
>90
Percent of peers

Figure 8

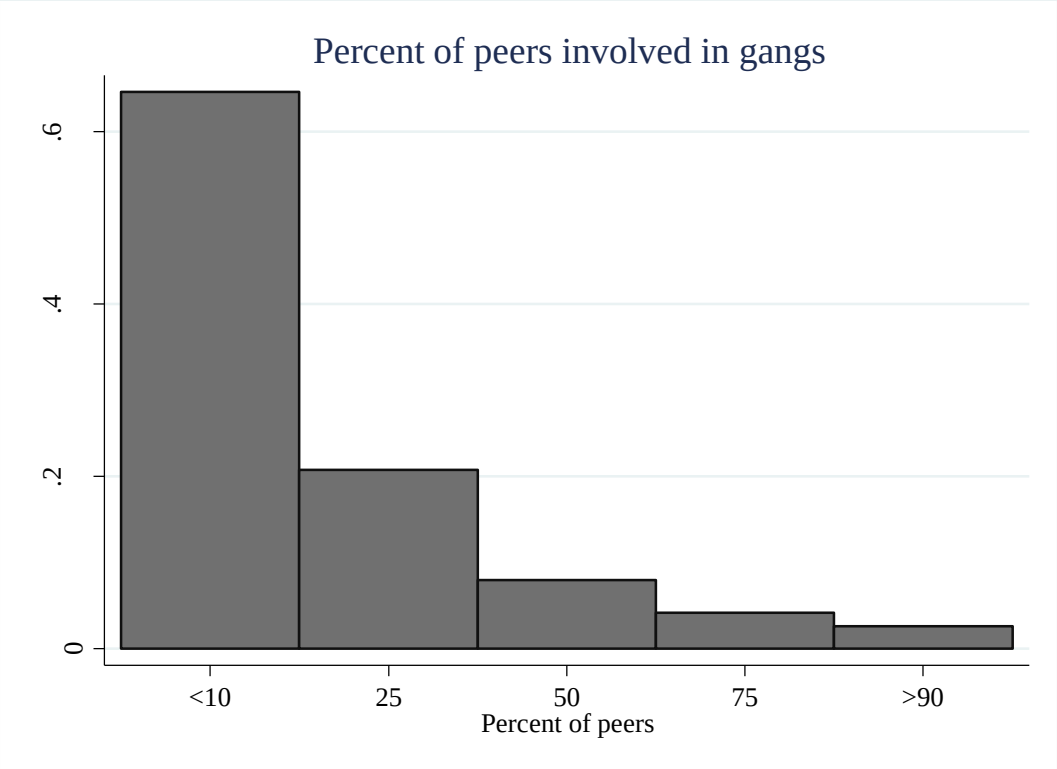
Percent of peers involved in gangs
0
.2
.4
.6
<10
25
50
75
>90
Percent of peers

Figure 9

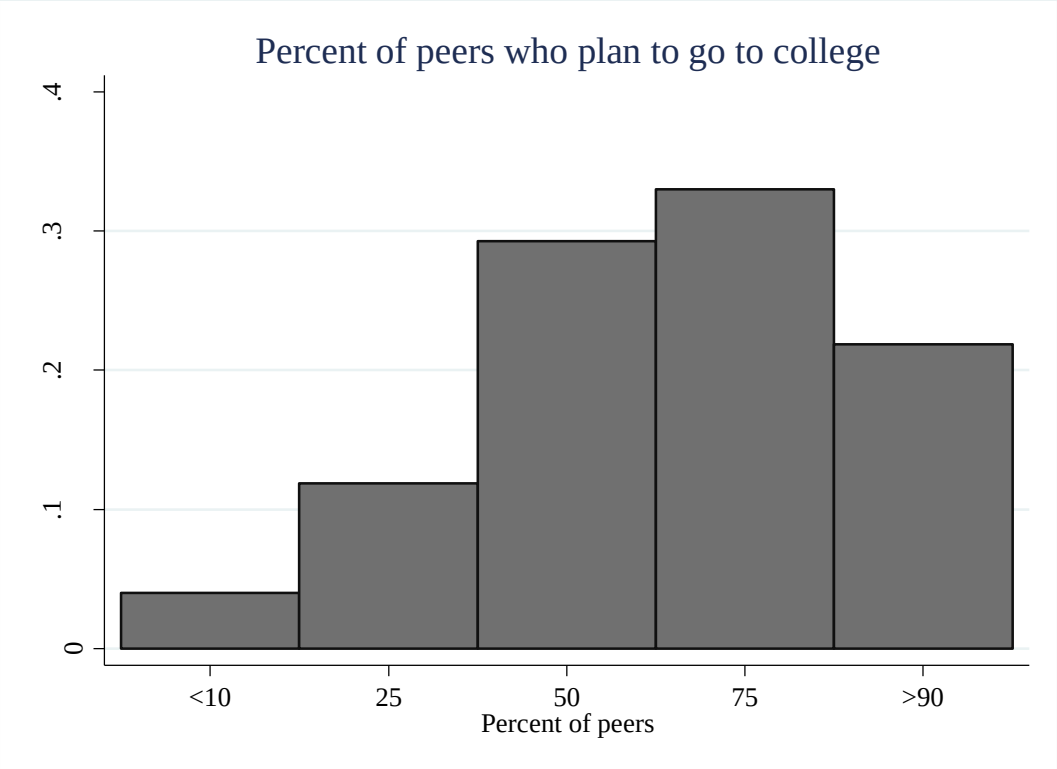
Percent of peers who plan to go to college
0
.1
.2
.3
.4
<10
25
50
75
>90
Percent of peers

Figure 10

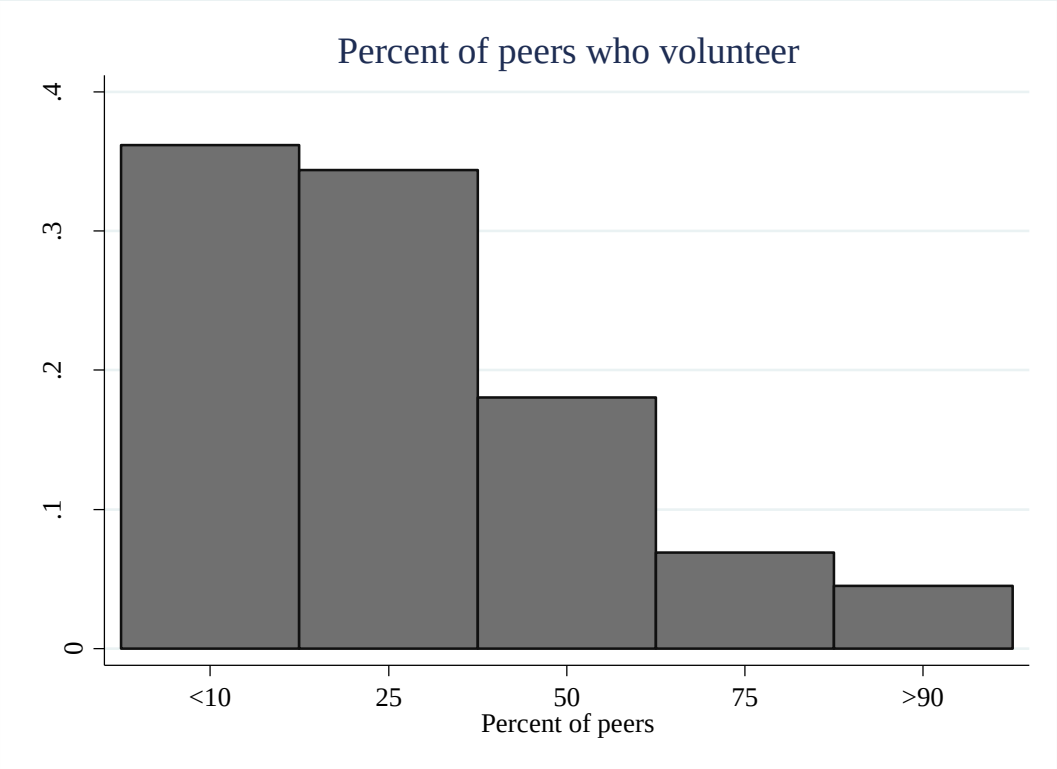
Percent of peers who volunteer
0
.1
.2
.3
.4
<10
25
50
75
>90
Percent of peers

Figure 11

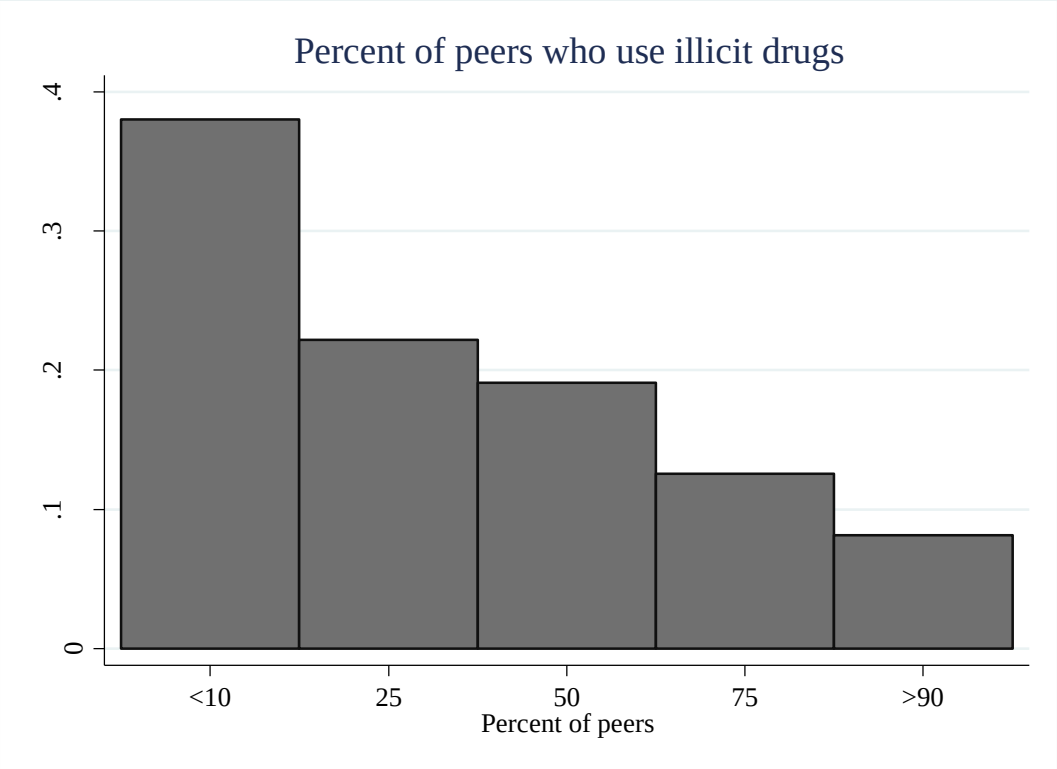
Percent of peers who use illicit drugs
0
.1
.2
.3
.4
<10
25
50
75
>90
Percent of peers

Table 1.1
Probit - Baseline with ASVAB and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.002	0.034***	-0.035***
	(0.010)	(0.013)	(0.009)
Black	0.000	-0.009	0.007
	(0.013)	(0.017)	(0.012)
Hispanic	0.013	-0.011	-0.002
	(0.014)	(0.018)	(0.013)
Age	-0.013*	0.041***	-0.025***
	(0.007)	(0.009)	(0.006)
Time difference	0.002**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.065***	-0.075***	0.002
	(0.015)	(0.021)	(0.015)
Married	-0.001	0.003	-0.002
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.003	-0.000
	(0.003)	(0.004)	(0.003)
Unemployed	-0.025	-0.012	0.032
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.011	0.022	-0.012
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.2
Probit - Baseline with ASVAB and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.003	0.030***	-0.025***
	(0.007)	(0.010)	(0.006)
Black	0.014	-0.002	-0.012
	(0.009)	(0.012)	(0.008)
Hispanic	0.008	-0.002	-0.006
	(0.010)	(0.013)	(0.009)
Age	-0.013***	0.036***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001***	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.024**	-0.025*	-0.002
	(0.010)	(0.014)	(0.010)
Married	0.022	-0.039	0.014
	(0.022)	(0.031)	(0.021)
Household size	-0.002	0.000	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.004	-0.046**	0.037***
	(0.016)	(0.021)	(0.014)
Out of labor force	-0.009	0.011	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.3
Probit - Baseline with ASVAB and Personal Characteristics

	(7) Over-report by one letter grade	(8) Accurate report within one letter grade	(9) Under-report by one letter grade
ASVAB percentile	-0.001***	0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.015**	-0.015***
	(0.005)	(0.006)	(0.004)
Black	0.004	-0.004	-0.001
	(0.006)	(0.008)	(0.005)
Hispanic	0.004	-0.005	0.002
	(0.006)	(0.008)	(0.005)
Age	-0.012***	0.024***	-0.011***
	(0.003)	(0.004)	(0.003)
Time difference	0.001***	-0.002***	0.001***
	(0.000)	(0.000)	(0.000)
Household income	0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Children	0.012**	-0.018**	0.005
	(0.006)	(0.009)	(0.006)
Married	0.005	-0.010	0.003
	(0.014)	(0.020)	(0.012)
Household size	-0.002	0.002	-0.000
	(0.001)	(0.002)	(0.001)
Unemployed	0.008	-0.035***	0.023***
	(0.010)	(0.013)	(0.008)
Out of labor force	0.001	-0.006	0.004
	(0.005)	(0.007)	(0.004)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.4
Probit - Baseline with ASVAB and Personal Characteristics

	(10) Over-report by 1 1/4 of letter grades	(11) Accurate report within 1 1/4 letter grades	(12) Under-report by 1 1/4 letter grades
ASVAB percentile	-0.000***	0.001***	-0.000***
	(0.000)	(0.000)	(0.000)
Female	-0.002	0.013***	-0.010***
	(0.003)	(0.004)	(0.003)
Black	-0.002	0.004	-0.001
	(0.004)	(0.006)	(0.003)
Hispanic	0.001	-0.005	0.004
	(0.004)	(0.006)	(0.003)
Age	-0.004**	0.013***	-0.007***
	(0.002)	(0.003)	(0.002)
Time difference	0.000*	-0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Household income	-0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Children	0.007*	-0.011**	0.004
	(0.004)	(0.005)	(0.003)
Married	-0.002	0.003	-0.001
	(0.010)	(0.014)	(0.008)
Household size	-0.001	0.002	-0.000
	(0.001)	(0.001)	(0.001)
Unemployed	0.011*	-0.018**	0.007
	(0.006)	(0.009)	(0.006)
Out of labor force	0.005	-0.009**	0.004
	(0.003)	(0.005)	(0.003)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.1
Probit - Baseline with ASVAB, Neighborhood Characteristics, and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
Good neighborhood	-0.012	0.040***	-0.027**
	(0.012)	(0.014)	(0.011)
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.035***	-0.035***
	(0.010)	(0.013)	(0.009)
Black	-0.002	-0.002	0.002
	(0.014)	(0.017)	(0.012)
Hispanic	0.011	-0.008	-0.004
	(0.014)	(0.018)	(0.013)
Age	-0.013**	0.041***	-0.025***
	(0.007)	(0.009)	(0.006)
Time difference	0.002**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.065***	-0.072***	-0.000
	(0.015)	(0.021)	(0.015)
Married	-0.003	0.006	-0.004
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.003	-0.001
	(0.003)	(0.004)	(0.003)
Unemployed	-0.025	-0.009	0.030
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.011	0.021	-0.012
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.2
Probit - Baseline with ASVAB, Neighborhood Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
Good neighborhood	-0.008	0.032***	-0.022***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.003	0.031***	-0.026***
	(0.007)	(0.010)	(0.006)
Black	0.013	0.004	-0.017*
	(0.009)	(0.012)	(0.008)
Hispanic	0.007	0.001	-0.008
	(0.010)	(0.013)	(0.008)
Age	-0.013***	0.036***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001***	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.024**	-0.023	-0.004
	(0.010)	(0.014)	(0.010)
Married	0.021	-0.036	0.013
	(0.022)	(0.031)	(0.020)
Household size	-0.002	0.001	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.003	-0.044**	0.035***
	(0.016)	(0.021)	(0.014)
Out of labor force	-0.009	0.011	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.3
Probit - Baseline with ASVAB, Neighborhood Characteristics, and Personal Characteristics

	(7) Over-report by one letter grade	(8) Accurate report within one letter grade	(9) Under-report by one letter grade
Good neighborhood	-0.006	0.018**	-0.011**
	(0.005)	(0.007)	(0.005)
ASVAB percentile	-0.001***	0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.015**	-0.015***
	(0.005)	(0.006)	(0.004)
Black	0.003	-0.001	-0.003
	(0.006)	(0.008)	(0.005)
Hispanic	0.004	-0.004	0.000
	(0.006)	(0.008)	(0.005)
Age	-0.012***	0.024***	-0.011***
	(0.003)	(0.004)	(0.003)
Time difference	0.001***	-0.002***	0.001***
	(0.000)	(0.000)	(0.000)
Household income	0.000	0.000	-0.000*
	(0.000)	(0.000)	(0.000)
Children	0.012**	-0.017**	0.004
	(0.006)	(0.009)	(0.006)
Married	0.005	-0.008	0.002
	(0.014)	(0.020)	(0.012)
Household size	-0.002	0.002	-0.000
	(0.001)	(0.002)	(0.001)
Unemployed	0.008	-0.033**	0.021***
	(0.010)	(0.013)	(0.008)
Out of labor force	0.001	-0.005	0.004
	(0.005)	(0.007)	(0.004)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2.4
Probit - Baseline with ASVAB, Neighborhood Characteristics, and Personal Characteristics

	(10) Over-report by 1 1/4 letter grades	(11) Accurate report within 1 1/4 letter grades	(12) Under-report by 1 1/4 letter grades
Good neighborhood	-0.008**	0.014***	-0.005*
	(0.003)	(0.005)	(0.003)
ASVAB percentile	-0.000***	0.001***	-0.000***
	(0.000)	(0.000)	(0.000)
Female	-0.002	0.013***	-0.010***
	(0.003)	(0.004)	(0.003)
Black	-0.004	0.007	-0.002
	(0.004)	(0.006)	(0.003)
Hispanic	0.001	-0.004	0.003
	(0.004)	(0.005)	(0.003)
Age	-0.004**	0.013***	-0.007***
	(0.002)	(0.003)	(0.002)
Time difference	0.000*	-0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Household income	0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Children	0.006*	-0.011*	0.004
	(0.004)	(0.005)	(0.003)
Married	-0.002	0.003	-0.001
	(0.010)	(0.014)	(0.008)
Household size	-0.002	0.002	-0.001
	(0.001)	(0.001)	(0.001)
Unemployed	0.010*	-0.017*	0.006
	(0.006)	(0.009)	(0.006)
Out of labor force	0.005	-0.009**	0.004
	(0.003)	(0.005)	(0.003)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
More than half of peers plan for college	0.012	0.004	-0.016*
	(0.010)	(0.013)	(0.009)
Good neighborhood	-0.012	0.040***	-0.026**
	(0.012)	(0.015)	(0.011)
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.035***	-0.034***
	(0.010)	(0.013)	(0.009)
Black	-0.001	-0.002	0.001
	(0.014)	(0.017)	(0.012)
Hispanic	0.012	-0.007	-0.005
	(0.014)	(0.018)	(0.013)
Age	-0.013**	0.041***	-0.025***
	(0.007)	(0.009)	(0.006)
Time difference	0.002**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Children	0.066***	-0.072***	-0.002
	(0.015)	(0.021)	(0.015)
Married	-0.002	0.006	-0.004
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.004	-0.001
	(0.003)	(0.004)	(0.003)
Unemployed	-0.026	-0.009	0.030
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.011	0.022	-0.012
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
More than half of peers active in extra-curricular activities	0.014*	-0.015	0.001
	(0.007)	(0.010)	(0.007)
Good neighborhood	-0.008	0.033***	-0.022***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.003	0.031***	-0.026***
	(0.007)	(0.010)	(0.006)
Black	0.013	0.004	-0.017**
	(0.009)	(0.012)	(0.009)
Hispanic	0.008	0.001	-0.008
	(0.010)	(0.013)	(0.009)
Age	-0.013***	0.036***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001***	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.024**	-0.023	-0.004
	(0.010)	(0.014)	(0.010)
Married	0.022	-0.037	0.013
	(0.022)	(0.031)	(0.020)
Household size	-0.002	0.001	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.003	-0.044**	0.035***
	(0.016)	(0.021)	(0.014)
Out of labor force	-0.009	0.010	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5369

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
More than half of peers volunteer	0.029*	-0.017	-0.013
	(0.016)	(0.021)	(0.016)
Good neighborhood	-0.012	0.040***	-0.026**
	(0.012)	(0.015)	(0.011)
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.035***	-0.035***
	(0.010)	(0.013)	(0.009)
Black	-0.004	-0.001	0.002
	(0.014)	(0.017)	(0.012)
Hispanic	0.010	-0.007	-0.003
	(0.014)	(0.018)	(0.013)
Age	-0.013**	0.041***	-0.025***
	(0.007)	(0.009)	(0.006)
Time difference	0.002**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.065***	-0.072***	0.000
	(0.015)	(0.021)	(0.015)
Married	-0.003	0.006	-0.004
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.004	-0.001
	(0.003)	(0.004)	(0.003)
Unemployed	-0.026	-0.008	0.030
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.011	0.021	-0.012
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
More than half of peers participate in gangs	0.012	-0.043**	0.025**
	(0.014)	(0.018)	(0.012)
Good neighborhood	-0.008	0.031***	-0.021***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.003	0.030***	-0.025***
	(0.007)	(0.010)	(0.006)
Black	0.012	0.007	-0.018**
	(0.009)	(0.013)	(0.009)
Hispanic	0.006	0.004	-0.010
	(0.010)	(0.013)	(0.009)
Age	-0.013***	0.035***	-0.019***
	(0.004)	(0.006)	(0.004)
Time difference	0.001***	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000*	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.023**	-0.021	-0.005
	(0.010)	(0.014)	(0.010)
Married	0.020	-0.035	0.012
	(0.022)	(0.031)	(0.020)
Household size	-0.002	0.001	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.003	-0.042**	0.034**
	(0.016)	(0.021)	(0.013)
Out of labor force	-0.009	0.011	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7.1
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
More than half of peers cut class	0.013	-0.045***	0.029***
	(0.012)	(0.016)	(0.011)
Good neighborhood	-0.012	0.040***	-0.027***
	(0.012)	(0.015)	(0.010)
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.038***	-0.037***
	(0.010)	(0.013)	(0.009)
Black	-0.003	0.002	-0.001
	(0.014)	(0.017)	(0.012)
Hispanic	0.011	-0.006	-0.005
	(0.014)	(0.018)	(0.013)
Age	-0.013*	0.040***	-0.024***
	(0.007)	(0.009)	(0.006)
Time difference	0.001**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.064***	-0.070***	-0.001
	(0.015)	(0.021)	(0.015)
Married	-0.002	0.005	-0.004
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.003	-0.000
	(0.003)	(0.004)	(0.003)
Unemployed	-0.025	-0.009	0.029
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.010	0.020	-0.011
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7.2
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
More than half of peers cut class	0.020**	-0.029***	0.008
	(0.008)	(0.011)	(0.008)
Good neighborhood	-0.008	0.032***	-0.022***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.004	0.032***	-0.026***
	(0.007)	(0.010)	(0.006)
Black	0.011	0.007	-0.018**
	(0.009)	(0.013)	(0.009)
Hispanic	0.006	0.003	-0.008
	(0.010)	(0.013)	(0.009)
Age	-0.012***	0.035***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001**	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000*	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.022**	-0.021	-0.004
	(0.010)	(0.014)	(0.010)
Married	0.021	-0.036	0.012
	(0.022)	(0.030)	(0.020)
Household size	-0.002	0.000	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.004	-0.044**	0.035**
	(0.016)	(0.021)	(0.014)
Out of labor force	-0.008	0.010	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5360

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(1) Over-report by half a letter grade	(2) Accurate report within half a letter grade	(3) Under-report by half a letter grade
More than half of peers use illicit drugs	0.022*	-0.077***	0.049***
	(0.012)	(0.016)	(0.011)
Good neighborhood	-0.011	0.040***	-0.027***
	(0.012)	(0.014)	(0.010)
ASVAB percentile	-0.001***	0.003***	-0.002***
	(0.000)	(0.000)	(0.000)
Female	0.001	0.038***	-0.037***
	(0.010)	(0.013)	(0.009)
Black	-0.003	0.001	-0.000
	(0.014)	(0.017)	(0.012)
Hispanic	0.011	-0.008	-0.003
	(0.014)	(0.018)	(0.013)
Age	-0.012*	0.039***	-0.023***
	(0.007)	(0.009)	(0.006)
Time difference	0.001**	-0.004***	0.002***
	(0.001)	(0.001)	(0.001)
Household income	0.000	0.000	-0.000**
	(0.000)	(0.000)	(0.000)
Children	0.064***	-0.068***	-0.003
	(0.015)	(0.021)	(0.015)
Married	-0.001	0.002	-0.001
	(0.035)	(0.045)	(0.032)
Household size	-0.003	0.002	0.000
	(0.003)	(0.004)	(0.003)
Unemployed	-0.025	-0.010	0.030
	(0.025)	(0.031)	(0.021)
Out of labor force	-0.010	0.020	-0.011
	(0.011)	(0.014)	(0.010)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
More than half of peers get drunk regularly	0.016*	-0.028**	0.010
	(0.009)	(0.012)	(0.008)
Good neighborhood	-0.008	0.032***	-0.022***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.004	0.032***	-0.026***
	(0.007)	(0.010)	(0.006)
Black	0.013	0.004	-0.016*
	(0.009)	(0.012)	(0.008)
Hispanic	0.008	0.000	-0.007
	(0.009)	(0.013)	(0.008)
Age	-0.012***	0.035***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001**	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.023**	-0.022	-0.004
	(0.010)	(0.014)	(0.010)
Married	0.020	-0.036	0.012
	(0.022)	(0.030)	(0.020)
Household size	-0.002	0.000	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.003	-0.042**	0.034**
	(0.016)	(0.021)	(0.013)
Out of labor force	-0.008	0.010	-0.002
	(0.008)	(0.010)	(0.007)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10
Probit - Baseline with ASVAB, Neighborhood Characteristics, Peer Characteristics, and Personal Characteristics

	(4) Over-report by 3/4 of a letter grade	(5) Accurate report within 3/4 of a letter grade	(6) Under-report by 3/4 of a letter grade
More than half of peers smoke	0.029***	-0.036***	0.005
	(0.008)	(0.010)	(0.007)
Good neighborhood	-0.007	0.031***	-0.022***
	(0.008)	(0.011)	(0.007)
ASVAB percentile	-0.001***	0.002***	-0.001***
	(0.000)	(0.000)	(0.000)
Female	-0.005	0.033***	-0.026***
	(0.007)	(0.010)	(0.006)
Black	0.013	0.002	-0.016*
	(0.009)	(0.012)	(0.008)
Hispanic	0.010	-0.002	-0.007
	(0.009)	(0.013)	(0.008)
Age	-0.012***	0.035***	-0.020***
	(0.004)	(0.006)	(0.004)
Time difference	0.001**	-0.003***	0.002***
	(0.000)	(0.001)	(0.000)
Household income	0.000*	0.000	-0.000***
	(0.000)	(0.000)	(0.000)
Children	0.022**	-0.021	-0.004
	(0.010)	(0.014)	(0.010)
Married	0.020	-0.037	0.013
	(0.021)	(0.030)	(0.020)
Household size	-0.002	0.000	0.002
	(0.002)	(0.003)	(0.002)
Unemployed	0.002	-0.042**	0.034**
	(0.016)	(0.021)	(0.013)
Out of labor force	-0.007	0.009	-0.002
	(0.007)	(0.010)	(0.007)
N	5381	5381	5381

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11.1
Probit regressions on various college experience measures

	(1) Apply to at least one college	(4) Accepted to at least one college (conditioned on applying)	(6) Attend first year of college (conditioned on acceptance)	(7) Attend second year of college (conditioned on first year attendance)
Under-report by at least ¾ of a letter grade	-0.102***	-0.012	-0.034**	-0.114***
	(0.026)	(0.009)	(0.016)	(0.035)
Actual GPA	0.001***	0.000	0.000***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
ASVAB percentile	0.003***	0.000**	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	0.036**	0.013**	-0.009	-0.001
	(0.015)	(0.006)	(0.009)	(0.018)
Black	0.076***	-0.010*	0.003	0.004
	(0.020)	(0.006)	(0.010)	(0.022)
Hispanic	0.012	-0.008	0.018	0.037
	(0.020)	(0.006)	(0.013)	(0.025)
Age	0.038***	-0.004	-0.007	-0.034***
	(0.008)	(0.003)	(0.006)	(0.013)
Time difference	-0.003***	0.000	-0.001	-0.001
	(0.001)	(0.000)	(0.001)	(0.001)
Household income	0.000	0.000	0.000*	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Number of applications to college		0.011***		
		(0.002)		
N	1956	1602	1550	1461

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11.2
Probit regressions on various college experience measures

	(8) Earn two-year degree	(9) Attend third year of college (conditioned on second year attendance)	(10) Attend fourth year of college (conditioned on third year attendance)	(11) Earn four-year degree
Under-report by at least ¾ of a letter grade	-0.029	-0.040	-0.074	-0.046
	(0.076)	(0.054)	(0.058)	(0.092)
Actual GPA	0.003***	0.002***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
ASVAB percentile	0.003***	0.003***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.025	0.035	-0.001	0.062**
	(0.030)	(0.023)	(0.025)	(0.031)
Black	-0.080**	0.091***	-0.031	-0.077*
	(0.040)	(0.031)	(0.031)	(0.041)
Hispanic	-0.094**	-0.007	0.003	-0.058
	(0.041)	(0.031)	(0.034)	(0.043)
Age	0.034	0.011	0.002	0.049**
	(0.021)	(0.016)	(0.018)	(0.023)
Time difference	0.001	0.003	-0.001	-0.002
	(0.003)	(0.002)	(0.002)	(0.003)
Household income	0.000***	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
N	1223	1223	952	783

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11.3
Probit regressions on various college experience measures

	(12) Apply for financial aid	(13) Get financial aid
Under-report by at least ¾ of a letter grade	-0.125**	-0.112**
	(0.049)	(0.049)
Actual GPA	0.002***	0.002***
	(0.000)	(0.000)
ASVAB percentile	0.002***	0.001**
	(0.001)	(0.001)
Female	-0.049	-0.001
	(0.032)	(0.032)
Black	0.086***	0.087***
	(0.024)	(0.024)
Hispanic	0.233***	0.269***
	(0.032)	(0.032)
Age	0.053	0.043
	(0.032)	(0.033)
Time difference	0.031**	0.037**
	(0.015)	(0.015)
Household income	-0.005***	-0.007***
	(0.002)	(0.002)
N	1956	1956

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Chapter 2: Influence of Self-Appraisal on College Outcomes

Abstract

The difference between actual and self-reported grades may be interpreted as a proxy for academic self-appraisal. This claim is motivated by literature from economics and psychology. A framework from Lazear (2016) is adopted to analyze the choice a student makes to continue school or to work in some non-college occupation. This choice is dependent on one's own appraisal of his or her academic and occupational abilities. Lazear's results reveal that the size of errors in academic or occupational abilities are correlated with increased switching. The present chapter offers results that support Lazear's hypothesis as well as a motivation-based narrative of college applications and other college outcomes.

I. Introduction

In the previous chapter, a relationship between peer effects and self-reported grades was found. Kuncel, Credé, and Thomas (2005) note in their discussion that "self-reported grades generally predict outcomes to a similar extent as actual grades" (p. 76), and that self-reported grades are a great predictor of future grades (citing Baird, 1976). It seems that if self-reports themselves can be used as a measure to predict future academic outcomes, then the difference between the self-report and the actual GPA could also provide interesting results.

Differences between self-reports and actual GPA may not just be measurement error, but a measure of its own. If a student received mostly Cs in high school, but reported mostly As, this could reflect overconfidence, a psychological predisposition for bragging, or even dissatisfaction with his or her own academic performance and a vow to perform better in the future. The exact interpretation of the difference in self-reported and actual grades depends on whether or not the difference is intentional or unintentional. Unfortunately, this is unobservable, but we may interpret this difference in a more general way, in which the intentional/unintentional distinction is no longer important.

Interpreting under-reporting as low academic self-appraisement is acceptable whether or not the erroneous self-reports are intentional or not. As discussed in the previous chapter, if the error is intentional, there is not much more say except that the respondent is willingly communicating a self-deprecating lie. The reasons for such behavior might include a desire to conform to a certain social group, or overblown humility (which seems even more far-fetched given the survey environment). If unintentional, but dependent on certain personal characteristics (not from classical or random error), we might say such misreports represent low self-appraisement, or low judgments of one's own abilities and achievements. Unintentional

differences may also be attributed to forgetting, though even forgetting must have a direction (over- or under-estimate one's own performance).

So, whether or not the under-reporting students did so intentionally or unintentionally, we can plausibly attribute under-reporting to low self-appraisement, because even intentional under-reporting could be due to low self-appraisement. The present chapter will outline how other researchers from psychology and economics have used and applied self-appraisement-type constructs, how the NLSY97 data may be used to examine the impact of self-appraisement on college outcomes, and how statistical results may reveal a link between self-appraisement, motivation, and college outcomes.

II. Literature Review

Psychology literature

Psychological literature on the self-concept construct is somewhat divided on the scope of self-concept. Ayodele (2011) surveys the literature and finds that while some restrict the definition of self-concept to a specific field or area of learning, others use it in a more general way, as a personality construct more related to "self-esteem, self-efficacy, self-image, and others" (p. 176). The present chapter views self-appraisement as a middle ground construct—not related to a specific academic field, but not related to the subjects' view of their self as a whole, either. Instead, our construct, academic self-appraisement, is viewed as a perception of one's own academic abilities relative to his or her true academic performance as reported on an official transcript.

House (1993) considered the relationship between "academic self-concept" (materially the same as this paper's "self-appraisement") and college math course grades. Self-concept was measured by self-reports from the students, who answered a question about their own abilities

relative to their peers. Controlling for sex, prior achievements in math courses, and other demographic variables, the student's own self-appraisement of their math abilities had a significant effect on their math course grades: "students with low academic self-concept earned mathematics course grades that were significantly lower […] than did students with high academic self-concept" (p. 65). Surprisingly, prior achievements in math courses was not significantly related to college math course grades in this study.

Ayodele (2011) similarly finds a relationship between students' self-concept and their achievement in mathematics. These results in view, the author suggests that teaching styles and procedures should be geared toward encouraging higher self-concept in students to boost academic performance.

Economics literature

Lazear (2016) offers a mathematical formalization of overconfidence using measurement error—he defines overconfidence as "over-estimating one's ability relative to true ability" (p. 4). This corresponds well with the present chapter's use of measurement error to measure academic appraisal. Lazear (2016) considers agents selecting an occupation based on their perceived abilities. The statistical theory suggests that since agents self-select into an occupation, ex-post (after the agent's initial occupation selection) estimates of ability are biased upward. Selection into an occupation can happen because of an accurate estimate of one's abilities to perform better in that occupation or because of overconfidence, an inaccurate estimate that one's abilities are better suited for one occupation compared to another. Also, occupations with noisier estimates of ability have more overconfident workers.

Lazear's (2016) formalization may be adopted in the following way: an overconfident student (high school grade over-reporter) or an appropriately confident student (accurate high

school grade reporter) may self-select into college thinking that his or her academic abilities are high enough to earn a degree. Conversely, an "underconfident" student (high school grade under-reporter) or an appropriately confident student who knows his or her academic abilities are not high enough to earn a degree decides not to go to college, but to earn a wage in some non-student occupation. In either case, students with accurate perceptions of their own abilities select either school or an occupation, depending on their abilities. Students who are overconfident in their academic abilities are more likely to choose college, while students who are underconfident in their abilities are more likely to choose the non-student occupation. Following Lazear (2016), a student may choose college (A) or work (B). The student's choice is determined by the student's estimate of his or her own academic and work performance abilities:

(1) $\hat{q}_A = q_A + \varepsilon_A$ and $\hat{q}_B = q_B + \varepsilon_B$

where q_A and q_B are the student's true abilities in college (A) and some other occupation (B) and ε_A and ε_B are the student's estimation errors, which are assumed to have (Lazear, p. 2)

$E(\varepsilon_A) = 0$ and $E(\varepsilon_B) = 0$ (expectation zero)

$E(\varepsilon_A \varepsilon_B) = E(\varepsilon_A)E(\varepsilon_B)$ (error independence)

$E(\varepsilon_A q_A) = E(\varepsilon_A)E(q_A)$ (independence with true academic ability)

$E(\varepsilon_B q_B) = E(\varepsilon_B)E(q_B)$ (independence with true occupation ability)

It is also assumed that student academic and occupational abilities reflect their potential net returns to education and wages. Therefore q_A reflects the higher wages of a successful degree-earner minus the opportunity costs of attending college, and q_B reflects the returns to working instead of going to college minus the opportunity costs of forgone higher future wages by earning a degree.

Still following Lazear (2016) if $\hat{q}_A > \hat{q}_B$, then the student will choose college, and if $\hat{q}_A < \hat{q}_B$, then the non-college occupation is chosen. The difference between these estimated abilities is given by

(2) $\hat{q}_A - \hat{q}_B = \delta + v$

where δ is the difference in the student's true abilities ($\delta = q_A - q_B$) and v is the difference in the student's estimation errors ($v = \varepsilon_A - \varepsilon_B$) (Lazear, p. 2). Lazear shows that the probability of erroneously choosing A or B and the cost of such an error are inversely related (p. 3). An incorrect choice happens when $-\delta < v$ (measurement error outweighs the difference in true abilities).

Since the present chapter takes ε_A to be estimated (by proxy) ex-ante by measurement error in self-reported grades, we can test Lazear's hypothesis. If under-reporters by larger margins (1 to 1.25 letter grades) drop out of college more often than under-reporters by smaller margins (0.5 and 0.75 letter grades) and accurate reporters, we can say that the measurement error proxies Lazear's ε_A in the present interpretation (error in academic ability estimation). A larger ε_A makes errors in the school versus work choice more likely, and a student may realize this mistake and switch, which Lazear tests with Current Population Survey data. However, Lazear also shows that the greater the so-called measurement error required to make a mistake (low probability), the less costly the mistake is because δ is closer to zero.

III. Data

The 1997 National Longitudinal Study of Youth

The NLSY97 is a large longitudinal survey given to 12-16 year olds as of the first year of the survey, 1997. Survey items cover a wide range of topics from personal attitudes to detailed earnings from jobs and IQ measures to drug use. The survey items relevant to the present chapter

include self-reported grades, transcript data, demographic and personal characteristics, and college outcomes like applying to college, college acceptance, attending various years of school, and earning two- or four-year degrees.

Self-Reported Grades

The NLSY97 contains self-reported grades and actual grades for most of the respondents. One survey item asked respondents "Overall, what grades did you receive in high school?" with response choices "Mostly below Ds", "Mostly Ds", "About half Cs and half Ds", "Mostly Cs", "About half Bs and half Cs", "Mostly Bs", "About half As and Bs", and "Mostly As". If a respondent could not decide on one of those categories, the interviewers were to probe the respondent for an average grade and the interviewer would accordingly code their response into one of the existing categories.

The self-reported grades were coded as GPAs (where "Mostly As" was coded as a GPA of 4.0, "About half As and Bs" was coded as a GPA of 3.5, etc.). The resulting distribution (mean=2.76, SD=0.817) of 8,521 self-reported grades is bimodal—but similar to the distribution of actual GPAs—with one mode at 2.5, "About half Bs and half Cs", and another at 3.5, "About half As and Bs" [Figure 1].

Actual Grades

NLSY97 researchers retrieved the high school transcripts of 6,232 of the respondents over the course of two "waves", with the permission of the survey respondents. Overall high school GPAs were calculated and credit-weighted by NLSY97 researchers for every respondent, so between school variation in the way GPA is calculated is eliminated. Actual GPAs approximated a normal bell curve with mean 2.81 and standard deviation .622 [Figure 2]. According to the Topical Guide to the Data,

In 1999-2000, transcripts were obtained and processed for 1,417 youths who had graduated from high school or had reached age 18 and were no longer attending high school. A second wave of transcripts was collected in 2004 for 4,815 youths. School registrars provided a copy of the transcript that the high school maintained, a course catalog (if available), and indicated whether the student was designated for such programs as bilingual education, special education, or gifted/talented programming.

Difference in Self-Reported and Actual GPAs

Despite the fact that the self-reported GPA sample mean is slightly lower than the actual GPA sample mean, the mean of respondent-level differences is statistically indistinguishable from zero. About 68 percent of the respondents reported grades within a half of a letter grade window, while about 15 percent over-reported their grades and about 16 percent under-reported. If the benefit of the doubt is expanded to a whole letter grade, 92 percent of the self-reported GPAs fall within the window, while the other 8 percent is split in half between over- and under-reporters. Self-report data is discrete, and actual transcript data is continuous, but the distribution of differences between the two is shown in Figure 3, above. Note that this is just an illustration of the direction and size of differences between the self-reported and actual GPA data, and it is not used in any of the following statistical analyses.

College outcomes

The data on college outcomes were self-reported by the survey respondents. Respondents were asked about whether they applied to college and the number of applications they submitted. Conditioned on applying to at least one college, the NLSY97 also records the number of acceptances for admission. If a student is accepted, he or she may attend the college for a first, second, third, and fourth year. These are also documented in the NLSY97, along with earning a

two-year degree and earning a four-year degree. Overall, we can track a student's progress through college from application to degree.

IV. Econometric Model

We estimate the following equation with various specifications:

$$CollegeOutcome_i = \alpha + \beta UnderReport_i + \gamma PC_i + \delta Time\ \ difference_i + \varepsilon_i$$

The college outcomes include applying to college, the number of applications a student submits, college acceptance, attending college, achieving a two-year degree, and achieving a four-year degree. $UnderReport_i$ is a binary variable that indicates whether the student under-reported their high school grades by certain thresholds, half a letter grade up to 1.25 letter grades. PC_i is a vector of personal characteristics, including the student's actual GPA, the appearance of their neighborhood, their ASVAB percentile, sex, race, ethnicity, age, household income, number of children, marital status, household size, and employment status. When estimating college acceptance, cumulative college applications were also included as a RHS variable.

Binary outcomes, like applying to college, being accepted by a college, attending the school, and getting a degree, were estimated using probit. OLS was used for other outcomes, like the number of college applications and the number of acceptances. The various under-reporting thresholds were estimated in separate regressions.

V. Results

Under-reporting is negatively associated with applying to at least one college at all reporting thresholds. Under-reporting by just a half a letter grade decreased the probability that a student would apply to at least one college by 8.3% ($p<0.01$). At the largest threshold, 1.25 letter grade difference, the effect is expanded to 18.9% ($p<0.01$). OLS regressions with the number of college applications as the outcome reveal similar results. Under-reporting by at least one letter

grade was associated with a 0.758 decrease in the number of college applications a student would make. This effect is still negative even when conditioned on applying to at least one college (coefficient on under-reporting is -0.423, $p<0.05$). This particular effect loses statistical significance at thresholds lower than one letter grade, but point estimates are still negative.

Conditioned on applying to college, however, there was no significant effect of under-reporting on the number of acceptances by the colleges to which they applied. Probit results show weaker significance and smaller effects of under-reporting on being accepted by at least one college. At the one letter grade threshold, the marginal effect of under-reporting is associated with a 2.3% decrease in the probability of acceptance ($p<0.05$), and at the half of a letter grade threshold, a 1.3% decrease in the probability of acceptance ($p<0.05$), but this result was not statistically significant at the other thresholds, implying poor robustness. Similar OLS regressions with the number of acceptances as the outcome have no statistically significant results, thought the point estimates are all negative.

Attending and staying in school is somewhat negatively associated with under-reporting, but results are mixed. Statistical significance was found at the half a letter grade threshold and attending college for a second or fourth year (-7.9%, and -11.2%, $p<0.01$, respectively). At the three-quarter letter grade threshold, under-reporters were less likely to attend their second year of college by 8.9% ($p<0.05$). At the one letter grade threshold, under-reporters were less likely to attend their second year of college by 24.7% ($p<0.01$). At the one and a quarter letter grade threshold, under-reporters were less likely to attend their first and second years of college (-5.9%, $p<0.05$, and -18.1%, $p<0.01$, respectively). Other results for attendance were not statistically significant.

The effect of under-reporting on getting either a two-year or four-year degree is inconclusive, with only one statistically significant marginal effect. At the half a letter grade threshold, under-reporters were less likely to get a two-year degree by 13.2% ($p<0.05$). This result should be interpreted with caution—the other results were statistically indistinguishable from zero. Full results are reported in Tables 12-15.

VI. Discussion

These results tell an interesting story. Those with low self-appraisement seem less motivated to apply to college and slightly less motivated to return to school for a second year. However, if they apply to college there is no major difference in their probability of acceptance compared to a student without low self-appraisement. Furthermore, if a student with low self-appraisement stays in school for two or four years, there is no major difference in their probability of achieving a two or four-year degree compared to students who do not under-report their high school grades.

Lazear's hypothesis

We have also adapted and tested Lazear's (2016) hypothesis, that under-reporters by larger margins would drop out of college more than under-reporters by smaller margins. Table 16 presents abridged results of a probit regression with the binary outcome of attending college a second year. Two under-reporting threshold intervals were included: under-reporting by half a letter grade, but less than a full letter grade, and under-reporting by at least a full letter grade (all previous control variables were included as well). The marginal effect of under-reporting by a smaller amount is statistically insignificant ($p>0.1$). The marginal effect of under-reporting at the one-letter grade threshold or greater on attending college a second year was -1.35 ($p<0.01$). A t-test reveals the point estimates to be significantly different ($p<0.01$).

Thus, two students who are identical in all observable characteristics, except one under-reports their high school grades by one letter grade, and another under-reports at a smaller threshold, will have different college outcomes on average. The under-reporter at the larger threshold has a higher ε_A, and therefore is more likely to erroneously choose college, when labor market returns out of college would be higher ($q_A < q_B$). Lazear (2016) predicted that switching occupations, or in our case, switching from school to work, is more likely when ε_A is larger. The present chapter attempts to proxy ε_A with the measurement error in self-reported grades, and statistical results support Lazear's (2016) theory and occupational switching hypothesis.

Selection bias check

Altonji, Elber, and Taber (2005) and Oster (2014) offer a method for estimating the amount of selection on unobservables required to produce a marginal effect of zero from the variable of interest. The method rests on the assumption that selection on observables is related to the selection on unobservables (Oster, p. 2). Coefficient movements are evaluated from imposing varying degrees of correlation between the residuals (ρ) from regressing the outcome of interest on all observables and the residuals from regressing the explanatory variable of interest on all other observables.

Table 17 presents the results of this method. The marginal effects of under-reporting by ½ a letter grade on various college outcomes are reported, using constrained probit regressions. At ρ<-0.1, the marginal effect of under-reporting by at least ½ a letter grade on applying to college (binary) becomes statistically indistinguishable from zero. The same applies to the 4-year degree earned outcome. For the admission to college outcome, ρ<-0.2 results in a nil marginal effect for under-reporting by ½ a letter grade. However, for all three outcomes (applying,

admission, 4-year degree), a ρ=-0.5 is required to achieve the opposite sign on the marginal effects.

Interpreting these results reveals some room for suspicion for selection bias, but narrowing down suspects for omitted variables or selection mechanisms is difficult. Also, the procedure rests on the assumption that the error terms in both equations are related, i.e., the bias from the same omitted variable or selection mechanism is present in the error terms of an equation estimating the probability of submitting college applications and an equation estimating the probability of under-reporting by ½ a letter grade. The present chapter suggests that the causal mechanism is low academic self-appraisement, but the results of the Altonji, Elber, and Taber (2005) procedure hints that some other mechanism could be at play. Further research along these lines should explore possible areas of bias in an effort to isolate the causal factors of student observables (like under-reporting high school grades) and others on college outcomes.

Table 12 – Regressions of College Outcomes on Under-reporting by ½ a Letter Grade

	(1) Apply to College (binary)	(2) Applications to College (OLS)	(3) Applications to College (OLS) (Apply cond.)	(4) Accepted to College (binary)	(5) Acceptances to Colleges (OLS) (Apply cond.)	(6) Attend One Year of College (binary)	(7) Attend Two Years of College (binary)	(8) Attain 2-year Degree (binary)	(9) Attend Three Years of College (binary)	(10) Attend Four Years of College (binary)	(11) Attain 4-year Degree (binary)
Under-report by ½ of a letter grade	-0.083***	-0.403***	-0.180	-0.017**	-0.116	-0.018	-0.079***	-0.132**	-0.056	-0.112***	-0.067
	(0.018)	(0.142)	(0.172)	(0.007)	(0.076)	(0.011)	(0.025)	(0.056)	(0.038)	(0.038)	(0.068)
True GPA	0.001***	0.006***	0.003***	0.000	0.001***	0.000***	0.002***	0.002***	0.002***	0.002***	0.001***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Neighborhood	0.047***	0.378***	0.320***	0.001	-0.005	0.009	0.063***	0.032	0.098***	-0.001	0.040
	(0.016)	(0.097)	(0.108)	(0.004)	(0.039)	(0.008)	(0.019)	(0.037)	(0.027)	(0.029)	(0.038)
ASVAB percentile	0.003***	0.013***	0.009***	0.000	0.001	0.000*	0.001***	0.003***	0.002***	0.002***	0.002**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.028*	0.325***	0.316***	0.009*	0.092**	-0.008	-0.011	0.026	0.053**	0.013	0.062*
	(0.015)	(0.090)	(0.098)	(0.005)	(0.039)	(0.008)	(0.018)	(0.033)	(0.024)	(0.026)	(0.034)
Black	0.085***	0.949***	0.869***	-0.009	0.059	0.004	0.024	-0.060	0.106***	-0.041	-0.071
	(0.019)	(0.135)	(0.147)	(0.006)	(0.056)	(0.010)	(0.023)	(0.043)	(0.033)	(0.032)	(0.043)
Hispanic	0.033*	0.095	-0.016	-0.007	0.007	0.008	0.044*	-0.076*	0.036	-0.009	-0.065
	(0.020)	(0.108)	(0.118)	(0.006)	(0.052)	(0.011)	(0.025)	(0.045)	(0.033)	(0.035)	(0.047)
Age	0.018	0.076	0.034	-0.006*	-0.018	-0.012*	-0.043***	0.034	0.014	-0.008	0.066**
	(0.012)	(0.074)	(0.086)	(0.003)	(0.036)	(0.007)	(0.016)	(0.029)	(0.022)	(0.023)	(0.031)
Time difference	0.006	0.030	0.014	0.002	0.007	0.003	-0.003	-0.004	0.004	0.005	-0.005
	(0.004)	(0.025)	(0.030)	(0.001)	(0.012)	(0.002)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Household income	-0.000	0.000**	0.000**	0.000	0.000	0.000	0.000**	0.000**	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	-0.034	-0.133	-0.034	-0.002	-0.156	-0.017	-0.031	-0.143*	-0.132***	-0.124**	-0.204*
	(0.025)	(0.201)	(0.250)	(0.007)	(0.107)	(0.011)	(0.035)	(0.079)	(0.050)	(0.062)	(0.108)
Married	-0.034	-0.399*	-0.386	-0.008	-0.017	-0.027	0.014	-0.269	-0.117	0.077	-0.055
	(0.054)	(0.239)	(0.235)	(0.014)	(0.123)	(0.021)	(0.067)	(0.172)	(0.100)	(0.138)	(0.199)
Household size	-0.000	-0.074***	-0.089***	-0.001	-0.010	-0.001	-0.001	-0.022**	-0.011	0.003	-0.013
	(0.004)	(0.027)	(0.029)	(0.001)	(0.011)	(0.003)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Unemployed	0.018	-0.130	-0.254	-0.006	-0.045	0.020	0.003	0.035	0.148***	0.008	-0.048
	(0.030)	(0.156)	(0.175)	(0.008)	(0.084)	(0.018)	(0.038)	(0.074)	(0.056)	(0.050)	(0.074)
Out of labor force	0.003	0.228**	0.275**	0.006	-0.006	0.019**	0.043**	0.051	0.083***	0.058**	0.051
	(0.016)	(0.100)	(0.109)	(0.005)	(0.042)	(0.009)	(0.019)	(0.033)	(0.025)	(0.026)	(0.034)
Cumulative applications				0.009***	0.646***						
				(0.002)	(0.033)						
N	1663	1675	1422	1422	1422	1376	1308	1107	1107	865	718

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13 – Regressions of College Outcomes on Under-reporting by ¾ a Letter Grade

	(1) Apply to College (binary)	(2) Applications to College (OLS)	(3) Applications to College (OLS) (Apply cond.)	(4) Accepted to College (binary)	(5) Acceptances to Colleges (OLS) (Apply cond.)	(6) Attend One Year of College (binary)	(7) Attend Two Years of College (binary)	(8) Attain 2-year Degree (binary)	(9) Attend Three Years of College (binary)	(10) Attend Four Years of College (binary)	(11) Attain 4-year Degree (binary)
Under-report by ¾ of a letter grade	-0.074***	-0.447***	-0.213	-0.013	-0.090	-0.023	-0.089**	0.009	-0.016	-0.051	-0.025
	(0.026)	(0.166)	(0.189)	(0.008)	(0.091)	(0.015)	(0.035)	(0.082)	(0.056)	(0.060)	(0.098)
True GPA	0.001***	0.006***	0.003***	0.000	0.001***	0.000***	0.002***	0.002***	0.002***	0.002***	0.001***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Neighborhood	0.046***	0.378***	0.322***	0.002	-0.003	0.009	0.064***	0.035	0.098***	0.002	0.044
	(0.016)	(0.096)	(0.106)	(0.005)	(0.039)	(0.008)	(0.020)	(0.037)	(0.027)	(0.029)	(0.038)
ASVAB percentile	0.003***	0.013***	0.009***	0.000	0.001	0.000**	0.001***	0.003***	0.002***	0.002***	0.002**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.029*	0.328***	0.317***	0.010**	0.094**	-0.008	-0.011	0.032	0.055**	0.016	0.062*
	(0.015)	(0.089)	(0.097)	(0.005)	(0.039)	(0.008)	(0.018)	(0.033)	(0.024)	(0.026)	(0.034)
Black	0.084***	0.936***	0.858***	-0.010	0.054	0.003	0.019	-0.063	0.104***	-0.044	-0.071
	(0.019)	(0.135)	(0.147)	(0.006)	(0.055)	(0.010)	(0.023)	(0.043)	(0.033)	(0.032)	(0.043)
Hispanic	0.034*	0.092	-0.021	-0.008	0.004	0.008	0.041	-0.082*	0.033	-0.018	-0.065
	(0.020)	(0.108)	(0.119)	(0.006)	(0.052)	(0.011)	(0.025)	(0.045)	(0.033)	(0.035)	(0.047)
Age	0.020	0.078	0.034	-0.007*	-0.018	-0.013*	-0.044***	0.036	0.015	-0.005	0.067**
	(0.012)	(0.075)	(0.086)	(0.004)	(0.036)	(0.007)	(0.016)	(0.030)	(0.022)	(0.023)	(0.031)
Time difference	0.006	0.030	0.013	0.002	0.006	0.003	-0.003	-0.006	0.003	0.004	-0.005
	(0.004)	(0.025)	(0.030)	(0.001)	(0.012)	(0.002)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Household income	-0.000	0.000**	0.000**	0.000	0.000	0.000	0.000**	0.000**	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	-0.036	-0.140	-0.033	-0.002	-0.156	-0.017	-0.030	-0.150*	-0.134***	-0.129**	-0.209*
	(0.026)	(0.202)	(0.251)	(0.007)	(0.109)	(0.011)	(0.035)	(0.079)	(0.051)	(0.063)	(0.107)
Married	-0.031	-0.385	-0.376	-0.007	-0.007	-0.026	0.019	-0.254	-0.112	0.090	-0.050
	(0.054)	(0.241)	(0.241)	(0.015)	(0.124)	(0.021)	(0.068)	(0.173)	(0.101)	(0.140)	(0.199)
Household size	-0.000	-0.072***	-0.087***	-0.001	-0.010	-0.000	-0.000	-0.022**	-0.011	0.004	-0.013
	(0.005)	(0.027)	(0.029)	(0.001)	(0.011)	(0.003)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Unemployed	0.022	-0.114	-0.248	-0.006	-0.041	0.021	0.007	0.041	0.151***	0.011	-0.045
	(0.031)	(0.157)	(0.175)	(0.008)	(0.084)	(0.019)	(0.039)	(0.075)	(0.057)	(0.051)	(0.074)
Out of labor force	0.002	0.232**	0.278**	0.007	-0.004	0.019**	0.043**	0.054	0.085***	0.059**	0.052
	(0.016)	(0.099)	(0.108)	(0.005)	(0.042)	(0.009)	(0.019)	(0.033)	(0.025)	(0.026)	(0.034)
Cumulative applications				0.010***	0.646***						
				(0.002)	(0.033)						
N	1663	1675	1422	1422	1422	1376	1308	1107	1107	865	718

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14 – Regressions of College Outcomes on Under-reporting by One Letter Grade

	(1) Apply to College (binary)	(2) Applications to College (OLS)	(3) Applications to College (OLS) (Apply cond.)	(4) Accepted to College (binary)	(5) Acceptances to Colleges (OLS) (Apply cond.)	(6) Attend One Year of College (binary)	(7) Attend Two Years of College (binary)	(8) Attain 2-year Degree (binary)	(9) Attend Three Years of College (binary)	(10) Attend Four Years of College (binary)	(11) Attain 4-year Degree (binary)
Under-report by one letter grade	-0.109***	-0.758***	-0.423**	-0.023**	-0.098	-0.036	-0.247***	0.212	0.121	0.106	0.007
	(0.040)	(0.195)	(0.201)	(0.012)	(0.117)	(0.022)	(0.060)	(0.213)	(0.161)	(0.124)	(0.181)
True GPA	0.001***	0.006***	0.003***	0.000	0.001***	0.000***	0.002***	0.003***	0.002***	0.002***	0.001***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Neighborhood	0.048***	0.385***	0.323***	0.002	-0.002	0.010	0.065***	0.035	0.099***	0.001	0.044
	(0.016)	(0.096)	(0.106)	(0.005)	(0.039)	(0.008)	(0.019)	(0.037)	(0.027)	(0.029)	(0.038)
ASVAB percentile	0.003***	0.013***	0.010***	0.000	0.001	0.000*	0.001***	0.003***	0.002***	0.002***	0.002**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.028*	0.326***	0.316***	0.010*	0.095**	-0.008	-0.012	0.033	0.056**	0.019	0.062*
	(0.015)	(0.089)	(0.097)	(0.005)	(0.039)	(0.008)	(0.018)	(0.033)	(0.024)	(0.026)	(0.034)
Black	0.085***	0.941***	0.862***	-0.010	0.056	0.003	0.020	-0.066	0.104***	-0.045	-0.071
	(0.020)	(0.135)	(0.147)	(0.006)	(0.056)	(0.010)	(0.023)	(0.043)	(0.033)	(0.032)	(0.043)
Hispanic	0.034*	0.092	-0.022	-0.008	0.004	0.008	0.044*	-0.082*	0.033	-0.020	-0.064
	(0.020)	(0.108)	(0.118)	(0.006)	(0.052)	(0.011)	(0.025)	(0.045)	(0.033)	(0.035)	(0.047)
Age	0.020*	0.076	0.032	-0.007**	-0.017	-0.013*	-0.046***	0.035	0.014	-0.004	0.067**
	(0.012)	(0.075)	(0.086)	(0.004)	(0.036)	(0.007)	(0.015)	(0.030)	(0.022)	(0.023)	(0.031)
Time difference	0.006	0.029	0.012	0.002	0.006	0.003	-0.004	-0.006	0.003	0.003	-0.005
	(0.004)	(0.025)	(0.030)	(0.001)	(0.012)	(0.002)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Household income	-0.000	0.000**	0.000**	0.000	0.000	0.000	0.000*	0.000**	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	-0.036	-0.143	-0.034	-0.002	-0.158	-0.017	-0.032	-0.148*	-0.133***	-0.129**	-0.210**
	(0.026)	(0.201)	(0.251)	(0.007)	(0.109)	(0.011)	(0.035)	(0.080)	(0.051)	(0.063)	(0.107)
Married	-0.027	-0.369	-0.369	-0.007	-0.002	-0.025	0.019	-0.254	-0.111	0.092	-0.048
	(0.054)	(0.241)	(0.240)	(0.015)	(0.124)	(0.021)	(0.067)	(0.173)	(0.101)	(0.141)	(0.199)
Household size	-0.001	-0.075***	-0.088***	-0.001	-0.011	-0.000	-0.001	-0.022**	-0.012	0.003	-0.014
	(0.005)	(0.027)	(0.029)	(0.001)	(0.011)	(0.003)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Unemployed	0.022	-0.114	-0.240	-0.005	-0.039	0.022	0.014	0.043	0.152***	0.012	-0.045
	(0.031)	(0.157)	(0.175)	(0.008)	(0.084)	(0.019)	(0.038)	(0.075)	(0.057)	(0.052)	(0.074)
Out of labor force	0.005	0.240**	0.279**	0.007	-0.003	0.020**	0.044**	0.055*	0.085***	0.060**	0.053
	(0.016)	(0.100)	(0.108)	(0.005)	(0.042)	(0.009)	(0.019)	(0.033)	(0.025)	(0.026)	(0.033)
Cumulative applications				0.010***	0.646***						
				(0.002)	(0.033)						
N	1663	1675	1422	1422	1422	1376	1308	1107	1107	865	718

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15 – Regressions of College Outcomes on Under-reporting by 1¼ a Letter Grade

	(1) Apply to College (binary)	(2) Applications to College (OLS)	(3) Applications to College (OLS) (Apply cond.)	(4) Accepted to College (binary)	(5) Acceptances to Colleges (OLS) (Apply cond.)	(6) Attend One Year of College (binary)	(7) Attend Two Years of College (binary)	(8) Attain 2-year Degree (binary)	(9) Attend Three Years of College (binary)	(10) Attend Four Years of College (binary)	(11) Attain 4-year Degree (binary)
Under-report by 1¼ letter grades	-0.189***	-1.203***	-0.844***	-0.014	-0.235	-0.059**	-0.181*	0.112	-0.058	-0.114	
	(0.056)	(0.203)	(0.178)	(0.019)	(0.161)	(0.029)	(0.103)	(0.320)	(0.199)	(0.159)	
True GPA	0.001***	0.006***	0.003***	0.000	0.001***	0.000***	0.002***	0.002***	0.002***	0.002***	0.001***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Neighborhood	0.049***	0.385***	0.321***	0.002	-0.002	0.010	0.064***	0.035	0.098***	0.001	0.039
	(0.016)	(0.096)	(0.106)	(0.005)	(0.039)	(0.009)	(0.020)	(0.037)	(0.027)	(0.029)	(0.038)
ASVAB percentile	0.003***	0.013***	0.010***	0.000	0.001	0.000**	0.001***	0.003***	0.002***	0.002***	0.002**
	(0.000)	(0.002)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Female	0.027*	0.323***	0.316***	0.011**	0.095**	-0.008	-0.010	0.032	0.056**	0.017	0.061*
	(0.015)	(0.089)	(0.097)	(0.005)	(0.039)	(0.008)	(0.018)	(0.033)	(0.024)	(0.026)	(0.034)
Black	0.084***	0.938***	0.863***	-0.009	0.056	0.004	0.022	-0.064	0.105***	-0.043	-0.073*
	(0.020)	(0.135)	(0.147)	(0.006)	(0.056)	(0.010)	(0.023)	(0.043)	(0.033)	(0.033)	(0.043)
Hispanic	0.034*	0.091	-0.022	-0.007	0.004	0.008	0.042*	-0.081*	0.033	-0.020	-0.066
	(0.020)	(0.107)	(0.118)	(0.006)	(0.052)	(0.011)	(0.025)	(0.045)	(0.033)	(0.035)	(0.047)
Age	0.019	0.072	0.032	-0.006*	-0.018	-0.013*	-0.045***	0.036	0.015	-0.004	0.071**
	(0.012)	(0.075)	(0.086)	(0.004)	(0.036)	(0.007)	(0.016)	(0.030)	(0.022)	(0.023)	(0.031)
Time difference	0.006	0.029	0.012	0.002	0.006	0.003	-0.003	-0.005	0.003	0.004	-0.004
	(0.004)	(0.025)	(0.030)	(0.001)	(0.012)	(0.002)	(0.006)	(0.010)	(0.008)	(0.008)	(0.011)
Household income	-0.000	0.000**	0.000**	0.000	0.000	0.000	0.000**	0.000**	0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children	-0.035	-0.140	-0.032	-0.002	-0.157	-0.016	-0.031	-0.150*	-0.134***	-0.130**	-0.212**
	(0.026)	(0.202)	(0.251)	(0.007)	(0.109)	(0.011)	(0.035)	(0.079)	(0.051)	(0.063)	(0.106)
Married	-0.027	-0.364	-0.367	-0.006	-0.002	-0.025	0.023	-0.254	-0.111	0.091	-0.050
	(0.054)	(0.241)	(0.240)	(0.016)	(0.124)	(0.021)	(0.068)	(0.173)	(0.101)	(0.141)	(0.199)
Household size	-0.001	-0.076***	-0.089***	-0.001	-0.011	-0.001	-0.002	-0.022**	-0.011	0.003	-0.014
	(0.005)	(0.027)	(0.029)	(0.001)	(0.011)	(0.003)	(0.005)	(0.010)	(0.008)	(0.008)	(0.011)
Unemployed	0.022	-0.120	-0.244	-0.006	-0.040	0.021	0.005	0.041	0.151***	0.010	-0.047
	(0.031)	(0.158)	(0.176)	(0.009)	(0.084)	(0.019)	(0.039)	(0.075)	(0.057)	(0.052)	(0.074)
Out of labor force	0.007	0.248**	0.282***	0.007	-0.002	0.021**	0.046**	0.054	0.086***	0.060**	0.051
	(0.016)	(0.100)	(0.108)	(0.005)	(0.042)	(0.009)	(0.019)	(0.033)	(0.025)	(0.026)	(0.033)
Cumulative applications				0.010***	0.646***						
				(0.002)	(0.033)						
N	1663	1675	1422	1422	1422	1376	1308	1107	1107	865	717

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 16
Probit Regression for Testing Lazear's Hypothesis

	Attend second year of college
Under-report by ½ to 1 letter grade	-0.240
	(0.152)
Under-report by at least 1 letter grade	-1.359***
	(0.317)
N	1308

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 17
Constrained Bivariate Probit

	Marginal effect of under-reporting by at least 1/2 a letter grade (std. errors in parentheses)		
Correlation of Residuals (constraint)	**Apply to College**	**Admission to College**	**4-year Degree Earned**
ρ = 0	-0.495***	-0.573***	-0.568***
	(0.109)	(0.104)	(0.132)
ρ = -0.1	-0.313**	-0.389***	-0.376**
	(0.109)	(0.104)	(0.131)
ρ = -0.2	-0.130	-0.204*	-0.177
	(0.108)	(0.102)	(0.130)
ρ = -0.3	0.051	-0.021	0.029
	(0.106)	(0.101)	(0.127)
ρ = -0.4	0.231	0.163	0.242
	(0.103)	(0.098)	(0.124)
ρ = -0.5	0.410***	0.346***	0.696***
	(0.099)	(0.094)	(0.113)

N = 1675
Standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

Chapter 3: Post-Marginalist Thought on the Wages Fund Doctrine

Abstract

The wages fund doctrine of the Classical economists suffered from poorly defined terms, tenuous macro-level relationships, and an over-eagerness in application and in generalization. F.W. Taussig's work, *Wages and Capital*, (1896) served as a fresh and comprehensive revision of the wages fund doctrine just after the Marginalist Revolution in economics. His new theoretical offerings were based on capital and production theory from Eugen von Böhm-Bawerk, stressing the time-consuming nature of consumption, the importance of a proper definition of capital, and a more practical and realistic conception of the wages fund. The present chapter outlines Taussig's contribution, reviews Frank Fetter's critical essay on Taussig's work, and proposes a synthesis of two more recent formalizations of the wages fund doctrine in an effort to formalize Taussig's thoughts on the wages fund doctrine.

I. Introduction

Frank William Taussig's *Wages and Capital* (1896) is an underappreciated contribution to economics and the history of economic thought. It hides between Taussig's more famous works, *The Tariff History of the United States* (1888) and his general treatise, *Principles of Economics* (1911). The contemporaneous development of marginal productivity theory also eclipses *Wages and Capital*, as a work that deals with total wages or distribution of total output. But these towering works and ideas should not keep readers from enjoying and learning from Taussig's impressive contribution. The present paper seeks to shed new light on Taussig's *Wages and Capital*. In so doing, we will also examine Frank Fetter's critical remarks on Taussig's work. In *Wages and Capital*, Taussig poured the old wages fund doctrine through a Böhm-Bawerkian sieve and collected the valuable insights, all the while discarding the useless, off-the-mark, or plainly wrong ideas of the classical economists and others before him. It is this process that makes the book shine. Taussig's unbiased and objective scholarship is on display—his careful isolation of good ideas amidst a crowd of bad ideas and explanation of the reasons for each choice.

We will see that "wages fund" is not the best term for Taussig's theory, despite his own use of the term. In evaluating and reformulating the old wages fund doctrine, Taussig widened it to include all income, resolved the confusion that came from not clearly delineating real and nominal figures, and allowed for a flow conception of real income as opposed to a rigid stock. While he expanded the scope of the theory along these lines, he also zealously narrowed the scope of how the theory may be applied, especially regarding the classical economists' desire to use the theory to determine precise money wages. These changes allowed Taussig to salvage the correct parts of the old wages fund doctrine, yet also explode the clearly incorrect parts and

applications of the old theory. Perhaps Taussig should have renamed his theoretical offering a "real income flow doctrine" or a "structure of production and consumption" to stave off potential misinterpretations like we see in Frank Fetter's critical review.

II. Frank William Taussig

Taussig's credentials certify his place as a central figure in the mainstream economics of his time: he graduated from Harvard, returned to Harvard for graduate studies, and eventually became a professor of economics at Harvard and President of the American Economic Association. He advised President Woodrow Wilson, chaired the United States Tariff Commission, and wrote what would become *the* standard work on tariffs which is still cited today, over 125 years later. His *Principles of Economics* was one of the most popular economics textbooks[3] from its publication in 1911 and into the 1930s. Even Paul Samuelson and his colleagues taught from Taussig's *Principles* at Harvard into the 1940s (Samuelson, 1997).

Taussig also has a few informal Austrian credentials. His name is among some of the Austrian greats in what I call the "cloud of witnesses" in the Wolfe Lecture Hall at the Mises Institute in Auburn, Alabama. The names of great economists like Ludwig von Mises, Murray Rothbard, Frank Fetter, Frederic Bastiat, and F.A. Hayek are showcased on the wall in raised lettering along with F.W. Taussig. Taussig regarded Eugen von Böhm-Bawerk (also in the "cloud of witnesses") as one of the "greatest economists of all times"[4] and praised the emergent Austrian school of economics in his writings.

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[3] "It was an immediate success and became, as it deserved to be, one of the most widely used textbooks of economics. Neither intent nor achievement, however, is adequately expressed by that phrase" (Schumpeter, Cole, and Mason, 1941).

[4] This is implied by his laudatory treatment of Böhm-Bawerk at the end of *Wages and Capital*, and independently verified by an anecdotal footnote in Schumpeter's *History of Economic Analysis*: "That eminent man (Taussig) told me once (I *think* it was in the spring of 1914) that he considered Böhm-Bawerk the greatest economist of all times, excepting Ricardo alone (or even that he considered Ricardo and Böhm-Bawerk, on a par, the two greatest economists: I do not remember which)" (Schumpeter, 1954).

Joseph Schumpeter, one of Böhm-Bawerk's students, said that Taussig "was a master of the art of welding factual and theoretical analysis" (Schumpeter, 1954). *Wages and Capital* showcases Taussig's so-called "welding" abilities, but the facts are not numbers or tariff records, like we see in his *Tariff History*. The facts in *Wages and Capital* are economists and economic ideas that came before Taussig. Indeed, the book is primarily a work in the history of economic thought, welded to original contributions to economic theory. The result is a brilliant display of scholarship and careful theoretical construction.

II. *Wages and Capital*

Taussig's wages fund doctrine vs. the old wages fund doctrine

From the start, we see Taussig adopting a Böhm-Bawerkian view of capital and production. He conceived of production as existing in stages, and even drew a rudimentary proto-Hayekian triangle (p. 23). Taussig also immediately recognized that consumption is the end of all production in two senses: (1) a consumer purchasing some final good at a retail store and enjoying it marks the end of the production process for that good, and (2) the goal or ultimate purpose in engaging in production is to consume ("consumption is the object of all production", pp. 35-36).

For Taussig, then, the wages fund was the final consumable output of all the various production processes. He realized that "*wages* fund" may not be the best term for this concept, as all real income, including what is earned in wages, rent, profit, or interest, must come from what has already been produced. The old wages fund doctrine of the classical economists held that capitalists and hired laborers consumed separate, mutually exclusive sets of goods, but Taussig put this aside, saying, "The members of the community, whether capitalists or landowners, headworkers or handworkers, […] all form one body of consumers […] and the whole fund or

flow of enjoyable things constitutes their real income" (Taussig, p. 36).[5] This is just one of many differences between Taussig's wages fund and that of earlier economists. Unfortunately, Taussig did not offer a new name for his theory, but instead kept the term "wages fund". The present chapter will seek to separate the two versions by using "old" or "classical" to refer to the wages fund doctrine of the classical economists.

The wages fund doctrine of Smith, Ricardo, and Mill held that total wages are fixed by the amount capitalists have saved and allotted to pay for labor. As such, wages are dependent on only two factors: capital and the number of laborers—dividend and divisor, respectively. The theory, then, was used to combat unions and collective bargaining for higher wages, because, as the theory was explained, capitalists are constrained by their accumulated money funds. Also, one group of laborers attaining higher wages would only decrease the wages for their fellow laborers in another industry. Even if all laborers successfully attained higher nominal wages, their real wages would remain the same or even decrease with the capitalists' profits. Wages are fixed and determined by factors outside the control or characteristics of the laborers, according to the classical theory. As Taussig described the old wages fund doctrine: "Not only […] are wages paid out of capital, and determined by a bargain in which the demand for labor comes from employers' capital; but the amount of that capital, compared with the number of the laborers, fixes wages definitely" (p. 168).

Wages and Capital, Part I

Taussig deliberated on the source of real income right at the start: "the active controversy

[5] See also pages 48-49: Since the goods that make up real wages are of the same set of produced consumer goods bought by the receivers of other sorts of income, "all forms of present income alike, while made up of enjoyable goods, were capital but a moment before." Taussig contrasted this to the classical economists, who only applied their theory to wages and held that capitalist profit or rent came from a separate source. However, "Past product, existing for any season mainly in the form of unfinished goods, is the source whence all laborers, hired or not hired, and all capitalists, and all the members of the community, get the income of the present and of the immediate future."

[is] whether wages come from the current product of labor or from a past product" (p. 1). Taussig immediately recognized that production takes time: "We naturally picture the various sorts of productive effort […] as taking place in succession" (p. 2). Taussig acknowledged that the relative shares going to different groups of laborers depend on productivity, but also that the source of all wage goods is the same: the structure of production. Real wages, or the goods that are bought by laborers with their money wages, must come from previously undertaken productive processes.

This distinction between real and nominal wages proved useful for Taussig when analyzing other assertions from the classical economists, especially on the futility in unions bargaining for higher wages. Taussig also considered a flow of consumption goods emerging from the structure of production as opposed to a rigid money fund somehow destined to be wages, as the classical economists described the wages fund. It was said that the advancement of wages in one industry must be made to the detriment of laborers in another industry, since the wages fund was fixed for all laborers. Taussig admitted that there may be small elements of truth to this, or at least a small possibility that such a situation could arise, but only in rare circumstances. The circumstances that would lead to such a zero-sum outcome include low or no savings throughout the economy, a completely and immediately perishable pool of final goods, and no surplus inventory in retail. In his words, "no stretching of the commodities available" is possible (p. 103). Besides, there is a steady "flow of finished goods from goods partly finished" (p. 22) which is dependent on the production decisions and efforts of the past, but it is "certainly not without some degree of flexibility at any given moment, and certainly not an accumulated or rigid fund" (p. 22), according to Taussig.

Even in a zero-sum case with one group of laborers successfully winning higher wages, the "losers" are not necessarily their fellow laborers in another industry. Taussig astutely noted that the actual losers depend on the particular circumstances: "Who would lose, would thus depend on the kind and amount of commodities which are bought with their new money means by the fortunate laborers, and on the response of prices and supplies to their new demand" (p. 103). Thus the classical theorists were over-eager in applying the old wages fund doctrine to declare winners and losers after a wage renegotiation. Taussig put the theory in its place, saying that these results are "hopelessly inexact" and would disappoint those looking for precise answers and "concrete application" (p. 103).

Taussig also dispelled Ricardo's iron law of wages, which claimed that wages would be permanently stuck at a level of bare subsistence for those in the laboring class.[6] Without naming

[6] Richard von Strigl also stressed the biological needs of laborers in his own attempt at reviving the wages fund in *Capital & Production* (2000). This led him to the view that consumption and investment are one and the same if the consumption is done to sustain a laborer through roundabout production (Strigl, p. 32). Mises briefly makes a similar point in Human Action (1998):

> Accumulation of capital begins with the formation of stocks of consumers' goods the consumption of which is postponed for later days. If these surpluses are merely stored and kept for later consumption, they are simply wealth […]. They remain outside the orbit of production. They become integrated—economically, not physically—into production activities only when employed as means of subsistence of workers engaged in more time-consuming processes. [p. 488]

However, Strigl maintained that the "form" in which the wages or subsistence get to the laborer is the only part of this discussion that is related to "the organization of the economic system." This is in contrast to the bulk of other Austrian capital theorists' method of building economic theory with assumptions of private property, unhampered markets, and exchange. Mises, for example, pointed out that the "ventures and processes" just described "are intellectually controlled by capital accounting," which "starts with the market prices of the capital goods available for further production" (p. 488, emphasis mine).

Of course, Strigl was not a proponent of the iron law of wages, but the language he uses when developing his capital theory refers to laborers merely being biologically sustained through a production process; e.g., they receive "rations" from the subsistence fund, these rations "secure their nourishment". We can hardly call this a wage, in the economic sense of the term, because it is no different than the grease applied to a machine in a factory, or the fuel pumped into a shipping truck. On this, Taussig would have responded:

> After all, the commodities which go to one and another sort of laborers, whether necessaries or comforts or luxuries, are immediate sources of satisfaction. They are consumed, not to enable work to be done, but as the result of work being done. They represent, not a stage in the production of wealth, but the consumption and enjoyment of wealth. Men are not to be regarded as cattle, fed and tended as a means toward an end. [p. 35]

it, Taussig called on Menger's imputation theory and he anticipated marginal productivity theory in the process. When he deliberated on the actual causal factors in determining particular wages, he included, first and foremost, consumer demand for the product of the laborers' efforts: "in the end, the wages which any particular group of workmen can get depend on what the consumers are able and willing to pay for the commodities produced" (p. 106). Also, productive "inventions and improvements" directed toward the production of goods demanded by consumers will result in increased real wages (p. 121). Thus Taussig concluded that Ricardo underestimated laborers' ability to emerge from mere survival.[7]

Taussig also commented on the residual theory of wages, which was fashionable at the time (p. 111). According to the theory, laborers received their share of total income last, after shares for profit and rent were carved off. Taussig reminded the reader that the money wages of hired laborers are set in advance of the actual sale of the good they are hired to produce: "They take no chances; they have been promised so much, and so much they receive" (p. 111). If any component of total income is to be considered residual, Taussig suggested that profits are "the true residual sharer" (p. 111). Entrepreneurs, sometimes called "active capitalists" or just "business men" by Taussig, are truly in the dark about their own pay. So, for Taussig, the entrepreneur was the uncertainty-bearer, "for how much he is finally to secure, depends on the outcome of operations still in progress" (p. 112). The entrepreneur "wins or loses, according as the industrial venture turns out well or ill" (p. 112).

Throughout Part I of *Wages and Capital,* Taussig stressed the distinction between real and nominal wages, the fact that production takes time, the relationship between consumable output and "inchoate wealth", and the role of the entrepreneur. His wages fund is not the wages

[7] "In the first place, the situation of the laborers in general is not so desperate as Ricardo and his followers were apt to assume" (Taussig, p. 32).

fund of the classical economists. Indeed, Taussig's revised wages fund theory bears a striking resemblance to Austrian capital theory[8]—he saw production existing in stages and he realized that the returns for various factors depend on their aid in producing valuable goods in the minds of consumers. Taussig also stressed that the wages fund doctrine is incapable of explaining or predicting individual wage rates. Taussig recognized that "What takes place in fact in the dealings of workmen with their employers is a succession of isolated bargains" (p. 101).[9] Most modern readers would be surprised to see an economist acknowledge the limitations of the model or theory before them. Taussig sees a place for a wages fund doctrine, but understands that "it does not tell the whole story" (p. 123) regarding wages and their determination.

Wages and Capital, Part II

The second part of the book traces the history of thought on the wages fund doctrine, definitions of capital, and theories of distribution. Taussig started with pre-Smithian discussions on the relationship of capital to wages, focusing on a few scant passages from Turgot.[10] He moves on to Adam Smith and finds the first bits of what might be called a wages fund doctrine—phrases like "funds destined for the maintenance of labour," and "funds destined for the payment of wages" (p. 145). At the beginning of Chapter VII, Taussig provided an instructive outline of which contributions were originally Smith's and which were borrowed from earlier writers.

[8] This is not a coincidence. Taussig had a high regard for Böhm-Bawerk and his *Positive Theory of Capital*. He even declined to fully summarize Böhm-Bawerk's work in Part II because "much of the analysis […] has been accepted in the first part" of *Wages and Capital* (p. 312).

[9] This is roughly in line with Böhm-Bawerk's (explicit) and Menger's (implicit) *Preiskampf* theory of the price determining competitive bargaining process. See Joseph Salerno's "Böhm-Bawerk's Vision of the Capitalist Economic Process: Intellectual Influences and Conceptual Foundations" in *New Perspectives on Political Economy* (2008).

[10] That Taussig even considered pre-Smithian thought on wages and capital shows how comprehensive his undertaking is, especially considering that some authors unfortunately have "the custom to treat all earlier contributions to economic thought as of little account, and to begin the history of the subject with the *Wealth of Nations*" (p. 131).

Taussig then devoted almost 100 pages to David Ricardo, John Stuart Mill, the period between them, and Mill's famous recantation of the doctrine. These authors were the primary exponents of the classical wages fund doctrine. According to Taussig, Ricardo's version had some rough edges and gaping holes, but he did at least apply some crude form of supply and demand analysis to the determination of wages: the demand for labor comes from capitalists and their capital, and the supply of labor is simply determined by the population—hence the popular formalization of Ricardo's wages fund, $\overline{Wage} = \frac{Capital}{Population}$.

The theory did not fare much better under Mill. Taussig noted that Mill's writings are inconsistent and "give unmistakable evidence of Mill's failure to revise his [writing] in cool blood, and so to give coherence to the scattered discussions" (p. 217). Mill's most definite statement regarding wages is as Ricardian as Ricardo himself: "Wages (meaning, of course, the general rate) cannot rise, but by an increase of the aggregate funds employed in hiring labourers, or a diminution in the number of competitors for hire; nor fall, except either by a diminution of the funds devoted to paying labour, or by an increase in the number of labourers to be paid."[11]

After tracing through Mill's unexpected recantation of the wages fund doctrine in 1869, Taussig arrived at more recent discussions on wages and capital, including Carl Menger and Eugen von Böhm-Bawerk. Taussig favorably reviewed both Menger and Böhm-Bawerk and heralded them as having the clearest ideas on the subject. Here, Taussig explained Menger's significant contribution of imputation theory, and came close to seeing the connection to laborers and wages that we know as marginal productivity theory today. He also compared Böhm-

[11] *Principles of Political Economy*, by John Stuart Mill, quoted in Taussig's *Wages and Capital*, p. 222.

Bawerk's subsistence fund to his own wages fund theory and only finds a difference in focus. Taussig focused on distribution ("the concrete mode in which the fund reaches laborers", p. 317) and Böhm-Bawerk focused on defining capital, interest, and the length of the production process. Nevertheless, Taussig concluded that "on these topics economic theory will gain by following the main trend of the exposition which has finally resulted from the labors of the Austrian school" (p. 318).

III. Fetter vs. Taussig

However, *Wages and Capital* was not received well by at least one of the members of the Austrian School in the United States. Frank Fetter (another "forgotten giant")[12] wrote a critical review of *Wages and Capital*,[13] but we will see that his critical remarks are based on a misunderstanding of Taussig's task.[14] The review is the first essay in Frank Fetter's *Capital, Interest, and Rent*. Fetter favorably reviewed the second half of *Wages and Capital*, in which Taussig presented the history of the wages fund doctrine. Fetter criticized the first half, however, in which Taussig constructed his own wages fund theory in the vein of Böhm-Bawerk and evaluated the old wages fund doctrine in light of his own.

[12] See Herbener (1999).
[13] Fetter (1977).
[14] Rothbard, who would usually act as an appellate court judge in cases like this, was uncharacteristically silent on the issue except to simply summarize Fetter's criticism about total vs. individual wages. Rothbard's comments on Fetter's criticism are purely descriptive:

> Frank A. Fetter's earliest article in this collection, a review of Frank W. Taussig's *Wages and Capital* […], was written in 1897 and sets the pace for the articles in the first part of this book. Here Fetter criticized Taussig's attempt to revive the classical notion of the "wage fund." Rather than attempting to explain aggregate wage payments, Fetter recommended explaining individual wage rates [Rothbard, in Fetter, p. 5].

This suggests that Rothbard never read Taussig's *Wages and Capital*. We know that Rothbard would not shy away from an opportunity to criticize Fetter or Taussig, because Rothbard did criticize Fetter later in his introduction: "Here is a vital distinction between land and capital goods that Fetter completely misunderstood" (Rothbard, in Fetter, p. 6). *Wages and Capital* is not in Rothbard's library at the Mises Institute in Auburn, AL, nor did Rothbard refer to it in his other writings.

Fetter seems to miss Taussig's point from the start, even when he introduces the task of his review essay: "This review, however, must be confined to the author's 'positive theory' as contained in the first 125 pages of the volume" (Fetter, p. 26). Although Fetter set "positive theory" in quotation marks, Taussig never did admit or imply that his purpose was to defend or promote the old wages fund doctrine, but to attempt to settle the debates surrounding the old theory and what truth, if any, resided on either side of those debates. In fact, in the preface to *Wages and Capital*, Taussig expressed that his intention for the first five chapters was to give "a statement at large of [his] own views on the relation of capital to wages, and on the wages fund doctrine" (Taussig, p. iii). At the other end of the book, Taussig restated his purpose:

> The inquiry here undertaken as to the true relation of wages to capital, and the summary of the historical development of the old doctrine, may put into truer light old views and modern criticisms, and may be helpful for that restatement of economic doctrines on which the present generation is so busily engaged. [Taussig, p. 325]

So Taussig did not write *Wages and Capital* as a defense of the old wages fund doctrine, but to criticize it while retaining what truth he could find in it.

Fetter also condemned at the outset Taussig's focus on total wages as opposed to individual wages or even the share of total wages that go to specific classes of laborers: "To suppose that one set of forces determines the total going to laborers and that another set of forces then distributes this among the different classes and individuals, is to reverse the true order of fact and of thought" (Fetter, p. 27). To Fetter's credit, aggregation problems abound in economics, and certainly Ricardo's $\overline{Wage} = \frac{Capital}{Population}$ is a prime example of this sin, but we do

not see these kinds of errors in Taussig's book. Taussig did not fall into the Ricardian Vice[15] or design some model for the purpose of predicting precise outcomes.

Indeed, one of Taussig's recurring points was the inherent inability of the wages fund doctrine to predict precise outcomes. Taussig explicitly narrowed the scope of any wages fund doctrine to exclude this tempting application and denied that it could be of any use in predicting or explaining particular wages. He confined his discussion to "total wages" because previous authors did so and Taussig's purpose for his book was to evaluate their claims. Either way, discussing economy-wide or "macroeconomic" phenomena is permissible in economics as long as it is realized that the causal relations in human action only exist at the individual level.[16]

Taussig explained where and to what (limited) extent the wages fund doctrine can apply as a concluding remark to Part I of *Wages and Capital*:

> The wages fund theory—if that name can be given to the form in which it has here been set forth—shows the steps by which wages get into the laborer's hands, and so points to the nearest and most obvious causes which affect them. It shows what is the process by which goods are produced in the great and complicated organism of modern society, and what are the channels by which the enjoyable commodities reach the hands of its various members. To understand that process, to follow those channels, is indispensable to truth and accuracy of knowledge. *But it does not tell the whole story.* [Taussig, p. 123, emphasis mine]

[15] The Ricardian Vice is "the habit of establishing simple relations between aggregates that then acquire a spurious halo of causal importance, whereas all the really important (and, unfortunately, complicated) things are being bundled away in or behind these aggregates" (Schumpeter, 1954, p. 668).
[16] "A case could easily be made that Böhm-Bawerk's superb capital-structure theory was 'macro' as well as 'micro'" (Rothbard, 2011).

Fetter's next source of disagreement involved the way Taussig "intends to retain the expression 'wages fund,' and to show that there are good reasons for looking upon such a fund as differing in some points worth the noting from the part of the social income going for rent, for profits and for interest" (Fetter, p. 28). Taussig, however, readily explained and admitted this dilemma in his evaluation of the old wages fund doctrine. He also generalized his own formulation of the wages fund to include the incomes of capitalists and entrepreneurs (p.36).

On actually using the term "wages fund", Taussig conceded the point by 1932, when he said in a new introduction to *Wages and Capital*, "Some things which are in this volume could certainly be said in a better way. […] Especially as regards the continued use of the term 'wages fund,' I should change what I wrote forty years ago" (Taussig, 1932 Introduction).[17]

Fetter's three expectations

Finally, Fetter outlined three different expectations of Taussig in his *Wages and Capital* endeavor: (1) "real wages, and not mere money wages, shall be the subject of his discussion" (Fetter, p. 28); (2) the "capital" or "fund" that makes up real wages should not be considered owned by the employers (Fetter, p. 29); and (3) "we may justly require of the author a comprehensible explanation of the way in which the 'wages fund' is marked off from, or carved out of, the total income of the community; and […] this shall be shown to differ from the process which apportions the shares of the other factors in distribution" (Fetter, p. 29). Fetter did not hold back when he concluded that "Every one of these minimum requirements the author fails to meet" (Fetter, pp. 29-30).

[17] Taussig reformulated the wages fund doctrine based on his own discussions, but was hesitant even to call his reformulation a "wages fund theory" even in the first 1896 edition because of the evident possibility for readers to confuse his (dramatically different) take with that of other economists. "The wages fund theory—if that name can be given to the form in which it has here been set forth […]" (Taussig, p. 123).

The position of the present chapter, however, is that for each of these, Taussig either satisfied Fetter's expectation or he explained how any wages fund theory is incapable of satisfying Fetter's expectation. Fetter's judgment was misdirected because of an admittedly confusing exposition of *two different wages fund theories* on the part of Taussig. Taussig's main error may have been calling his own theory and discussion a new (or renewed) and better "wages fund doctrine", even if he did so hesitantly, while evaluating the claims of the old wages fund doctrine at the same time. Nevertheless, Fetter's accusations can be explored.

First, on emphasizing real wages over money wages, Taussig consistently highlighted this important distinction throughout the book. Fetter focused his criticism on one chapter in which Taussig deals with money wages specifically. He particularly points out the supposedly embarrassing "announcement" at the beginning of the chapter: "Here money and money income play a vital part" (Taussig, p. 51, quoted in Fetter, p. 30). Fetter failed to cite the very next sentence: "Money wages, money interest, money rent, are the only avenues to the real income of consumable commodities" (Taussig, p. 51). And in the next paragraph, Taussig repeats, "All real income is thus derived from the use of money income" (Taussig, p. 52). Indeed, throughout the chapter Taussig continually returns to the point that nominal wages only matter in this discussion to the extent that they are a "key" to access real goods, an analogy Taussig makes at the end of Part I (p. 117).

It is also worth noting that Taussig's task, in his chapter dealing with money wages, was to provide specific points of evaluation on the wages fund doctrine as it has appeared throughout the history of thought on the topic.[18] Taussig devoted the second part of his book to this history,

[18] In the first paragraph of the next chapter (which serves as a summary of the previous chapter on money wages), Taussig explains how the various conclusions he arrived at in discussing money wages contradict traditional claims of the wages fund doctrine.

in which we see repeated instances of economists conceiving of the wages fund as a rigid money fund in the hands of the capitalists. John Stuart Mill notably confused himself into recanting his own theory by falling into the same trap that Fetter thought had ensnared Taussig.[19] No such errors are found in *Wages and Capital*, however.

On Fetter's second requirement, that the goods that make up real wages should not be considered as necessarily owned by the employing capitalist, we find similar results. Fetter claimed that "the capital or funds that are discussed are throughout looked upon as in the hands of the employing class, except where the conception is widened to include the great body of money lenders" (Fetter, p. 30). He went as far as to say that Taussig's

> concept of capital, or funds, fails to include all the sources of the real income that the laborers enjoy—for example, stores of goods in the hands of independent producers, and even a portion of labor itself, so far as personal services make up that real income. *There is no hint that such elements may play a part in determining the remuneration of labor*. [Fetter, p. 31. Emphasis mine]

However, Taussig *did* include personal services and goods produced by independent producers as a part of the so-called wages fund. His first task in *Wages and Capital* was to conceptually separate consumers' goods from all of the undeveloped, "inchoate" wealth (capital goods). In so

[19] Ekelund (1976) uses Mill's own assumptions to create a point-input—point-output model with separate markets for wage goods and goods consumed by a capitalist class to show that Mill's stated reasons for recanting the classical wages fund doctrine were not consistent with his own theory:

> The lacunae in Mill's analysis of the question, then, were twofold. First, Mill identified money funds in the hands of individual capitalists with the aggregate real stock of goods produced from previous periods. Second, Mill's explanation (in the recantation) of the investment/consumption decision process of the individual entrepreneur was faulty in that he specified an elasticity to the money allocation implying an elasticity in the real allocation over a given period of production. [Ekelund, 1976, p. 72]

Ekelund, then, is in agreement with Taussig that Mill was inconsistent and most likely confused about the real versus nominal distinction, especially when comparing short- and long-run effects of exogenous nominal changes in wages.

doing, he listed personal services and the goods of independent producers as a part of the mass of consumable output: “The baker bakes bread, the tailor makes clothes. The shopkeeper sells us things necessary or convenient or agreeable, and so brings them to the point where they finally meet our desires. The servant waits on our needs or contributes to our ease” (p. 4). Taussig referred to similar examples throughout the book.

Furthermore, Taussig criticized Ricardo for committing the same error Fetter believed Taussig had committed:

> For shortness of reasoning and of statement (too often with the result of confusion in both) this stock was reasoned [by Ricardo] as if it were owned by the immediate employers and handed over by them directly to laborers who ate it. The miller and the baker were put aside; and, what was more dangerous to accurate thought, it was assumed for brevity that the capitalists who employed the laborers were the individuals who owned the grain. The source of wages was then easily conceived as a fund stored up, all ready for use, controlled by employers, limited in amount for the time being, and entirely the product of past labor [Taussig, p. 19].

Taussig then borrowed this same assumption—just temporarily—to make some first theoretical steps toward evaluating the claims of old wages fund economists like Ricardo. This is surely the source of Fetter’s confusion.

Fetter’s third requirement was that Taussig would explain the mechanisms by which specific shares of total income are distributed. Taussig, however, maintained that the wages fund doctrine was wholly incapable of such a task. Fetter even quoted Taussig admitting this: “In fact the wages-fund doctrine, or what there is of truth in it, … can tell us little … as to the

fundamental causes which … determine the share of that real income which in the long run shall go to wages or interest or rent" (Taussig, p. 322, quoted in Fetter, p. 31). This was one of Taussig's clearest points in his book, that, over the history of the old wages fund doctrine, "its truth has been misconceived, its importance exaggerated" (Taussig, p. 322).[20] It is perplexing, then, that Fetter would expect Taussig to apply the wages fund doctrine in a task that Taussig repeatedly admits is beyond the scope of the wages fund doctrine.

Two wages fund theories in Wages and Capital

Fetter's final comment was that Taussig had evidently aligned himself with the old wages fund doctrine in his final concluding chapter by saying, "Hired laborers are dependent on a wages fund (if one chooses so to call it), which is in the hands of the capitalist class. Their money income is derived from what the capitalists find it profitable to turn over to them" (Taussig, p. 321, quoted in Fetter, p. 32). This quote, however, was taken out of context, like some of the others in Fetter's review, as noted above. At this point in *Wages and Capital*, Taussig was summarizing his conclusions chapter by chapter, and had arrived at a point he had made in Chapter III about the restrictive assumptions needed to make the claims of the old wages fund doctrine work. The next few sentences reveal this:

> This is *a* wages fund doctrine, and a conclusion as to the relation of capital to wages, quite different from that reached in the first two chapters. *It bears not on the permanent and unalterable relation of real capital to real wages*, but on the relations of certain kinds of laborers to the capitalists of our modern communities. [Taussig, p. 321, emphasis mine]

[20] This statement appears directly after the one quoted by Fetter.

Perhaps, then, *three* wages fund doctrines are presented in *Wages and Capital*, and the debate between Taussig and Fetter may be settled by giving one or the other (or both) the benefit of the doubt as to which wages fund doctrine they were either defending, developing, or criticizing.

The whole purpose of the book was to evaluate an old theory with a more rigorous treatment than it had in the past. In the process, Taussig offers new discussions on the relation of capital to real income, clumsily calling his own offering by the same name as the version on the chopping block (an error Taussig later realized and regretted). Fetter commented at the end of his review that he did see two wages fund doctrines: that of the classical economists and a revised one presented by Taussig. However, the use of the term "wages fund" for both seemed to have confused Fetter, because he mentioned that Taussig's "is the one wherein the superficial monetary aspects alone are kept in view" (Fetter, p. 31). A thorough reading, especially of Taussig's first two chapters, reveals this to be very uncharacteristic of Taussig's contribution. This confusion of terms by itself is the root of Fetter's criticisms and it is just one of many misunderstandings that have plagued this particular topic since its inception.

IV. Conclusion on Taussig

There are errors in *Wages and Capital*, but most of them are due to one of three reasons: (1) Taussig had not yet adopted a marginal productivity theory of wage determination, which would have helped him parse through the classical economists' attempts at explaining particular wage rates, and clear up his own theory as well; (2) Taussig would have also benefitted by a clear distinction between capital goods and capital in the accounting sense; and (3) in Fetter's defense, Taussig did seem eager to retain certain elements of the old wages fund theory in some places.

Taussig sought to apply Böhm-Bawerk's capital theory to the wages fund debate, especially regarding the production process and definition of capital. In the process, he was able to discard many of the erroneous claims of the classical economists regarding wages and capital. Each step of his analysis was carefully made—only proceeding once he had come to some conclusion about the validity of a claim from the classical economists or once he realized that any so-called wages fund doctrine is incapable of resolving some issue. In the latter case, Taussig did not hesitate to challenge the earlier economists on over-stepping their bounds with the theory.

The wages fund theory has been formalized in a few different ways, but never with the explicit goal of incorporating Taussigian insights. This may be because the theory is just inherently difficult to formalize. Mark Blaug (1985), in his attempt to formalize Mill's wages fund noted that "the dozen pages explaining this proposition in Mill's book are among the most tortuous in the whole literature of economics" (p. 184). He continues:

> Among other things, it is never made clear whether this proposition [employment is a function of capitalist saving] is supposed to hold regardless of the existence of unemployed resources. Mill seems to be assuming full employment by affirming that an increased demand for labour in one industry must draw labour out of another. In that case it seems to follow tautologically that an increased demand for consumer goods cannot increase the demand for labour. [p. 184]

The lack of clarity in Mill has already been noted here and in Taussig's Wages and Capital. Ekelund (1976) came to a similar conclusion on Mill, as will be shown subsequently. Blaug (1985), however, manages to come up with an algebraic representation of Mill's wages fund theory, based on $N_t = \frac{\bar{W}_{t-1}}{\bar{w}}$, where $\bar{W}$ is the wages fund, N is the number of laborers, and $\bar{w}$ is

the real wage rate (p. 184). It is obvious that this is just a rearranged version of $\overline{Wage} = \frac{Capital}{Population}$, with the added time dimension and implicit assumption that $Capital$, or total capitalist saving, is the wages fund.

Blaug (1985) agrees that the classical economists erred in "identifying the part with the whole" (p. 186), i.e., they took total capital for wage goods, when capital includes other, non-consumable produced factors of production. A Taussigian formalization of the wages fund would dehomogenize this stock and would not equate capital with the wages fund. There is, however, some relationship between capital and wages, according to Taussig, but an indirect one via production decisions and saving. Ekelund (1976) and Breit (1967) offer graphical representations of the wages fund theory, which may be altered and combined to propose a formal Taussigian wages fund model that incorporates a dehomogenized investment (using Ekelund's model) and the long-run, indirect consequences of production decisions on wages (using Breit's model). Ekelund's model also achieves a clear distinction between the real and nominal variables, which Taussig stressed in his own work.

V. Ekelund's Model

In "A Short-Run Classical Model of Capital and Wages: Mill's Recantation of the Wages Fund", Ekelund (1976) expresses dissatisfaction with previous authors' take on John Stuart Mill's recantation of the wages fund theory. Ekelund offers a diagrammatical exposition of Mill's conception of the wages fund doctrine using Mill's own stated or implied assumptions to show that Mill's stated reasons for abandoning the theory in the face of Thornton's criticism do not stand. This model will be applied to other authors as a basis for comparative analysis, as it is highly generalizable. Ekelund uses three assumptions or descriptions of the wages fund from Mill to construct his model (Figure 12):

(1) an aggregate point-input-point-output production function for all goods produced; (2) an economy's real output composed solely of machinery (fixed capital), wage goods, and capitalist (non-wage-earner) consumables; (3) a constant ratio of fixed to circulating capital in the economy;

and adds three simplifying assumptions:

(4) perfect competition (at constant cost) in all markets; (5) a fixed money stock; and (6) constant population and productivity over the period or periods under discussion.

These six assumptions will be altered or relaxed in the following sections based on various authors' conceptions of the wages fund or subsistence fund.

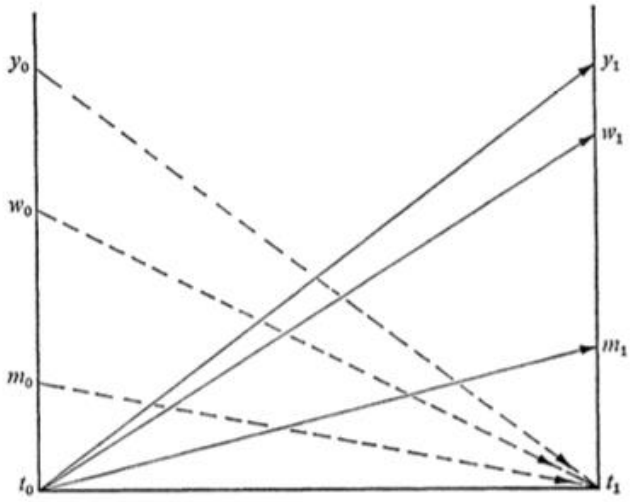

Figure 12

Figure 12 presents the distribution and allocation of real goods in two periods (taken directly from Ekelund's original paper). The allocation in t_0 determines the allocation of real goods in t_1, but is assumed to have no effect on total output (see Assumption 6). The capitalists and laborers are playing a zero-sum game, in effect. Tools and machines make up t_0m_0 ($=M_0$), wage goods for laborers are m_0w_0 ($=W_0$), and capitalist consumables are w_0y_0 ($=C_0$). These mutually exclusive components of $t_0y_0=Y_0$ are the only components of Y_0, so we may write

$Y_0=C_0+I_0$, if $I_0=M_0+W_0$, or $Y_0=C_0+W_0$ if we ignore purchases of fixed capital (based on Mill's recantation).[21]

Ekelund has us consider the effects of an increase in nominal wages.[22] Figure 12 only shows the allocation of real resources, so Ekelund disentangles the real from the nominal by way of supply and demand functions (Figure 13): one graph for wage goods and one for capitalist consumables:

[21] The relevant part of Mill's recantation may be quoted at length. The specific details of and implications from Ekelund's model directly apply to what Mill expounds here:

> "In the common theory, the order of ideas is this: The capitalist's pecuniary means consist of two parts—his capital, and his profits or income. His capital is what he starts with at the beginning of the year, or when he commences some round of business operations; his income he does not receive until the end of the year, or until the round of operations it completed. His capital, except such part as is fixed in buildings and machinery, or laid out in materials, is what he has got to pay wages with. He cannot pay them out of his income, for he has not yet received it. When he does receive it, he may lay by a portion to add to his capital, and as such it will become part of next year's wages-fund, but has nothing to do with this year's.
> "This distinction, however, between the relation of the capitalist to his capital, and his relation to his income is wholly imaginary. He starts at the commencement with the whole of his accumulated means, all of which is potentially capital: and out of this he advances his personal and family expenses, exactly as he advances the wages of his labourers.... If we choose to call the whole of what he possesses applicable to the payment of wages, the wages-fund, that fund is co-extensive with the whole proceeds of his business, after keeping up his machinery, buildings and materials, and feeding his family; and it is expended jointly upon himself and his labourers. The less he expends on the one, the more may be expended on the other, and vice versâ. The price of labour, instead of being determined by the division of the proceeds between the employer and the labourers, determines it. If he gets his labour cheaper, he can afford to spend more upon himself. If he has to pay more for labour, the additional payment comes out of his own income; perhaps from the part which he would have saved and added to capital, thus anticipating his voluntary economy by a compulsory one; perhaps from what he would have expended on his private wants or pleasures. There is no law of nature making it inherently impossible for wages to rise to the point of absorbing not only the funds which he had intended to devote to carrying on his business, but the whole of what he allows for his private expenses, beyond the necessaries of life. The real limit to the rise is the practical consideration, how much would ruin him or drive him to abandon the business: not the inexorable limits of the wages-fund."

Taken from Mill, J. S. [1848] (1909). Principles of Political Economy. Edited by W. J. Ashley. London: Longmans, Green. Appendix O.

[22] The cause of this increase is beside the point: "Even if capitalists are assumed to be altruistic in arbitrarily reallocating their money expenditures to labour, or if economy-wide union pressure is brought to bear upon capitalists, the short-run results are the same" (Ekelund, p. 76).

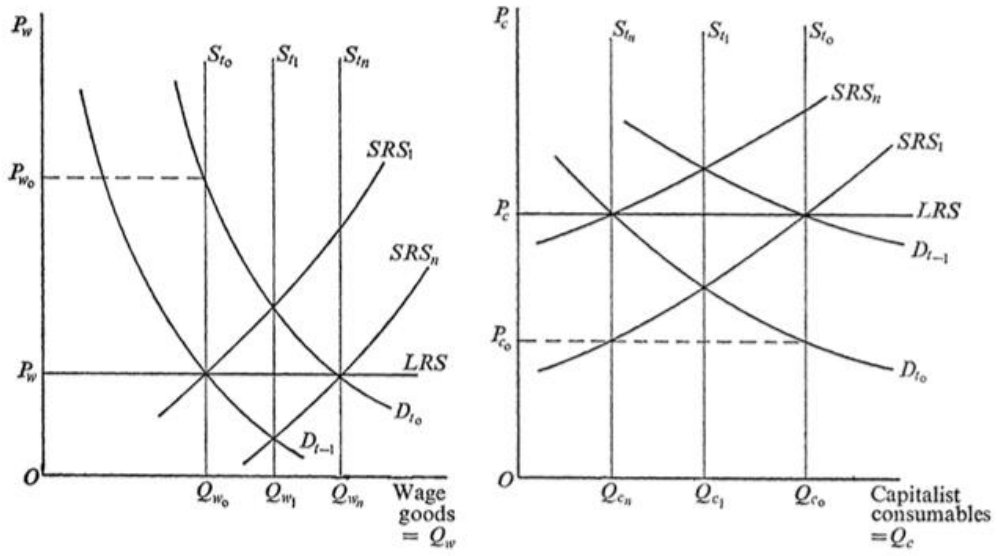

Figure 13

There is no overlap in who can consume these goods—only laborers may consume the wage goods represented on the left, and only capitalists may consume the capitalist consumables on the right.

First, capitalists devote more of their monetary expenditures to wages in t_0, which increases the demand for wage goods and decreases the demand for capitalist consumables. The supply of both wage goods and capitalist consumables is fixed in the extreme short-run (within t_0), but is upward sloping over the t_0t_1 period. Therefore, the price of wage goods and capitalist consumables are given by P_{w0} and P_{c0}, respectively. The previous demand curves for both sets of goods are given by D_{t-1}, to show that the new price-quantity combinations represent disequilibria and offer profit opportunities for the capitalist qua producer.

Thus, there are no real effects of the shift in the immediate-term. Only nominal wages and nominal expenditure on goods change. This is because of the fixed, inelastic stock of real goods at any given time. Real effects do, however, come into play by t_1. Profit-maximizing capitalist-producers shifted production to wage goods and away from capitalist consumables at t_0, yielding

$W_1>W_0$. And, because of assumption 3 ($M_0/W_0=M_1/W_1$), $M_1>M_0$. Assumption 6 gives $Y_0=Y_1$, therefore $C_1<C_0$, necessarily. The result, then, is that a model with a fixed wage fund, like that of Mill's before his recantation, may still yield real wage changes over the short- to medium-term and certainly over the long-run.

The results of this model involving the exogenous increase in nominal wages and eventual endogenous increase in real wages are meant to show that Mill did not have theoretical grounds (based on his own conception of the wages fund) to recant his theory based on the newly-supposed implication that the wages fund doctrine precludes wages from ever rising. Indeed, in his recantation Mill references the immediate short-run constraint on (both real and nominal) funds payable to laborers (Mill, 1848):

> The theory rests on what may be called the doctrine of the wages fund. There is supposed to be, at any given instant, a sum of wealth, which is unconditionally devoted to the payment of wages of labour. This sum is not regarded as unalterable, for it is augmented by saving, and increases with the progress of wealth; but it is reasoned upon as at any given moment a predetermined amount. More than that amount it is assumed that the wages-receiving class cannot possibly divide among them; that amount, and no less, they cannot but obtain. So that, the sum to be divided being fixed, the wages of each depend solely on the divisor, the number of participants....
>
> But is there such a thing as a wages-fund, in the sense here implied? Exists there any fixed amount which, and neither more nor less than which, is destined to be expended in wages?
>
> Of course there is an impassable limit to the amount which can be so expended; it cannot exceed the aggregate means of the employing classes. It cannot come up to those means;

> for the employers have also to maintain themselves and their families. But, short of this limit, it is not, in any sense of the word, a fixed amount.
>
> […]
>
> The doctrine hitherto taught by all or most economists (including myself), which denied it to be possible that trade combinations can raise wages, or which limited their operations in that respect to the somewhat earlier attainment of a rise which the competition of the market would have produced without them,—this doctrine is deprived of its scientific foundation, and must be thrown aside. The right and wrong of the proceedings of Trade Unions becomes a common question of prudence and social duty, not one which is peremptorily decided by unbending necessities of political economy. [p. 992]

Ekelund's model shows that Mill can have his wages fund doctrine (cake) and still maintain that collective bargaining can increase wages (and eat it, too). Ekelund concludes that

> The lacunae in Mill's analysis of the question, then, were twofold. First, Mill identified money funds in the hands of individual capitalists with the aggregate real stock of goods produced from previous periods. Second, Mill's explanation (in the recantation) of the investment/consumption decision process of the individual entrepreneur was faulty in that he specified an elasticity to the money allocation implying an elasticity in the real allocation over a given period of production. [p. 72]

Ekelund, then, is in agreement with Taussig that Mill was inconsistent and most likely confused about the real versus nominal distinction, especially when comparing short- and long-run effects of purely nominal changes.

This, then, settles and answers most of the controversies that have plagued the wages fund doctrine throughout its tumultuous history. The debate has centered on the wages fund's rigidity and confusions about whether the theory pertains to nominal money wages or real wages. The real wages fund may be conceived as rigid in the short-run, and elastic in the long-run. Changes in the nominal value of the fund may determine changes in the allocation of the real fund over time. The model also serves as a conveniently generalizable framework for formalizing some of Taussig's conclusions on the wages fund.

VI. Breit's model

In "The Wages Fund Controversy Revisited" William Breit (1967) derives a downward sloping labor demand curve using the assumptions and theories of the classical economists, including the wages fund doctrine. His diagram is divided into four quadrants (Figure 14), with positive values in all directions. Quadrant A shows the negative relationship between wages and profit. Quadrant B shows the positive relationship between profit and reinvestment. Quadrant C is a graphical representation of the classical wages fund doctrine: a positive relationship between the amount of wage goods and the number of laborers that can be supported. A larger wages fund means the population can increase, while a smaller wages fund means the population would decrease. According to Breit, Quadrant C is based on a "Malthusian theory of population, and says that the labour force is a function of real wages. As real wages rise, population and therefore the supply of labour increases" (Breit, p. 524). The top-right quadrant (D) shows the supply and demand for labor, with the demand curve being completely derived from the relationship mandated by the curves in quadrants 1-3.

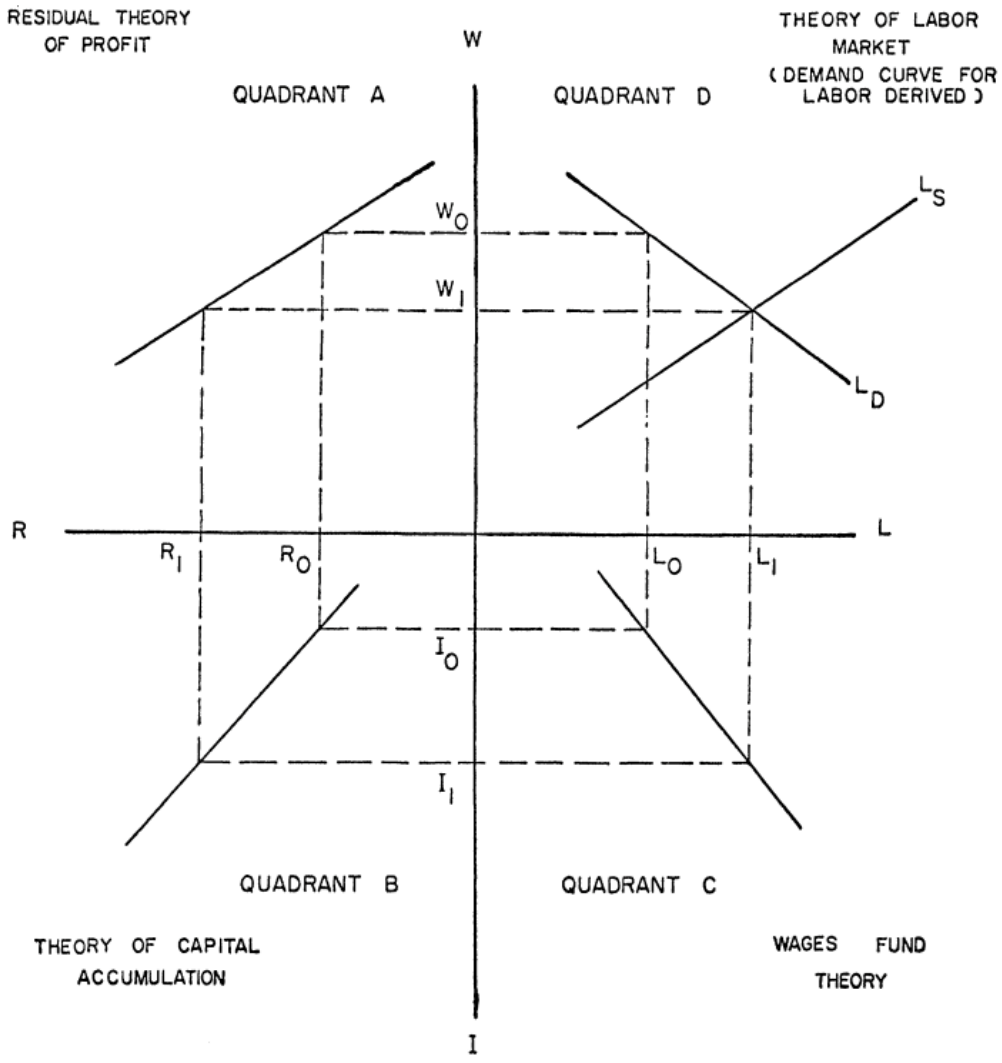
RESIDUAL THEORY
OF PROFIT
W
THEORY OF LABOR
MARKET
(DEMAND CURVE FOR
LABOR DERIVED)
QUADRANT A
QUADRANT D
W_O
W_I
L_S
L_D
R
L
R_I
R_O
L_O
L_I
I_O
I_I
QUADRANT B
QUADRANT C
THEORY OF CAPITAL
ACCUMULATION
WAGES FUND
THEORY
I

Figure 14

The purpose of Breit's model is to show that, "contrary to Longe and Thornton, the analysis can be put in terms of supply and demand schedules" and that such analysis would still use classical theories of employment, profit, capital, and the wages fund doctrine (p. 527). Breit's model, however, misses an important characteristic of production, namely, that it is time-consuming. He mentions this in the beginning of his paper but does not incorporate it into his diagrammatical exposition of the wages fund theory: "As everybody knows, the origin of the wages fund theory rests on the classical theory of capital which in turn was based upon a conception of the production process as being discontinuous and time-consuming" (p. 509). This leads him to arbitrary and exogenous (but still instructive) shifts in his model to account for increased worker productivity, when such changes may be considered endogenous, or at least somewhat dependent on the inner workings of the mechanisms in his model.

Another minor issue with Breit's model involves the composition of the investment axis (bottom, vertical axis between quadrants B and C). In Quadrant B, profits are positively related to net reinvestment in production, according to the classical theory of capital accumulation. This net investment, however is composed of both consumable (wage) goods and non-wage goods ("machines, buildings, and inventories of non-wage goods", p. 524). In Quadrant C, however, only wage goods are depicted in relationship with the number of laborers that can be supported via the wages fund theory. Breit brushes this aside, saying "The classical economists generally assumed that both wage capital (circulating) and technological capital (fixed) increase together" (p. 524). And later, "Since investment adds to capital stock, its increase means a rise in the stock of all kinds of capital, circulating as well as fixed. […] If we assume that the proportion of circulating capital is relatively large, an increase in capital would support a larger quantity of labour" (p. 524). Thus, the bottom vertical axis is composed of both "circulating" (consumable

wage goods) and "fixed" (not consumable producer goods) capital, when only the consumable wage goods may support laborers as depicted in Quadrant C.

VII. Combining Ekelund's and Breit's Models

Both of these issues with Breit's model may be solved by separating Quadrants B and C and inserting Ekelund's point-input—point-output model between them. Ekelund (1976) noted that Breit's model is geared more toward long-period or long-run analysis, while Ekelund's model is explicitly short-run (one- or two-period) (Ekelund, pp. 68-69, fn. 2). The two models may be combined to connect the short- and immediate-run with the long-run (Figure 15). This way, production may be depicted as existing in time, but the wage goods available for laborers may be shown as fixed by previous production decisions. Also, wage goods may be marked off from the non-wage goods in investment. The net reinvestment in Quadrant B cannot immediately yield wage goods, unless the investment is conceived as a relinquishing of present wage goods by capitalists for the consumer-laborers. Therefore, the new framework may simultaneously depict both immediate- and short-term allocations of consumable output, and long-run trends (especially the Malthusian Quadrant C). When combining Breit's model with Ekelund's, Quadrant C may be interpreted as the relationship between the size of the wages fund and the number of laborers that may be supported by the fund, and not necessarily as the actual population. Explicitly short-run relationships must use a vertical segment, where the population or number of laborers does not change.

Two small changes must be made to Ekelund's model. First, we can now relax assumptions 2, 3, and 6, to allow both capitalists and hired laborers to consume from the same

stock of wage goods (relaxed assumption 2)[23], fixed and circulating capital may exist in various proportions (relaxed assumption 3), and population and productivity may change over time (relaxed assumption 6). Secondly, we may flip Ekelund's model over its horizontal axis and reverse the order of stacking the machines and wage goods, so that wage goods are measured starting from the origin in Quadrants B and C.

Let us first consider a static case, with no changes in wages (real or nominal), productivity, distribution of income to laborers and capitalists, or population (Figure 15). This is just to establish the new relationships between Quadrants B and C and the relationship between Breit's and Ekelund's models. Notice that the bottom axes in Quadrants B and C are now different. In Quadrant B, profits are positively associated with net reinvestment, which includes both wage and non-wage goods. In Quadrant C, only the consumable portion of investment, as a stock of wage goods, is included in relationship with the number of laborers that may be supported. Also note that we have taken a downward-sloping labor demand curve for granted, despite Breit's purpose in deriving it through his model. Additionally, it is assumed that this economy is not "starting from scratch", and that a stock of wage goods equal to WF_0 was produced by a previous production period.

At a given wage, w_0, profits are R_0 (Quadrant A). This yields I_0 in net reinvestment, including both wage and non-wage goods (Quadrant B). In t_0, laborers are paid from a stock of wage goods from previous production, which makes up the present wages fund (WF_0). This WF_0 supports L_0 laborers (Quadrant C), which corresponds to the same w_0 from our starting point on a downward sloping demand curve (Quadrant D). With no changes in productivity or nominal

[23] Another possibility is that we can retain the separation between wage goods and capitalist consumables, but simply disregard capitalist consumption, since they would not be included in L_t and their consumption goods would not be a part of I_t either.

wages, this stationary economy produces the same results in t_1. The processes of t_0 produce WF_1, just as WF_{t-1} sustained laborers through t_0 to t_1. This was one of Taussig's main emphases, that "production proceeds by successive stages, and that the community at present is supplied with necessaries and comforts made mainly by the labor of the past" (Taussig, p. 25).

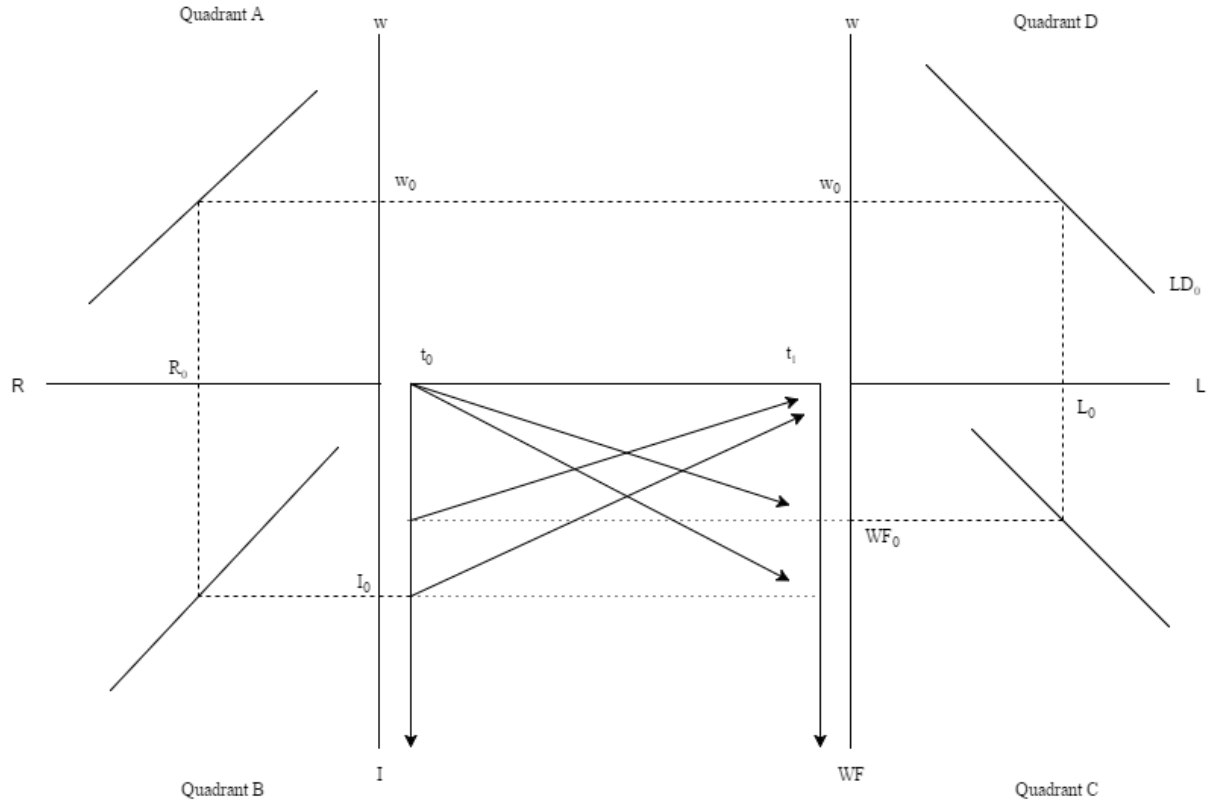
Quadrant A
w
w
Quadrant D
w_0
w_0
LD_0
R_0
t_0
t_1
R
L
L_0
WF_0
I_0
I
WF
Quadrant B
Quadrant C

Figure 15

Replicating Breit's result

Now let us consider the shifts and consequences of an increase in worker productivity. First, as Breit shows in his model, "an increase in the productivity of labour involves an upward and outward shift of the wage-profit function, as shown in Quadrant A" (p. 526, shown diagrammatically on p. 527). The change in productivity happens at t_0, and does not yield greater output until t_1. First, profits increase to R_1, even though nominal wages remain at w_0. Net investment expands to I_1 (long-run), and the size of the wages fund expands with it, to WF_1. WF_1 is produced, however, from I_0. The new, larger wages fund can support more laborers (L_1), and these laborers are paid the nominal average wage, w_1, on the new, increased labor demand curve, Ld_1. The result, $w_0<w_1$ because of an increase in worker productivity, is the same as Breit's, but it is now clear when, and how, the real wages fund is realized. In this model, the wages fund is produced by a one-period production process, which may be repeated, given a certain production decision (wage good and machine quantities). An increase in productivity allows for a larger wages fund, which in the long-run may support a larger population (per Quadrant C). There are no immediate gains to increased productivity, however. All gains must be realized after production has taken place.

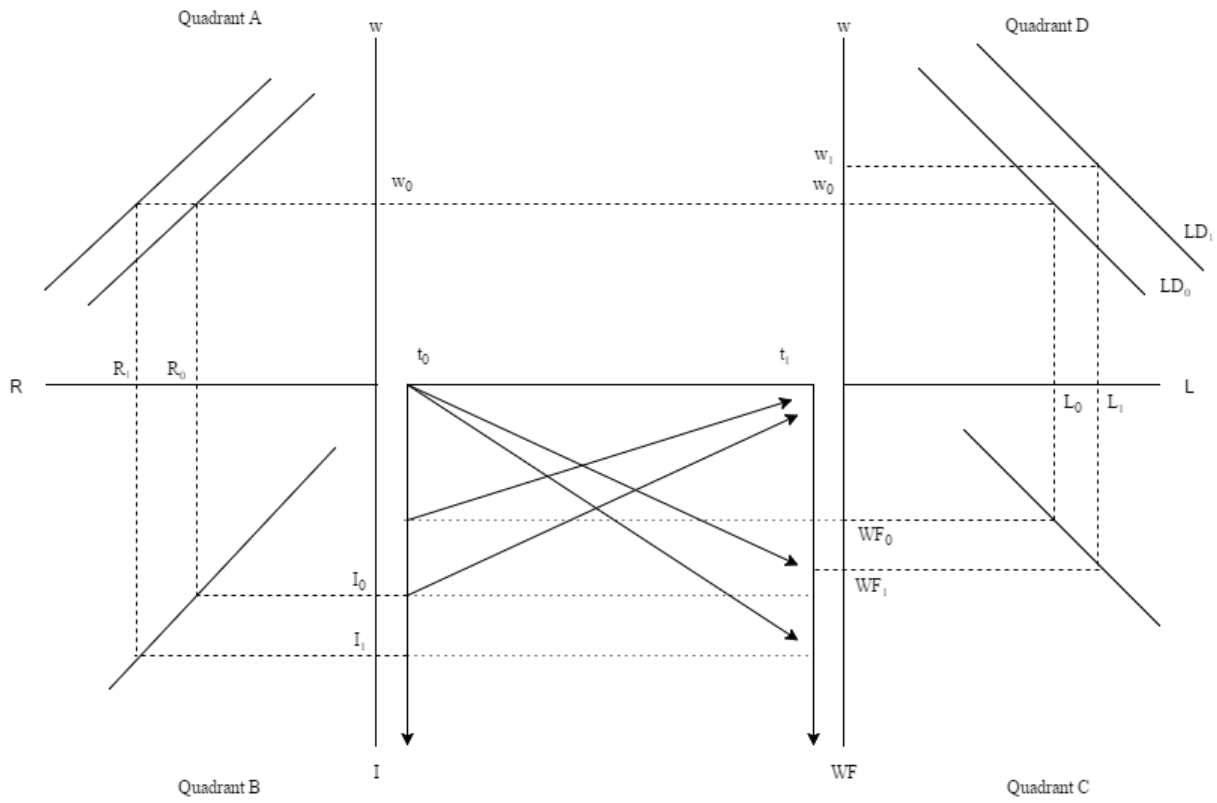
Quadrant A
w
w
Quadrant D
w_1
w_0
w_0
LD_1
LD_0
t_0
t_1
R
R_1
R_0
L
L_0
L_1
WF_0
WF_1
I_0
I_1
I
WF
Quadrant B
Quadrant C

Figure 16

Replicating Ekelund's result

Ekelund's (1976) main result may also be replicated in the present framework. We can take two approaches along these lines: (1) one with the original short-run assumptions relaxed, allowing changes in labor productivity, and (2) one retaining the original assumptions as much as possible. Ekelund showed that laborers could bargain for higher nominal wages and still achieve real gains in future periods, contra Mill's recantation. Through their bargaining, the laborers would "convince" their capitalist-producer employers that they are more value-productive than their current wage suggests. We may also disentangle nominal wages from real wages in this case. At t_0, nominal wages are driven up by increased demand for labor, but the (real) wages fund is fixed from the productive decisions and efforts from the previous period (Figures 17 and 18). Quadrant A shows expected, unrealized returns after the bargain, which leads to increased nominal investment. Real investment, like the real wages fund, is constrained by past production. Taussig suggested that funds in the hands of capitalists are somewhat elastic, and may be stretched in this way. Likewise, investment may increase if capitalists offer future goods as payment for present factors or if they relinquish their own present consumption goods as payment for present wages.

In this exercise, we see that increased real wages for laborers depends on whether they correctly predicted their own productivity. The diagram shows such an outcome, however the opposite (decreased real wages fund) is also a possible outcome. Employers may revise their previous demand for labor with the new information as well.

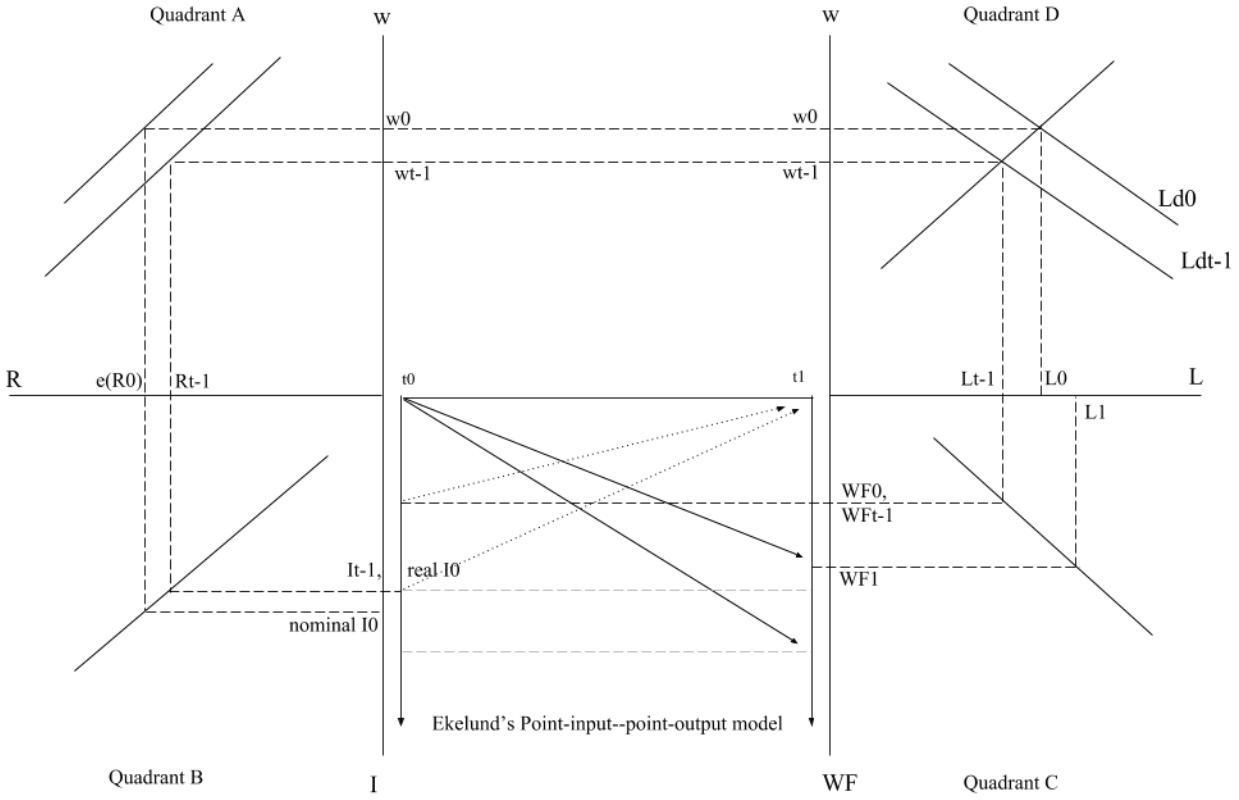
Quadrant A
W
W
Quadrant D
w0
w0
wt-1
wt-1
Ld0
Ldt-1
R
e(R0)
Rt-1
t0
t1
Lt-1
L0
L
L1
WF0,
WFt-1
It-1,
real I0
WF1
nominal I0
Ekelund's Point-input--point-output model
Quadrant B
I
WF
Quadrant C

Figure 17

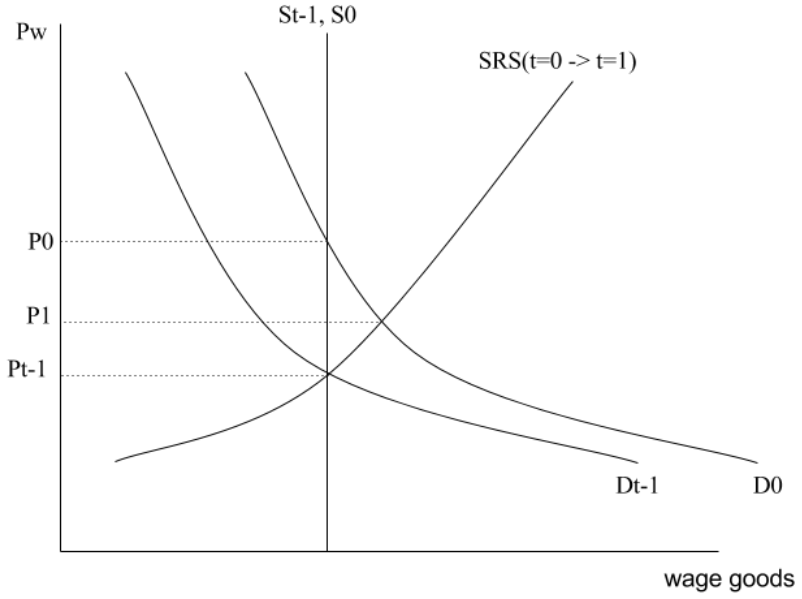

Figure 18

Another attempt to replicate Ekelund's (1976) result might involve re-establishing his original assumptions, mainly constant population and productivity and a separation of wage goods and capitalist consumables. In this case, even without a change in laborer productivity, an exogenous increase in nominal wages results in real gains for laborers. The greater nominal wages increase the demand for wage goods, driving up their price. Capitalists substitute away from producing capitalist consumables (or even machines, unless we maintain the $\frac{m_0}{w_0} = \frac{m_1}{w_1}$ short-run assumption). Given constant productivity, increases in the price of labor are matched by decreases in the prices of the only other two goods in the economy: machines and capitalist consumables. Total investment (total income minus capitalist consumables), therefore, is fixed by the prior production of machines and wage goods, and future investment is also constrained by $\frac{m_0}{w_0} = \frac{m_1}{w_1}$. As the production of wage goods (which makes up the wages fund) increases, machine production increases in proportion, and both substitute for capitalist consumables, which decrease. After this increased wages fund is realized, however, the parallel with Breit's

model must end due to Ekelund's constant population assumption. The wages fund in t_1 cannot be shown supporting more laborers with Breit's Malthusian interpretation of Quadrant C.

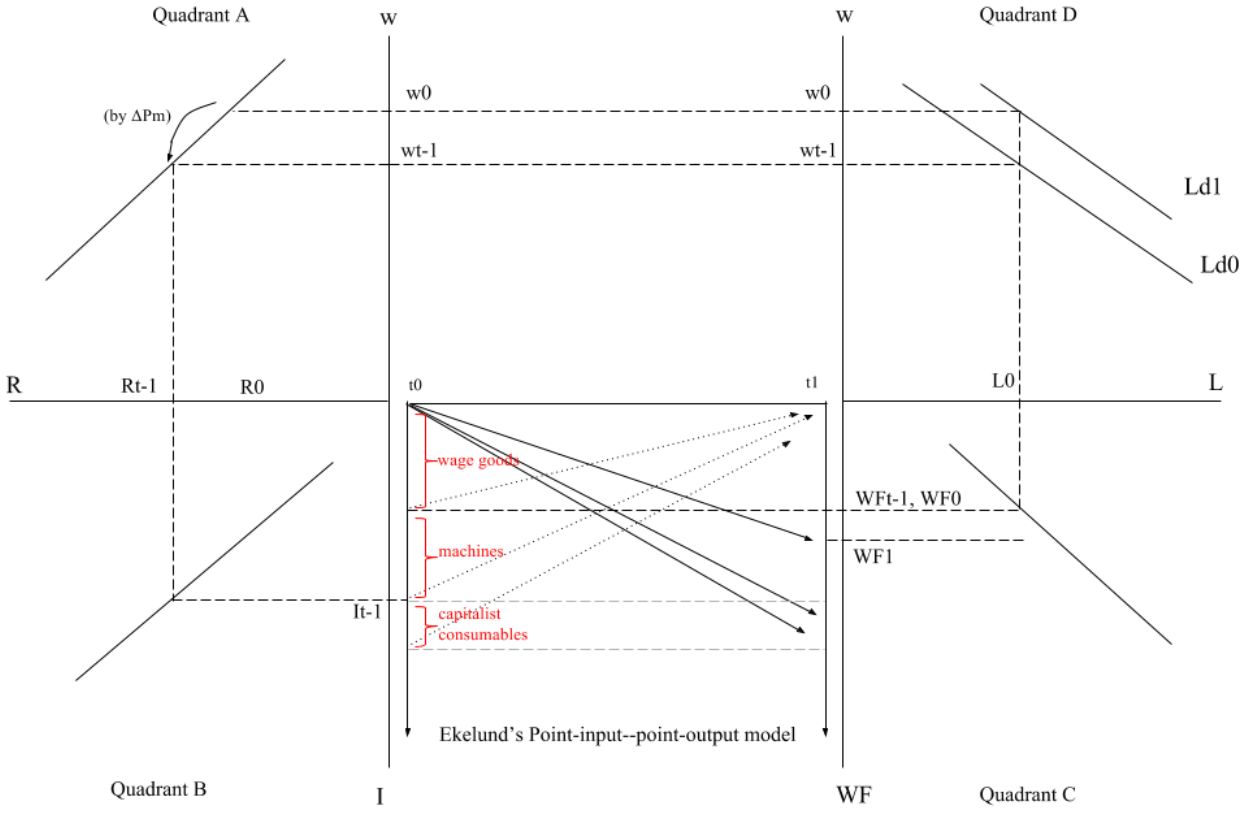
Quadrant A
W
W
Quadrant D
w0
w0
(by ΔPm)
wt-1
wt-1
Ld1
Ld0
R
Rt-1
R0
t0
t1
L0
L
wage goods
WFt-1, WF0
machines
WF1
It-1
capitalist
consumables
Ekelund's Point-input--point-output model
Quadrant B
I
WF
Quadrant C

Figure 19

It should be noted that Ekelund's result with all of the original assumptions is tenuous in the current framework. Breit's model simply does not function well with assumptions of constant productivity (no changes in Quadrant A, or increases in total output) and constant population (Quadrant C cannot work). Also, Ekelund's model does not contain an explicit labor market. This, of course, should not be taken as a criticism of Ekelund's model, but simply a drawback to imposing short-run assumptions in a long-run framework. In Breit's model and in the long-run, productivity, population, and technology can change—in Ekelund's model and in the short-run, these are held constant. In the short-run, capitalists and laborers play a zero-sum game, while in the long run, the wages fund and capitalist consumption (even if assumed mutually exclusive) may increase together.

Increase in savings

One further example may display the usefulness of putting the short- and long-run together in one framework. Suppose laborers do not consume the entire wages fund, but instead choose to save a portion of their wages (Figures 20 and 21). In this case, laborers act as capitalists by supplying means of production. The substitutability of wage goods and machines is no issue here, because in whatever case (perfect substitutability or no substitutability), productivity increases. In the case of perfect substitutability, the saved wage goods of one period simply become the machines of the next period, by the choice of the laborers qua capitalists. In the case of no substitutability, the saved wage goods either allow for more laborers to be employed in the production process (assuming the previous period did not have full employment) or, in the more interesting case, allows for more a more roundabout production process, as Taussig and Böhm-Bawerk suggest.

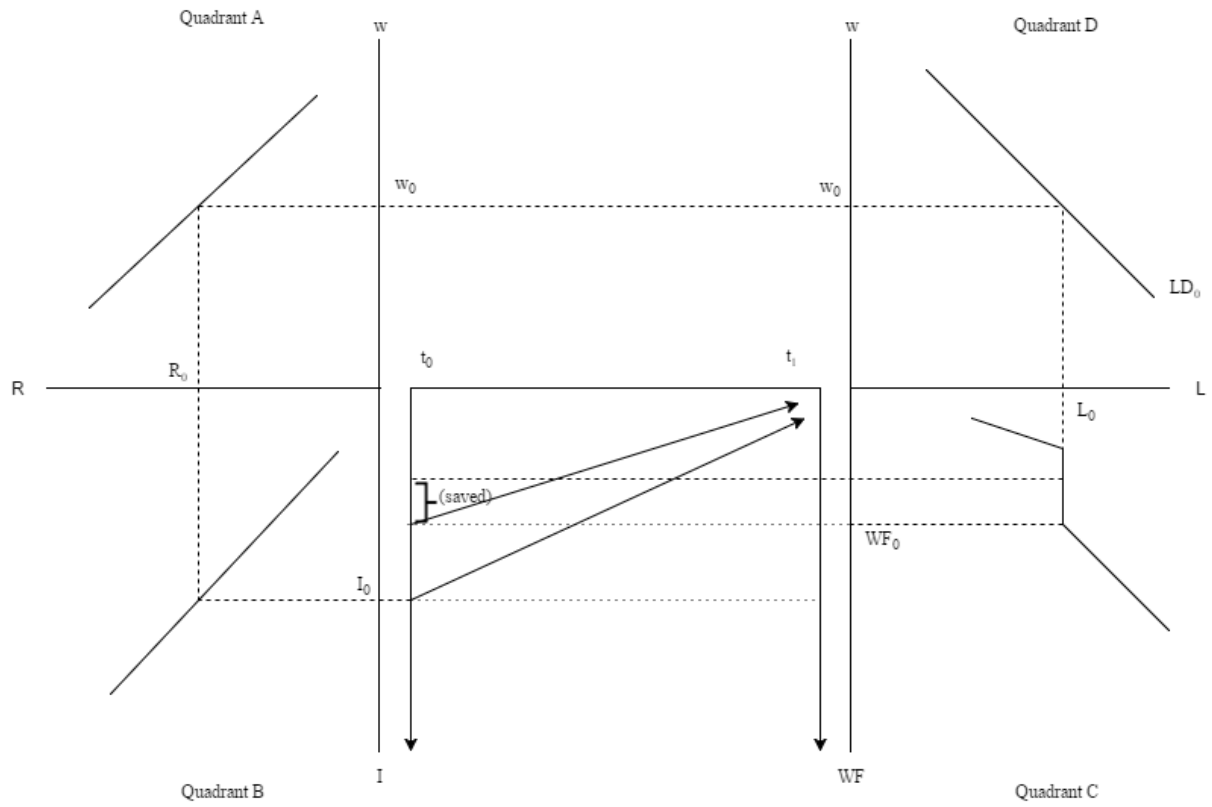
Quadrant A
w
w
Quadrant D
w_0
w_0
LD_0
R_0
t_0
t_1
R
L
L_0
(saved)
WF_0
I_0
I
WF
Quadrant B
Quadrant C

Figure 20

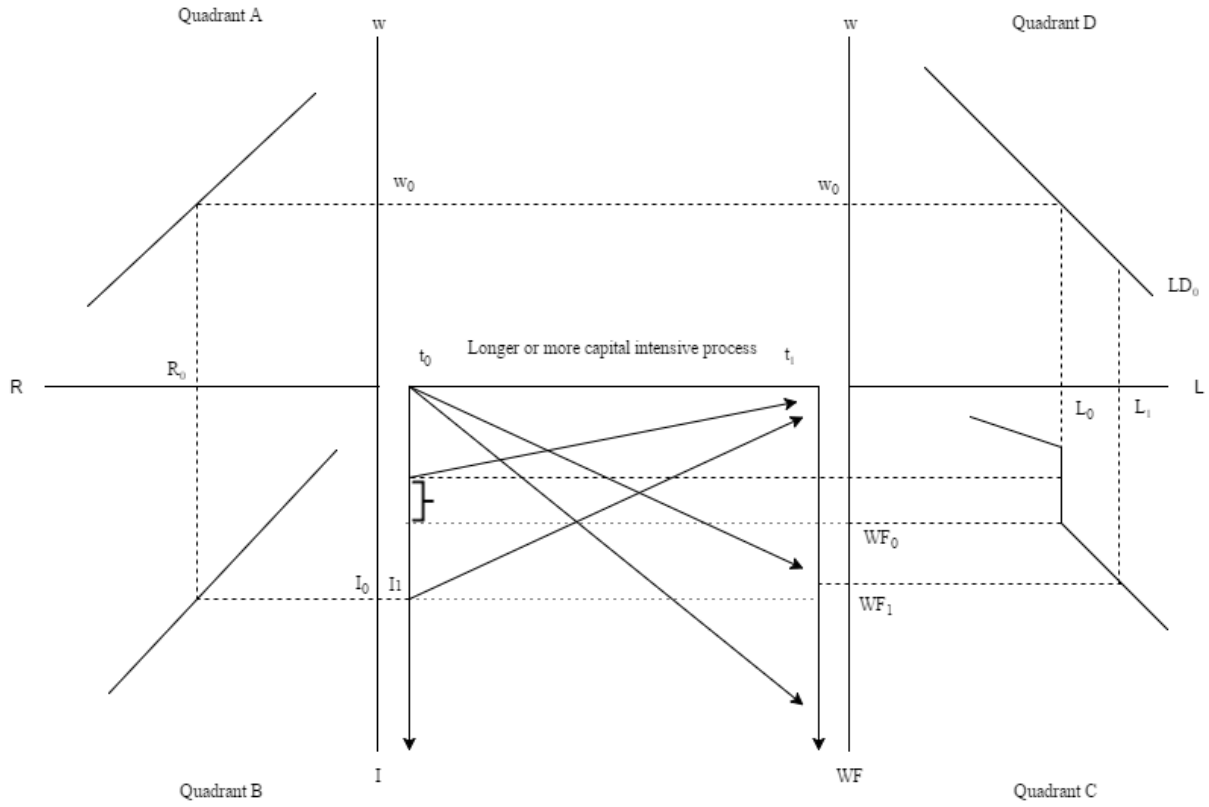
Quadrant A
w
w
Quadrant D
w_0
w_0
LD_0
t_0
Longer or more capital intensive process
t_1
R
R_0
L
L_0
L_1
WF_0
I_0
I_1
WF_1
I
WF
Quadrant B
Quadrant C

Figure 21

In Quadrant C, we may alter the relationship between the size of the wages fund and the number of laborers that may be supported. In the present scenario, the laborers voluntarily forgo some level of consumption, choosing to save and invest some of their real wages instead. If this is done voluntarily, we may assume that the number of laborers will not decrease from t_0 to t_1. Thus, at least for WF_0 and the actually consumed real wage goods (WF_0 minus the amount saved), the number of laborers may remain constant.

Conclusion

The synthesis is instructive. A short-run model of the wages fund doctrine is constrained by constant productivity and population assumptions, which disallows analysis of some crucial features of classical growth theory. An exclusively long-run model of the wages fund doctrine neglects the important mechanisms by which the real wages fund is produced. The lessons from Taussig's *Wages and Capital* therefore inspire a synthesis of both the short- and long-run models, so that a production process (albeit a highly simplified one) is shown as a prerequisite for a wages fund, but this wages fund has long-run consequences on the labor market, profits, investment, and even future production processes.

We therefore arrive at the same conclusion as Butos (1967): "Wages are paid from the product of past labor, and wages are paid from capital, but a 'fund' as described by the Classicists does not correspond to the real world" (p. 86). Taussig's conception, which transformed the theory in light of Böhm-Bawerk's capital and production theory, is the more realistic approach, especially since Taussig acknowledged the severe limitation of the theory in predicting precise wage outcomes. The theory is best conceived as an explanation of how real wage goods are produced and the short- and long-term consequences of changes in the size of the so-called "fund".

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