

## **Data Appendix**

### **The Effects of High School Career and Technical Education for Non-College Bound Students**

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## A. High School Curricula Construction Rules

### A.1 High School Course Mapping

The transcript courses in ELS:2002 are coded using the Classification of Secondary School Courses (CSSC), a coding system based on the High School Transcript Studies conducted by the NCES (National Center for Education Statistics, 2000). All U.S. high school courses are coded with a six digit code, organized by course type. The first two digits, which denote the main program area, range from 01 – 56. See Table A.1 for how these codes are mapped to the five high school fields in my model (*Academic, General Education, Business Vocational, Trade Vocational, and Other Curriculum*).

Table A.1: CSSC Code Mapping

Course Content	CSSC Code
<i>Academic Courses</i>	
Area and Ethnic Studies (Honors)	050105, 050116, 050120, 050126
Computer and Information Sciences (Honors/AP/IB)	110132-44, 110212, 110213
Engineering	14****
Foreign Languages (Honors/AP/IB/CEEB Prep)	160517, 160544, 160545, 160556, 160907, 160917, 160937, 160943-52
Letters/English (Honors/AP/IB)	230102, 230105, 230108, 230111, 230114, 230117, 230165-71
Liberal/General Studies (Gifted / College Level)	240141, 240151
Life Sciences (Honors/AP/IB)	260141-46
Mathematics (Honors/AP/IB/Advanced)	270410, 270414, 270415, 270417-20, 270424, 270429-35, 270532
Multi/Interdisciplinary Studies (IB/Advanced)	300112-21, 300623
Philosophy and Religion (IB)	380142
Physical Sciences (Honors/AP/IB/ Advanced)	400300, 400521-41, 400622, 400821-31
Psychology (AP/IB)	420114, 420115
Social Sciences (Honors/AP/IB)	450613-16, 450711, 450803, 450806, 450808, 450836, 450850, 450853, 450856, 450870-74, 450921, 451013, 451015, 451018, 451034-37, 451171-81
<i>General Education Courses</i>	
Area and Ethnic Studies (non-honors)	05****
Foreign Languages (non-honors)	16****
Letters/English (non-honors)	23****
Liberal/General Studies (non-honors)	24****
Life Sciences (non-honors)	26****
Mathematics (non-honors)	27****
Multi/Interdisciplinary Studies (non-honors)	30****

Philosophy and Religion (non-honors)	38****
Physical Sciences (non-honors)	40****
Science Technologies	41****
Psychology (non-honors)	42****
Public Affairs	44****
Social Sciences (non-honors)	45****
<i>Business Vocational Courses</i>	
Business and Management	06****
Business and Office	07****
Marketing and Distribution	08****
Communications (except Journalism and Special languages)	09****
Computer and Information Sciences (non-honors)	11****
CTE Business and Office	552***
<i>Trade Vocational Courses</i>	
Communications Technologies	10****
Consumer, Personal, and Miscellaneous Services	12****
Engineering and Engineering-related Technologies	15****
Industrial Arts	21****
Protective Services	43****
Construction Trades	46****
Mechanics and Repairers	47****
Precision Production	48****
Transportation and Material Moving	49****
CTE Industrial Arts, CTE Precision Production, CTE Trades & Industrial Construction, CTE Mechanics & Repairers, Service Occupations	555***, 557***, 558***, 559***
<i>Other Curriculum Courses</i>	
Architecture and Environmental Design	04****
Communications (Journalism and Special languages)	0904**, 0908**
Education	13****
Home Economics	19****
Vocational Home Economics	20****
Law	22****
Summer Abroad, Independent Study, Other Liberal/General Studies	240121, 2401131, 240100
Library and Archival Sciences	25****
Military Sciences	28****
Military Technologies	29****
Parks and Recreation	31****
Citizenship/Activities	33****
Health Related Activities	34****
Interpersonal Skills	35****
Leisure and Recreational Activities	36****
Personal Awareness	37****
Theology	39****
Visual and Performing Arts	50****
Executive Internship	51****

General EMH (Including Pre-vocational Programs)	52****
Special Education	54****
Vocational Career Prep / Exploration, CTE Home Economics	550***, 554***
Special Education – Resource Curriculum	56****
Agribusiness and Agricultural Production	01****
Agricultural Sciences	02****
Renewable Natural Resources	03****
CTE Agriculture	551***
Allied Health	17****
Health Sciences	18****
CTE Health Occupations	553***
Basic Skills	32****

Notes:

1) “\*” Indicates that all courses within the program area, not listed elsewhere, fall within the stated course content.

## A.2 Yearly Curriculum Construction Rule Details

I assign a yearly field concentration to each year of high school based on the credit hours and field types of the classes the individual passed during the year. Each individual takes six credit hours of classes in a given year.<sup>1</sup> I assign yearly field concentration as described below. This specification is similar to other specifications used in the literature, such as Meer (2007).

- The year is coded as a Trade Vocational yearly field concentration if the individual took more Trade Vocational credits than either Business Vocational credits or Academic credits *AND* took 1.25 or more Trade Vocational credits.
- The year is coded as a Business Vocational yearly field concentration if the individual took more Business Vocational credits than either Trade Vocational credits or Academic credits *AND* took 1.25 or more Business Vocational credits.
- The year is coded as an Academic yearly field concentration if the individual took more Academic credits than either Trade Vocational credits or Business Vocational credits *AND* took 1.25 or more Academic credits.
- The year is coded as a General Education yearly field concentration if the individual took 1.25 or more General Education credits *AND* took less than 1.25 Trade Vocational credits,

<sup>1</sup> Credit hours from schools that assign a different number of credit hours in a year (e.g. 12 credit hours per year) are first adjusted so that the average number of credit hours taken by a full time student at that school each year is six.

took less than 1.25 Business Vocational credits, took less than 1.25 Academic credits, and took less than 2 Other Curriculum credits.

- The year is coded as an Other Curriculum yearly field concentration if the individual took 2 or more Other Curriculum credits *AND* took less than 1.25 Trade Vocational credits, took less than 1.25 Business Vocational credits, and took less than 1.25 Academic credits.
- The year is coded as an Other Curriculum yearly field concentration if an individual took less than 1.25 credits in each of the other four fields.
- In the event of ties, the tiebreaking order is Trade Vocational, Business Vocational, Academic.<sup>2</sup>

### **A.3 Alternative Curriculum Construction Rules**

I investigated three alternative curriculum construction rules. The first rule defines an individual's overall curriculum as the yearly field concentration (constructed as described above) taken during her senior year. The second rule aggregates a student's classes and credit hours across all four years of high school and then chooses an overall concentration based on aggregate credit hours in each field.<sup>3</sup> Finally, the third rule defines an individual's overall curriculum as the value of the pre-constructed variable in the ELS:2002 data set that assigned high school graduates to either an academic, occupational, academic & occupational, or other curriculum.

See Table A.2 for a comparison of how aggregate outcomes change with each of the four construction rules. The table shows that curriculum outcomes are very similar across all four construction rules.

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<sup>2</sup> 0.2% of student-year curricula observations had ties. Using alternative tiebreaking orders does not affect the estimation results.

<sup>3</sup>For this alternative construction rule I followed the yearly field concentration rules as defined above, except with slightly different credit assignment ratios (taking the place of 1.25 out of 6 and 2 out of 6): 3 out of 24 for trade vocational, business vocational, and academic, 6 out of 24 for general education, and 8 out of 24 for other curricula. These ratio's were chosen to take into account the large number of general education and other curricula courses that individual's take during their first and second years of high school, and to roughly follow the construction rules used in the previous literature (e.g. Meer, 2007).

Table A.2: Curriculum Construction Rule Comparison

HS Curriculum	Constructed Outcomes	Alternative 1: Senior Year Classes	Alternative 2: All Classes	Alternative 3: ELS Concentrations	
Academic	27.2%	25.2%	30.6%	<i>Academic</i>	24.6%
Gen Ed	42.9%	46.0%	44.3%	<i>Occupational</i>	12.6%
Bus Voc	7.0%	6.7%	5.8%	<i>Acad &amp; Occ</i>	2.3%
Trade Voc	5.8%	5.2%	5.8%	<i>Other</i>	60.4%
Other	17.2%	16.8%	13.5%		

Notes:

- 1) Total # of classifiable observations varies across construction rules based on available data, from 11,880 to 14,810.
- 2) Sample sizes are rounded to the nearest ten to comply with secure data disclosure requirements.

## B. Employment Construction Rules

An ELS:2002 survey participant denoted her occupations between the years of 2002 and 2012 using six-digit O\*NET occupation codes. ELS:2002 survey staff then mapped these six-digit O\*NET occupation codes to one of 14 constructed occupations (Ingels et al., 2014). See Table B.1 for how these 14 occupations are mapped into the five occupation choices in my model (*Professional*, *Skilled Manual Labor*, *Skilled Non-manual Labor*, *Skilled Other*, and *Unskilled*).

**Table B.1: 2002-2012 Occupation Code Mapping**

Coded Occupation	ELS:2002 Occupation
<i>Professional</i>	
	Manager, Administrator
	Professional A
	Professional B
<i>Skilled Manual Labor</i>	
	Craftsperson
	Operative
	Technical
	Protective Service
	Laborer (skilled, see notes)
<i>Skilled Non-Manual Labor</i>	
	Clerical
	Sales
	Service (skilled, see notes)
<i>Skilled Other</i>	
	Farmer, Farm Manager
	Military
	School Teacher
<i>Unskilled</i>	
	Laborer (unskilled, see notes)
	Service (unskilled, see notes)

Notes:

1) Based on six-digit O\*NET codes, the following Laborer and Service occupations were coded as Unskilled Occupations: Merchandise Displayers and Window Trimmers; Lifeguards, ski patrol, and other recreational protective service workers; cooks – fast food; food prep, bartenders, counter attendants, waiters, hosts, dishwashers; janitors and cleaners; Attendants (service stations, ticket takers, etc); bellhops; and cashiers. All other Laborer and Service occupations were coded as Skilled Manual Labor and Skilled Non-Manual Labor occupations, respectively.

An ELS:2002 survey participant denoted her occupations prior to 2002 by selecting one of 15 occupation types. The 15 occupation types available were chosen by ELS:2002 survey staff. See table B.2 for how these 15 occupations are mapped into the five occupation choices in the model (*Professional*, *Skilled Manual Labor*, *Skilled Non-manual Labor*, *Skilled Other*, and *Unskilled*).

**Table B.2: 2000-2001 Occupation Code Mapping**

Coded Occupation	ELS:2002 Occupation
<i>Professional</i>	
	<i>No Codes</i>
<i>Skilled Manual Labor</i>	
	Construction work
	Beautician, hair stylist, barber
<i>Skilled Non-Manual Labor</i>	
	Salesperson, customer service
	Computer related job
	General office or clerical worker
<i>Skilled Other</i>	
	Farm worker
	Hospital or health worker
<i>Unskilled</i>	
	Food service/server/host/dishwasher
	Babysitter or child care
	Cashier, grocery clerk/bagger
	Lawn work or odd jobs
	Camp counselor/lifeguard/coach
	Warehouse worker
	House cleaning or janitorial work
<i>Unknown Occupation</i>	
	Other



## C. Local Labor Market Characteristic Construction Rules

### C.1 Local Labor Market Industry Mapping

Bureau of Economic Analysis Local Area Personal Income & Employment data (U.S. Bureau of Economic Analysis, 2002) contains county-level employment percentages for each two-digit NAICS industry. See Table C.1 for how each two-digit NAICS industries is mapped into one of four constructed industries (*Professional Industries*, *Skilled Manual Labor Industries*, *Skilled Non-manual Labor Industries*, and *Other Industries*).

Table C.1: Local Labor Market Industry Mapping

Industry	NAICS Industry Code
<i>Professional</i>	
Professional, Scientific, and Technical Services	54
Management of Companies and Enterprises	55
<i>Skilled Manual Labor</i>	
Mining	21
Utilities	22
Construction	23
Manufacturing	31-33
Transportation and Warehousing	48-49
Waste Management	562
Other Services (Repair and Maintenance)	811
<i>Skilled Non-Manual Labor</i>	
Wholesale Trade	42
Retail Trade	44-45
Information	51
<i>Finance and Insurance</i>	52
Real Estate and Rental and Leasing	53
<i>Other</i>	
Farm Employment	NA
Agriculture, Forestry, Fishing, and Hunting	11
Administration	561
Educational Services	61
Health Care and Social Assistance	62
Arts, Entertainment, and Recreation	71
Accommodation and Food Services	72
Other Services (Everything except Repair and Maintenance)	812,813,814
Public Administration	92

## C.2 Industry / Occupation Comparison

As discussed in Section 4.1, local labor market industry variables are used because local labor market occupation data is not available at the county level. However, occupation data is only available at the national level and for each metropolitan statistical area in the United States. This occupation data is available from the Bureau of Labor Statistics' Occupational Employment Statistics (OES) program (U.S. Bureau of Labor Statistics, 2002). In order to compare industry percentages and occupation percentages at the national and MSA level, I first map each Standard Occupation Classification (SOC) System occupation code into one of four constructed occupations (*Professional Occupations*, *Skilled Manual Labor Occupations*, *Skilled Non-manual Labor Occupations*, and *Other Occupations*) as described in Table C.2.

**Table C.2: Local Labor Market Occupation Mapping**

Occupation	SOC Code
<i>Professional</i>	
Management Occupations	11
Computer and Mathematical Occupations	15
Architecture and Engineering Occupations	17
Life, Physical, and Social Science Occupations	19
Legal Occupations	23
Healthcare Practitioners and Technical Occupations	29
<i>Skilled Manual Labor</i>	
Construction Trades and Extraction Workers	47
Installation, Maintenance, and Repair Workers	49
Production Occupations	51
Transportation and Material Moving Occupations	53
<i>Skilled Non-Manual Labor</i>	
Business Operations and Financial Specialists	13
Sales Occupations	41
Office and Administrative Support Occupations	43
<i>Other</i>	
Community and Social Science Occupations	21
Education, Training, and Library Occupations	25
Arts, Design, Entertainment, Sports, and Media Occupations	27
Healthcare Support Occupations	31
Protective Service Occupations	33
Food Preparation and Serving Occupations	35
Building and Ground Cleaning and Maintenance Occupations	37
Personal Care and Service Occupations	39
Farming, Fishing, and Forestry Occupations	45
Military Specific Occupations	55

Table C.3 presents a comparison of national occupation percentages and industry percentages using my constructed occupations and industries. Table C.4 provides the average difference across MSAs between occupation percentages and industry percentages. Finally, Table C.5 provides a more detailed crosswalk between national occupation percentages, broken down by OCCSOC codes, and national industry percentages, broken down by two-digit NAICS industry codes. Tables C.3, C.4, and C.5 show that the industry mapping used to create my local labor market characteristic variables reasonably reflect OCC occupation mappings at the national level and within MSAs. As such, my local labor market industry percentages are likely a good proxy for local labor market occupation percentages at the county level.

**Table C.3: National Constructed Industry / Occupation Crosswalk**

<u>Occupations</u>	<u>Industries</u>			
	Professional	Sk. Manual Labor	Sk. Non-Manual Labor	Other
Professional	<b>47.5%</b>	10.1%	11.6%	16.8%
Sk. Manual Labor	5.8%	<b>71.7%</b>	16.0%	8.7%
Sk. Non-Manual Labor	38.8%	16.0%	<b>65.0%</b>	20.7%
Other	7.8%	1.9%	6.7%	<b>53.7%</b>

Notes:

- 1) Constructed occupations are on the y-axis, and constructed industries are on the x-axis.
- 2) Data is from 2002.

**Table C.4: Constructed Industry / Occupation Variable  
Difference Across MSAs**

	Professional	Sk. Manual Labor	Sk. Non-Manual Labor	Other
Mean	-9%	-1%	-8%	17%
Std Dev	3%	5%	3%	6%

Notes:

- 1) Percentages are industry percentages minus occupation percentages.
- 2) Data is from a comparison of 295 MSAs in 2002.

Table C.5: Detailed National Crosswalk

SOC Occupations	NAICS Industries																									
	Professional		Sk. Manual Labor										Sk. Non-Manual Labor						Other							
	54 - Professional Services	55 - Management	21 - Mining	22 - Utilities	23 - Construction	31 - Manufacturing A	32 - Manufacturing B	33 - Manufacturing C	48 - Transportation A	49 - Transportation B	562 - Waste Management	811 - Repair	42 - Wholesale Trade	44 - Retail Trade A	45 - Retail Trade B	51 - Information	52 - Finance & Insurance	53 - Real Estate & Leasing	11 - Agriculture & Forestry	561 - Administration	61 - Education	62 - Health Care	71 - Arts	72 - Lodging & Food	812-4 - Other Services	92 - Public Administration
Professional																										
11 - Management	9%	16%	6%	6%	6%	4%	6%	6%	4%	4%	6%	4%	7%	4%	3%	8%	9%	11%	3%	3%	5%	4%	5%	4%	8%	6%
15 - Computer / Mathematical	11%	9%	1%	3%	0%	0%	1%	2%	0%	1%	0%	0%	3%	1%	0%	10%	5%	1%	0%	1%	1%	0%	0%	0%	1%	2%
17 - Architecture / Engineering	16%	3%	4%	8%	1%	1%	2%	8%	0%	1%	2%	0%	1%	0%	0%	2%	0%	0%	0%	1%	0%	0%	0%	0%	0%	3%
19 - Sciences	5%	2%	3%	2%	0%	1%	3%	0%	0%	0%	1%	0%	0%	0%	0%	1%	0%	0%	1%	0%	1%	1%	0%	0%	0%	3%
23 - Legal	6%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	3%
29 - Health Technical	3%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	1%	0%	2%	2%	32%	1%	0%	0%	4%
Sk. Manual Labor																										
47 - Construction / Extraction	1%	1%	33%	7%	67%	0%	2%	2%	1%	0%	18%	1%	0%	0%	0%	0%	0%	2%	0%	2%	0%	0%	0%	0%	0%	5%
49 - Maintenance / Repair	1%	2%	9%	26%	8%	5%	6%	4%	8%	3%	6%	50%	7%	7%	2%	8%	0%	14%	2%	2%	1%	1%	3%	1%	1%	4%
51 - Production	2%	2%	10%	12%	1%	55%	49%	54%	1%	3%	3%	7%	7%	3%	1%	4%	0%	1%	4%	8%	0%	1%	0%	1%	9%	2%
53 - Transportation	1%	3%	17%	2%	3%	16%	13%	5%	56%	58%	44%	18%	20%	9%	6%	3%	0%	7%	13%	10%	3%	1%	2%	2%	5%	4%
Sk. Non-Manual Labor																										
13 - Business Ops / Financial	9%	14%	4%	7%	2%	1%	2%	3%	2%	2%	2%	1%	3%	1%	1%	4%	19%	3%	0%	2%	2%	1%	1%	0%	8%	8%
41 - Sales	4%	5%	1%	2%	2%	4%	3%	2%	2%	3%	2%	5%	25%	50%	56%	13%	13%	22%	1%	9%	0%	0%	8%	4%	6%	1%
43 - Office & Admin Support	24%	34%	10%	23%	9%	8%	11%	10%	19%	25%	12%	11%	24%	14%	20%	23%	50%	22%	5%	22%	11%	17%	10%	4%	17%	25%
Other																										
21 - Community / Social Sci	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	6%	0%	0%	4%	4%
25 - Education	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	58%	3%	2%	0%	3%	2%
27 - Arts	4%	1%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	2%	16%	0%	1%	0%	0%	1%	0%	9%	0%	2%	1%
31 - Heath Support	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	1%	0%	19%	0%	0%	1%	2%
33 - Protective Service	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	2%	0%	13%	1%	0%	4%	1%	1%	18%
35 - Food Prep & Serving	0%	1%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	4%	1%	2%	0%	2%	0%	1%	4%	3%	18%	75%	4%	1%
37 - Building Maintenece	1%	1%	0%	1%	1%	1%	1%	1%	0%	1%	1%	1%	1%	1%	0%	1%	0%	10%	1%	21%	5%	3%	10%	6%	4%	2%
39 - Personal Care	1%	1%	0%	0%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	0%	3%	0%	2%	1%	1%	2%	7%	26%	2%	24%	3%
45 - Farming & Forestry	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	68%	0%	0%	0%	0%	0%	0%	0%
55 - Military	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Notes:

- 1) Percentages aggregate vertically. They display the occupational breakdown of types of job in each industry nationwide.
- 2) Constructed occupations are on the y-axis, and constructed industries are on the x-axis.
- 3) Data is from 2002.

## **D. Variable Construction Details**

### **D.1 ELS:2002 Raw Variables**

This subsection provides additional information about the data elements available in ELS:2002 that are used to construct the variables used in this paper. See table D.1 for a list of the variables in the ELS:2002 raw data file that are used to create log-hourly wage, high school attendance, PSE attendance, and employment outcomes each year. The Stata do files that map this information into the variables discussed in Section 4 are available upon request.

### **D.2 Additional Imputation Rules**

As discussed in Section 4.2, choice information is missing for many student-year observations in the data set. In addition, conflicting choice information is provided for a small number of student-year observations. See Table D.2 for details on how a subset of these missing student-year observations are imputed based on available data as well as how conflicting choice information is coded. The Stata do files that contain these rules are available upon request.

Table D:1: Raw Variables

Constructed Variable / Raw Variables
<i>High School Attendance</i>
High School Transcript data 2000-2003 (courses, credits, grades)
Year/month graduated from high school, and type of graduation (GED or diploma)
Year/month left high school (prior to 2006) and why (graduated, dropped out, or transferred)
High School grade attended in 2003
Enrolled in the spring of 2003 (Y/N)
Enrolled in the spring of 2004 (Y/N)
Working towards graduation (GED) in 2012 (Y/N)
Failed 9th or 10th grade (Y/N)
Failed 11th or 12th grade (Y/N)
Dropouts
Year/month first dropped out
Year/month first returned
Year/month second dropped out
Last grade attended before dropping out and whether passed/failed
Attended High School in 2002 (Y/N)
<i>Post-Secondary Education Attendance</i>
Year/month first began attending a PSE institution, and institution type
Year/month began attending most recent PSE institution, and institution type
Year/month last attended most recent PSE institution, and institution type
Year/month first received a PSE degree, and degree type
Year/month received highest PSE degree, and degree type
Ever attended a PSE (asked in both 2006 and 2012) (Y/N)
Attended a PSE institution, and institution type, monthly from 2003 to 2005 (Y/N)
Attending a PSE institution in 2012 and institution type (Y/N)
<i>Employment</i>
Prior to Jun 2012: Occupation type and year/month began and ended most recent job
Prior to Jan 2006: Occupation type and year/month began and ended first job after high school
Occupation type and year/month began the job employed in during Jan 2006.
Prior to May 2002: Occupation type and year/month began and ended most recent job
Occupation and hours worked a week in 2001
Whether working in 2012
Number of weeks employed in 2011
Whether working for six or more months in 2010 and 2009
Whether employed each month from Jun 2002 to Jan 2006
Number of hours worked a week in 2001 and 2003
Whether working in 2003
Year/month began and ended most recent job (as of '03), only for dropouts and early gradulators
<i>Log Hourly Wages</i>
Wages current / most recent job as of 2012
Wages in 2011
Wages in 2005
Wages first job after school (prior to Jan 2006)
Wages current / most recent job (as of Jan 2006)
Wages current / most recent job (as of 2003), only for dropouts and early gradulators

Table D.2: Additional Interpolation Rules (for Years with Missing Data)

Constructed Variable / Raw Variables

*High School Attendance*

*On Time Graduates*: Individuals that graduated on time (in 2003) are coded as attending in 2000, 2001, and 2002

*Early Graduates*: Individuals that graduated early (in 2002 or 2001) are coded as attending in 2000 and 2001, and are coded as already having finished 1-2 years of high school (respectively) prior to 2000

*Late Graduates*: Individuals that graduated after 2003 are coded as attending in the year of graduation

All years after graduation are coded as not attending

*Dropouts*: Every year after final dropout, including final dropout year, is coded as not attending. Every year before first dropout year is coded as attending. If dropped out twice, year of return is coded as attending and year of first dropout is coded as not attending

*Post-Secondary Education Attendance*

Individuals that attended a PSE institution for at least six months in a year are coded as attending that year

Every year before began attending first PSE institution is coded as not attending

Every year after last began attending most recent PSE institution is coded as not attending

If the first year attended and most recent year attended are both at 4-yr institutions, and the years are four years apart, the two years between them are coded as attending 4-yr institutions

*Employment*

Code as working (type unknown) if worked more than six months each year

Code as working if worked more than 20 hours a week in 2001

*Conflicting Data*

When data on whether an individual attended HS / PSE full-time or part-time is missing, I code individuals as follows:

a. Individuals that attended school (credit amount unknown) and worked during any year between 2000 and 2008 are coded as attended school

b. Individuals that attended school (credit amount unknown) and worked during any year between 2009 and 2012 are coded as worked

Notes:

1) These interpolation rules are only used for student-years for which outcomes are unobserved in the data.

## E. First Stage Regression Results

### E.1 High School Curriculum

The first-stage regression, used to construct high school curriculum predicted probabilities, is a multinomial logit regression of high school curriculum on personal characteristics ( $X_i$ ), local labor market characteristics ( $M_i$ ), and high school vocational instruments ( $I_i$ ). The estimates from the first-stage regression are displayed in Table E.1; note that all estimates are relative to graduating high school in a general education curriculum. Overall, men are more likely to concentrate in a trade vocational field than women. Specifically, men receive 1.43 more utils than women from concentrating in the trade vocational curriculum relative to concentrating in the general education curriculum. Next, Caucasian individuals are more likely than black, Hispanic, and other race individuals to concentrate in a trade vocational, business vocational, or other curriculum, and individuals who attend Catholic or non-Catholic private high schools are very likely to take general education courses as opposed to academic or vocational courses and are also very unlikely to drop out of high school. Local labor market characteristics have little effect on curriculum take-up, although there are a few exceptions. For example, as the hourly wage increases in the county where the school is located, the number of individuals who concentrate in other curricula decreases, and as the percent of manual labor employment increases in the county where the school is located, the number of individuals who concentrate in a trade vocational curriculum increases.

Each instrument has a significant effect on the utility associated with at least one high school curriculum relative to graduating in the general education field, with the exception of whether most vocational courses are taught in the high school, at an area vocational school, or both (this variable has a positive but statistically insignificant effect on concentrating in a trade or business vocational curriculum).<sup>4</sup> As the number of individuals in the previous year's graduating class who took vocational courses increases, the probability that an individual concentrates in a trade vocational curriculum or a business vocational curriculum increases. Next, when business courses such as marketing are taught on-site, individuals are more likely to concentrate in business vocational fields. When trade courses such as precision are taught on-site, individuals are more

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<sup>4</sup> The first-stage estimates for vocational course location are significant for many alternative specifications of the instrument subset. As discussed in Section 4.1 of LaForest (2017), changing the instrument subset has little effect on the estimates in the second-stage regressions. The instrument subset presented here was chosen to be indicative of the full set of variables available in ELS:2002.



Table E.1: Selected First Stage Estimates

Variable	Academic		Business Voc		Trade Voc		Other		GED		Dropping Out	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
<u>1. Personal Characteristics</u>												
Male	-0.36 ***	0.06	-0.05	0.08	1.43 ***	0.11	-0.18 ***	0.05	0.62 ***	0.11	0.42 ***	0.08
Black	0.02	0.12	-0.15	0.15	-0.83 ***	0.17	-0.37 ***	0.10	-0.62 ***	0.19	-0.22	0.15
Hispanic	-0.14	0.10	-0.56 ***	0.18	-0.83 ***	0.18	-0.36 ***	0.10	-0.23	0.20	0.21	0.13
Other Race	0.60 ***	0.08	-0.06	0.14	-0.39 ***	0.15	-0.36 ***	0.11	-0.04	0.18	0.19	0.14
Socio-Economic Status	0.24 ***	0.03	-0.11 **	0.05	-0.16 ***	0.06	-0.04	0.03	-0.18 ***	0.06	-0.39 ***	0.05
Test Score	1.34 ***	0.04	-0.07	0.05	-0.36 ***	0.05	-0.29 ***	0.04	-0.14 **	0.07	-0.66 ***	0.05
Midwest	-0.43 ***	0.13	-0.22	0.19	-0.41 **	0.19	0.27 *	0.15	-0.24	0.26	-0.43 **	0.19
South	0.08	0.13	-0.03	0.18	-0.56 ***	0.20	0.03	0.15	0.16	0.25	-0.39 **	0.19
West	-0.65 ***	0.14	-1.29 ***	0.25	-0.85 ***	0.26	-0.03	0.19	-0.63 **	0.28	-0.84 ***	0.23
Suburban	-0.33 ***	0.10	-0.06	0.15	0.24	0.16	0.11	0.11	-0.12	0.16	-0.20	0.13
Rural	-0.46 ***	0.14	-0.06	0.18	-0.10	0.21	0.12	0.14	-0.16	0.24	-0.01	0.20
Catholic School	-0.83 ***	0.19	0.18	0.29	-0.85 **	0.36	-1.44 ***	0.27	-1.33 ***	0.41	-1.74 ***	0.32
Non-Catholic Private School	-1.07 ***	0.21	-0.78 **	0.32	-1.32 ***	0.41	-1.46 ***	0.27	-0.83 **	0.39	-1.01 ***	0.28
<u>2. Local Labor Market Characteristics</u>												
Unemployment Rate	-0.60	3.12	4.83	4.06	-1.57	5.04	-1.01	2.80	-0.83	4.26	-3.58	3.01
(ln) Average Hourly Wage	0.08	0.28	-0.08	0.41	-0.27	0.45	-0.74 **	0.32	-0.39	0.49	-0.32	0.37
% Professional Employment	0.40	2.09	0.81	2.73	-0.65	3.59	0.89	2.31	-5.16	3.54	-3.11	2.99
% Manual Labor Employment	-0.32	0.70	0.54	0.90	2.25 **	1.10	-1.27 *	0.67	-1.21	0.99	-1.10	0.93
% Non-Manual Labor Employment	-0.10	1.22	1.87	1.74	0.17	2.05	-1.31	1.21	-1.43	1.85	0.64	1.63
<u>3. Vocational Instruments</u>												
Voc Taught in High School	-0.05	0.16	0.37	0.31	0.43	0.30	0.13	0.16	-0.24	0.36	0.26	0.25
Voc Taught in Area School	-0.29 **	0.14	0.21	0.35	0.16	0.28	0.03	0.17	-0.29	0.43	0.45 *	0.26
Voc Taught in Both HS & Area Sch	-0.14	0.16	0.33	0.32	0.22	0.30	0.14	0.17	-0.15	0.38	0.30	0.25
Marketing Courses Taught On-Site	-0.03	0.12	0.61 ***	0.17	0.15	0.17	0.20 *	0.11	0.36 **	0.18	0.06	0.14
Marketing Courses Taught at Area Sch	-0.31 *	0.18	0.08	0.25	0.04	0.27	0.09	0.16	-0.01	0.28	-0.24	0.24
Precisions Courses Taught On-Site	0.15	0.14	-0.16	0.20	0.42 **	0.20	-0.06	0.14	-0.02	0.23	0.18	0.19
Precisions Courses Taught at Area Sch	-0.03	0.16	-0.13	0.22	0.41 *	0.24	-0.14	0.17	-0.03	0.26	0.16	0.21
# Vocational Teachers per 100 Students	-0.26 **	0.11	0.07	0.13	0.16 *	0.09	0.06	0.08	-0.10	0.13	0.03	0.11
Career Pathways Prog Available	0.14	0.10	0.31 *	0.17	0.26	0.19	-0.02	0.11	-0.09	0.45	0.03	0.21
% Students Free/Reduced Price Lunch	0.12	0.22	-0.10	0.32	0.31	0.31	-0.07	0.21	0.08	0.35	0.46 *	0.25
% Students Take Academic Courses	-0.06	0.20	-0.55 **	0.27	-0.20	0.31	-0.62 ***	0.17	-1.88 ***	0.70	0.16	0.35
% Students Take Vocational Courses	0.45	0.45	1.00 ***	0.37	1.88 ***	0.43	1.19 ***	0.34	1.92 **	0.90	0.42	0.53
% Prev Students Enter Labor Market (0-5)	-0.04	0.07	0.12	0.09	0.10	0.10	0.06	0.06	-0.41 *	0.24	-0.22 **	0.11
Admission Based on Geography	0.04	0.13	0.06	0.19	0.13	0.23	-0.04	0.13	0.60	0.59	-0.53 **	0.24
Student Infl on Course Selection (0-3)	0.01	0.06	0.17 *	0.10	0.15	0.11	0.08	0.07	-0.25	0.21	0.10	0.15
GED Conferred by High School	-0.03	0.14	-0.12	0.17	-0.08	0.19	-0.34 ***	0.11	0.90 **	0.35	0.48 **	0.21
Constant	-0.20	0.91	-2.87 **	1.43	-4.15 ***	1.39	1.67 *	1.00	-2.12	2.07	-1.23	1.29

Notes:

1) Multinomial Logit regression. Estimates are relative to graduating high school in the general education field.

2) \*, \*\*, \*\*\* denote 90%, 95%, and 99% statistical significance respectively.

3) Standard Errors (SE) are clustered at the school level.

4) Total # Observations is 15,890.

likely to concentrate in trade vocational fields. Offering career pathways programs to students increases their likelihood of taking business vocational courses, while increasing the number of vocational teachers per student at a school increases the likelihood of taking trade vocational courses. As well, students who attend schools that confer GEDs on-site are more likely to pursue GEDs and are also slightly more likely to drop out of high school. Whether schools admit students based on geographic location has little effect on curriculum choice, with the exception that students are less likely to pursue GEDs or dropout. Finally, as students' influence on course selection

increases, students are more likely to take business vocational courses relative to general education courses and are less likely to pursue GEDs.

## E.2 PSE Attainment

Table E.2 provides the results of a first first-stage regression used to construct post-secondary education attainment predicted probabilities. The regression is a multinomial logit regression of PSE attainment on personal characteristics ( $X_i$ ), local labor market characteristics ( $M_i$ ), and high school instruments related to PSE attendance and PSE opportunities ( $A_i$ ).

Table E.2: Selected PSE First Stage Estimates

Variable	1-yr Trade School		2-yr CC		4-yr University	
	Estimate	SE	Estimate	SE	Estimate	SE
<u>1. Personal Characteristics</u>						
Male	<b>-0.63</b> ***	0.06	<b>-0.47</b> ***	0.07	<b>-0.60</b> ***	0.04
Black	0.07	0.10	<b>-0.31</b> ***	0.12	0.05	0.09
Hispanic	<b>-0.21</b> **	0.10	-0.14	0.11	<b>-0.16</b> *	0.09
Other Race	-0.10	0.11	<b>-0.21</b> *	0.11	<b>0.37</b> ***	0.07
Socio-Economic Status	0.04	0.04	<b>0.12</b> ***	0.04	<b>0.51</b> ***	0.03
Test Score	<b>-0.08</b> **	0.04	<b>0.15</b> ***	0.04	<b>0.94</b> ***	0.03
Midwest	0.04	0.10	-0.01	0.11	<b>-0.26</b> ***	0.08
South	0.04	0.10	<b>-0.19</b> *	0.11	<b>-0.24</b> ***	0.08
West	0.10	0.11	-0.16	0.14	<b>-0.44</b> ***	0.09
Suburban	-0.02	0.08	0.04	0.09	<b>-0.17</b> ***	0.06
Rural	-0.02	0.11	0.11	0.13	<b>-0.18</b> **	0.09
Catholic School	<b>0.31</b> **	0.15	<b>0.29</b> *	0.18	<b>0.44</b> ***	0.11
Non-Catholic Private School	0.18	0.15	<b>0.42</b> **	0.17	<b>0.41</b> ***	0.11
<u>2. Local Labor Market Characteristics</u>						
Unemployment Rate	2.56	2.20	0.43	2.58	<b>7.44</b> ***	2.10
(ln) Average Hourly Wage	0.40	0.21	0.12	0.28	0.10	0.19
% Professional Employment	-1.95	1.86	0.86	1.95	<b>3.63</b> **	1.46
% Manual Labor Employment	1.34	0.48	0.70	0.59	0.56	0.44
% Non-Manual Labor Employment	0.02	0.89	0.86	1.12	0.35	0.75
<u>3. High School PSE Instruments</u>						
% Students Attend College Fairs	-0.03	0.03	0.00	0.04	0.03	0.02
% Students in College App Prog (0-5 Scale)	0.01	0.03	0.01	0.03	-0.02	0.02
% Prev Students Enter Labor Market (0-5 Scale)	0.00	0.05	-0.03	0.06	-0.05	0.04
% Prev Students Attend 2yr College (0-5 Scale)	<b>0.13</b> ***	0.05	<b>0.16</b> ***	0.05	0.03	0.03
% Prev Students Attend 4yr College (0-5 Scale)	0.02	0.04	-0.09	0.06	<b>0.12</b> ***	0.04
% Students Free/Reduced Price Lunch	-0.03	0.15	-0.09	0.18	<b>-0.29</b> *	0.16
% Students Take Academic Courses	-0.13	0.16	0.07	0.20	<b>-0.28</b> **	0.14
Admission Based on Geography	0.03	0.13	0.07	0.13	0.10	0.08
Student Infl on Course Selection (0-3)	-0.01	0.06	<b>0.11</b> *	0.06	0.07	0.04
Constant	<b>-2.80</b> ***	0.68	<b>-2.18</b> **	0.91	<b>-1.14</b> ***	0.63

Notes:

1) Multinomial Logit regression. Estimates are relative to no PSE attainment.

2) \* \*\* \*\*\* denote 90%, 95%, and 99% statistical significance respectively.

3) Standard Errors (SE) are clustered at the school level.

4) Total # Observations is 13,250.

## F. Structural Estimates

Tables F.1, F.2, and F.3 display the 216 structural parameter estimates not provided in section 6.2. Table F.1 displays the omitted parameters related to the five occupation choices in the model. Table F.2 displays the omitted parameters related to the three PSE institution choices in the model. Table F.3 displays the omitted parameters related to the five high school field choices and the GED choice in the model.

Table F.1: Additional Structural Occupation Parameters

Variable	Professional		Skilled Manual Labor		Skilled Non-Manual Labor		Skilled Other		Unskilled	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
<u>1. HS Curriculum &amp; 1-yr Trade School Complementarity (Log-Wage Utility)</u>										
Business Voc & 1-yr PSE	-	-	-0.01	(.028)	-0.02	(.025)	-	-	-	-
Trade Voc & 1-yr PSE	-	-	0.05 *	(.030)	0.11 ***	(.039)	-	-	-	-
<u>2. Local Labor Market Characteristics (Log-Wage Utility)</u>										
Unemployment Rate	-0.12	(.274)	0.66 ***	(.179)	-0.62 ***	(.212)	1.35 ***	(.472)	-1.40 ***	(.309)
(ln) Average Hourly Wage	0.10 ***	(.024)	0.03 *	(.017)	0.13 ***	(.020)	-0.07	(.044)	0.11 ***	(.032)
% Professional Emp	0.90 ***	(.197)	0.59 ***	(.141)	-0.55 ***	(.153)	0.52	(.342)	-0.84 ***	(.252)
% Manual Labor Emp	0.22 ***	(.060)	0.25 ***	(.044)	-0.19 ***	(.049)	0.07	(.100)	-0.63 ***	(.074)
% Non-Manual Labor Emp	-0.07	(.104)	-0.08	(.081)	0.44 ***	(.087)	0.44 **	(.195)	0.11	(.138)
<u>3. Personal Characteristics (Log-Wage Utility)</u>										
Midwest	-0.10 ***	(.016)	-0.04 **	(.018)	-0.04 **	(.017)	-0.16 ***	(.035)	-0.03	(.029)
South	-0.09 ***	(.016)	-0.05 ***	(.018)	-0.02	(.017)	-0.10 ***	(.033)	-0.05 *	(.027)
West	-0.02	(.017)	0.04	(.019)	0.03	(.019)	-0.20 ***	(.041)	-0.07 **	(.030)
Suburban	0.02	(.013)	0.05 ***	(.014)	-0.01	(.013)	0.02	(.028)	0.01	(.021)
Rural	0.01	(.017)	0.02	(.018)	0.02	(.018)	-0.06	(.034)	-0.07 **	(.027)
Catholic School	0.07 ***	(.016)	0.11 ***	(.024)	0.06 ***	(.021)	-0.04	(.038)	-0.02	(.038)
Non-Catholic Private Sch	0.02	(.018)	0.03	(.024)	0.09 ***	(.021)	0.09 **	(.037)	0.07	(.043)
<u>4. Personal Characteristics (Non-Pecuniary Utility)</u>										
Midwest	-0.01	(.028)	0.13 ***	(.027)	0.06 *	(.027)	0.11 *	(.054)	0.10 **	(.047)
South	-0.18 ***	(.027)	-0.03	(.026)	-0.15 ***	(.025)	-0.07	(.051)	0.17 ***	(.044)
West	-0.22 ***	(.031)	-0.12 ***	(.029)	-0.13 ***	(.029)	0.03	(.067)	0.18 ***	(.051)
Suburban	0.05 *	(.023)	0.13 ***	(.021)	0.09 ***	(.021)	0.09 **	(.044)	0.14 ***	(.034)
Rural	-0.01	(.029)	0.14 ***	(.028)	-0.01	(.027)	0.16 ***	(.056)	0.11 **	(.047)
Catholic School	0.78 ***	(.038)	0.22 ***	(.037)	0.49 ***	(.036)	0.95 ***	(.065)	0.4 ***	(.065)
Non-Catholic Private Sch	-0.09 **	(.037)	-0.20 ***	(.039)	-0.24 ***	(.035)	-0.09	(.060)	-0.57 ***	(.073)

Notes:

- 1) The parameter on log hourly wages (relating wage utility to non-pecuniary utility) is 1.37, with SE of (.002).
- 2) The variance of the normal wage error terms is estimated to be 0.16, with a SE of (.001).
- 4) \*, \*\*, \*\*\* denote 90%, 95%, and 99% statistical significance respectively.
- 5) Total # Observations is 16,200.
- 6) Standard errors (SE) are calculated using the covariance of the parameter estimate scores, following Train (2003).

Table F.2: Additional PSE Education Structural Parameters

Variable	1-yr Trade School		2-yr CC		4-yr University	
	Estimate	SE	Estimate	SE	Estimate	SE
<u>1. PSE Instruments</u>						
% Prev Students Enter Labor Market (0-5 Scale)	-0.01	(.043)	-0.04 *	(.020)	-0.18 ***	(.021)
% Prev Students Attend 2yr College (0-5 Scale)	0.10 ***	(.038)	0.18 ***	(.018)	-0.16 ***	(.021)
% Prev Students Attend 4yr College (0-5 Scale)	0.05	(.032)	-0.11 ***	(.015)	0.51 ***	(.018)
% Students Attend College Fairs	-0.04	(.031)	0.01	(.014)	0.03	(.016)
% Students in College App Prog (0-5 Scale)	0.01	(.027)	0.04 ***	(.012)	0.18 ***	(.014)
<u>2. Personal Characteristics</u>						
Midwest	0.11	(.106)	-0.09 *	(.048)	-0.90 ***	(.054)
South	0.11	(.101)	-0.17 ***	(.046)	-0.68 ***	(.051)
West	0.09	(.114)	-0.08	(.052)	-0.92 ***	(.058)
Suburban	-0.04	(.077)	0.10 ***	(.037)	-0.74 ***	(.038)
Rural	-0.07	(.102)	-0.01	(.049)	-0.91 ***	(.049)
Catholic School	0.26 *	(.132)	0.75 ***	(.060)	2.71 ***	(.080)
Non-Catholic Private School	0.01	(.134)	0.04	(.060)	1.29 ***	(.082)

Notes:

2) \*, \*\*, \*\*\* denote 90%, 95%, and 99% statistical significance respectively.

3) Total # Observations is 16,200.

4) Standard errors (SE) are calculated using the covariance of the parameter estimate scores, following Train (2003).

Table F.3: Additional HS Education Structural Parameters

Variable	Academic		General Ed		Business Voc		Trade Voc		Other		GED	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
<u>1. HS Education Instruments</u>												
# Voc Teachers per 100 Students	-	-	-	-	-0.01	(.144)	-0.02	(.144)	-0.02	(.094)	-	-
% Stu Free / Reduced Price Lunch	0.12	(.116)	-0.28 ***	(.084)	-0.01	(.149)	-0.02	(.148)	-0.23 **	(.110)	-0.44 ***	(.151)
Admission Based on Geography	7.01 ***	(.110)	6.86 ***	(.101)	6.88 ***	(.129)	6.76 ***	(.124)	6.74 ***	(.110)	8.09 ***	(.258)
Stu Infl on Course Selection (0-3 Scale)	1.77 ***	(.053)	1.8 ***	(.050)	1.83 ***	(.060)	1.80 ***	(.061)	1.87 ***	(.053)	1.81 ***	(.118)
% Prev Stu Enter Labor Market (0-5 Scale)	2.75 ***	(.053)	2.77 ***	(.050)	2.90 ***	(.058)	2.79 ***	(.057)	2.77 ***	(.052)	2.62 ***	(.119)
% Prev Stu Attend 4yr Col (0-5 Scale)	-1.45 ***	(.055)	-1.46 ***	(.053)	-1.40 ***	(.061)	-1.41 ***	(.059)	-1.42 ***	(.055)	-1.66 ***	(.124)
% Prev Stu Attend 2yr Col (0-5 Scale)	4.35 ***	(.042)	4.31 ***	(.040)	4.33 ***	(.047)	4.29 ***	(.046)	4.30 ***	(.042)	4.08 ***	(.092)
<u>2. Personal Characteristics</u>												
Midwest	-0.11	(.092)	0.29 ***	(.080)	0.23 *	(.117)	0.06	(.111)	0.49 ***	(.096)	0.35 **	(.138)
South	-0.17 *	(.082)	-0.27 ***	(.072)	0.04	(.111)	-0.67 ***	(.104)	-0.18 *	(.090)	-0.03	(.126)
West	0.47 ***	(.097)	0.89 ***	(.084)	0.13	(.143)	-0.02	(.129)	0.85 ***	(.102)	0.57 ***	(.152)
Suburban	0.05	(.071)	0.35 ***	(.062)	0.54 ***	(.092)	0.61 ***	(.093)	0.52 ***	(.073)	0.59 ***	(.105)
Rural	-0.42 ***	(.100)	-0.05	(.088)	0.19	(.118)	0.08	(.121)	0.24 **	(.099)	0.15	(.140)
Catholic School	14.81 ***	(.224)	15.29 ***	(.218)	15.64 ***	(.263)	13.82 ***	(.294)	13.48 ***	(.251)	14.74 ***	(.454)
Non-Catholic Private School	3.67 ***	(.111)	4.65 ***	(.089)	4.19 ***	(.197)	2.95 ***	(.263)	3.12 ***	(.151)	5.27 ***	(.157)

Notes:

1) \*, \*\*, \*\*\* denote 90%, 95%, and 99% statistical significance respectively.

2) Total # Observations is 16,200.

3) Standard errors (SE) are calculated using the covariance of the parameter estimate scores, following Train (2003).

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