Supplement to "A dynamic model of personality, schooling, and occupational choice"

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S1. DATA PATTERNS

Figure S1 reports the age-earnings profile by blue-collar or white-collar occupations between ages 18 to 44.[1] Both the white-collar and blue-collar earnings profiles exhibit a concave increase. Prior to age 24, earnings of white-collar and blue-collar workers are similar. Subsequently, however, the shape of the blue-collar earnings profile becomes flatter and then stops growing after age 28. The white-collar earnings profile keeps increasing. Peak average earnings from blue-collar jobs is around AU$58,000, whereas the peak from white-collar jobs is much higher, around AU$99,000.

S2. ADDITIONAL MODEL FIT STATISTICS

Figure S2 shows the probability of changing type. It starts at around 0.75 at age 15 then diminishes to almost 0 around age 30. In other words, our estimation results show that the types become relatively fixed by the time an individual reaches age 30.

Table S1 shows mean values of personality traits by age, education, and occupation categories. It compares data means to the means based on model simulations. It shows that the model captures fairly well the age trends and the differences by education level and occupation.

Table S2 compares the sector transition probabilities for the data and for the model simulations. Cell (i, j) of this table (where i represents the row and j represents the column) gives the percentage of individuals in sector i in the current period who switch to sector j in the next period. Our model replicates the larger diagonal elements of the choice transition matrix, which indicates a substantial persistence in sectors over time. Our simulation also replicates that employed people are fairly likely to switch jobs between white-collar and blue-collar occupations but are not likely to switch to the schooling or home-staying sectors.

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[1]We do not include wage observations between age 15 and age 17, because a large fraction of this age group attends school and works part-time.
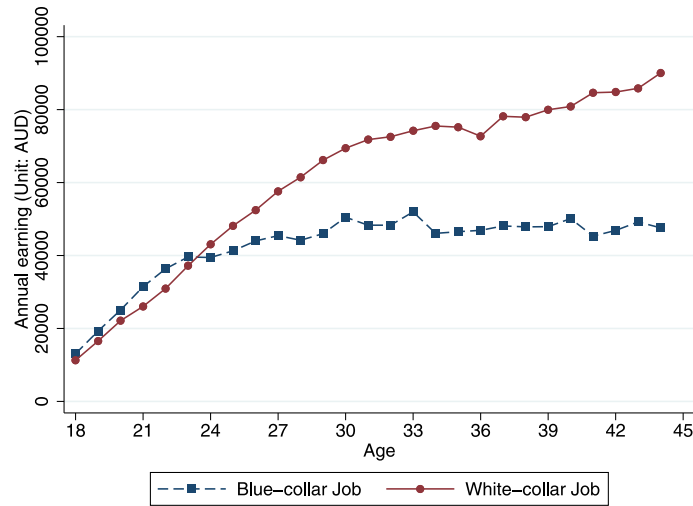
FIGURE S1. Average annual earnings by occupation over the life cycle. *Note*: this figure shows the average annul earnings of blue-collar workers and white-collar workers within each age cohort (18–44). Data source: HILDA data, 2001–2013.

S2.1 *Understanding the importance of time-varying types*

To understand the empirical importance of allowing for time-varying types, we evaluate the same education policies under the restricted "fixed types" model," in which the type probabilities depend only on family background and initial personality traits and do not vary over time. The results are reported in Table S3 and Table S4. There are two main differences. First, as seen by comparing Table 17 with Table S3, the policy impacts are
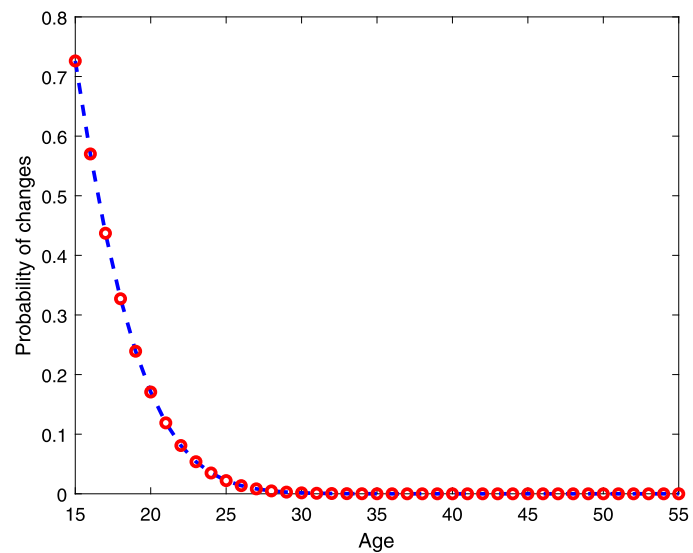

FIGURE S2. The probability of type changing by age.

Table S1. Comparison of mean data and model simulation values (conditional on age groups, education groups, and occupation sectors).

	Open to Exp		Conscientiousness		Extraversion		Agreeableness		Emotional Stab.	
	Data	Sim	Data	Sim	Data	Sim	Data	Sim	Data	Sim
Age groups										
15–19	4.308	4.274	4.532	4.535	4.613	4.616	4.994	4.988	5.083	5.097
20–24	4.377	4.443	4.736	4.787	4.569	4.585	5.085	5.099	5.012	5.070
25–29	4.416	4.417	4.957	4.932	4.411	4.393	5.119	5.114	5.048	5.034
30–34	4.376	4.393	4.956	4.969	4.348	4.360	5.147	5.201	5.039	5.027
35–39	4.328	4.332	5.028	5.039	4.304	4.310	5.149	5.183	5.087	5.066
40–44	4.323	4.321	5.044	5.032	4.204	4.205	5.101	5.122	5.033	5.014
Education										
year ≤ 12	4.170	4.131	4.992	4.981	4.302	4.310	5.092	5.119	5.024	5.017
year > 12	4.552	4.560	5.040	5.055	4.229	4.242	5.176	5.206	5.088	5.047
Occupation										
Blue collar	4.154	4.170	4.887	4.863	4.382	4.387	5.089	5.060	5.014	5.032
White collar	4.452	4.528	5.035	5.022	4.381	4.339	5.159	5.209	5.090	5.062

Note: Data source: HILDA 2005, 2009, and 2013. Males whose personality traits are measured at least one time between 15–44.

now more concentrated among certain types of individuals. The college subsidy policy has no effect on the college graduation decision of type III and has a smaller effect on type II. Second, the effects on labor market earnings are smaller. In our baseline model, the 50% college subsidy policy boosts employed workers' average annual earnings of types II and III by AU\$2234 and AU\$1640. In contrast, the earnings increase drops to AU\$1159 and AU\$77 in the restricted "fixed type" model. The reason for the larger effects in the varying type model is straightforward. When type is changeable, the education investment has both a direct reward in terms of increasing wage offers and an indirect reward through the chance to become a different type.

One can compare the earnings inequality reported in the first panel of Table 15 with the first panel in Table S4 to see how the policy effects on inequality differ for the two models. For the college tuition policy, the 90/10 earnings ratio reduces from 3.77 to 3.67

Table S2. Comparison of the data and model simulation transition probabilities.

		Schooling	Blue Collar	White Collar	Home Staying
Schooling	Data	0.488	0.206	0.215	0.090
	Sim	0.472	0.167	0.273	0.088
Blue collar	Data	0.020	0.781	0.153	0.047
	Sim	0.040	0.781	0.108	0.071
White collar	Data	0.021	0.104	0.846	0.029
	Sim	0.042	0.082	0.844	0.032
Home staying	Data	0.016	0.285	0.223	0.476
	Sim	0.087	0.362	0.218	0.334

Note: Current choices are shown in the left column and next period's choice in the top row.

TABLE S3. Effects of educational policies under the restricted fixed-types model.

Model Simulation	Type I	Type II	Type III	Type IV	Total
	Percentage Finishing High school				
Benchmark	100.0%	91.1%	66.5%	100.0%	87.8%
50% college subsidy	0.0%	0.0%	0.0%	0.0%	0.0%
Compulsory senior secondary school	0.0%	8.9%	33.5%	0.0%	12.2%
	Percentage College Graduates				
Benchmark	57.5%	13.9%	0.1%	84.7%	38.3%
50% college subsidy	20.7%	9.3%	0.9%	7.0%	8.9%
Compulsory senior secondary school	0.0%	0.2%	0.0%	0.8%	0.2%
	Years of Education				
Benchmark	15.639	12.671	11.565	16.770	14.100
50% college subsidy	0.597	0.357	0.038	0.490	0.350
Compulsory senior secondary school	0.001	0.129	0.554	0.035	0.208
	Annual Earnings (for workers, unit: AU$)				
Benchmark	114,110	84,350	32,878	64,128	74,240
50% college subsidy	2241.3	1159.4	77.489	1989.1	1408.8
Compulsory senior secondary school	14.688	622.56	1366.3	245.53	338.89
	Fraction Blue Collar (%)				
Benchmark	9.9%	54.4%	59.6%	12.4%	34.2%
50% college subsidy	−1.4%	−0.6%	−0.2%	−2.8%	−1.2%
Compulsory senior secondary school	0.0%	−0.3%	0.5%	−0.4%	0.0%
	Fraction White Collar (%)				
Benchmark	89.9%	44.9%	11.8%	84.4%	55.7%
50% college subsidy	1.4%	0.6%	0.1%	3.7%	1.4%
Compulsory senior secondary school	0.0%	0.4%	0.9%	0.5%	0.5%
	Utility Change (Unit: AU$10,000)				
Benchmark	88.168	82.715	82.729	86.148	84.958
50% college subsidy	0.925	0.692	0.715	0.949	0.823
Compulsory senior secondary school	−0.322	−0.428	−0.435	−0.306	−0.373

Note: The rows labeled "50% college subsidy" and "compulsory senior secondary school" show the deviations from baseline values under the two separate policy experiments.

in the varying-type model in comparison to 4.25 to 4.23 in the fixed-type model. Thus, the policy effect is greater in the varying-type model. For the compulsory schooling policy, the 90/10 earnings ratio reduces from 3.77 to 3.66 in the varying-type model in comparison to 4.25 to 4.13 in the fixed-type model, a change of similar magnitude.

S3. ADDITIONAL TABLES

Table S5 shows our classification of blue-collar occupations and white-collar occupations. In practice, we classify all occupations into two categories: blue-collar job and white-collar job. White collar jobs includes managers, professionals, technicians, and trades person as well as clerical and administrative workers. Blue- collar jobs include community and personal service workers, sales workers, machinery operators, and drivers as well as laborers.

Table S4. Cost-benefit analysis of the two educational policies under the restricted fixed-type model.

	Baseline Case (no Policy)	50% College Subsidy	Compulsory Senior Secondary School
Earning inequality (for workers) at age 40			
50/10 earnings ratio	2.48	2.49	2.42
90/10 earnings ratio	4.25	4.23	4.13
Expected utility (Unit: AU$10,000)	84.96	85.78	84.58
Expected utility changes (Unit: AU$10,000)	–	0.82	−0.37
Government expenditure (Unit: AU$10,000)	–	1.38	0.00
Exp. utility - gov exp. (Unit: AU$10,000)	–	−0.56	−0.37
Tax revenue (Unit: AU$10,000)	28.21	28.70	28.46
Increase in tax revenue (Unit: AU$10,000)	–	0.48	0.25

Note: Inequality is measured by the 90/10 and 50/10 percentile earnings ratios. The row "expected utility" reports the expected lifetime utility at age 15. The extra gain (loss) under the two policies are reported in the next row "expected utility change". The row "government expenditure" reports the average subsidy the government needs to pay for each individual. The differences between expected utility gain (loss) and government expenditure are reported in the next row "exp. utility - gov exp." The row "tax revenue" shows the expected value of average tax revenue that government would collect from each individual over the life time (until age 65). The change under the two policies are reported in the next row "increase in tax revenue."

Table S6 the detailed survey of personality questionnaires. More specifically, openness to experience is constructed from average scores on six adjective items including imaginative, creative, intellectual, philosophical, deep, and complex. Conscientious-

Table S5. Definitions and examples of the ANZSCO coding of occupations.

Collars	Occupations	Examples
White collar	Managers	Legislators, senior officials, corporate/general managers
	Professionals	Professionals, physicians, mathematicians, engineers, and life science
	Technicians and trades persons	Technicians and associate professionals, physical and engineering scientists, life science, and health associates
	Clerical and administrative workers	Service workers and shop workers, personal and protective service workers, models, salespersons
Blue Collar	Community and personal service workers	Office clerks, consumer service clerks
	Sales workers	Sales representatives, insurance brokers, checkout operators, models, and telemarketers
	Machinery operators and drivers	Industrial spray painters, sewing machinists, motion picture projectionists, crane operators, forklift drivers, and train drivers
	Labourers	Cleaners, steel fixers, product assemblers, packers, slaughters, farm workers, kitchen hands, freight handlers, and handy persons

TABLE S6. Survey used to elicit personality information.

B19 How well do the following words describe you? For each word, cross **one** box to indicate how well that word describes you. There are no right or wrong answers.

*(Cross ☒ **one** box for **each** word.)*

	Does not describe me at all					*Describes me very well*			*Does not describe me at all*					*Describes me very well*
	1	2	3	4	5	6	7		1	2	3	4	5	6	7
talkative	1 2 3 4 5 6 7							jealous	1 2 3 4 5 6 7
sympathetic	1 2 3 4 5 6 7							intellectual	1 2 3 4 5 6 7
orderly	1 2 3 4 5 6 7							extroverted	1 2 3 4 5 6 7
envious	1 2 3 4 5 6 7							cold	1 2 3 4 5 6 7
deep	1 2 3 4 5 6 7							disorganised	1 2 3 4 5 6 7
withdrawn	1 2 3 4 5 6 7							temperamental	1 2 3 4 5 6 7
harsh	1 2 3 4 5 6 7							complex	1 2 3 4 5 6 7
systematic	1 2 3 4 5 6 7							shy	1 2 3 4 5 6 7
moody	1 2 3 4 5 6 7							warm	1 2 3 4 5 6 7
philosophical	1 2 3 4 5 6 7							efficient	1 2 3 4 5 6 7
bashful	1 2 3 4 5 6 7							fretful	1 2 3 4 5 6 7
kind	1 2 3 4 5 6 7							imaginative	1 2 3 4 5 6 7
inefficient	1 2 3 4 5 6 7							enthusiastic	1 2 3 4 5 6 7
touchy	1 2 3 4 5 6 7							selfish	1 2 3 4 5 6 7
creative	1 2 3 4 5 6 7							careless	1 2 3 4 5 6 7
quiet	1 2 3 4 5 6 7							calm	1 2 3 4 5 6 7
cooperative	1 2 3 4 5 6 7							traditional	1 2 3 4 5 6 7
sloppy	1 2 3 4 5 6 7							lively	1 2 3 4 5 6 7

ness is constructed from average scores on six adjective items including orderly, disorganized, efficient, sloppy, inefficient, and systematic. Extraversion is constructed from average scores on six adjective items including quiet, shy, talkative, extroverted, bashful, and lively. Agreeableness is constructed from average scores on four items including warm, kind, sympathetic, and cooperative. Lastly, emotional stability is constructed from average scores on six items including moody, temperamental, jealous, fretful, envious, and touchy.

Co-editor Peter Arcidiacono handled this manuscript.