12 Parental education–occupation matching and offspring earnings

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Introduction

A dominant stream of labor market stratification research is oriented toward job allocation because of its implications for educational expansion and labor market policies. Analyses of overeducation and undereducation, in particular, measure the extent to which earnings variation is attributable to education–occupation "matching" of individuals. Pioneering work by Duncan and Hoffman (1981) revealed that 42 percent of US workers hold more education than is required for their jobs. In later years, scholars reported overeducation rates between 11 percent (Groot 1996) and 31 percent in various high-income countries (Sloane et al. 1999), while a meta-analysis across similar countries estimated the overeducation rate to be 23 percent (Groot and Maassen van den Brink 2000). Importantly, Duncan and Hoffman (1981) and subsequent studies demonstrated that overeducation – also called "surplus education" – yields an earnings advantage over and above the required level of education for one's job. The surplus education coefficient (O) is typically lower than the required education coefficient (R), which means that overeducated workers earn less than equally educated workers in "matched" jobs. "Surplus occupation" (U) also boosts earnings compared to equally educated workers but is associated with an earnings disadvantage *relative to* workers in the same jobs who hold exactly the right amount of education. The model is named after its key parameters – overeducation, required education, and undereducation (ORU) – in a joint wage function.

The ORU model is a dominant framework in the economics of education. It is an appealing model because it improves on the Mincer wage function (which ignores matching), is easy to interpret, and elegantly specifies the joint and separate impact of two highly correlated predictors of earnings, namely the *job's* education requirement and the *worker's* level of education. While

the empirical validity of ORU models is uncontested, scholarship debates its (non-mutually exclusive) theoretical interpretations (Levels et al. 2014). Several economists are concerned with the extent to which overeducation and undereducation indicate "true" skill gaps, skill shortages, and skill mismatches (Cappelli 2015). Conversely, sociologists emphasize why credentials do not always (have to) align with job requirements to generate earnings payoffs, as well as the consequences of both over- and undereducation for job allocation dynamics and various socio-economic outcomes.

This chapter explores the *intergenerational* dimensions of the ORU model, asking: what is the association between parental over- and undereducation and *offspring* earnings? Specifically, we measure the effects of parental "surplus education" (O parameter), parental "surplus occupation" (U parameter), and parental "education–occupation match" on one's earnings – terms preferred in our own analysis but used interchangeably in the literature discussion. Our exercise combines ORU wage-setting mechanisms with scholarship on intergenerational transmission of socio-economic standing: the origin-education-destination (OED) framework. We argue that if forms of education–occupation matching produce relative advantages for the socio-economic wellbeing of individuals and families, they must also give the next generation a leg up in their educational outcomes *and* labor market position. This dynamic bears similarities with the transmission of socio-economic status within families and between generations (Blau and Duncan 1967; Breen and Müller 2020; Featherman and Hauser 1978). To be sure, if surplus education (O) and surplus occupation (U) reflect relatively smaller economic advantages, as shown in conventional ORU models, these parental statuses should be associated with smaller relative boosts for educational attainment and earnings *of offspring*. We further expand this "intergenerational ORU model" with offspring's *own* ORU in order to measure the net intergenerational effect of education–occupation matching on earnings.

Our intergenerational ORU model is applied to US longitudinal data. The earnings of offspring are measured during occupational maturity (mid-1990s). The Online Appendix includes a full replication of the study with UK data from mid-2010s interviews, displaying similar results. The Online Appendix further unpacks gender differences in the parental generation (i.e., both father's and mother's education–occupation matching) and the offspring generation (i.e., both men's and women's earnings) in both countries.

Literature

The standard ORU model

The ORU model is an expansion of the Mincer equation (Mincer 1974), in which earnings are modeled as a function of individuals' attained level of education (in years) and experience (in years, plus a quadratic term). In their original application of the ORU model, Duncan and Hoffman (1981) found that overeducation yields higher earnings relative to individuals in comparable jobs, yet lower earnings compared to similarly educated workers in jobs with education requirements that exactly match their qualifications. Using US Panel Study of Income Dynamics data, they estimated that one year of surplus education (O) is associated with 3 to 5 percent higher earnings. These findings have been replicated in various countries with remarkably similar effect sizes (e.g., Alba-Ramirez 1993; Daly et al. 2000; Hartog and Oosterbeek 1988; Kiker et al. 1997; Korpi and Tåhlin 2009; Sloane 2003; Sloane et al. 1999), including the United States (Cohn and Khan 1995; Rumberger 1987; Sicherman 1991; Tsang et al. 1991). Researchers also reported comparable ORU estimates in subsamples of college graduates (Tsai 2010).

While evidence from ORU models is by no means controversial, scholarship has contested its theoretical implications (Hartog 2000). Duncan and Hoffman (1981) debunked the job competition model (Berg 1970; Freeman 1976; Thurow 1975) and the screening model (Arrow 1973; Spence 1973). The former explicitly stated that surplus education cannot be absorbed by the labor market and that wage setting is solely dependent on job characteristics – not the individual. The ORU model demonstrated that wages are a function of the occupation, its educational requirements, *and* their match with the individual. Some have argued that this is because firms slowly adapt to (new) skills and credentials, which restricts skill-use in individuals' first jobs. Thus, surplus education reflects a *temporary* disequilibrium as overeducated workers are allocated to positions more appropriate to their education later on (Sicherman and Galor 1990). Scholars have cast doubt on this interpretation. Overeducation is indeed much less prevalent among older workers (Alba-Ramirez 1993; Hartog 2000; Sicherman 1991), but overeducated workers also tend to remain overeducated while still enjoying earnings advantages compared to their colleagues (Mendes de Oliveira et al. 2000).

As evidence mounted in favor of surplus education being a stable labor market position, scholarship sought for alternative explanations for its advantage. Most popular among ORU researchers is the assignment model (Sattinger 1993), which stands in the middle between human capital theory and job

competition theory. It states that higher educational requirements raise firms' productivity (including wages), which is *simultaneously* realized by matching the worker's educational level with the job level. This implies that overeducated workers indeed underutilize their skills, but that undereducated workers raise the market's productivity ceiling because they are more productive than they would have been in lower-ranked jobs. Raising educational requirements is optimal as long as workers are top-down allocated according to their skills: "most skilled" workers assigned to the most complex jobs (experiencing surplus education) and "least skilled" workers assigned to the least complex jobs (Teulings 1995). Individuals would continue to invest in education because the returns to surplus education remain positive. This is consistent with persistence of overeducation across careers (Meroni and Vera-Toscano 2017) and with the positive association between overeducation and firm productivity (Kampelmann and Rycx 2012).

Crucially, ORU models allow for an empirical examination of job characteristics, educational requirements, and education–occupation "(mis)matching." This may pick up "skill mismatches," although the connection between both forms of mismatch remains ambiguous. One could be overeducated and still provide a perfect match with regard to demanded and supplied skills on the job. Furthermore, someone with fewer skills than required may be formally matched on the basis of their education and someone whose education matches the job requirement may possess more skills (Kracke et al. 2018). Studies have shown that educational mismatches and skill mismatches correlate only weakly (Flisi et al. 2017; Green and McIntosh 2007). For these reasons, the ORU estimates in models presented should be interpreted in a straightforward manner: deviations from the educational level as required on the job (see Leuven and Oosterbeek's [2011] discussion). This strict definition of overqualification – rather than skill mismatch *per se* – is important for our intergenerational perspective on parental ORU.

Consequences of education–occupation matching

The observed ORU effects have given rise to research on the implications for socio-economic inequalities. Do different forms of education–occupation matching lead to long-term desirable and undesirable outcomes for society and individuals across their work lives? For example, it is paramount to examine consequences of surplus education because overeducated workers are evidently not becoming less educated over time – mid-career education *level* typically remains unchanged. Yet they are likely becoming more educated (or skilled) through on-the-job training or job-specific credentials. The long-term consequences of surplus education hinge on two possible underlying dynam-

ics: workers may either (intentionally) move from one overeducated position to another, or workers simply fail to make progress within their (current) overeducated position (Sloane et al. 1999). In other words, surplus education yields continuous payoffs that are sought-after, or it reflects workers who are potentially stuck in a secondary sector from which they cannot escape. These possibilities are not mutually exclusive and also apply to surplus occupation (U).

On the one hand, one may assume forms of accumulating disadvantages from the fact that being overeducated is associated with lower job satisfaction and lower job retention (Tsang et al. 1991). These could be non-trivial indicators of adverse effects for future employment positions as well as personal and family life. Some scholars also argue that overeducation is associated with a net earnings penalty and reduced employment opportunities later on (Baert et al. 2013), such that the societal investments made in surplus education workers could be perceived as "a waste of resources" (Caroleo and Pastore 2018). Research also suggests that historically disadvantaged groups are at higher risk of attaining a surplus education position, as well as workers who have had labor market interruptions, such as women with children (Groot and Maassen van den Brink 1996).

On the other hand, evidence points to overeducation being a desirable labor market status. In line with the assignment model, surplus education appears more prevalent among younger workers (Groot 1993, 1996) – which can be attributed to less experience and less on-the-job training – and overeducated workers change jobs more frequently (Sicherman 1991). Overeducated workers who switch jobs are more likely to change occupation, while undereducated workers are more likely to move to a different firm within the same occupation (Alba-Ramirez 1993). Furthermore, early-career overeducated workers are more likely to be overeducated later on (Meroni and Vera-Toscano 2017) and have significantly steeper earnings progression (Mendes de Oliveira et al. 2000). These mobility patterns suggest that many overeducated workers "choose" to be overqualified, while experiencing relative labor market advantages. It also implies that overeducated workers are not necessarily in a position of frustration about "unfulfilled skill-use."

Taken together, it is paramount to examine the long-lasting advantages and disadvantages of education–occupation matching for individuals and households. The extension proposed in this study asks whether matching (R), surplus education (O), and surplus occupation (U) are associated with the earnings of *offspring* (who grew up in the same household). We therefore derive hypotheses from intergenerational mobility research.

The intergenerational ORU model

The cornerstone of intergenerational mechanisms of socio-economic inequality is the occupation-education-destination (OED) framework as originally proposed by Blau and Duncan (1967). It spurred a wide body of research on the relationship between parental occupation ("origin") and offspring labor market outcomes ("destination"). This relationship is twofold – it contains one indirect path via offspring education (E) into destination and another direct path toward destination. It uncovers the extent to which ascriptive features of individuals (i.e., parental class) impact their socio-economic destination and, simultaneously, how much of this relationship is moderated or mediated by offspring's own attained education. The paths of the OED framework have been well established in subsequent empirical work in the United States and many other high-income countries (Breen and Müller 2020).

Many social stratification researchers treat the O and D parameters as indicators of socio-economic standing in both generations, which allows measurement of intergenerational inequality. While many studies rely on class or occupation (SEI), recent studies have explored a variety of socio-economic indicators to understand intergenerational mechanisms – most prominently the parent–offspring correlations in educational attainment, family income, and individual earnings (Blanden 2013; Corak 2004). The results underscore the plurality of transmission of economic, social, and cultural advantages and inequalities across generations. Thus far, the role of parental education–occupation matching has not been considered in an intergenerational mobility or inequality framework.

The current intergenerational ORU exercise contains several non-mutually exclusive implications for OED research. The degree of perfect parental "education–occupation" (R) may carry the largest intergenerationally transmissible socio-economic advantage. In addition, a positive association between parental surplus education (O) and offspring earnings, or a positive association between parental surplus occupation (U) and offspring earnings, would indicate that *deviating* from a "perfect education–occupation match" also yields advantages for the next generation. Some of these advantages may operate via offspring education (E), such that the effects of parental ORU on offspring earnings are moderated by offspring education. The different parental ORU components could point to the specific elements of parents' relative labor market position that are relevant for intergenerational advantages. These parameters could, for instance, indicate whether growing up in a household in which parents are bringing more (or less) education to their jobs than required

may carry economic advantages or (unconsciously) set examples for one's initial school-to-work transition and subsequent labor market integration.

Analytical approach and research design

We concentrate on two interrelated questions about the intergenerational associations between parental education–occupation matching and offspring educational and labor market outcomes, as well as whether the earnings effects are moderated by offspring's earnings own educational pathway. First, focusing on offspring education and labor market location, we ask: (1a) What is the association between parental ORU on offspring years of education? (1b) And what is the association between parental ORU on offspring required years of education for their current occupation? Second, addressing the intergenerational effects of parental education–occupation matching, we ask: (2a) What is the association between parental ORU and offspring earnings? (2b) And to what extent are these pathways absorbed by individuals' own educational destinations?

Data are drawn from the 1996 wave of the National Longitudinal Survey of Youth 1979 (NLSY79) (Bureau of Labor Statistics 2019), when most respondents had reached occupational maturity (ages 31–38). The NLSY79 records the father's and mother's occupation in three-digit 1970 census codes, which we converted to the Standard Occupational Classification (SOC). The SOC can subsequently be matched with occupations' education requirements in the Occupational Information Network (O*NET) (National Center for O*NET Development 2022).

From this sample, individuals are selected if they are not enrolled in education, are employed, and report positive annual earnings in the interview year. We also only select respondents for whom intergenerational linkages can be observed based on parent(s), stepparent(s), or adoption parent(s). Parental data should include (a) their highest educational credential and (b) a valid occupation code for the main job when respondents were in high school. Finally, we drop cases for whom (c) the parental SOC cannot be matched with the O*NET data because of inevitable data limitations. For example, some jobs are only classified in the broadest possible category (e.g., "miscellaneous teachers"), which cannot be linked to any particular SOC code. A similar problem arises for occupational titles that have disappeared (e.g., "molder apprentice"). Military occupational titles are not covered in O*NET. These steps reduce the analytical sample by about 25 percent (remaining N = 4,556).

One straightforward way to transform the original ORU model into an intergenerational ORU model would be to regress offspring's logged annual earnings ($\ln E_i$) on parental overeducation (E^{po}), parental **r**equired education (E^{pr}), and parental **u**ndereducation (E^{pu}), while controlling for respondent's work experience (i.e., age) and residence in an urban area [1]:

$$\ln E_i = \beta + \delta_{po} E^{po} + \delta_{pr} E^{pr} + \delta_{pu} E^{pu} + \gamma_i AGE + \alpha_i URBAN + \varepsilon_i \quad [1]$$

This equation deviates slightly from Duncan and Hoffman's (1981) model because no squared age term is necessary for our mid-career study sample and city size and residence in the South are replaced with a dummy variable for urbanicity. Following Korpi and Tåhlin (2021), we employ another modification to improve the interpretability of the ORU parameters. We use years of matched education–occupation (δ_{pm}) instead of years of required education (R). This implies that the parental overeducation and undereducation parameters can be interpreted as years of "surplus education" (δ_{se}) and years of "surplus occupation" (δ_{so}), respectively, while the R parameter reflects both matched occupation and matched education since these have identical (matched) values. We further add dummies for the respondent's gender, part-time employment, and self-employment:

$$\ln E_i = \beta + \delta_{se} E^{se} + \delta_{pm} E^{pm} + \delta_{so} E^{so} + \gamma_i AGE + \alpha_i URBAN + \omega_i GENDER + \lambda_i PTIME + \psi_i SELFEMP + \varepsilon_i \quad [2]$$

We assess the extent to which the intergenerational associations of ORU are moderated through respondent's own education and job attainment by expanding equation [2]. In order to (first) establish whether a relationship exists between parental ORU and offspring initial educational and labor market destinations, we fit the parental ORU parameters on [3] offspring years of education (D_i) and [4] offspring required years of education in their current job (R_i):

$$D_i = \beta + \delta_{se} E^{se} + \delta_{pm} E^{pm} + \delta_{so} E^{so} + \gamma_i AGE + \alpha_i URBAN + \omega_i GENDER + \varepsilon_i \quad [3]$$

$$R_i = \beta + \delta_{se} E^{se} + \delta_{pm} E^{pm} + \delta_{so} E^{so} + \gamma_i AGE + \alpha_i URBAN + \omega_i GENDER + \varepsilon_i \quad [4]$$

Components of the parental ORU

The ORU variables can be derived using a variety of different approaches (Capsada-Munsech 2019). These include "worker self-assessment" (WA), which was employed by Duncan and Hoffman (1981). One disadvantage of this measure is the likely upward bias of overeducation because workers could interpret a question about the level of education as referring to qualifications to *get* the job rather than to perform job tasks (Hartog 2000). This question is unavailable in the NLSY79. Second, proposed by Verdugo and Verdugo (1989), one can use "realized matches" (RA) in the labor market to derive either the mean or the mode for the educational credentials in the respondent's occupations (see also Groot and Maassen van den Brink 1996). Although this technique produces similar results (Cohn and Khan 1995), it is not preferred because it treats job allocation as endogenous (Hartog 2000). Third, a "job analysis" (JA) approach makes use of a systematic evaluation by professional job analysts of the required level of education for all jobs titles in an occupational classification (e.g., Rumberger 1987). This measure is most sensitive to the role of technological change in occupations' skill requirements and has shown to produce the most reliable estimates of over- and undereducation, both over time and across countries (Groot and Maassen van den Brink 2000; Hartog 2000).

In this study, the JA approach is used to measure the required years of education of each parental job and respondent job. We derive the modal education level required for each SOC codes using the occupational information in O*NET. The modal credential required for the occupation is converted into years of education using the following conversions: less than high school (10 years), high school (12 years), some college (13 years), associate's degree (14 years), bachelor's degree (16 years), and postgraduate degree (17 years). The number of matched education–occupation years (R) and its deviations (O and U) are calculated by comparing the education years required with education years attained. We apply the same approach for offspring's ORU variables. Parental ORU variables are calculated for fathers and mothers separately. However, we opt for a dominance approach in the analysis, whereby the ORU variables of the parent with the highest ranking ISEI (International Socio-Economic Index of Occupational Status) are included in the model.

Results

Offspring education and required years of education

The first exercise examines the relationship between, on the one hand, parental over- and undereducation and, on the other hand, offspring education attained and labor market position. Table 12.1 presents the parental ORU coefficients in a regression on the attained number of years of education of respondents. Having parents with more matched education–occupation years yields higher levels of education attained, as shown in the baseline model (1) as well as the full model which contains all socio-demographic controls (2): β=.476 and β=.471, respectively. Furthermore, concentrating on model 2, we find that parental surplus education is associated with higher educational attainment (β=.245), while parental surplus occupation also increases the number of years of education (β=.164). Hence, parental ORU is associated with individuals' educational attainment in a similar way as in the standard ORU model. Furthermore, in agreement with research on the O-E pathways from intergenerational inequality research, offspring from families in which parental education and occupation were matched attain more education, followed by those with surplus education parents and surplus occupation parents. In practice, these individuals overlap rather than being distinct as many have one "matched" part and one "mismatched" part of their link between education and occupation. However, by definition, no individual has positive values all three ORU components.

Table 12.2 contains the parental ORU estimates of offspring required years of education of their occupation. The coefficients from the baseline model 1 indicate that matched education–occupation years of parents yields a significantly higher required level of education of offspring's job (β=.271). Parental surplus education is associated with significantly higher educational requirements of one's job: one year of parental overeducation increases offspring required years of education with .207 years. Each year of parental surplus occupation is associated with .153 more years of required years of education for offspring jobs. Controls for socio-demographics, which are added in model 2, do not change these coefficients. Model 3 indicates that the effects of parental ORU on offspring required years of education are moderated by offspring's *own* educational attainment in both countries, which accords with research on OED pathways.

Table 12.1 Effects of parental ORU on offspring years of education

	model 1	model 2
parental matched education–occupation (years)	.476***	.471***
	(.017)	(.017)
parental surplus education (years)	.258***	.245***
	(.047)	(.047)
parental surplus occupation (years)	.163***	.164***
	(.023)	(.023)
age		-.003
		(.015)
gender (woman)		.287***
		(.063)
urban area		.468***
		(.079)
intercept	7.464	6.839
	(.222)	(.571)
R-sq	.191	.200
N	4,556	4,556

Notes: Ages 31–38. P-values: * = <.05, ** = < .01, *** = < .001 (two-sided). Standard errors in parentheses.
Source: NLSY79 (offspring observed in 1996).

Intergenerational ORU

The main results from the intergenerational ORU are presented in model 1 of Table 12.3. This specification replicates the original ORU as introduced by Duncan and Hoffman (1981). Parental matched education–occupation years (R) is associated with about 9.9 percent higher offspring earnings. Surplus education (O) in the parents' generation has *no* statistically significant impact on offspring earnings. However, parental surplus occupation (U) increases offspring earnings. Each year of parents being short of the educational requirement of their occupation increases offspring earnings with about 4.0 percent. Model 3 adds additional controls for part-time work and self-employment

Table 12.2 Effects of parental ORU on required years of education of offspring occupation

	model 1	model 2	model 3
parental matched education–occupation (years)	.271***	.270***	.093***
	(.016)	(.016)	(.016)
parental surplus education (years)	.207***	.199***	.094*
	(.045)	(.045)	(.041)
parental surplus occupation (years)	.153***	.152***	.092***
	(.022)	(.021)	(.019)
offspring education (years)			.378***
			(.013)
age		-.004	-.001
		(.014)	(.013)
gender (woman)		.398***	.272***
		(.061)	(.055)
urban area		.127	-.049
		(.074)	(.067)
intercept	10.001	9.481	6.810
	(.212)	(.545)	(.499)
R-sq	.083	.094	.265
N	3,713	3,713	3,713

Notes: Ages 31–38. P-values: * = <.05, ** = < .01, *** = < .001 (two-sided). Standard errors in parentheses.
Source: NLSY79 (observed in 1996).

to the original ORU specification, which leads to parental surplus education becoming statistically significant (+3.9%).

We next add offspring's own years of education to the baseline specification (model 2) and the expanded specification (model 4) of the intergenerational ORU. This additional control, which mimics an OED framework, moderates the parental R and U effects on earnings. The coefficients of parental education–occupation matching and parental surplus occupation are reduced by about half.

Table 12.3 Intergenerational ORU model applied to offspring logged annual earnings

	model 1	model 2	model 3	model 4
parental matched education–occupation (years)	.099***	.041***	.103***	.045***
	(.007)	(.007)	(.007)	(.007)
parental surplus education (years)	.036	.006	.039*	.009
	(.020)	(.019)	(.020)	(.019)
parental surplus occupation (years)	.040***	.020*	.041***	.021*
	(.010)	(.009)	(.009)	(.007)
offspring education (years)		.124***		.122***
		(.006)		(.006)
age	.008	.009	.010	.010
	(.007)	(.006)	(.006)	(.006)
gender (woman)	-.534***	-.569***	-.449***	-.485***
	(.027)	(.026)	(.027)	(.026)
urban area	.168***	.109**	.164***	.107**
	(.034)	(.033)	(.033)	(.032)
part-time			-.915***	-.901***
			(.052)	(.050)
self-employed			-.123**	-.100*
			(.047)	(.045)
intercept	9.047	8.198	8.895	8.063
	(.246)	(.239)	(.238)	(.231)
R-sq	.126	.198	.183	.253
N	4,556	4,556	4,556	4,556

Notes: Part-time defined as 30 hours or less. Ages 31–38. P-values: * = <.05, ** = < .01, *** = < .001 (two-sided). Standard errors in parentheses.
Source: NLSY79 (observed in 1996).

Combined generations ORU

Presented in Table 12.4, we fit a standard ORU specification for respondents (model 2) and a combined standard and intergenerational ORU specification (model 3), which can be compared to the intergenerational ORU (model 1).

Table 12.4 Combined standard and intergenerational ORU model applied to offspring logged annual earnings

	model 1	model 2	model 3
parental matched education–occupation (years)	.103***		.035***
	(.007)		(.008)
parental surplus education (years)	.039*		.007
	(.020)		(.020)
parental surplus occupation (years)	.041***		.017
	(.009)		(.009)
offspring matched education–occupation (years)		.201***	.186***
		(.008)	(.008)
offspring surplus education (years)		.094***	.082***
		(.013)	(.013)
offspring surplus occupation (years)		.063***	.060***
		(.011)	(.011)
age	.010	.018**	.018**
	(.006)	(.006)	(.006)
gender (woman)	-.449***	-.484***	-.478***
	(.027)	(.027)	(.027)
urban area	.164***	.120***	.118***
	(.033)	(.033)	(.033)
part-time	-.915***	-.889***	-.899***
	(.052)	(.054)	(.054)
self-employed	-.123**	.021	.008
	(.047)	(.051)	(.051)
intercept	8.895	7.323	7.104
	(.238)	(.243)	(.249)
R-sq	.183	.272	.277
N	4,556	3,713	3,713

Notes: Part-time defined as 30 hours or less. Ages 31–38. P-values: * = <.05, ** = < .01, *** = < .001 (two-sided). Standard errors in parentheses.
Source: NLSY79 (observed in 1996).

We find that the standard ORU yields estimates that are in line with the literature. *Respondent's* surplus education is associated with higher earnings compared to workers in the same jobs (+9.4%, model 2). However, this positive effect is smaller compared to the earnings advantage from (perfect) matching education–occupation: +20.1%, model 2. Respondent's surplus occupation is associated with the smallest positive effect: +6.3% (model 2). As expected, the coefficients of the standard ORU are much stronger than the intergenerational (parental) ORU coefficients (model 1).

The results from model 3, which adds parental ORU variables, indicate that the respondent's ORU associations with their own earnings remain virtually unchanged compared to model 2. The parental ORU coefficients are reduced in the combined standard and intergenerational compared to model 1. Importantly, after accounting for respondent's ORU effects, *parental* years of matched education–occupation (still) increase earnings by about 3.5 percent. However, parental surplus occupation is no longer statistically significant (comparing models 1 and 3). In other words, (perfect) parental education–occupation matching affects offspring's earnings in a similar fashion as in the standard ORU relationships with earnings, over and above the impact of offspring's *own* degree of over- and undereducation.

Conclusion

The ORU framework continues to influence the economics of education and social stratification scholarship because higher education continues to expand, and a substantial share of the workforce remains overeducated. This study is the first to examine the long-term intergenerational consequences of ORU by measuring the association between parental over- and undereducation and *offspring* earnings. This approach contributes to our understanding of the long-term advantages and disadvantages of educational matching, as well as the extent to which educational matching in "O" (origin), has something to say about the "E" (education) and "D" (destination), analogous to the OED framework for intergenerational mobility research.

The empirical results from the intergenerational ORU are straightforward. Parents' levels of education–occupation matching (R parameter), as measured in years, increase earnings by 10.3 percent. We find a positive association between parents' surplus education and offspring earnings (+3.9%). Importantly, a parent's surplus occupation (or "undereducation") also yields a positive earnings effect of about 4 percent. These intergenerational ORU

estimates are remarkably similar to the standard ORU model. Hence, all three parental skill components have significant positive payoffs, with matched education–occupation providing the strongest impact. Note that ORU coefficients do not reflect exact counterfactuals: in practice, many individuals have parents with positive values on both matched education–occupation and either surplus education or surplus occupation, while having positive values on all three ORU indicators is not possible.

How should we understand the findings from an intergenerational ORU? First, it is important to note that parental ORU impacts both offspring's educational and occupational attainment (see Tables 12.1 and 12.2). Second, we found that the positive earnings effects of parental education–occupation matching (R) and parental surplus occupation (U) persist after additionally controlling for respondents' own educational attainment. This is also the case for the positive effect of parental education–occupation matching (O) when accounting for respondent's own ORU. This suggests that the type and strength of educational matching in the childhood home have considerable direct impact on one's earnings level. Specifically, surplus occupation boosts the earnings of individuals, but it also positively affects the earnings of the next generation, regardless of their offspring's education. It implies that surplus education and surplus occupation reflect socio-economic advantages with far-reaching consequences. Future research should therefore address the ways in which young individuals experience the educational matching of their parents, and how these *relative* advantages in turn boost earnings.

Furthermore, our findings have implications for intergenerational mobility research. The ORU estimates indicate intergenerational effects on earnings that bear conceptual similarities with the ways in which parental occupation have shown to affect offspring occupational attainment (Blau and Duncan 1967) and offspring earnings (Corak 2004). Future research should therefore address the ways in which young individuals experience the educational matching of their parents while in school and transitioning to the labor market. Integrating the OED and ORU frameworks, one may consider "origin occupation" as containing intergenerationally transmissible relative advantages that are located in parental job, *as well as* the embedded parental education–occupation matching. The intergenerational ORU demonstrates that the origin component in the O-D pathway is multifaceted: advantages are not only located in the vertical occupational positioning of parents, but also in the ways in which parents' education is matched with the occupation's requirements. Different *types of parental occupation match* absorb a considerable component of the intergenerational effect of O on both E and D.

Additional exercises available in the Online Appendix demonstrate that, among workers with two working parents during childhood, components of the ORU of the father and the mother can *jointly* affect offspring earnings – with slightly larger effect sizes being for fathers. These results should be interpreted with some caution given the smaller sample sizes of the selected subgroup of two-parent working families. Finally, we find virtually the same effect sizes for the parental ORU parameters for offspring's attained education and offspring's occupational attainment, and only small differences between the United States and the United Kingdom.

References

Alba-Ramirez, A. (1993). "Mismatch in the Spanish labor market: Overeducation?" *Journal of Human Resources*, 28(2): 259–78.

Arrow, K.J. (1973). "Higher education as a filter." *Journal of Public Economics*, 2(3): 193–216.

Baert, S., Cockx, B., and Verhaest, D. (2013). "Overeducation at the start of the career: Stepping stone or trap?" *Labour Economics*, 25: 123–40.

Berg, I. (1970). *Education and Jobs: The Great Training Robbery*. Westport, CT: Praeger.

Blanden, Jo. (2013). "Cross-country rankings in intergenerational mobility: A comparison of approaches from economics and sociology." *Journal of Economic Surveys*, 27(1): 38–73.

Blau, P.M., and Duncan, O.D. (1967). *The American Occupational Structure*. New York: Free Press.

Breen, R., and Müller, W. (2020). "Introduction: Social mobility and education in the twentieth century." Pp. 1–19 in Breen, R. and Müller, W. (eds.). *Education and Intergenerational Social Mobility in Europe and the United States*. Stanford, CA: Stanford University Press.

Bureau of Labor Statistics, U.S. Department of Labor. (2019). *National Longitudinal Survey of Youth 1979 Cohort, 1979–1996*. Columbus, OH: Center for Human Resource Research (CHRR), Ohio State University.

Cappelli, P.H. (2015). "Skill gaps, skill shortages, and skill mismatches: Evidence and arguments for the United States." *ILR Review*, 68(2): 251–90.

Capsada-Munsech, Q. (2019). "Measuring overeducation: Incidence, correlation and overlaps across indicators and countries." *Social Indicators Research*, 145(1): 279–301.

Caroleo, F.E., and Pastore, F. (2018). "Overeducation at a glance: Determinants and wage effects of the educational mismatch based on AlmaLaurea data." *Social Indicators Research*, 137(3): 999–1032.

Cohn, E., and Khan, S.P. (1995). "The wage effects of overschooling revisited." *Labour Economics*, 2(1): 67–76.

Corak, M. (2004). *Generational Income Mobility in North America and Europa*. Cambridge: Cambridge University Press.

Daly, M.C., Büchel, F., and Duncan, G.J. (2000). "Premiums and penalties for surplus and deficit education: Evidence from the United States and Germany." *Economics of Education Review*, 19(2): 169–78.
Duncan, G.J., and Hoffman, S.D. (1981). "The incidence and wage effects of overeducation." *Economics of Education Review*, 1: 75–86.
Featherman, D.L., and Hauser, R.M. (1978). *Opportunity and Change: Studies in Population*. New York: Academic Press.
Flisi, S., Goglio, V., Meroni, E., Rodrigues, M., and Vera-Toscano, E. (2017). "Measuring occupational mismatch: Overeducation and overskill in Europe – Evidence from PIAAC." *Social Indicators Research*, 131(3): 1211–49.
Freeman, R.B. (1976). *The Over-Educated American*. New York: Academic Press.
Green, F., and McIntosh, S. (2007). "Is there a genuine under-utilization of skills amongst the over-qualified?" *Applied Economics*, 39(4): 427–39.
Groot, W. (1993). "Overeducation and the returns to enterprise-related schooling." *Economics of Education Review*, 12(4): 299–309.
Groot, W. (1996). "The incidence of, and returns to overeducation in the UK." *Applied Economics*, 28(10): 1345–50.
Groot, W., and Maassen van den Brink, H. (1996). "Glass ceilings or dead ends: Job promotion of men and women compared." *Economics Letters*, 53(2): 221–6.
Groot, W., and Maassen van den Brink, H. (2000). "Overeducation in the labor market: A meta-analysis." *Economics of Education Review*, 19(2): 149–58.
Hartog, J. (2000). "Over-education and earnings: Where are we, where should we go?" *Economics of Education Review*, 19(2): 131–47.
Hartog, J., and Oosterbeek, H. (1988). "Education, allocation and earnings in the Netherlands: Overschooling?" *Economics of Education Review*, 7(2): 185–94.
Kampelmann, S., and Rycx, F. (2012). "The impact of educational mismatch on firm productivity: Evidence from linked panel data." *Economics of Education Review*, 31(6): 918–31.
Kiker, B.F., Santos, M.C., and Mendes De Oliveira, M. (1997). "Overeducation and undereducation: Evidence for Portugal." *Economics of Education Review*, 16(2): 111–25.
Korpi, T., and Tåhlin, M. (2009). "Educational mismatch, wages, and wage growth: Overeducation in Sweden, 1974–2000." *Labour Economics*, 16(2): 183–93.
Korpi, T., and Tåhlin, M. (2021). "On-the-job training: A skill match approach to the determinants of lifelong learning." *Industrial Relations Journal*, 52(1): 64–81.
Kracke, N., Reichelt, M., and Vicari, B. (2018). "Wage losses due to overqualification: The role of formal degrees and occupational skills." *Social Indicators Research*, 139(3): 1085–1108.
Leuven, E., and Oosterbeek, H. (2011). "Overeducation and mismatch in the labor market." *Handbook of the Economics of Education*, 4: 283–326.
Levels, M., Van der Velden, R., and Allen, J. (2014). "Educational mismatches and skills: New empirical tests of old hypotheses." *Oxford Economic Papers*, 66: 959–82.
Mendes de Oliveira, M., Santos, M.C. and Kiker, B.F. (2000). "The role of human capital and technological change in overeducation." *Economics of Education Review*, 19(2): 199–206.
Meroni, E.C., and Vera-Toscano, E. (2017). The persistence of overeducation among recent graduates. *Labour Economics*, 48: 120–43.
Mincer, J. (1974). *Schooling, Experience and Earnings*. New York: Columbia University Press.

National Center for O*NET Development. (2022). O*NET OnLine. http:// www .onetonline.org.
Rumberger, R.W. (1987). "The impact of surplus schooling on productivity and earnings." *Journal of Human Resources*, 22(1): 24–50.
Sattinger, M. (1993). "Assignment models of the distribution of earnings." *Journal of Economic Literature*, 31(2): 851–80.
Sicherman, N. (1991). "'Overeducation' in the labor market." *Journal of Labor Economics*, 9(2): 101–22.
Sicherman, N., and Galor, O. (1990). "A theory of career mobility." *Journal of Political Economy*, 98(1): 169–92.
Sloane, P.J. (2003). "Much ado about nothing? What does the overeducation literature really tell us." Pp. 11–48 in Büchel, F., de Grip, A., and Mertens, A. (eds.). *Overeducation in Europe: Current Issues in Theory and Policy*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar Publishing.
Sloane, P.J., Battu, H., and Seaman, P.T. (1999). "Overeducation, undereducation and the British labour market." *Applied Economics*, 31(11): 1437–53.
Spence, M. (1973). "Job market signaling." *Quarterly Journal of Economics*, 87(3): 353–74.
Teulings, C.N. (1995). "The wage distribution in a model of the assignment of skills to jobs." *Journal of Political Economy*, 103(2): 280–315.
Thurow, L.C. (1975). *Generating Inequality*. New York: Basic Books.
Tsai, Y. (2010). "Returns to overeducation: A longitudinal analysis of the US labor market." *Economics of Education Review*, 29(4): 606–17.
Tsang, M.C., Rumberger, R.W., and Levin, H.M. (1991). "The impact of surplus schooling on worker productivity." *Industrial Relations: A Journal of Economy and Society*, 30(2): 209–28.
Verdugo, R.R., and Verdugo, N.T. (1989). "The impact of surplus schooling on earnings: Some additional findings." *Journal of Human Resources*, 24(4): 629–43.