The interplay of the origin, education, destination triangle over the life course

An application of counterfactual mediation analysis

Fabian Kratz, Bettina Pettinger, University of Munich (LMU)

Introduction

- Life course approach prominent in all social science

  (Mayer 2009)

- Scientific interest in life cycle patterns of social inequality

  (Yang & Lee 2009; Manzoni et al. 2014)

Our contribution

- – Apply counterfactual mediation analysis to examine how the total, direct (net of education) and indirect effect of social origin on prestige develop over the life course
- – Explore interdependencies between inter and intra-generational mobility
- – *Outcome variable:*
  Occupational status (Treiman occupational prestige scale SIOPS)

O,E,D triangle

Going back to Blau & Duncan (1967): O, E, D

Exposure
(social origin)
  a)
Mediator
(education)
  b)
Outcome
(prestige)
  c)
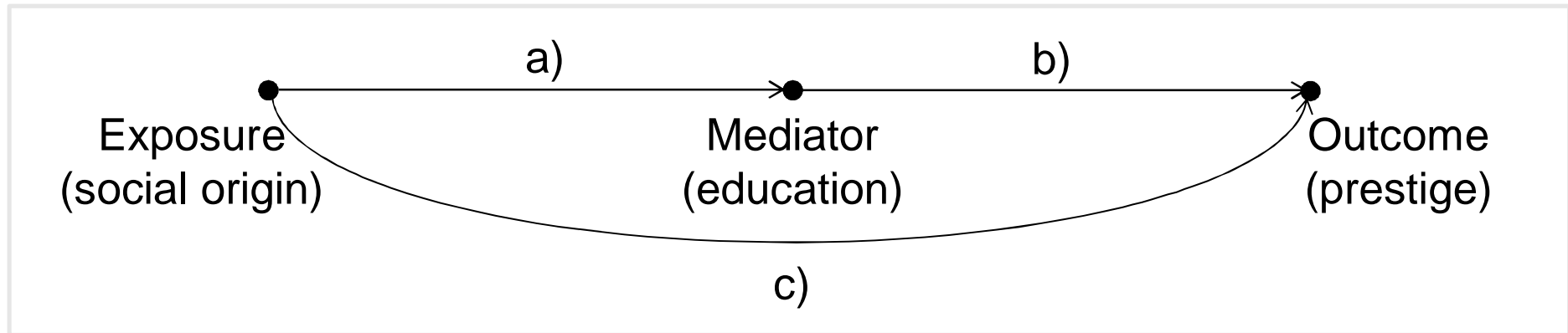
A large sociological literature examines:

Total and direct effects (net of education) of some kind of social-origin measure (e.g. parental education) on some kind of outcome (e.g. prestige)

Counterfactual mediation analysis

- Conduct counterfactual mediation analyses, examine if there is an exposure mediator interaction

- If there is such an interaction, the CDE depends on m:

  $CDE(m)$: The controlled direct effect expresses how much prestige would change on average if education were fixed at level m uniformly in the population but the treatment were changed from level $a^* = 0$ to level $a = 1$.

- But NDE and NIE that are independent of m

(Vander Weele 2015)

Counterfactual mediation analysis

- NDE: The natural direct effect expresses how much prestige would change if social origin were set at level a **= 1** versus level a^* **= 0** but for each individual education were kept at the level it would have taken, for that individual, in the absence of the exposure.

- NIE: The natural indirect effect expresses how much prestige would change on average if social origin were fixed at level a **= 1** but education were changed from the level it would take if a^* **= 0** to the level it would take if a **= 1**.

- Proportion mediated: PM **=** $\dfrac{NIE}{NDE+NIE}$

(Vander Weele 2015)

Exposure-mediator interaction

In our example exposure-mediator interactions are highly plausible

- – Direct effects of social origin (net of education) may work through parental networks, information or habitus

  (e.g. Breen and Goldthrope 2001, Bukodi and Goldthorpe 2011, Jackson et al. 2005, Jackson 2006, Goldthorpe and Jackson 2008)

- – The networks and information of high educated parents (and the habitus) may be more beneficial for highly educated offspring than for low educated offspring

  (e.g. Brown 1995, Brown and Hesketh 2004, Gugushvili et al. 2017, Mastekaasa 2009)

Exposure-mediator interaction

Direct origin effects

High education

Low education

Age
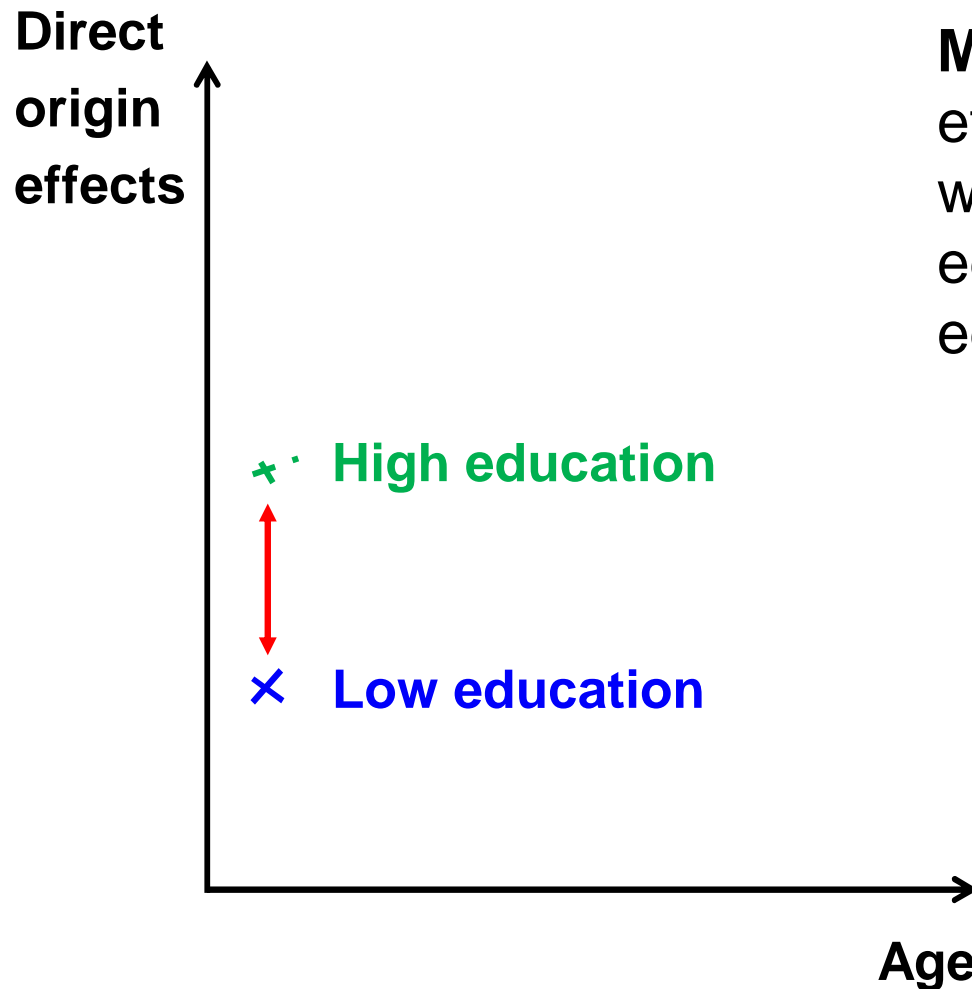
Mechanism: Direct social origin effects at the beginning of the working career are higher for high educated individuals than for low educated individuals

→Networks and information of highly educated parents are more valuable when offspring themselves possess high educational levels

(e.g. Jackson et al. 2005, Jacob et al. 2015, Schulz and Maas 2012)

Exposure-mediator interaction

Low educated offspring with higher educated parents show higher levels of intra-generational mobility than low educated with low educated parents and that high educated with higher educated parents

- Selection explanation: Low educated offspring with high educated parents have higher career ambition/asprations/(Statuserhaltsmotiv)/benefits from career progression than low educated with low educated parents
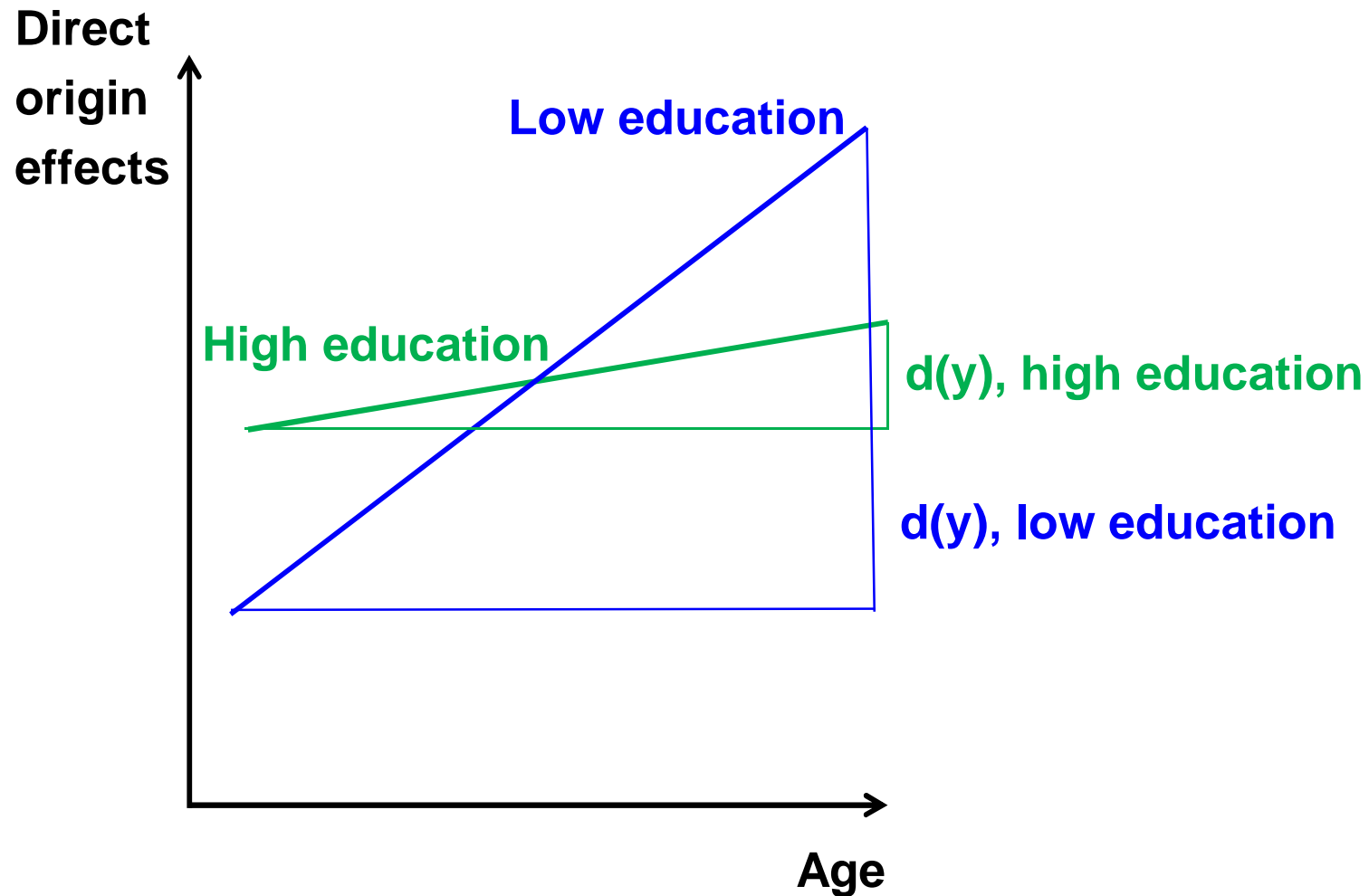
  (e.g. Boudon 1974, Mastekaasa 2009)

- Causal explanation: For low educated offspring, parental resources may be important for career progression, intra-generational mobility and thus at later stages in the life course

  (e.g. Diewald et al. 2014)

Exposure-mediator interaction

d(y), low education > **d(y), high education**

Direct origin effects (y-axis) vs Age (x-axis), showing Low education (blue, steep line) and High education (green, shallow line), with brackets indicating d(y), high education and d(y), low education.

Data

- German Socio-economic Panel (SOEP) V31 (1984-2014)
- All person-years from West Germans with information on status according to the SIOPS scale
- Only employed persons
- Age range 30 – 60
- For each age min. 2,913 persons (age 60) and max. 6,580 persons (age 45)
- 166,672 observations in total

Variables: Outcome and Explanatory Variables

Outcome Variable:

Treiman occupational prestige scale *SIOPS*
(range from 13 to 78)

Explanatory variables:

– *Social origin*: education of parents, binary, at least one parent holding higher school-degrees ('Mittlere Reife' or 'Abitur')

– *Education:* operationalized through ISCED in 4-classes: low or middle education and no training, middle vocational, higher vocational and higher education

Variables: Confounders

Confounders:

- **Cohort effects** (grouped by historical époques):
    - 1924-1945: born before end of Third Reich
    - 1946-1955: post-World War II period
    - 1956-1970: Baby-boomer
    - 1971-1984: low-fertility generations

- **Period effects** (avoiding the APC problem):
  Unemployment rate, GDP growth rate, change in disposable income rate

- **Gender**

- **Nation**

Total, direct and indirect effect: paramed
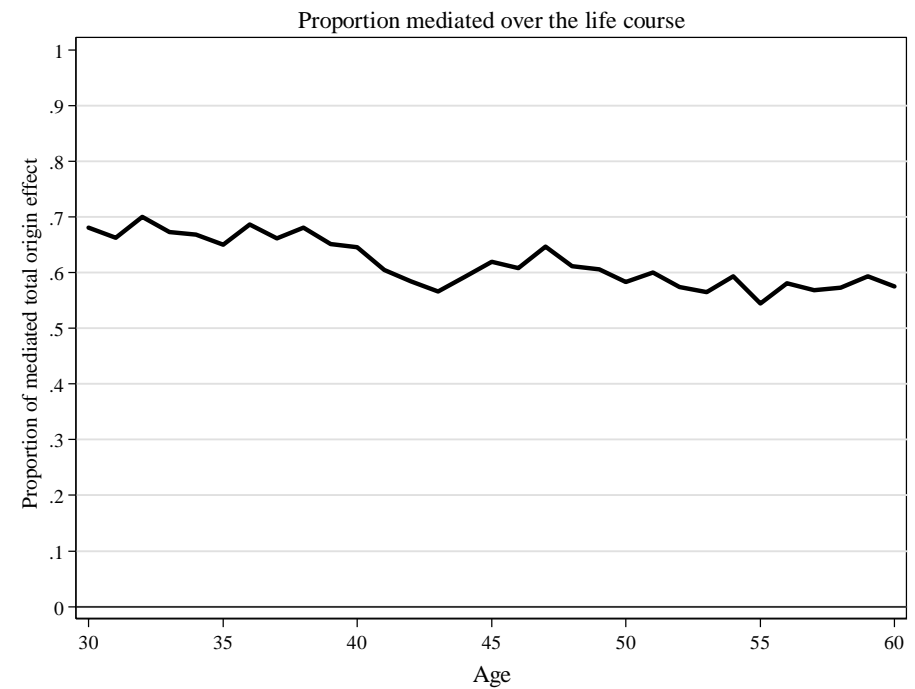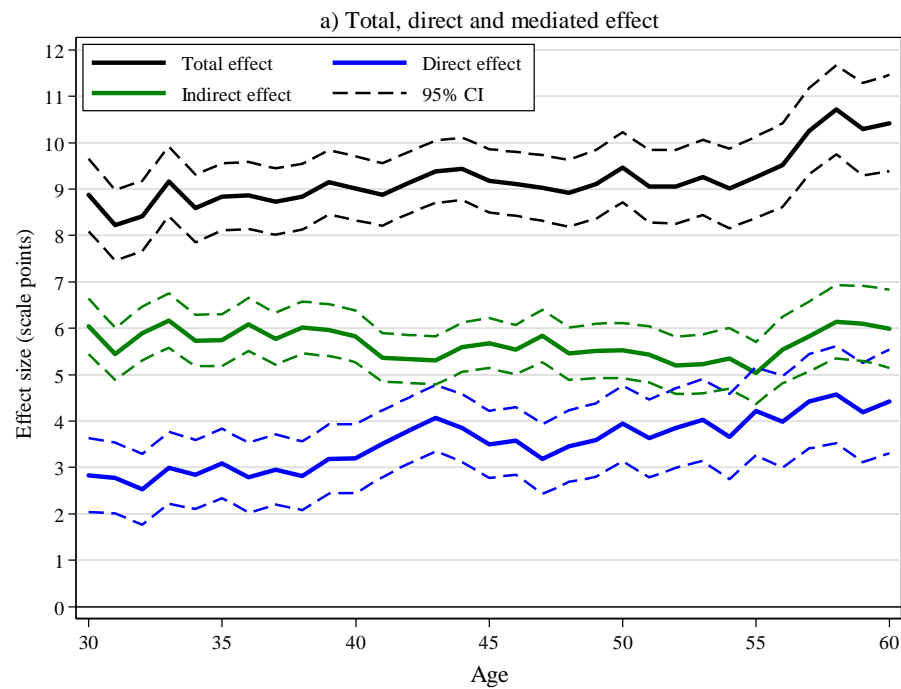
Origin, education interaction: paramed

a) Controlled direct effects by educational level
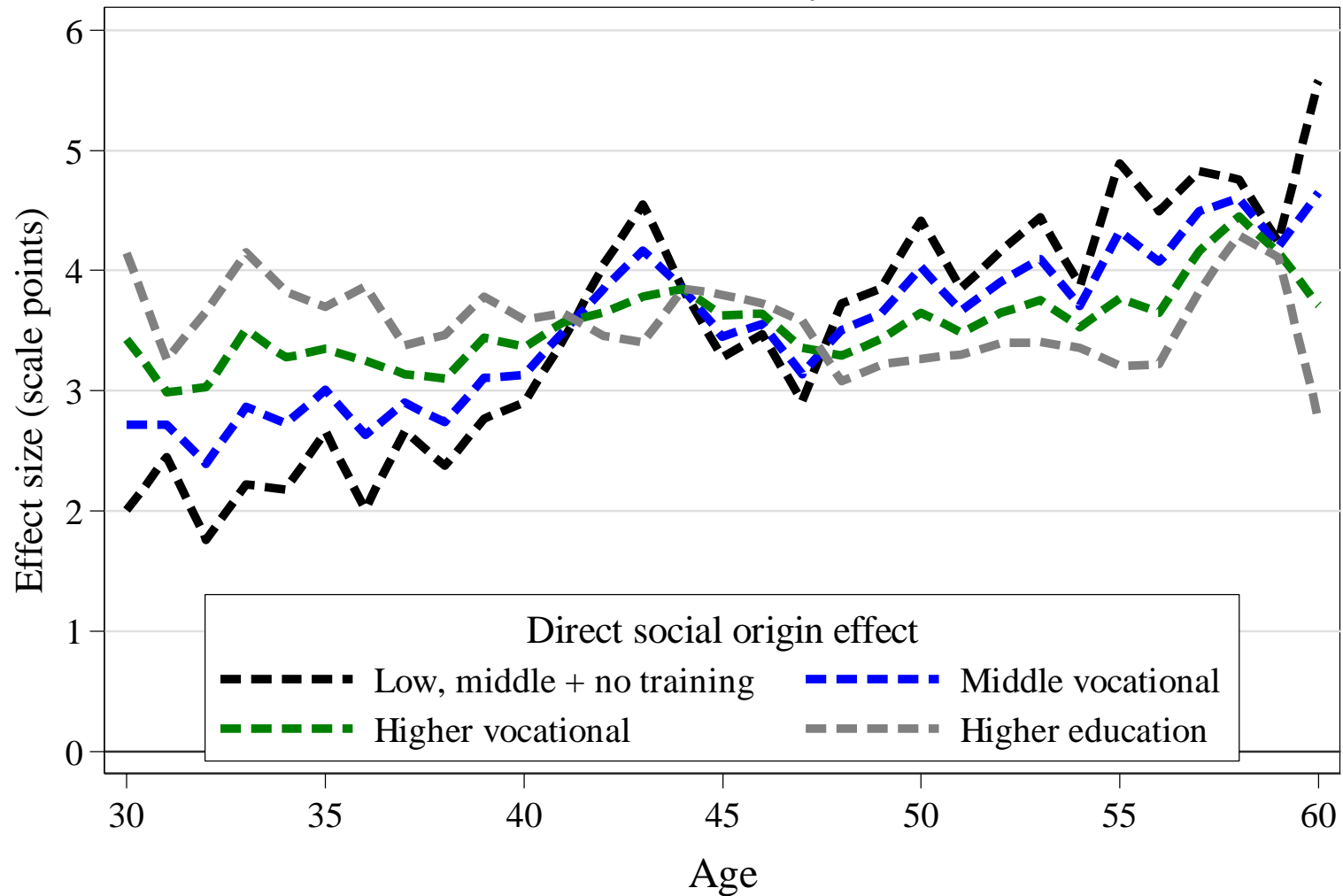
Discussion

- Importance of exposure-mediator interactions:

$\Rightarrow$ Direct effects of social origin depend on the level of education

- Life course variation in education-specific direct effects of parental education have been completely ignored:

$\Rightarrow$ For individuals with high levels of education, high parental education helps more in the first years of the working career

$\Rightarrow$ For individuals with lower levels of education, high parental education helps more to advance career progression (intra-generational mobility)

Thank you!

Literature

Blau, P. M., & Duncan, O. D. (1967). The American occupational structure.

Boudon,R. (1974).Education, opportunity, and social inequality: Changing Prospects in western society.

Breen, R., & Goldthorpe, J. H. (2001). Class, mobility and merit the experience of two British birth cohorts. *European sociological review, 17*(2), 81-101.

Brown, P. (1995). Cultural capital and social exclusion: some observations on recent trends in education, employment and the labour market. *Work, Employment and Society, 9*(1), 29-51.

Brown, P., Hesketh, A., & Williams, S. (2004). *The mismanagement of talent: Employability and jobs in the knowledge economy*. Oxford University Press.

Bukodi, E., & Goldthorpe, J. H. (2011). Class Origins, Education and Occupational Attainment in Britain: Secular Trends or Cohort-Specific Effects?. *European Societies, 13*(3), 347-375.

Diewald, M., Schulz, W., & Baier, T. (2015). Intergenerational downward mobility in educational attainment and occupational careers in West Germany in the twentieth century. European Sociological Review, 31(2), 172-183.

Goldthorpe, J., & Jackson, M. (2008). Education-based meritocracy: The barriers to its realization. *Social class: How does it work*, 93-117.

Gugushvili, A., Bukodi, E., & Goldthorpe, J. H. (2017). The Direct Effect of Social Origins on Social Mobility Chances:'Glass Floors' and 'Glass Ceilings' in Britain. European Sociological Review, 33(2), 305-316.

Jackson, M. (2006). Personality traits and occupational attainment. *European Sociological Review, 22*(2), 187-199.

Jackson, M., Goldthorpe, J. H., & Mills, C. (2005). Education, employers and class mobility. Research in Social Stratification and Mobility, 23, 3-33.

Literature

Jacob, M., Klein, M., & Iannelli, C. (2015). The impact of social origin on graduates' early occupational destinations—An Anglo-German comparison. European Sociological Review, 31(4), 460-476.

Manzoni, A., Härkönen, J., & Mayer, K. U. (2014). Moving on? A growth-curve analysis of occupational attainment and career progression patterns in West Germany. *Social Forces*, *92*(4), 1285-1312.

Mastekaasa, A. (2009). Social origins and labour market success—stability and change over Norwegian birth cohorts 1950–1969. *European Sociological Review*, *27*(1), 1-15.

Mayer, K. U. (2009). New directions in life course research. Annual review of sociology, 35, 413-433.

Schulz, W., & Maas, I. (2010). Studying Career Success—The Role of Resources and Norms for Occupational Status Attainment in the Netherlands, 1865–1940. *European Sociological Review*, *28*(2), 220-240.

VanderWeele, T. (2015). Explanation in causal inference: methods for mediation and interaction. Oxford University Press.

Yang, Y., & Lee, L. C. (2009). Sex and race disparities in health: Cohort variations in life course patterns. Social Forces, 87(4), 2093-2124

Mediation analysis

Define total effect, direct effect and indirect effect from a counterfactual perspective:

$$E(Y/A = a, M = m, C = c) = \theta_0 + \theta_1 a + \theta_2 m + \theta_3 am + \theta_4' c$$

Y: outcome (prestige)

a: exposure (social origin)

m: mediator (education)

am: exposure-mediator interaction

c: vector capturing confounders

Exposure-mediator interaction

- If there is an exposure mediator interaction, conventional mediation analyses (that ignores such interactions) lead to erroneous conclusions

- Consider the following:

$$CDE(m) = (\theta_1 + \theta_3 m)(a - a^*)$$

$$NDE = (\theta_1 + \theta_3 \beta_0 + \theta_3 \beta_1 a^* + \theta_3 \beta_2' c)(a - a^*)$$

$$NIE = (\theta_2 \beta_1 + \theta_3 \beta_1 a)(a - a^*)$$

- CDE refers to the controlled direct effect.

- This CDE is what most sociological research is explicitly or implicitly interested in

- If θ_3 is unequal to 0, this CDE depends on m and averaging over m can lead to highly misleading conclusions

(Vander Weele 2015)

Exposure-mediator interaction

The extent of the exposure-mediator interaction may well depend on the stage in the life course
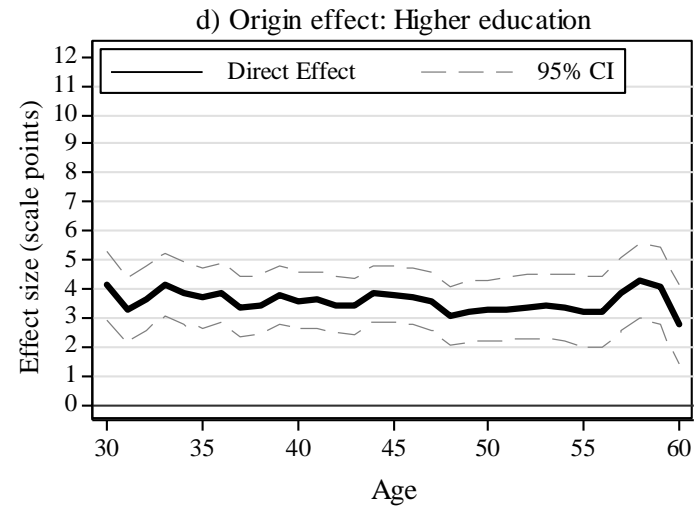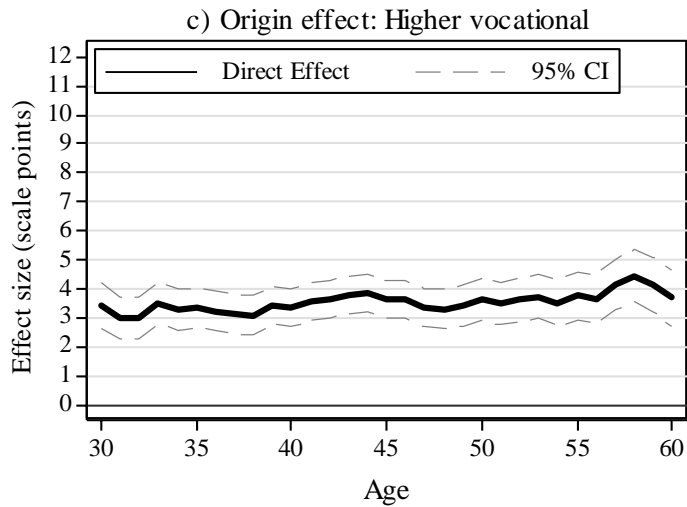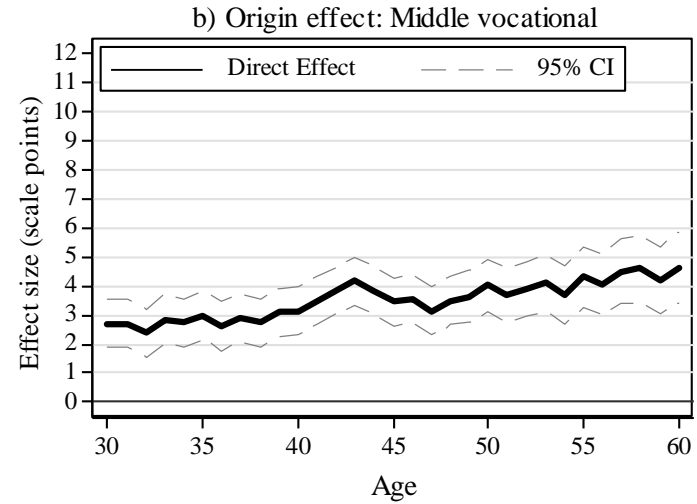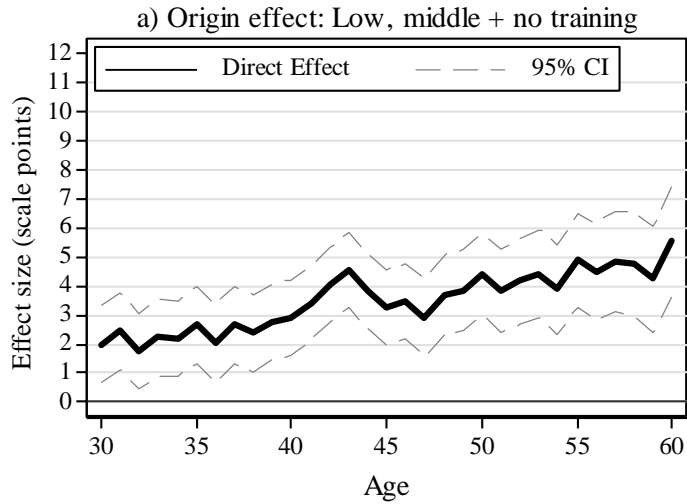
- For highly educated offspring, parental resources may be more important at early stages in the life course while

(e.g. Jackson et al. 2005, Jacob et al. 2015)

- For low educated offspring, parental resources may be important for career progression, intra-generational mobility and thus at later stages in the life course
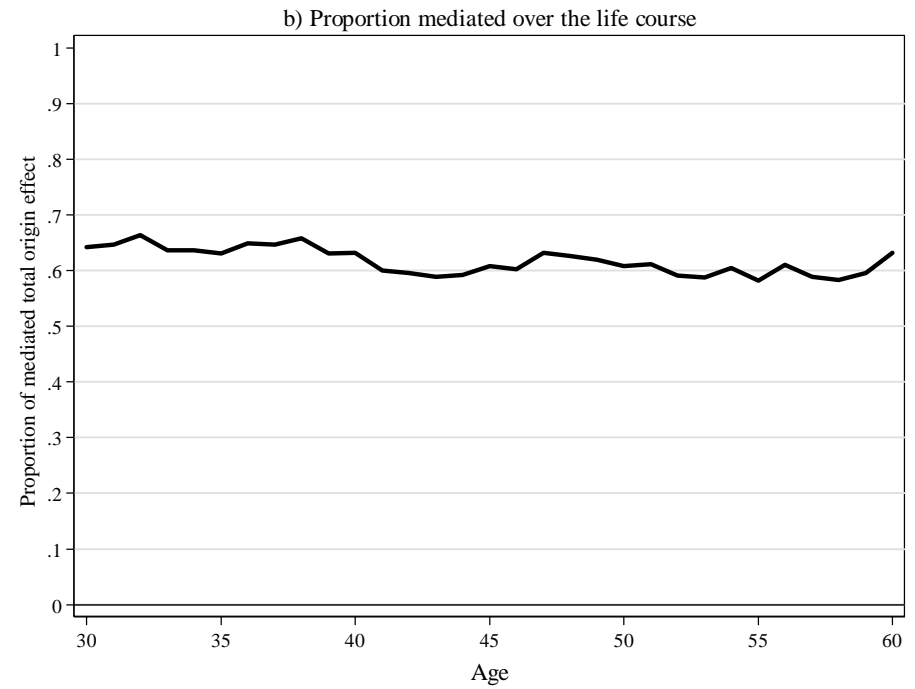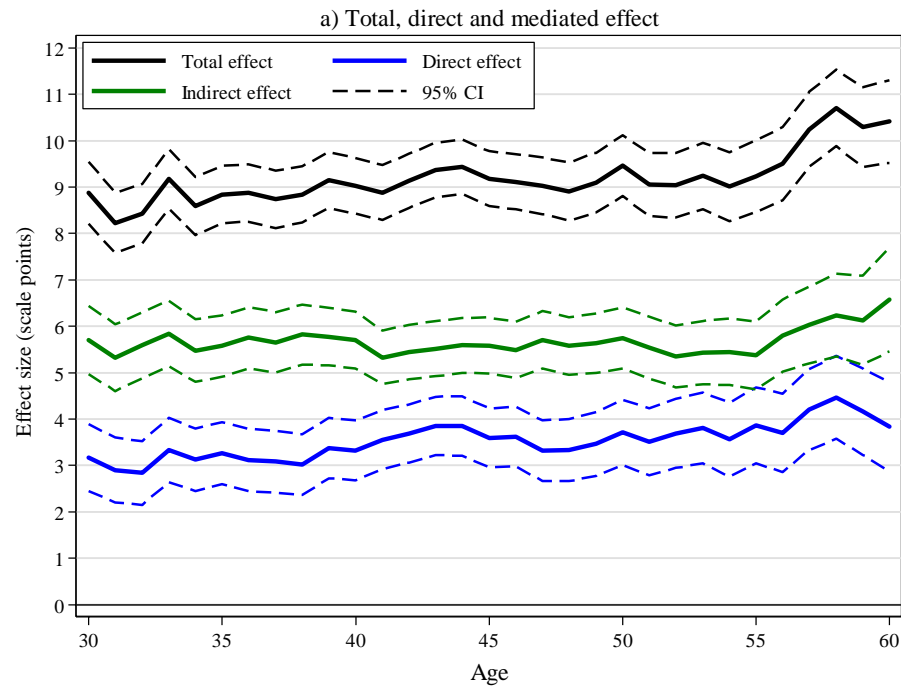
(e.g. Diewald et al. 2014)

Variables

Description

Variable	Mean	Std. Dev.
Siops scale	43.84	13.37
Parents' Education	0.29	
Persons' Education (ISCED)	2.46	0.10
Women	0.45	

Appendix

a) Origin effect: Low, middle + no training

b) Origin effect: Middle vocational

c) Origin effect: Higher vocational

d) Origin effect: Higher education

Total, direct and indirect effect: khb

Origin, education interaction: paramed

a) Controlled direct effects by educational level (women) a) Controlled direct effects by educational level (men)

Origin, education interaction: paramed

a) general education (woman) b) vocational education (woman)