Spread out your gown and fly? Early career effects of graduate migration in the Danish labour market

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Mobility and Early Career Effects

Introduction

- We contribute to the empirical literature on **causes and consequences of human capital migration**
- Specifically, we use detailed **registry data for graduates** from Danish higher educational institutions (HEIs)…
- … estimate **returns to migration** while treating mobility decision as endogenous with regard to observed labour market outcomes (employment probability and entry wage)
- Reduced form and endogenous treatment model estimates
  - Migration decision **endogenous** to labour market outcomes
  - **IV strategy:** (Aggregate) local labour market signals in origin region of graduates at time period of graduation (exogenous supply push)

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Related Literature / Contribution

- Growing number of studies on **labour market returns** to education, migration, urbanization (e.g. urban wage premium)
- *What is missing?*
  - Identification of **causal effects for graduate migrants**
  - Accounting for heterogeneous HEI systems (**academic/professional**)
  - Decomposing **spatial patterns** of migrants and associated returns
- *Closest references to…*
  - …*our research focus:* Wage differences among U.S. graduates as studied in Card and Lemieux (2001), Yankow (2003) and Wozniak (2010)
  - …*our identification strategy:* Probability model to control for selection into mobility (Böheim and Taylor, 2007; Fitzenberger et al. , 2015)

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Empirical Approach

- We estimate a linear POLS model for **outcome** y_{it} as

$$y_{it} = \beta_0 + \beta_1 \mathbf{x2}_{it} + \delta d_i + \lambda_t + \mu_{n(i)} + u_{it} \qquad (1)$$

where: $y_{it} = [\Pr(Emp_{it}), \log(wage_{it})]$

$\mathbf{x2}_{it}$ = individual factors, λ_t = time-fixed effects

$\mu_{n(i)}$ = municipality-fixed effects, ε_{it} = error term

- Combes (2008): $\mu_{n(i)}$ to account for **spatial sorting effects**
- Binary **treatment variable** d_i defined as

$$d_i = \begin{cases} 1 & \text{if individual } i \text{ is a } \mathbf{Graduate\ Mover} \\ 0 & \text{otherwise} \end{cases}$$

- Coefficient δ as parameter of interest (return to migration)

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Empirical Approach

- Problem of reduced-form estimation of eq.(1) is that a "causal" interpretation of parameter δ is not possible due to **endogenous selection into treatment**
  - Endogeneity arises from underlying **correlation structure** of unobservables affecting treatment (d_i) and outcome (y_{ijt})
- Endogenous **treatment effects model** specifies d_i as

$$d_i = \begin{cases} 1 & \text{if } \theta_0 + \theta_1 \mathbf{x1}_i + \theta_2 \mathbf{z}_{(i)n} + \epsilon_i \\ 0 & \text{otherwise} \end{cases} \qquad (2)$$

- Estimation of eq.(2) as first-step **(linear) probability model** for becoming a Grad Mover as
  - Use $\widehat{d_i}$ in structural form IV regression of eq.(2)

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Empirical Approach

- To account for endogeneity problem, we aim at formulating **exclusion restrictions** on basis of individual ($\mathbf{x1}_i$) and municipality ($\mathbf{z}_{(i)n}$) characteristics

- **Key criterion:** Exclusion restrictions shall be directly correlated with **mobility decision of graduates**, but only indirectly correlated with outcome variable(s)

$\mathbf{z}_{(i)n}$ = [current and lagged labour market conditions at place of residence for time period of graduation]

$\mathbf{x1}_i$ = [age, sex, family status, Δfamily status, education status, employment status(t-n),commuting(t-n), migration(t-n)]

$\mathbf{x2}_i$ = [age, sex, education status, employment status, commuting status, industry, job classification]

Data Description

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Data

- Longitudinal micro-database from the residents' registry in Denmark from Statistics Denmark 2006-2011
- *Sample:* All residents aged between 16-70, **who graduated** between 2006-2011 (final graduation record)
  - 405,559 registered graduates
  - 31% are identified as graduate movers
- We associate migration activities through registered **movements across Danish municipalities** with graduation event…
  - …if they occur in the period between $t_{1(i)}$ and $t_{1(i)} + 2$
  - …where $t_{1(i)}$ time period of graduation for each individual

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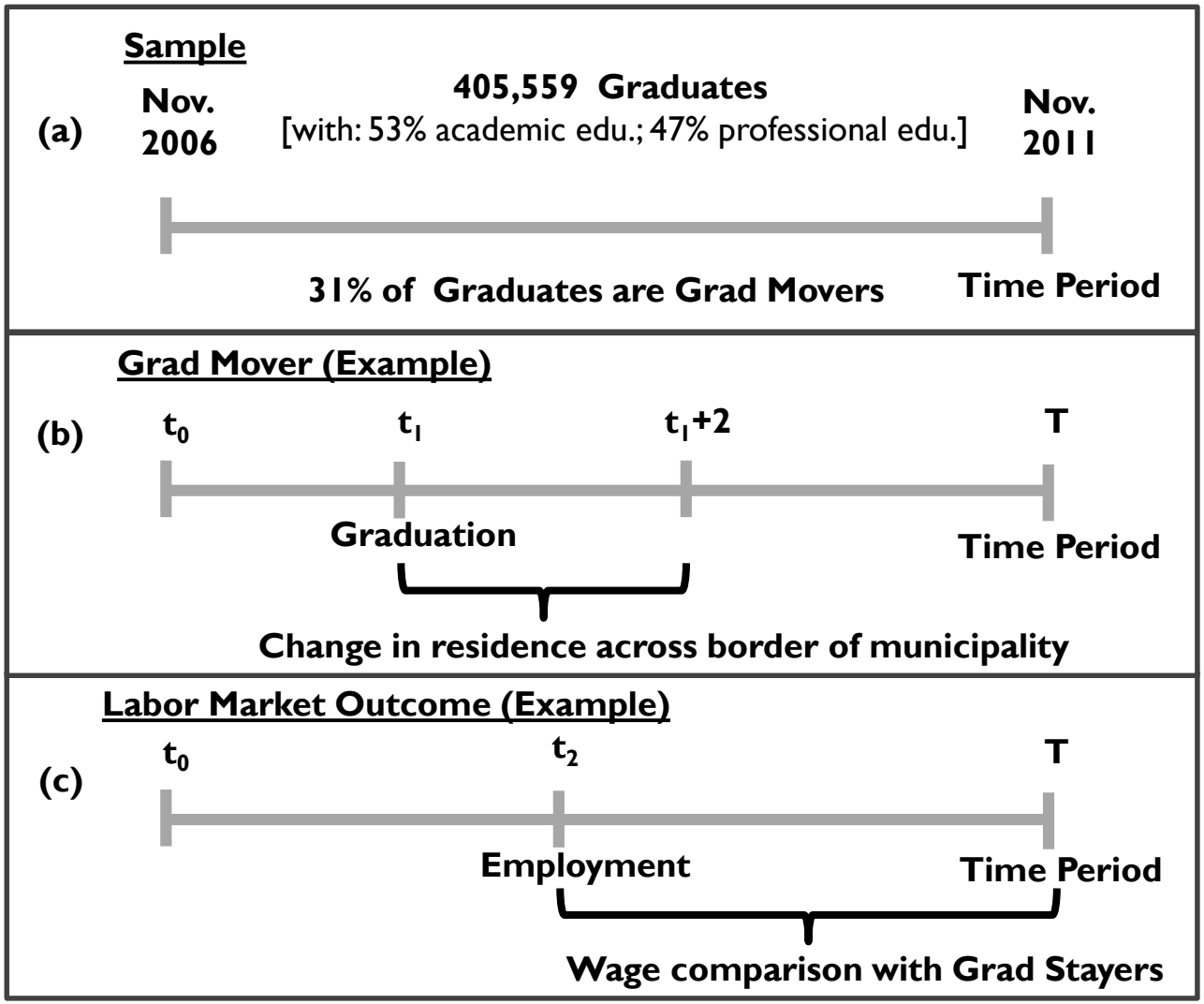
Data



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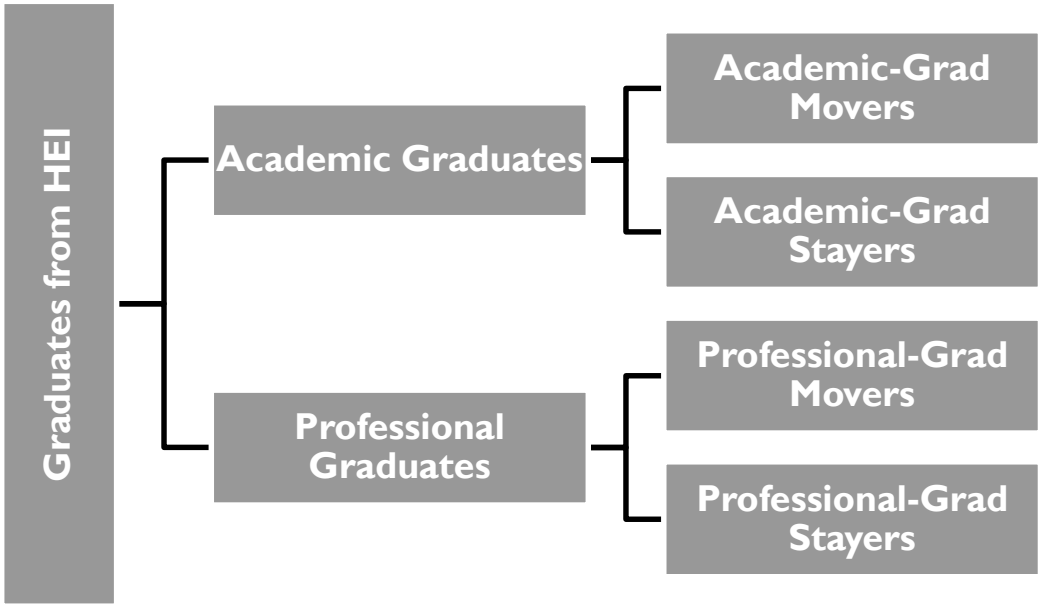
Data

Decomposition I



Decomposition II

Academic-Grad
Professional-Grad

- stayers in rural municipality
- stayers in urban municipality
- movers from rural to urban
- movers from urban to rural
- movers from rural to rural
- movers from urban to urban

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Empirical Results

Table 1: Reduced form estimates

Dep. Var.	***Pr*(Emp)**			***log*(Wage)** §		
	Overall	Academic	Professional	Overall	Academic	Professional
Grad Mover	**0.004*****	**0.006*****	**0.003*****	**0.071*****	**0.085*****	**0.057*****
(S.E.)	(0.0004)	(0.0005)	(0.0006)	(0.0016)	(0.0023)	(0.0024)
Obs.	1,279,899	662,784	617,115	871,453	466,281	405,172
Individual Factors	✓	✓	✓	✓	✓	✓
Time Dummies	✓	✓	✓	✓	✓	✓
Municipality Fixed-Effects	✓	✓	✓	✓	✓	✓

Note: § = only full-time employment. ***,**,* denote statistical significance at the 1%, 5% and 10% significance level, respectively. Results reported for pooled OLS specification with two-way clustered standard errors at the individual and municipality level. Individual-specific controls include age, sex, dummies for sector of employment, occupational types, educational level and a dummy whether the person commutes to work or not

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Empirical Results

Table 2: Endogenous treatment model

Dep. Var.	***Pr*(Emp)**			***log*(Wage)** §		
	Overall	Academic	Professional	Overall	Academic	Professional
Grad Mover	-0.003*	**0.007****	**-0.015****	**0.038****	**0.093****	**-0.030****
(S.E.)	(0.0018)	(0.0009)	(0.0020)	(0.0096)	(0.0153)	(0.0111)
Obs.	1,069,861	554,246	515,615	705,775	382,060	323,715
Weak IV Test	*F*=9.82 > 15% crit. val. of Stock-Yogo			*F*=11.14 > 15% crit. val. of Stock-Yogo		
Individ. Factors	✓	✓	✓	✓	✓	✓
Time Dummies	✓	✓	✓	✓	✓	✓
Municipality Fixed-Effects	✓	✓	✓	✓	✓	✓

Note: § = only full-time employment. ***,**,* denote statistical significance at the 1%, 5% and 10% significance level. Results for linearized 2SLS with two-way clustered standard errors at individual and municipality level. Instruments: graduates' family status at time of graduation, change in family status at time of graduation, graduate's commuting and mobility history as well as for current and one-period lagged values for local labour market variables in HEI region at time period of graduation.

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Dep. Var.:	*Pr*(Emp)			*log*(Wage) §		
	Overall	Academic	Professional	Overall	Academic	Professional
Mover Rural-Urban	-0.003*	**0.011*** **	-0.018***	**0.143*** **	**0.206*** **	**0.101*** **
(S.E.)	(0.0019)	(0.0023)	(0.0019)	(0.0137)	(0.0197)	(0.0094)
Mover Urban-Rural	0.003*	**0.004** **	0.003	**0.071*** **	**0.077*** **	**0.071*** **
(S.E.)	(0.0015)	(0.0021)	(0.0019)	(0.0072)	(0.0115)	(0.0078)
Mover Urban-Urban	-0.014***	-0.002*	-0.022***	**0.126*** **	**0.136*** **	**0.144*** **
(S.E.)	(0.0019)	(0.0011)	(0.0014)	(0.0098)	(0.0141)	(0.0046)
Mover Rural-Rural	**0.006*** **	**0.008*** **	**0.005*** **	**0.061*** **	**0.087*** **	**0.058*** **
(S.E.)	(0.0015)	(0.0019)	(0.0016)	(0.0044)	(0.0078)	(0.0047)
Stayer Urban-Urban	-0.016***	-0.006***	-0.023***	**0.055*** **	**0.058*** **	**0.084*** **
(S.E.)	(0.0025)	(0.0012)	(0.0023)	(0.0061)	(0.0076)	(0.0042)

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Conclusions

- Being mobile after graduation offers positive labour market returns
- If we control for endogeneity of mobility decision (unobservable individual productivity) effects complex:
  - i.e. if there are **two academic graduates** with similar productivity and individual characteristics, but differences in their graduation environment and core personal traits, then the one who decides to move, will have higher employability and higher wage premium
  - Results for **professional graduates** show mixed returns due to different labour market embeddedness (e.g. apprenticeships); mobility decisions that does not reflect productivity have a negative impact on their labour market outcomes

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Conclusions

- Results for spatial decomposition of migration patterns show
  - **Moving to urban area** has a largest positive effect both on employment and wages of the academic graduates
  - For professional graduates, **employment probability is highest in rural areas**, both for stayers and movers (however, professional graduates moving to the urban areas get higher wage premium)
- Results underline importance of spatial mobility for optimising the labour market allocation and individual outcomes
- Results may guide **regional policy** with regard to impact channels of graduate migration and mobile human capital
  - Academic graduates favour the urban areas and "thick" labour markets
  - Professionals can contribute for building the local labour market in mainly rural areas

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Data

Table 1: Variables (y_{it}, $\mathbf{x1}_{it}$, $\mathbf{x2}_{it}$)

		Graduate mover			Graduate stayer		
Category	Variable	Obs.	Mean	S.D.	Obs.	Mean	S.D.
Outcome	Annual wage (in DKK)	575,057	228897	150398	585,749	217544	158128
Outcome	Employment (0=no, 1=yes)	634,321	0.861	0.346	645,578	0.843	0.363
Control (x1, x2)	Age (in years)	634,321	28.74	5.94	645,578	32.79	9.30
Control (x1, x2)	Male (0=female, 1=male)	634,321	0.473	0.499	645,578	0.419	0.493
Control (x1)	Family status: Married partnership	634,321	0.228	0.419	645,578	0.399	0.490
Control (x1)	Family status: Unmarried partnership	634,321	0.102	0.343	645,578	0.089	0.333
Control (x1)	Family status: Alone with no partner	634,321	0.670	0.937	645,578	0.512	0.855
Control (x2)	Sector: Agriculture, fishing, mining	634,321	0.038	0.192	645,578	0.033	0.180
Control (x2)	Sector: Manufacturing	634,321	0.043	0.204	645,578	0.037	0.190
Control (x2)	Sector: Energy and water supply	634,321	0.013	0.112	645,578	0.011	0.104
Control (x2)	Sector: Building and construction	634,321	0.166	0.372	645,578	0.126	0.332
Control (x2)	Sector: Trade, hotel, restauration	634,321	0.057	0.232	645,578	0.049	0.216
Control (x2)	Sector: Transport, post and telecom	634,321	0.078	0.268	645,578	0.068	0.252
Control (x2)	Sector: Finance and business	634,321	0.077	0.266	645,578	0.076	0.265
Control (x2)	Sector: Public and personal service	634,321	0.406	0.491	645,578	0.473	0.499
Control (x2)	Occupation: High-skilled	634,321	0.689	0.462	645,578	0.706	0.455
Control (x2)	Occupation: Medium-skilled	634,321	0.473	0.499	645,578	0.484	0.499
Control (x2)	Occupation: Service-skilled	634,321	0.317	0.465	645,578	0.324	0.468
Control (x2)	Occupation: Manual workers	634,321	0.224	0.417	645,578	0.241	0.428
Control (x2)	Occupation: Military workers	634,321	0.193	0.394	645,578	0.210	0.407
Control (x2)	Occupation: Unknown	634,321	0.193	0.394	645,578	0.210	0.407
Control (x2)	Education: Vocational education	634,321	0.423	0.494	645,578	0.386	0.487
Control (x2)	Education: Short higher education	634,321	0.077	0.267	645,578	0.078	0.268
Control (x2)	Education: Medium level education (BA)	634,321	0.281	0.449	645,578	0.309	0.462
Control (x2)	Education: Higher education (MA/PhD)	634,321	0.218	0.413	645,578	0.227	0.419
Control (x2)	Commuter (0=no, 1=yes)	634,321	0.405	0.491	645,578	0.380	0.485

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Back to main part

Data

Table 2: Variables ($\mathbf{z}_{(i)n}$)

Variables (z)	Description	NUTS4 regions	Mean	S.D.
Unemployment Rate	Unemployment rate (in %)	98	5.209	1.703
Disposable Income	Disposable income per capita (in DKK)	98	187223	22785
% Human Capital	Share of persons with Bachelor, Master and PhD university degrees in total population aged 15-69 (in %)	98	10.04	6.930
Net Migration	Net in-migration balance as share of total population	98	1.001	0.005
Net Commuting	Number of gross in-commuters relative to gross out-commuters	98	1.000	0.214
Δ House Prices	Annual growth rate of average property prices per square meter (in %)	98	15.60	6.928
% Home Ownership	Share of home owners in total population (in %)	98	0.212	0.074
% Manufacturing	Number of workplaces in the manufacturing sector relative to total number of manufacturing workplaces in Denmark	98	91.96	32.16
% Business Services	Number of workplaces in business-related services relative to total number of workplaces in business-related services in Denmark	98	105.9	19.35
% Other Services	Number of workplaces in non-business-related services relative to total number of workplaces in other services in Denmark	98	100.0	8.529
Crime Rate	Total number of crime offenses per population	98	11.11	4.324
Population Density	Total population per area (in square km)	98	1893.7	2928.3
City Type1	City of residence in municipality: Capital city/surrounding (binary dummy)	98	0.308	0.461
City Type2	City of residence in municipality: Pop. ≥100,000 (binary dummy)	98	0.146	0.354
City Type3	City of residence in municipality: Pop. 30,000 – 99,999 (binary dummy)	98	0.139	0.345
City Type4	City of residence in municipality: Pop. 2,000 – 29,999 (binary dummy)	98	0.401	0.490

Source: Authors' calculations based on data from STATBANK (Statistics Denmark). NUTS4 region = Number of municipalities per year, S.D. = Standard deviation. Variables take values for the individual's place of residence at the time period of graduation.