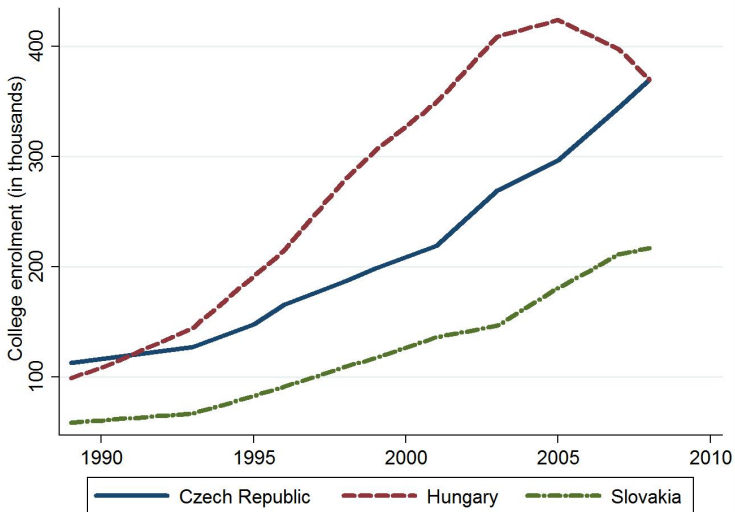


Productivity Spillovers and Occupational Allocation of College Graduates in Central European Countries

Barbara Pertold-Gebicka and Anna Lovasz
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College expansion in Central Europe

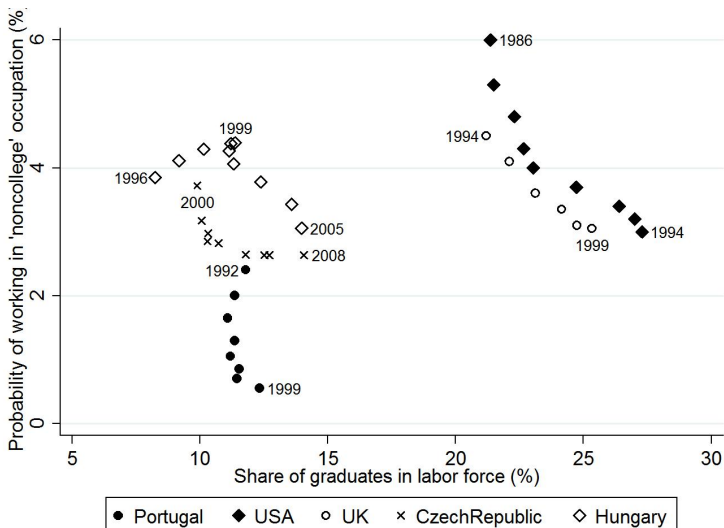


Literature

Is it profitable to provide college education to a high fraction of population?

- Social returns to education
 - compare wages across regions with different shares of educated people
(Acemoglu and Angrist, 2000; Moretti, 2004; Jurajda, 2004)
- Occupational allocation of college graduates
 - compare individual's education to the median of her occupation
(Walker and Zhu, 2005; McGuinness, 2006)
 - classify occupations into “college” and “noncollege” based on the college wage premium
(Gottschalk and Hansen, 2003; Cardoso, 2007; Grazier, O’Leary and Sloane, 2008)

College graduates in “noncollege” occupations across countries



Research questions

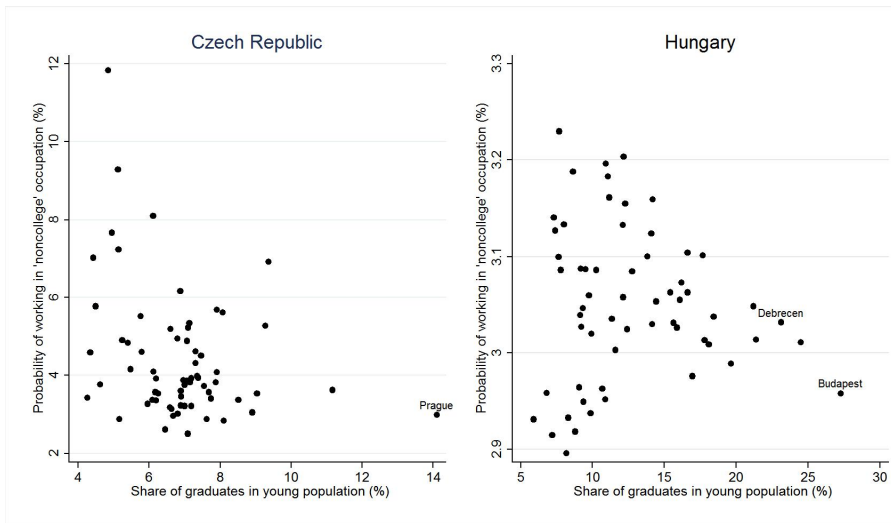
Is there a causal relationship between the number of college graduates in the labor market and the fraction of them working in “noncollege” occupations?

How strong (if any) is this relationship?

Why Central European countries?

- Great majority of higher education institutions are state funded
⇒ policy implications
- Strong expansion of college education after the break of communism ⇒ "experimental" setup
- High inflow of FDI during the period of college expansion ⇒ possible to relate skilled workforce availability to firms' investment decisions
- Large cross-regional differences in access to colleges ⇒ source of identification
- Many higher education institutions established during communism ⇒ their location is independent of current market conditions

Cross-regional variation in supply of college graduates



Theoretical model

- A model of labor allocation across districts and occupations
- Assumptions of the model
 - 2 firm types, 2 worker types, several districts
 - each worker type has different productivity
 - workers have heterogeneous preferences towards working in “noncollege” occupations
 - firms are free to move across districts
 - workers prefer living where they have graduated

$$\pi_C = \gamma_0 + \gamma_1 \frac{L_C}{L_N + L_C} + \gamma_2 \frac{\alpha_{C1}}{\alpha_{N1}} + \varepsilon,$$

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$$\pi_C = \gamma_0 + \gamma_1 \frac{L_C}{L_N + L_C} + \gamma_2 \frac{\alpha_{C1}}{\alpha_{N1}} + \varepsilon,$$

- there are positive productivity spillovers
(college workers' productivity is an increasing function of their share in local population: $\frac{\alpha_{C1}}{\alpha_{N1}} = \alpha + \delta \frac{L_C}{L_N + L_C}$)

$$\pi_C = \gamma_0 + \underbrace{(\gamma_1 + \gamma_2 \delta)}_{\theta} \frac{L_C}{L_N + L_C} + \gamma_2 \frac{\alpha_{C1}}{\alpha_{N1}} + \varepsilon.$$

Empirical model

- Propensity of a college graduate to work in a “noncollege” occupation

$$nocollege_{ik} = \delta_0 + \mathbf{X}'_{ik}\delta_1 + \underbrace{(\gamma_1 + \gamma_2)}_{\theta_1} \cdot CollSh_k + \mathbf{Y}'_k\theta_2 + \epsilon_{ik},$$

where $\gamma_1 > 0$ and $\gamma_2 \leq 0$

- Identification issue: district share of college graduates influenced by district-specific productivity shocks (ϵ)
- Instrumental variable: presence of a college in a district as of the end of communism

Data

Individual-level information

- National employer surveys covering wage data for 2001
 - Czech Republic and Slovakia: Information System on Average Earnings
 - Hungary: Wage and Employment Survey

District-level information

- 1991 (1990 in Hungary) and 2001 national censuses (aggregate data)
- NUTS-4 district level

Share of college graduates \Rightarrow probability that a college graduate works in a “noncollege” occupation

	OLS			IV		
	Czech Republic	Hungary	Slovakia	Czech Republic	Hungary	Slovakia
10% threshold						
with capital city	-0.214*** (0.001)	-0.488 (0.118)	-0.128* (0.088)	-0.200*** (0.002)	-0.613 (0.137)	0.017 (0.437)
excluding capital city	-0.164 (0.133)	-0.488* (0.099)	-0.149* (0.078)	-0.061 (0.780)	-0.611 (0.117)	0.016 (0.382)
15% threshold						
with capital city	-0.245*** (0.001)	-0.514 (0.105)	-0.281 (0.101)	-0.214*** (0.003)	-0.653 (0.122)	0.008 (0.379)
excluding capital city	-0.197 (0.110)	-0.510* (0.090)	-0.285* (0.085)	-0.004 (0.986)	-0.642 (0.109)	-0.069 (0.325)

Interpretation of results

- OLS estimates driven by three forces
 - Direct effect, Spillover effect, Feedback effect
- Using IV eliminates the feedback effect \Rightarrow we estimate the sum of direct and spillover effect
 - Nonpositive estimates indicate the existence of a spillover effect
- The IV-estimated coefficient have a long term interpretation
 - Firms observe where the established higher education institutions are located and make investments in their proximity to assure continuous supply of qualified labor
- What is captured by our estimates depends on the timing of FDI inflow

FDI inflows as percentage of GDP

Year	Czech Republic	Hungary	Slovakia
1993	1.8	6.2	1.3
1994	2.0	2.7	1.7
1995	4.6	11.2	1.2
1996	2.3	7.1	1.9
1997	2.3	8.8	1.1
1998	6.0	6.8	3.2
1999	10.5	6.7	2.1
2000	8.8	5.8	9.4
2001	9.1	7.4	7.5
2002	11.3	4.5	16.9
2003	2.3	2.5	6.5
2004	4.5	4.4	7.2
2005	9.4	7.0	5.1
2006	3.8	6.2	8.4
2007	6.0	3.9	4.8
2008	3.0	4.1	5.0

Source: OECD2012

Summary

- We observe a negative relationship between the share of college graduates in population and the fraction of them working in “noncollege” occupations in both over-time and cross-district context
- Is this relationship caused by productivity spillovers from high concentration of educated labor?
- We use cross district variation in population shares of college graduates and historical distribution of colleges across districts to estimate this relationship
- There are positive productivity spillovers from having many college graduates in a district
- Spillover effects are the strongest in countries where FDI flew in early after transition