The Macroeconomics of Managers: Supply, Selection and Competition

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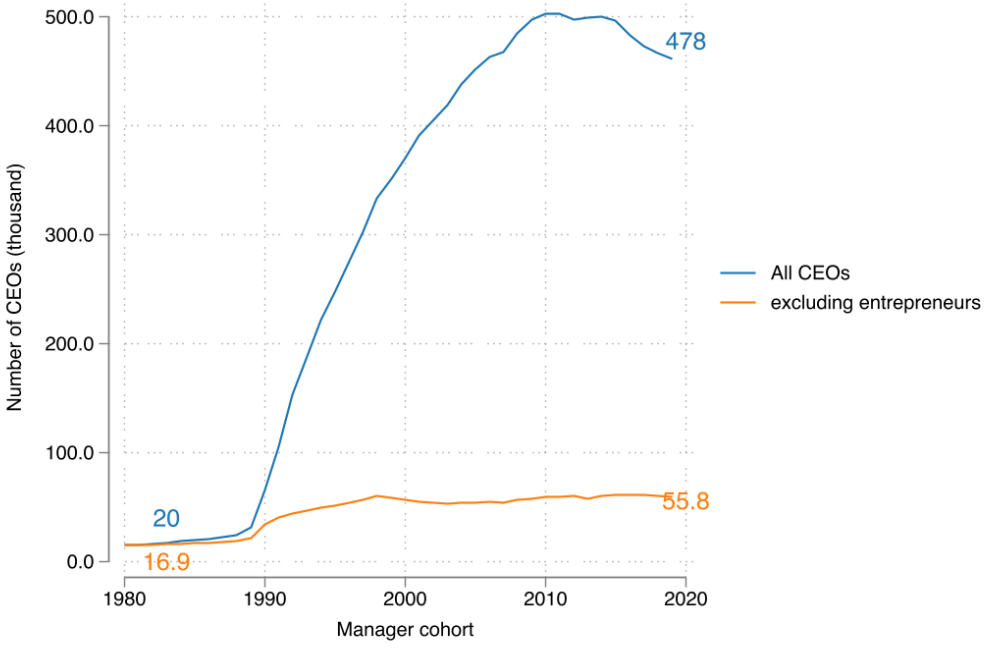
Introduction

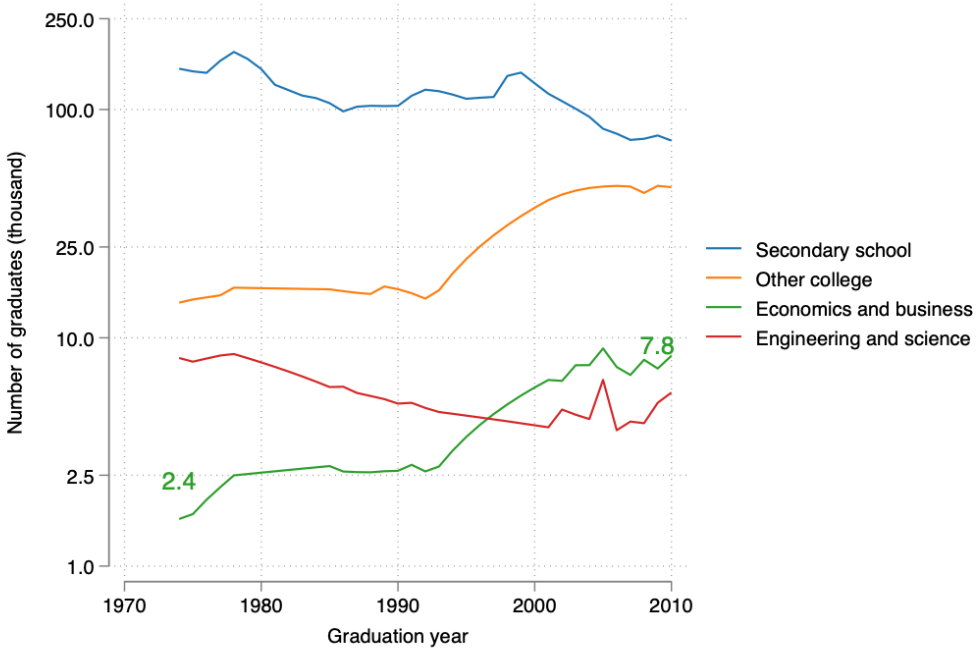
Hungary, 1980 (Fortepan / Szalay Zoltán)

Hungary, 1990 (MTI)

Number of Executive Positions Increased



Business Degrees Became More Prominent



What Can We Learn From Hungary?

Use Hungarian post-socialist transition as a natural experiment to study the supply side of the market for managers.

Why Micro $\neq$ Macro

What we know

1. Management matters
2. Training works
3. Managers matter

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1. What policy interventions can improve management for an entire country?
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What we need

1. Endogenous supply: how to incentivize people to become managers?
2. Selection: who will become managers?
3. Competition: what are the GE feedbacks of interventions?

Setup and Data

Data

Manager Data 1985-2019

Universe of corporations (1m) and their CEOs (1.3m). Firm size (employment) as proxy for manager quality.

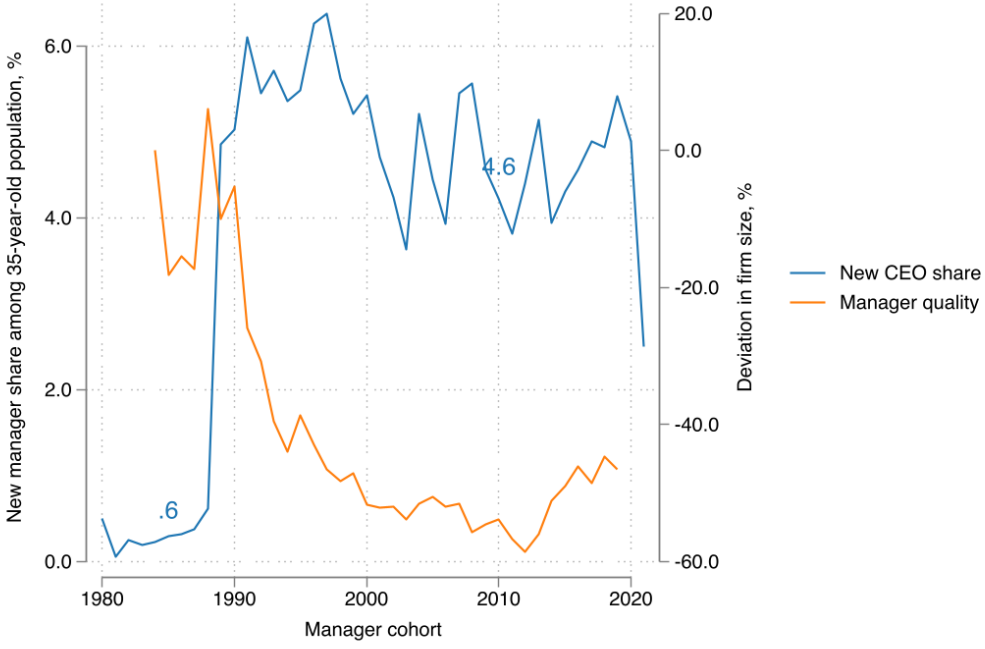
Biographies

Full biographies (school, work experience, etc.) for 63k people in 2013. 30k matched to CEO panel.

College graduates

Number of gradues by degree and year.

Quantity Up, Quality Down



An Equilibrium Model of Managers

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1. Managers have innate skill and can be trained (at university).
2. Schooling responds to incentives.
3. Self-selection into management based on skill (frictions + dynamics).
4. Wages determined in equilibrium.

Production Function

A manager with skill z can hire l workers to produce output

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Aggregate GDP:

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Policy goal: Increase Z via either N (more managers) or $\bar{z}$ (better training).

Corporate Governance Friction

Operating surplus,

$$\Pi(z) = q(z) - wl(z) = z\pi(w)$$

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Owners cannot commit to sharing more than a fraction of surplus.

Manager wage is

$$\omega(z) \leq \phi\Pi(z) = \phi z\pi(w)$$

with $\phi < 1$.

Underprovision of manager skills.

Education and Career Choice

Career Choice

Manager if $\omega(z) > w$,

$$z > z_{\min}(Z).$$

Education

Different degrees lead to different z distributions (Pareto). Discrete choice over degrees given tuition, expected income, and non-pecuniary preferences.

What Can Policy Do?

1. Reduce corporate governance frictions.
2. Subsidize business schools.
3. Reform business school curriculum.

A Taxonomy of Equilibrium Feedback Effects

Supply

Higher share going to business schools, more managers

Selection

Different innate ability of managers, *conditional* on school choice

Competition

Worker and manager wages respond to entry of new managers

Steady State Results

Manager share

$$\frac{N_*}{L} = \frac{1}{1 + \frac{1-\nu}{\phi\nu}\frac{\theta}{\theta-1}}$$

with $\theta > 1$ the shape of the Pareto skill distribution.

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Value added per worker

$$\frac{Y_*}{L} = \left(\frac{\nu}{1-\nu}\right)^{\nu} \phi^{\nu} (\Lambda_* z_0)^{\nu} \left(\frac{N_*}{L}\right)^{-\nu/\theta} \left(1 - \frac{N_*}{L}\right)$$

with $\Lambda_* = \left[\sum_i x_i \lambda_i^{\theta}\right]^{1/\theta}$ the average skill multiplier across degrees.

Taking the Model to the Data

Goal

Calibrate model to match two steady states:

1. communism (-1989)
2. capitalism (2005-2010)

with only one change, $\phi_0 \rightarrow \phi_1$.

Calibration

Table 1: Calibrated parameter values

Parameter	Explanation	Value
ν	Steady-state ratio of managers to workers	0.174
ϕ_0	Surplus sharing under communism	0.130
ϕ_1	Surplus sharing under capitalism	1.000
θ	Skill distribution, shape	6.87
λ_1	Skill multiplier in business school	1.80
λ_2	Skill multiplier in engineering	1.71
λ_3	Skill multiplier in other college	1.35
γ	Importance of non-pecuniary education benefits	0.06

Policy Counterfactuals

1. **Transition**: Increase ϕ to 1 suddenly.
2. **Manager subsidy**: Increase ϕ to increase GDP by 5 percent.
3. **School benefit**: Increase α_i to increase GDP by 5 percent.
4. **Curriculum reform**: Increase λ_i to increase GDP by 5 percent.

Policy Counterfactuals

	Transition	Manager subsidy	School benefit	Curriculum
Percentage change		41.5	28.0	41.8
Manager entry	49.1	7.0	0.0	0.0
Average education	1.6	0.2	5.0	5.0
Selection	-5.2	-1.0	0.0	0.0
Competition	-15.0	-1.1	0.0	0.0
Total GDP change	22.1	5.0	5.0	5.0
Share in business school	10.6	4.0	72.0	6.0

Conclusion

Results

- Transition results in "gold rush" of managers and business schools.
- Every policy faces strong pushback from selection and competition.
- Curriculum reform has most direct effect.

Contributions

- Tractable, quantifiable model of manager demand and supply.
- Novel data for Hungary, 1985-2019.
- Use transition as macro shock to identify macro model.

Appendix

Literature

- Large-scale management interventions: Italy (Giorcelli 2019), US (Bianchi and Giorcelli 2022, Giorcelli 2023)
- Large-scale education interventions: Italy (Bianchi and Giorcelli 2020), Colombia (Ferreyra et al 2023), Vietnam (Vu 2023)
- Selection by skill: Denmark (Akcigit, Pearce and Prato 2020)
- Calibrated models with education and selection: Guner et al 2008, Bhattacharya et al. 2013, Gomes and Kuehn 2017 and Esfahani 2019.

Education and Career Choice

Education and Career Choice

1. Choose school i
2. Draw innate manager skill z
3. Get trained in school: $z \to \lambda_i z$
4. Choose whether manager or worker

We solve the model backwards.

Distribution of Manager Skills

We assume that z is distributed Pareto, depending on schooling

$$1 - F_i(x) = \Pr(z > x | \text{school} = i) = \left(\frac{x}{\lambda_i z_0} \right)^{-\theta}$$

for $\theta > 1$ (so that the distribution has a finite mean).

Career Choice After Graduation

Potential managers choose to enter if net value exceeds the opportunity cost,

$$\phi v(t) z > J(t)$$

Selection on manager skill,

$$z > z_{\min}(t) := \frac{J(t)}{\phi v(t)}.$$

Entry cutoff $z_{\min}$ independent of school i.

Expected Career When Entering School

Schools affect

1. the probability of becoming a manager
2. expected skills and wages

Probability of becoming a manager

$$\pi_i(t) = z_{\min}(t)^{-\theta}(\lambda_i z_0)^{\theta}$$

Average manager skills

$$\tilde{z}(t) = \frac{\theta}{\theta - 1} z_{\min}(t)$$

Manager Value

Bellman equation for manager value:

$$\rho V(t,z) = \omega[z, Z(t)] - \delta V(t,z) + V_t(t,z)$$

Guess solution:

$$V(t,z) = v(t)z$$

If this is the case, the Bellman can be rewritten as

$$\rho v(t) = \nu p \left[\frac{L^p(t)}{Z(t)}\right]^{1-\nu} - \delta v(t) + v'(t)$$

Expected labor income from a degree

$$E_i(t) = \pi_i(t)\phi v(t)\tilde{z}(t) + [1 - \pi_i(t)]J(t) =$$
$$J(t)\left[1 + (\lambda_i z_0)^\theta \phi^\theta v(t)^\theta J(t)^{-\theta}/(\theta - 1)\right]$$

Probability of choosing school i

$$x_i = \frac{e^{\alpha_i}\left[1 + (\lambda_i z_0)^\theta \phi^\theta v(t)^\theta J(t)^{-\theta}/(\theta - 1)\right]^{1/\gamma}}{\sum_j e^{\alpha_j}\left[1 + (\lambda_j z_0)^\theta \phi^\theta v(t)^\theta J(t)^{-\theta}/(\theta - 1)\right]^{1/\gamma}}.$$

$1/\gamma$: elasticity of school choice

α_i: attractiveness of school i

Aggregate skill level

$$\Lambda(t) = \left[\sum_i x_i \lambda_i^\theta \right]^{1/\theta}$$

Demographics

Manager and Worker Demographics

Workers and managers die at a constant rate δ.

The stock of population:

$$L := \int_{-\infty}^{t} e^{\delta(s-t)} l ds = l/\delta.$$

The mass of active managers:

$$N(t) := \int_{-\infty}^{t} e^{\delta(s-t)} n(s) ds.$$

The stock of workers:

$$L^p(t) := L - N(t)$$

Competition Between Firms

Potential new managers have a time invariant skill distribution $F(z)$.

Only the best become managers: a time varying truncation of F.

The distribution of skill among the stock of managers, denoted by $G(t, z)$, is a mixture of these truncated distributions.

Dynamics

Dynamics

Bellman equation of manager wages

$$v'(t) = (\rho + \delta)v(t) - \nu \left[\frac{L^p(t)}{Z(t)}\right]^{1-\nu}$$

The set of managers will be a slowly moving state variable.

$$N'(t) = n(t) - \delta N(t)$$

The change in the overall skill of managers is

$$Z'(t) = n(t)\tilde{z}(t) - \delta Z(t)$$

The change in the discounted PV of worker wages is

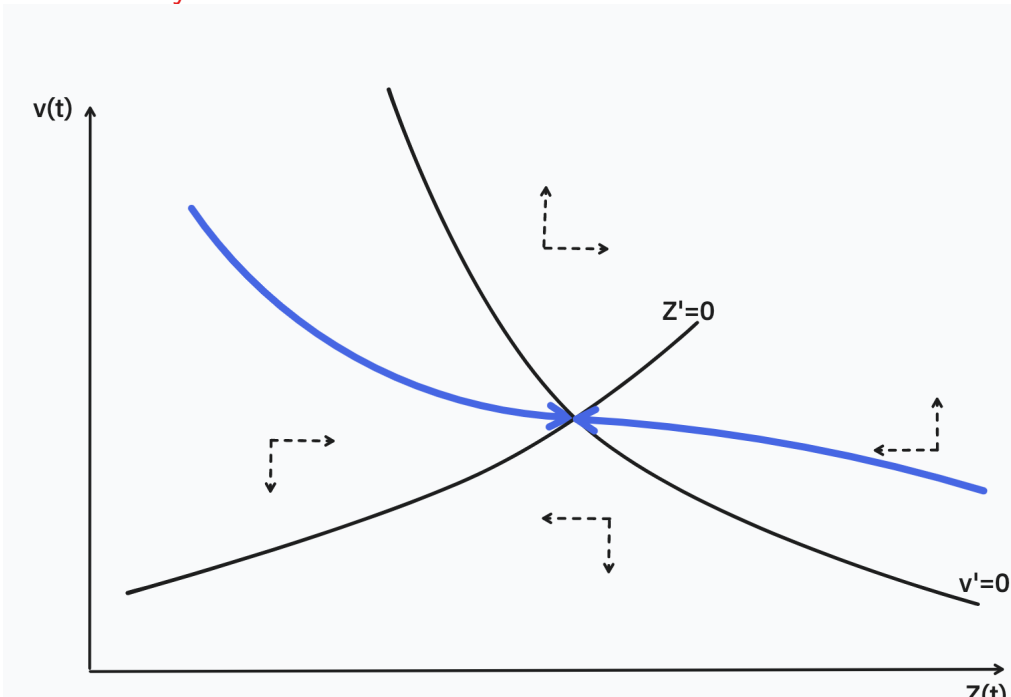
$$J'(t) = (\rho + \delta)J(t) - w(t)$$

Dynamic Equilibrium

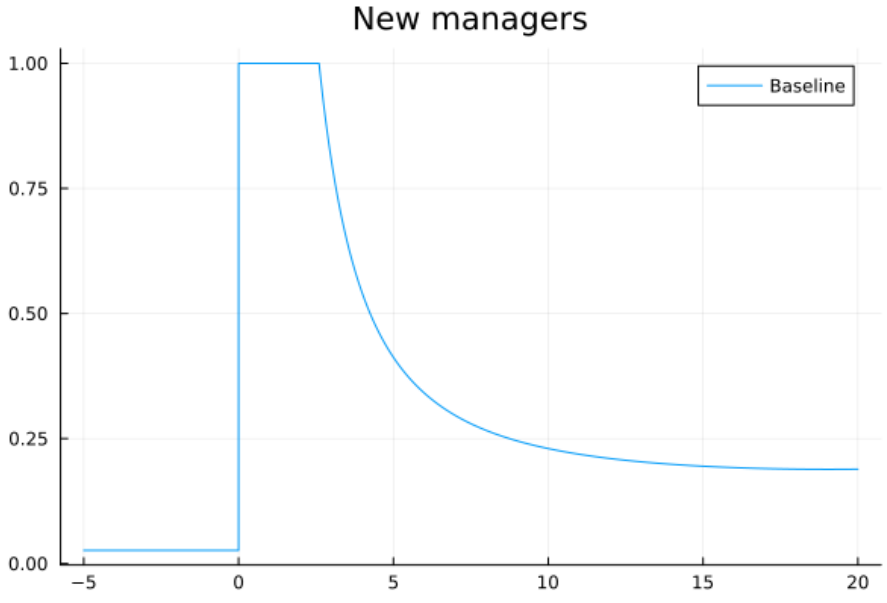
Ordinary differential equations in Z and N (state) and v and J (co-state):

$$
\begin{aligned}
v'(t) &= (\rho+\delta)v(t) - \nu\left[\frac{L-N(t)}{Z(t)}\right]^{1-\nu} \\
Z'(t) &= \frac{\theta}{\theta-1}\delta L[\Lambda(t)z_0]^{\theta}\phi^{\theta-1}[v(t)/J(t)]^{\theta-1} - \delta Z(t) \\
N'(t) &= \delta L[\Lambda(t)z_0]^{\theta}\phi^{\theta}[v(t)/J(t)]^{\theta} - \delta N(t) \\
J'(t) &= (\rho+\delta)J(t) - (1-\nu)\left[\frac{L-N(t)}{Z(t)}\right]^{-\nu}
\end{aligned}
$$

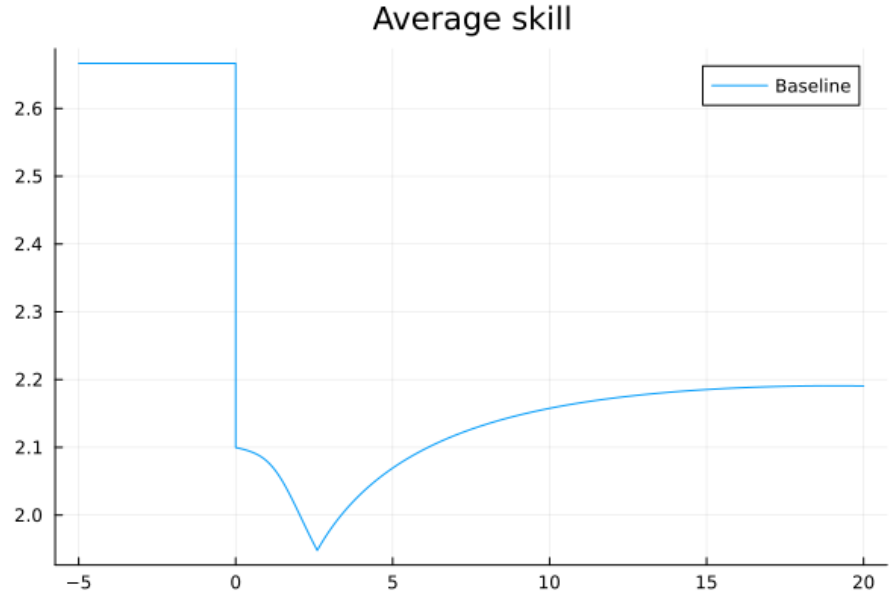
Transitional Dynamics



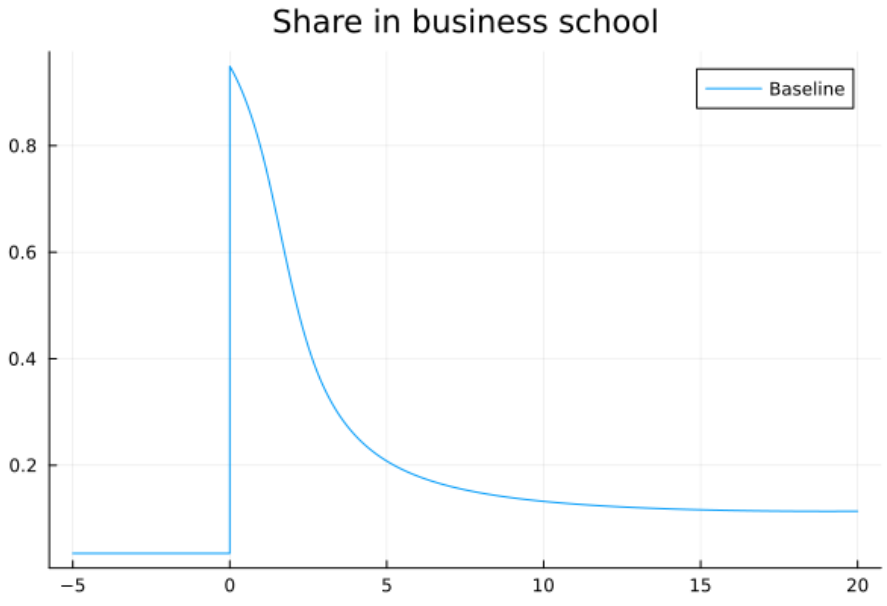
Transition: Manager entry increases suddenly



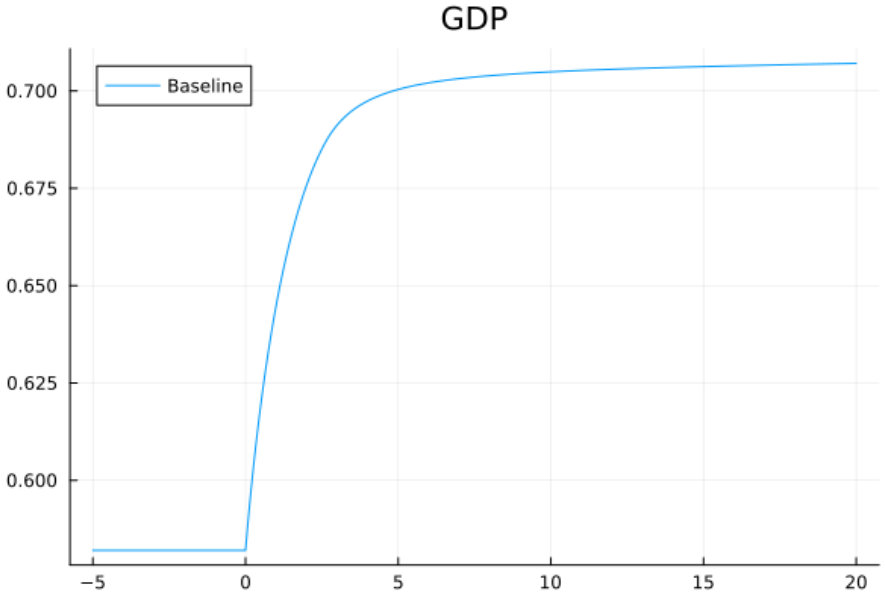
Transition: Entrant skill drops sharply



Transition: Business schools become more popular



Transition: GDP converges to a higher steady state



Measuring Manager Quality

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Log employment of firm i in year t in industry s, with a mananager having entered in cohort c is

$$\ln L_{icst} = \beta_1 \text{manager\_age}_{ict} + \beta_2 \text{firm\_age}_{ict} + \mu_c + \xi_{st} + \epsilon_{ict}.$$

Quality: μ_c

Degree of Selection

$$\ln \pi_{ic} = \theta \ln \lambda_i - \theta \mu_c + \varepsilon_{ic}.$$

Selectivity: θ

Manager Selection by Degree

VARIABLES	(1) ln_pi
(firstnm) firm_size	-6.872***
	(1.982)
(firstnm) degree = 1, economics	4.032***
	(0.368)
(firstnm) degree = 2, engineering	3.676***
	(0.492)
(firstnm) degree = 3, other	2.041***
	(0.455)
Constant	-14.92***
	(2.106)
Observations	87
R^2	0.553

Robust standard errors in parentheses