

Croissance et Organisation de l'Education Supérieure

Deux questions

- Devons-nous investir davantage dans l'université?
- Devons-nous changer la gouvernance de nos universités?

Question 1: Croissance et investissement dans l'éducation superieure

Cri d'alarme de Lisbonne

- En 1999-2000, les Etats-Unis ont investi 3% de leur PIB dans l'éducation supérieure contre 1.4% dans l'Union Européenne
- In 1999-2000, 37.3% de la population américaine entre 25 et 64 ans ont un diplôme universitaire contre 23.8% de la population au sein de l' Union Européenne

Faut-il s'en inquieter?

- Oui:
 - La croissance dans les pays développés repose sur l'innovation
- D' un autre côté:
 - Les Asian Tigers ont connu une forte croissance en investissement dans l'éducation primaire et secondaire

Notre approche

- Innovation “frontière” versus imitation
- Innovation “frontière” devient de plus en plus un levier de croissance à mesure qu’un pays se rapproche de la frontière technologique
- Par conséquent, plus un pays ou une région se rapproche de la frontière technologique, plus il doit investir dans l’université et la recherche

Econométrie sur les pays

Table 1: TFP Growth Equation (Fractions BL)

Econométrie sur les Etats
américains....ou comment le
clientélisme fait le bonheur de
l'économetre

Analyse sur les Etats américains

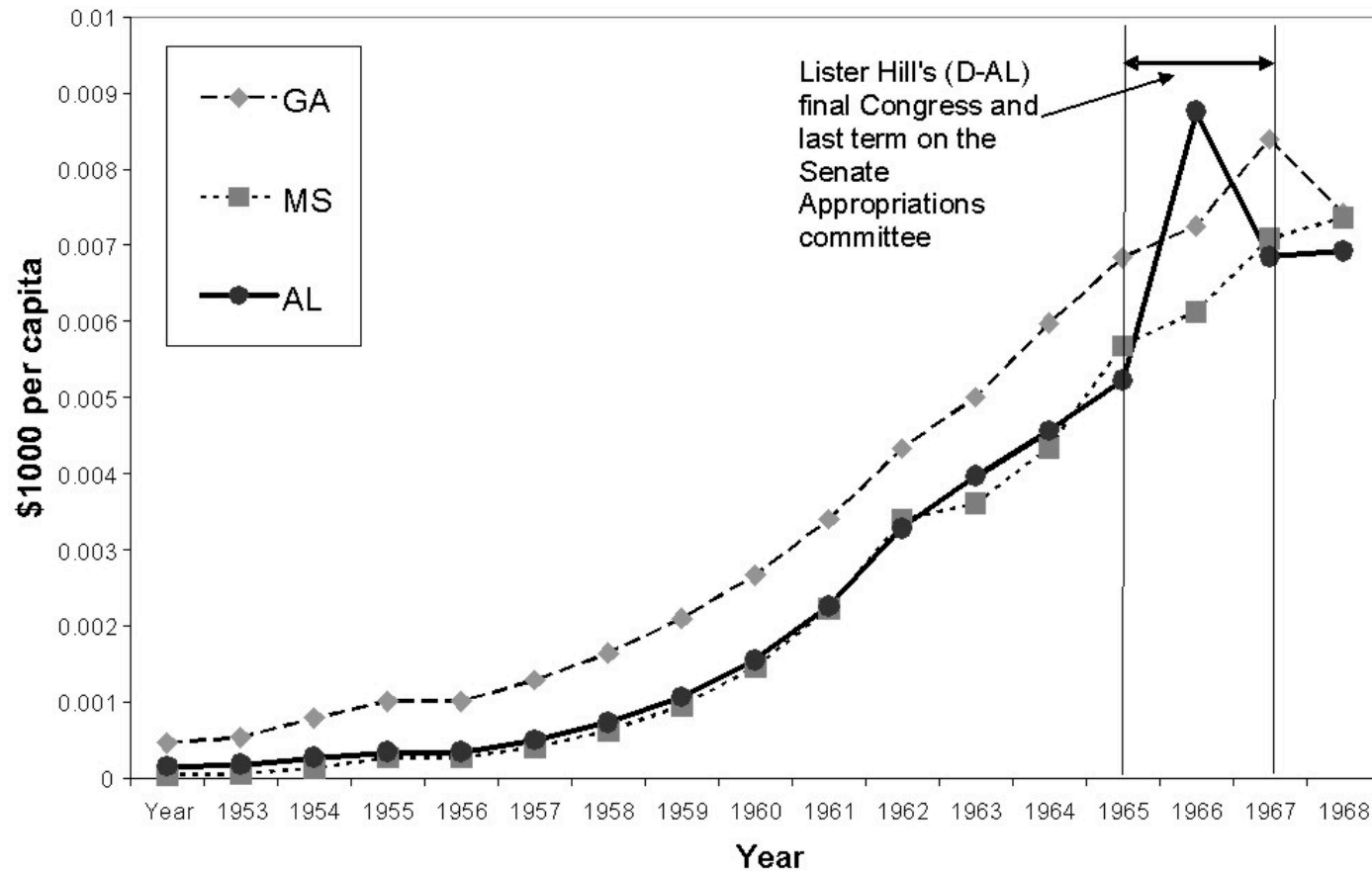
- On considère 26 cohortes dans 48 Etats
- **Avantage:**
 - Plus grande abondance et homogénéité des données
 - Meilleurs instruments
- **Inconvénient**
 - Il faut prendre en compte les migrations d'un Etat vers un autre

Le clientélisme comme instrument

- Individual appointments to key appropriations committees generate state “mistakes” (arbitrary shocks) to education investments
 - A vacancy on a appropriations committee happens to arise when the state’s representative is “first in line” based on seniority & geography
 - Once on the committee, the legislator needs to pay back his constituents.
 - His position only gives him ability to deliver in specific forms especially “earmarked” grants to universities and highway funds.
 - He ends up making education investments based on the forms of pork he can deliver.

Case Study: Alabama (Lister Hill)

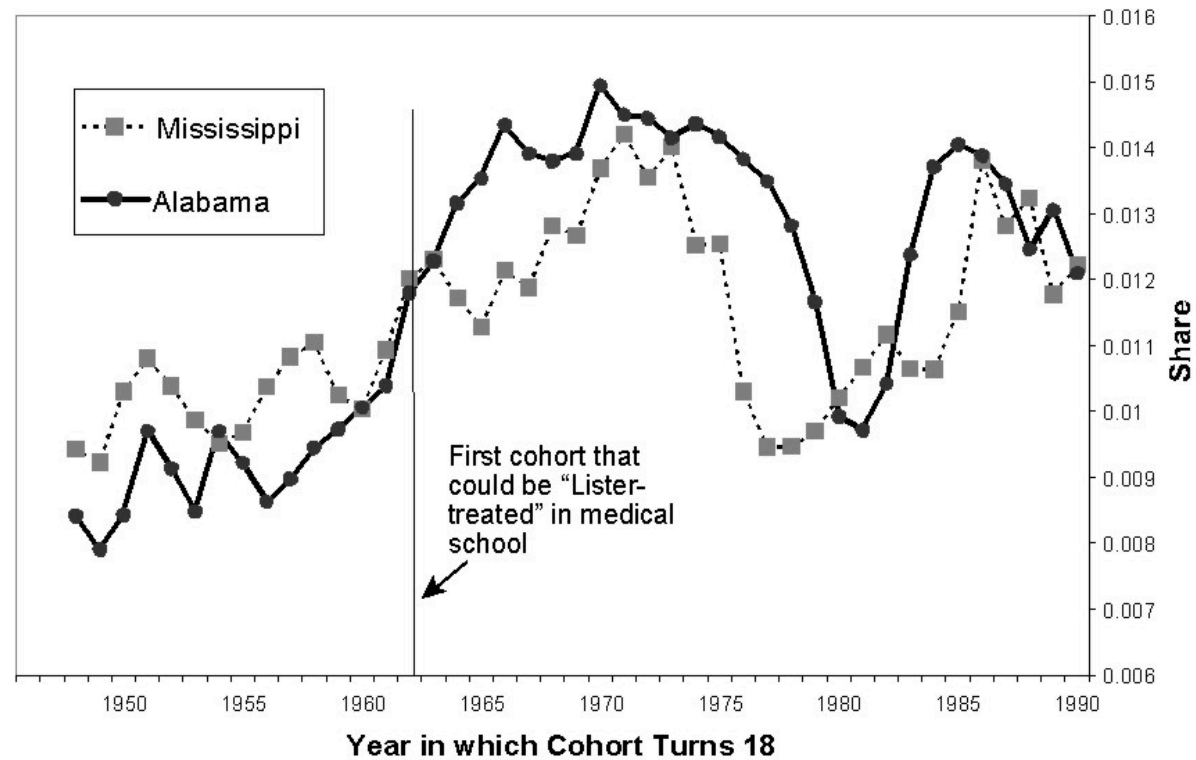
Appropriations Committee Membership & Federal Spending on Research Education, Alabama Case Study



Case Study: Alabama (Lister Hill)

Appropriations Committee Membership & Educational Attainment: Alabama Case Study

Share of Cohort with Professional Degree



Case Study: Massachusetts (Conte)

Appropriations Committee Membership & Federal Spending on Research Education, Massachusetts Case Study

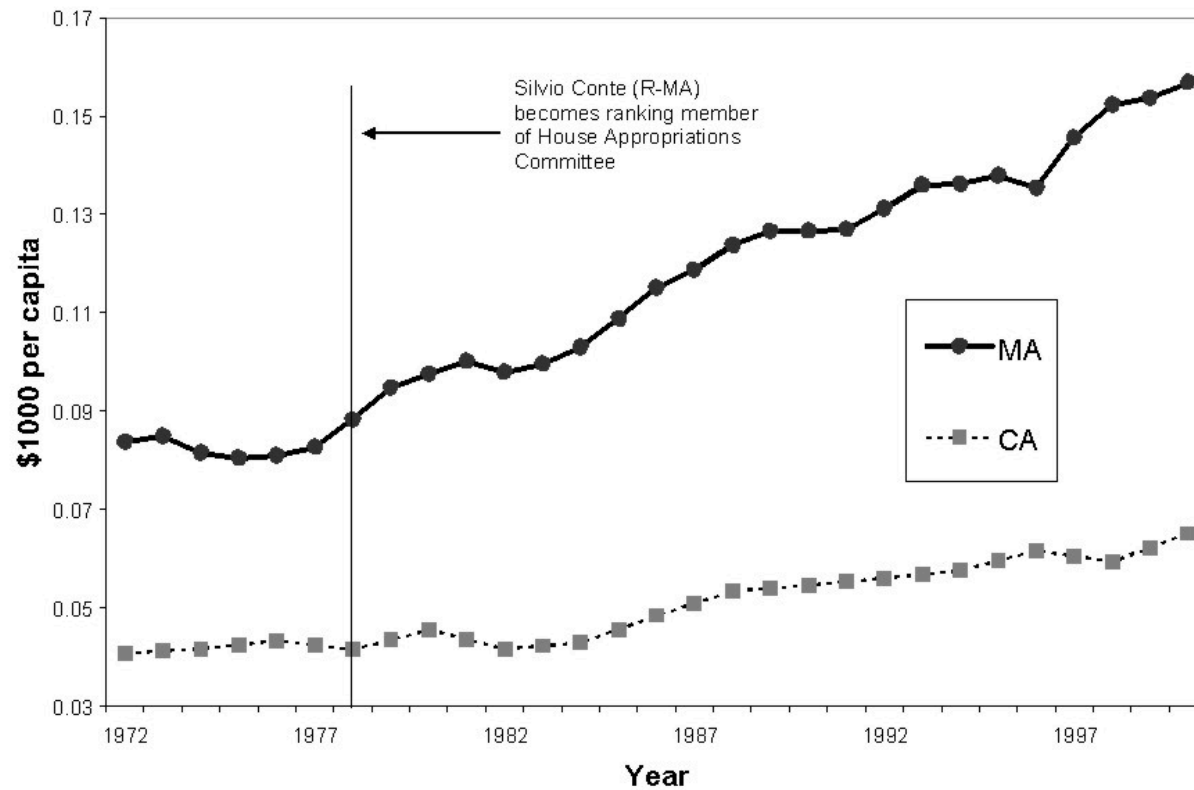
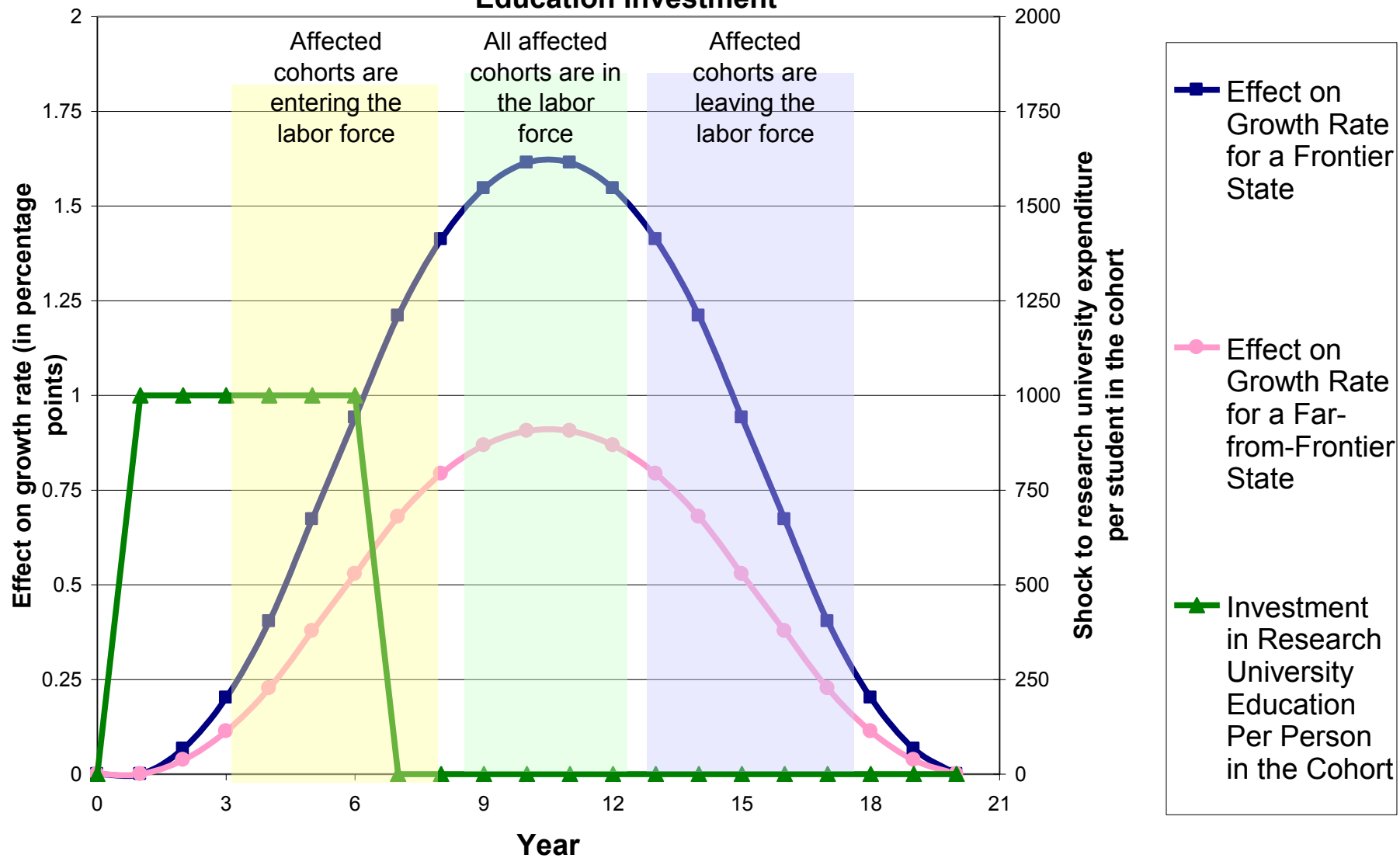
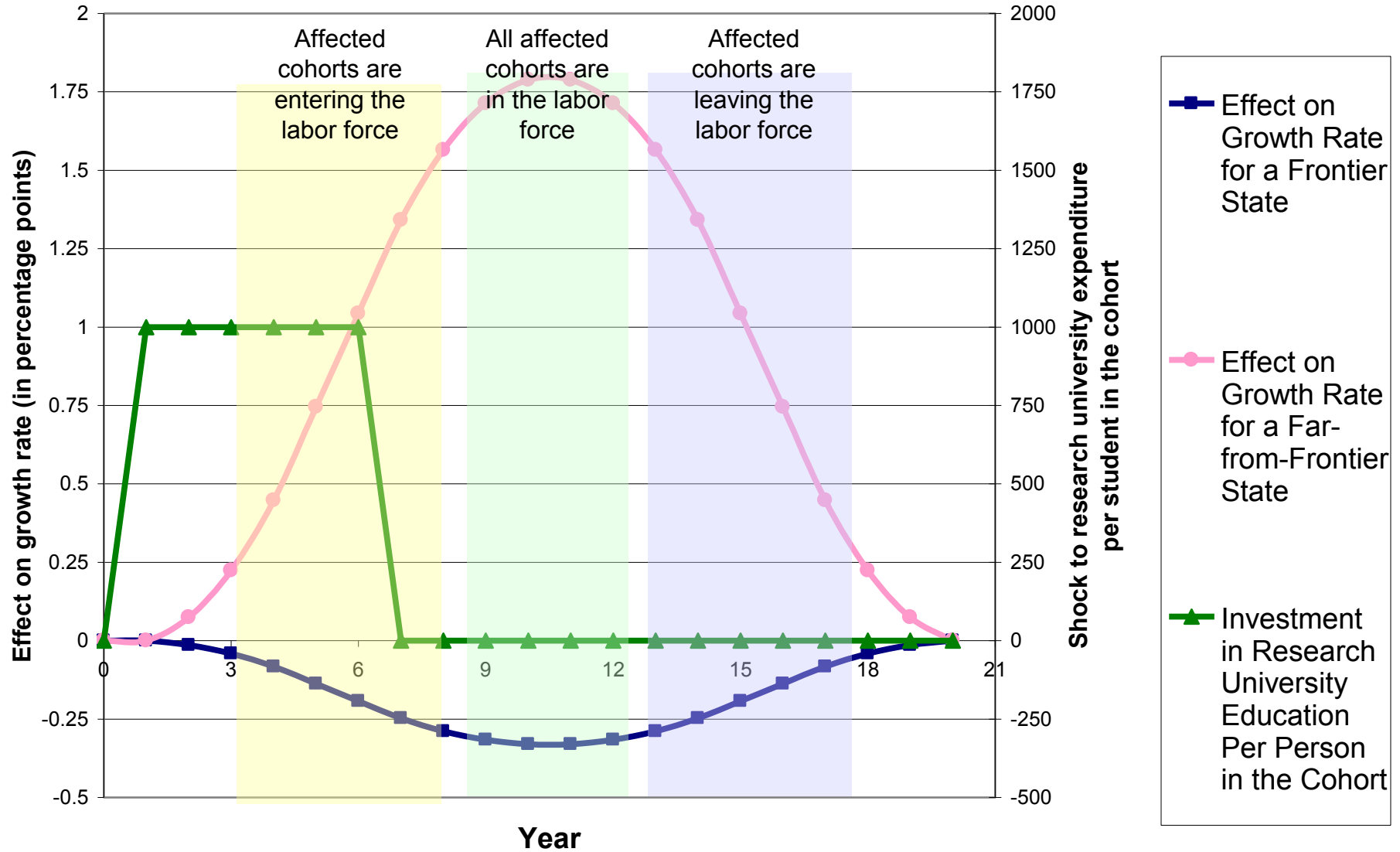


Figure 15: Effect on Growth Rates for Typical Shock to Research-Type Education Investment



Effect on Growth Rates for Typical Shock to 2-Yr College Education Investment



Results: Education investment measured by spending; migration un-done

Effects for far-from-frontier states (0.5 of frontier)	
Expenditure (M) on research-type ed per person in cohort	0.079
Expenditure (M) on 4-yr college ed per person in cohort	-0.008
Expenditure (M) on 2-yr college ed per person in cohort	0.149
Effects for at-the-frontier states	
Expenditure (M) on research-type ed per person in cohort	0.157
Expenditure (M) on 4-yr college ed per person in cohort	0.051
Expenditure (M) on 2-yr college ed per person in cohort	-0.024

Résumé

- A la fois l'économetrie sur données de pays et celle sur les Etats américains, montrent qu'investir dans l'éducation plus avancée stimule davantage la croissance de la productivité dans les pays ou Etats plus proches de la frontière technologique
- Inversement, se concentrer sur l'éducation primaire, secondaire et le 1er cycle universitaire stimule davantage la croissance dans les pays ou Etats américains plus loin de la frontière technologique

Question 2: Gouvernance et Performance des Universités

Questions

Est-ce que des universités gouvernées différemment performant différemment?

- ❖ En termes de performances de recherches (brevets, Shanghai, ..)?
- ❖ En termes d'impact sur la croissance du pays ou de la région?

Importance de l'autonomie des universités:

- ❖ Budget?
- ❖ Ressources Humaines?
- ❖ Choix d'équipements?
- ❖ Choix des programmes?

Shanghai

The Shanghai index puts weights on 6 criteria:

1. Alumni winning Nobel Prizes and Fields Medals (10%)
2. Faculty winning Nobel Prizes and Fields Medals (physics, chemistry, medicine and economics) and Field Medals in mathematics (20%)
3. Articles published in Nature and Science (20%)
4. Articles in Science Citation Index-expanded and Social Science Citation Index (20%)
5. Highly cited researchers in 21 broad subject categories (20%),
6. Academic performance with respect to the size of an institution (10%)

The ranking is oriented towards pure science, as opposed to applied science, social science, or the humanities.

- We'll examine the overall index (500=top, 1=bottom) and highly cited researchers, the broadest-based component.

Figure 1: the EU-US performance gap for Shanghai Top 100 universities (US=100)

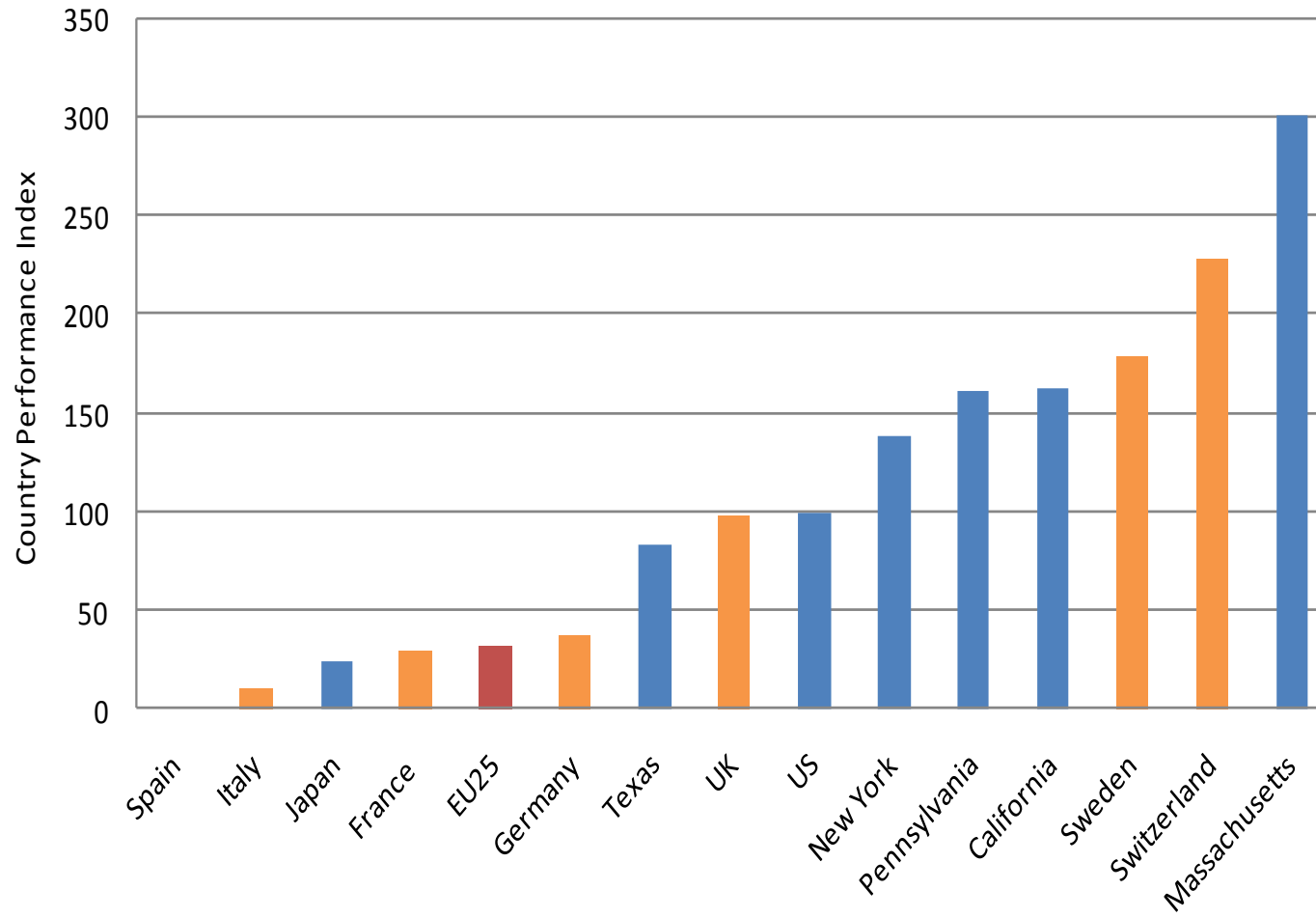


Table 1: Country performance index (US= 100)

Country	Population (millions)	Shanghai ranking			
		Top 50	Top 100	Top 200	Top 500
Austria	8	0	0	0	53
Belgium	10	0	0	61	122
Czech Republic	10	0	0	0	13
Denmark	5	0	75	114	161
Finland	5	0	46	75	81
France	60	3	15	29	45
Germany	83	0	17	37	67
Greece	11	0	0	0	12
Hungary	10	0	0	0	13
Ireland	4	0	0	0	50
Italy	58	0	0	11	34
Netherlands	16	20	51	76	131
Poland	38	0	0	0	4
Spain	43	0	0	0	14
Sweden	9	7	117	179	217
UK	60	72	86	98	124
EU15	383	13	26	41	67
EU25	487	10	21	32	54
Australia	20	0	31	66	101
Canada	32	39	54	63	104
Japan	128	14	17	24	27
Norway	5	0	66	91	107
Switzerland	7	97	166	228	230
US	294	100	100	100	100
California	36	234	199	163	103
Massachusetts	6	449	308	302	263
New York	19	196	167	139	148
Pennsylvania	12	111	177	161	115
Texas	23	33	61	83	103

Déterminants de la performance des universités

Dépenses par étudiant

Figure 2: Relationship between expenditure per student and country performance

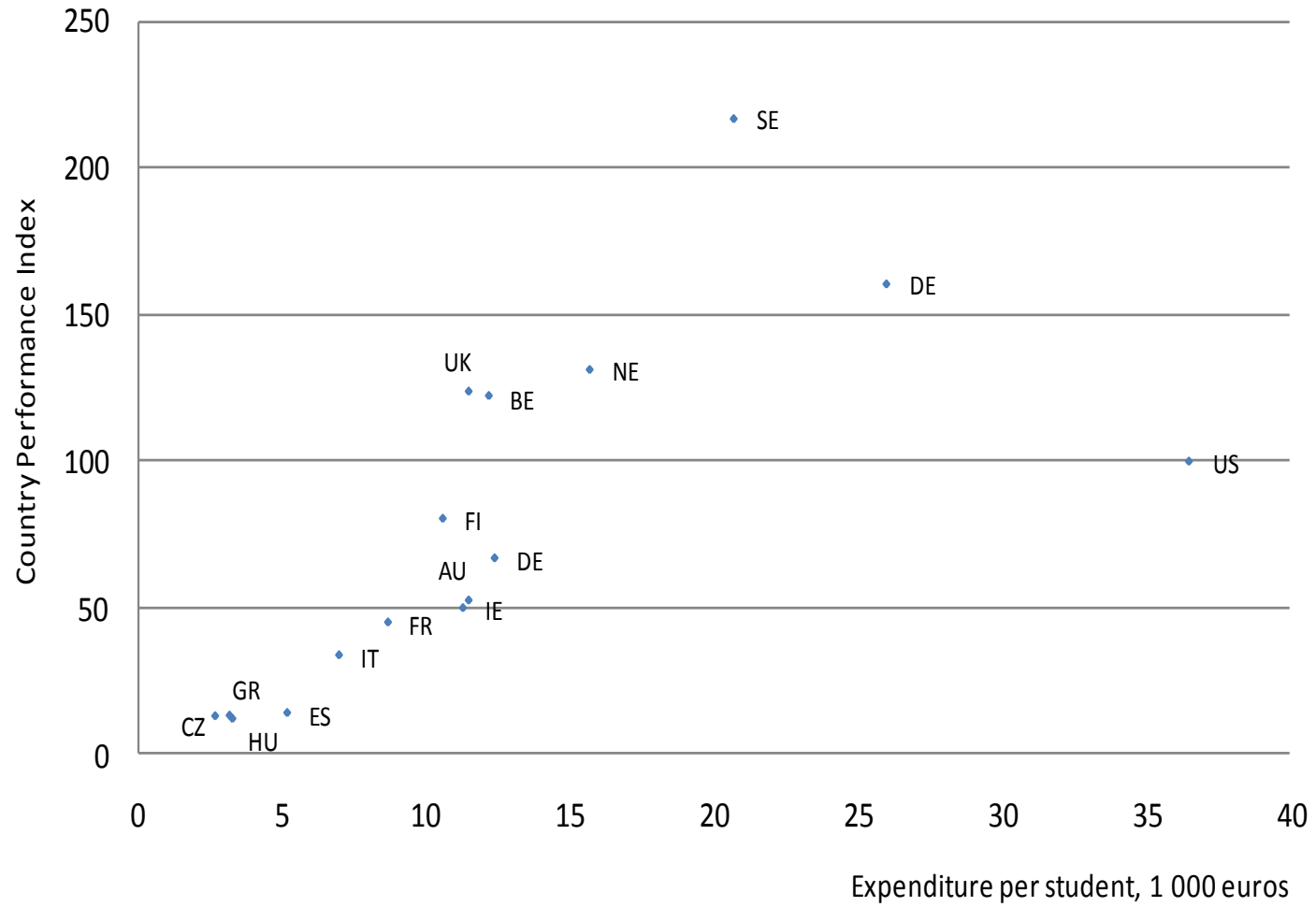


Table 2: Public and private expenditure on higher education, 2001

Country	As % of GDP			In thousand euros per student		
	Public	Private	Total	Public	Private	Total
Austria	1.4	0.1	1.5	11.0	0.5	11.5
Belgium	1.4	0.2	1.6	10.6	1.6	12.2
Czech Republic	0.8	0.1	0.9	2.3	0.4	2.7
Denmark	2.7	0.0	2.7	25.6	0.4	26.0
Finland	2.1	0.1	2.2	10.3	0.3	10.6
France	1.0	0.2	1.2	7.5	1.2	8.7
Germany	1.1	0.1	1.2	11.5	0.9	12.4
Greece	1.2	0.0	1.2	3.3	0.0	3.3
Hungary	1.1	0.3	1.4	2.6	0.6	3.2
Ireland	1.2	0.2	1.4	9.7	1.6	11.3
Italy	0.8	0.2	1.0	5.6	1.4	7.0
Netherlands	1.3	0.3	1.6	13.0	2.7	15.7
Poland	1.1	.*	.*	1.7	.*	.*
Spain	1.0	0.3	1.3	4.0	1.2	5.2
Sweden	2.1	0.2	2.3	18.9	1.8	20.7
UK	0.8	0.3	1.1	8.4	3.1	11.5
EU25	1.1	0.2	1.3	7.3	1.4	8.7
Japan	0.5	0.6	1.1	6.5	7.3	13.8
US	1.5	1.8	3.3	16.6	19.9	36.5

Gouvernance: Europe

A survey on governance was sent to European universities in the top 500 of the Shanghai ranking in 2006

- 196 universities, 14 countries
- University characteristics: age, public/private, # of students, faculties (medicine, law, natural sciences...).
- University operating independence:
 - Does the university set its own curriculum?
 - Does the university select its own students or is there centralized allocation?
 - To what degree does the university select its own professors?
 - Is there strong endogamy (% of professors with PhD from their university), which suggests that hiring is not open?
 - What is the role of state in setting wages?
 - Are all professors with the same seniority paid the same wage?
 - What share of funding is core public funding that the university can influence only through politics?
 - What share of funding can be controlled by the university? For instance, does the university control its tuition or compete for research grants?
 - What is the composition of the university board (# of faculty, students, scientific personnel...).
 - What are the voting rights of board members?

Table 3: Characteristics of the universities in the sample (country averages)

Country	Age (years)	Number of students (thousands)	Budget per student (1 000€)*	Public status [†]	Budget autonomy [§]	Building ownership [§]	Hiring autonomy [§]	Wage-setting autonomy [§]	Faculty with in-house PhD (%)
Belgium	284	21.7	11.3	0.5	0.4	1.0	1.0	0.0	63
Denmark	59	18.2	11.4	1.0	1.0	0.3	0.5	0.5	40
Germany	289	26.2	9.6	0.9	0.0	0.5	0.8	0.0	40
Ireland	259	16.3	12.7	0.5	0.5	1.0	1.0	0.0	49
Italy	444	44.9	10.1	1.0	0.9	1.0	0.4	0.0	24
Netherlands	217	21.4	20.5	0.8	0.8	1.0	0.8	0.2	33
Spain	342	44.8	7.0	1.0	0.5	1.0	0.5	0.0	69
Sweden	266	27.1	16.2	0.8	0.8	0.2	1.0	1.0	58
Switzerland	326	12.8	26.2	0.8	0.1	0.4	0.8	0.0	24
UK	242	14.6	24.5	0.5	0.9	0.9	1.0	0.8	8
Total	290	24.9	16.1	0.8	0.6	0.8	0.8	0.3	29

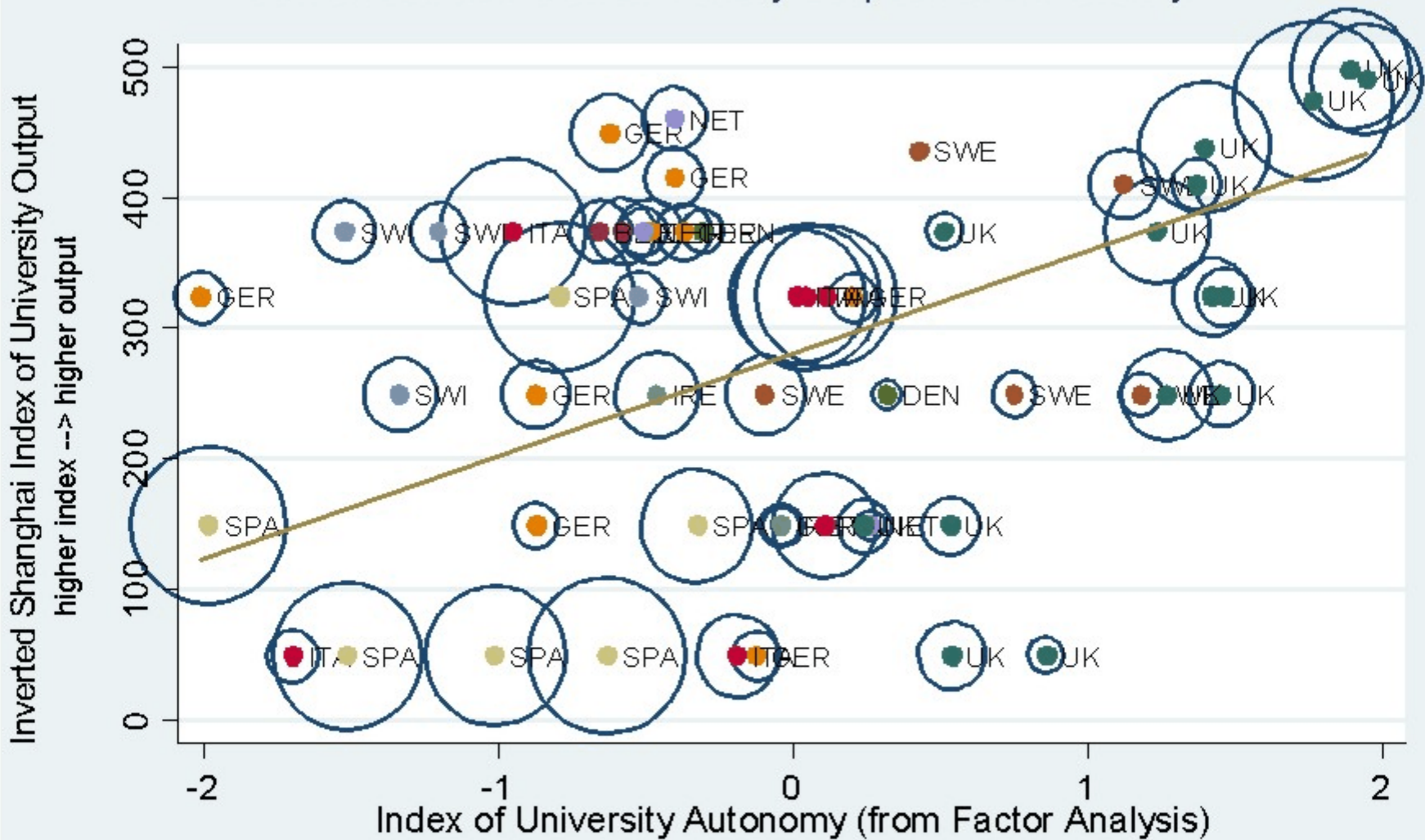
Source: Bruegel survey.

* PPP adjusted. † 1 if public, 0 if private. § 1 if yes, 0 if no.

Gouvernance: Etats-Unis

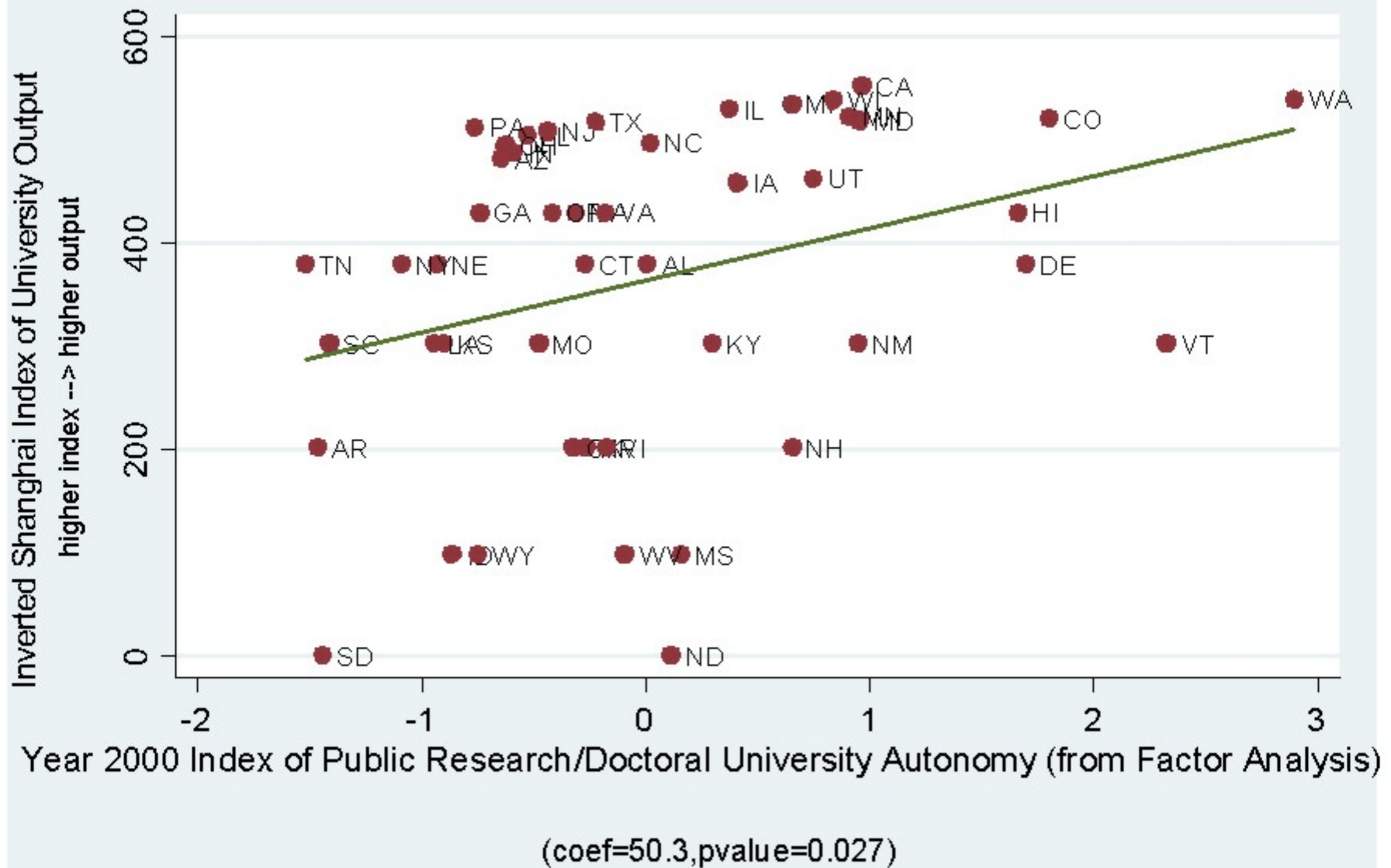
- Pourcentage d'universités privées au sein de l'Etat
- Autonomies des universités publiques: trois variables en 1950
 - Liberté d'achats d'équipements
 - Indépendance budgétaire vis-à-vis de l'Etat
 - Autonomie dans la gestion des ressources humaines

Correlation between University Output and Autonomy

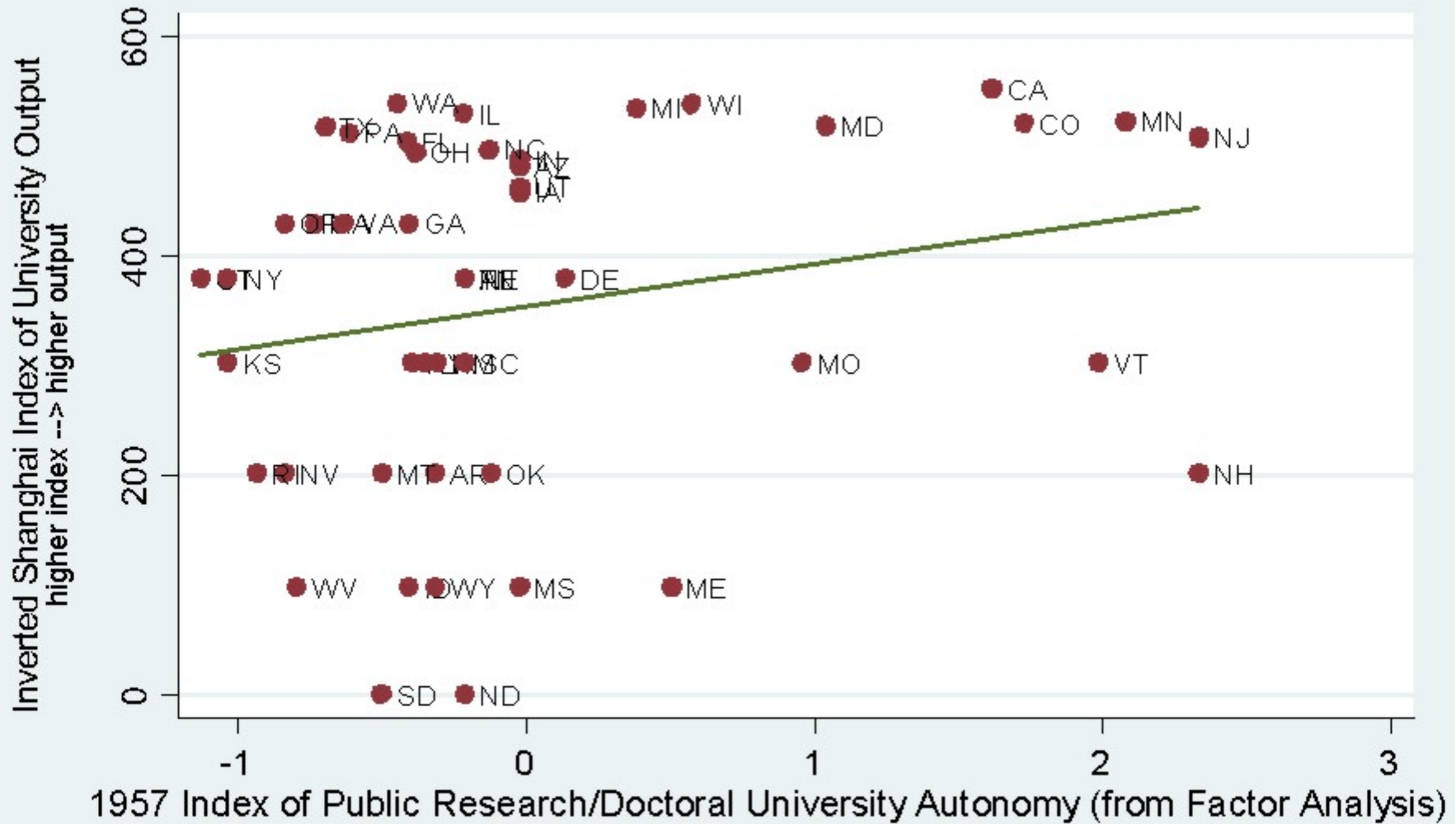


(coef=78.5, pvalue<0.001)

Correlation between University Output and Recent Autonomy

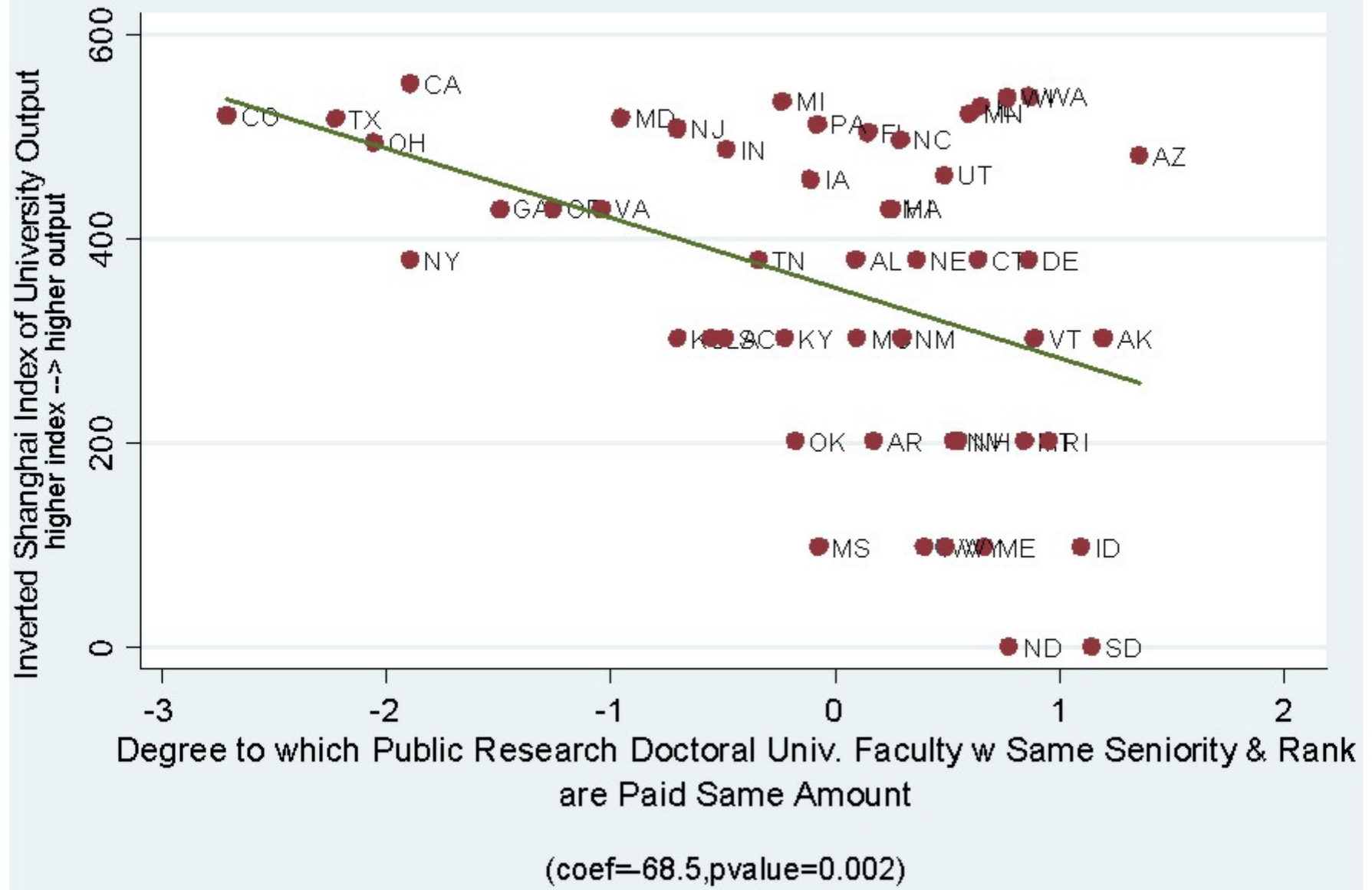


Correlation between University Output and 1950s Autonomy

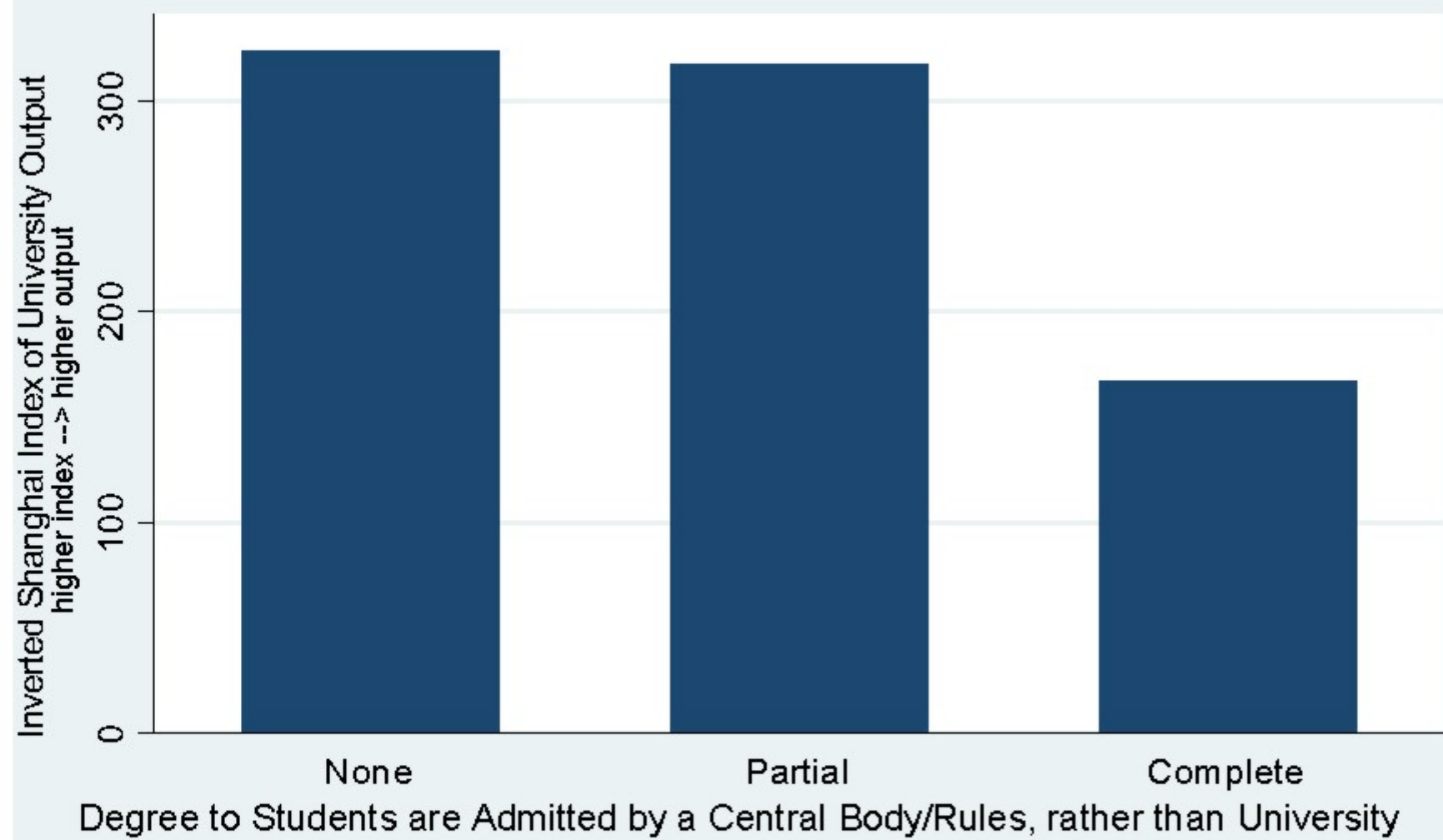


(coef=38.7,pvalue=0.130)

Correlation between University Output and Gov't Control of Faculty Salaries

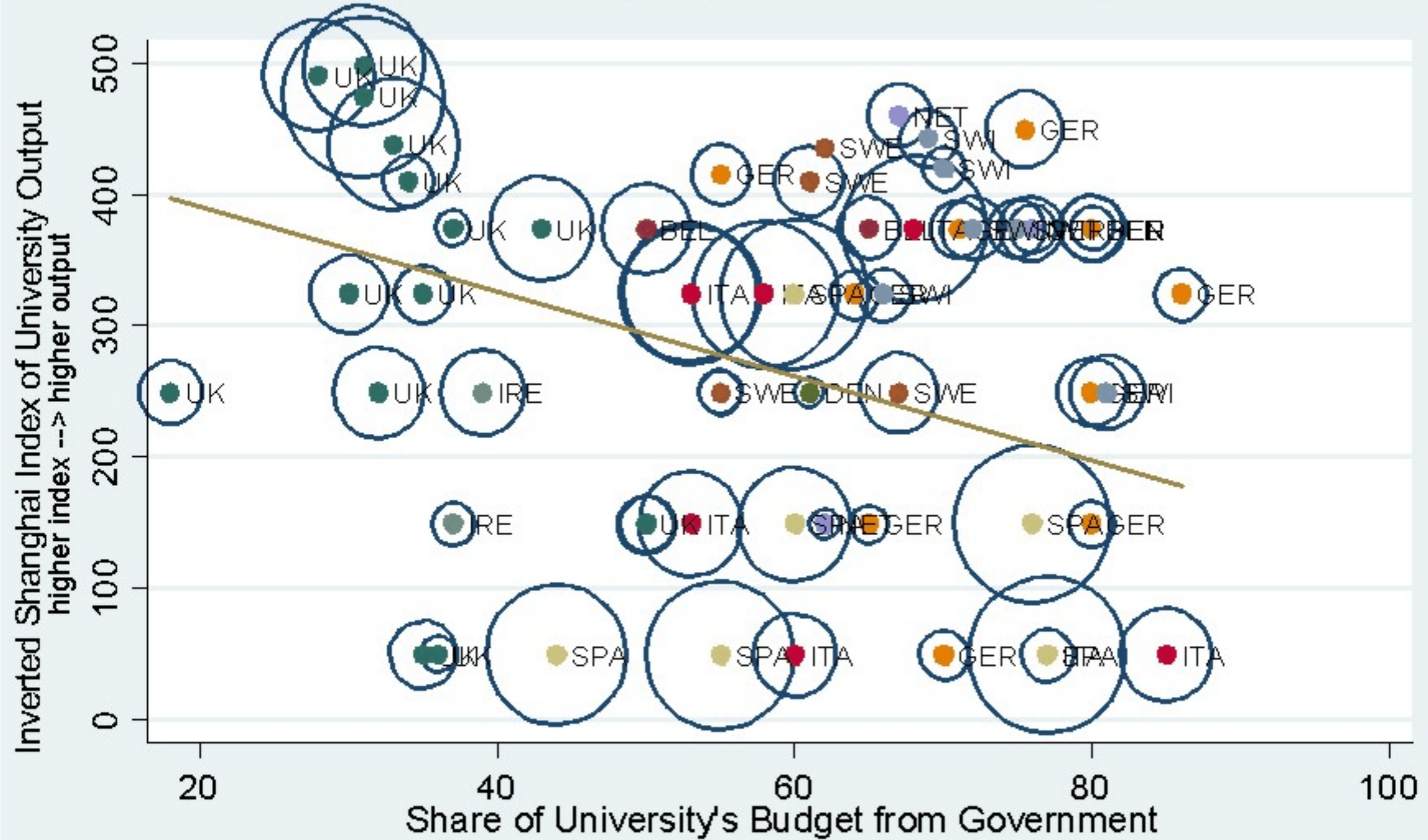


Relationship between University Output and Gov't Control of Student Admissions



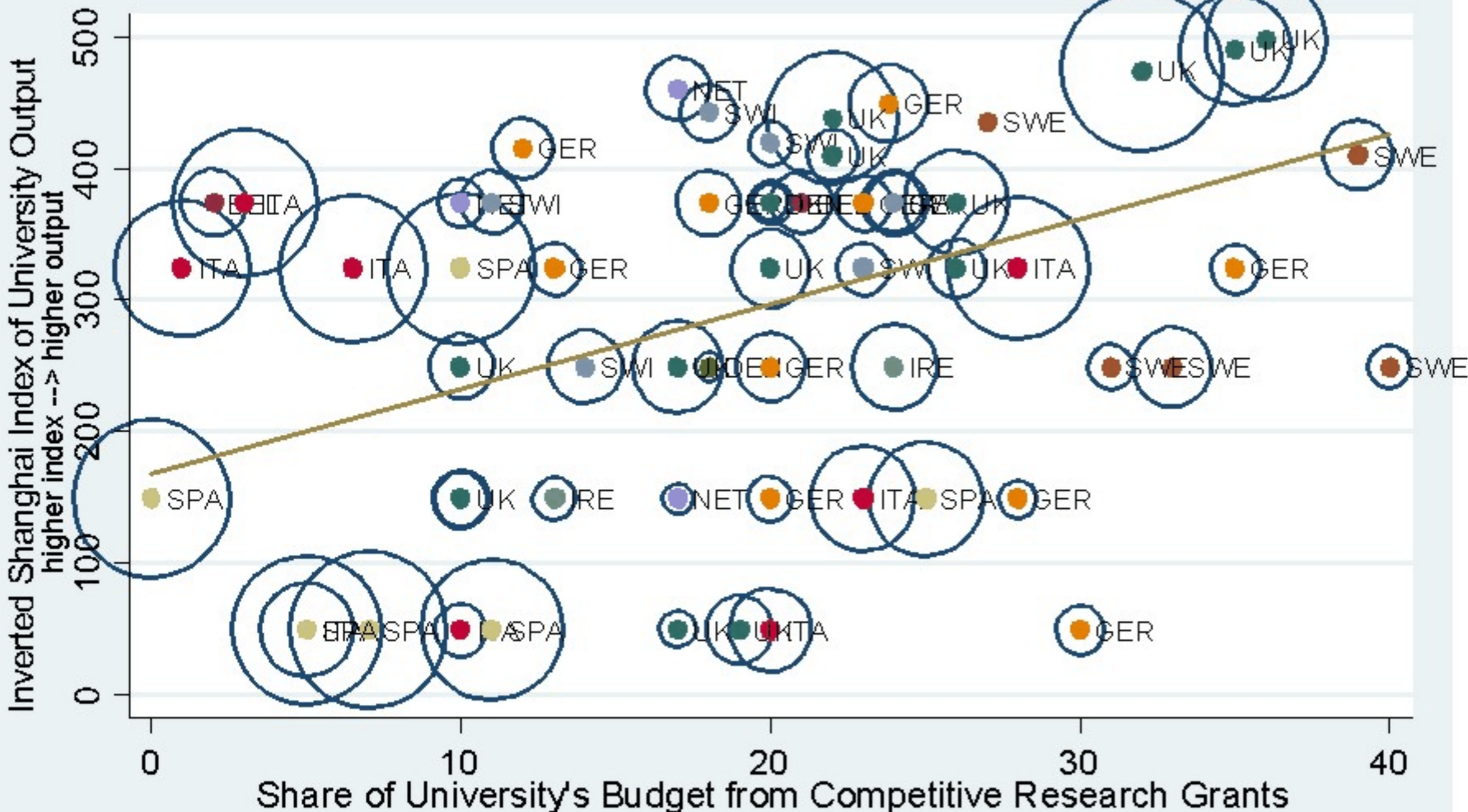
pvalue=0.002 for Difference between Complete and None

Correlation between University Output and Share of Budget from Gov't



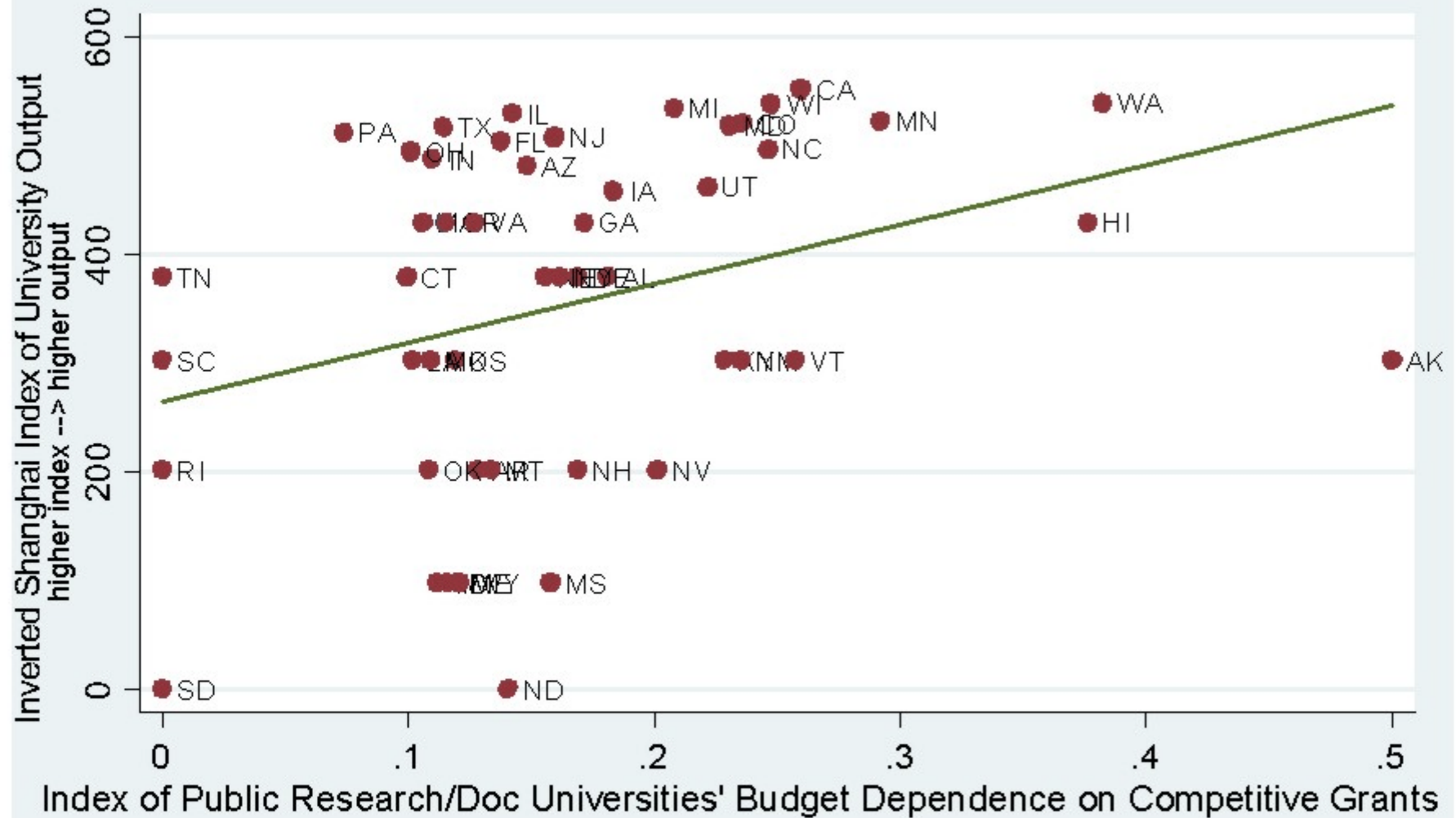
(coef=-3.2,pvalue=0.004)

Correlation between University Output & Pct. of Budget from Competitive Grants



(coef=6.5,pvalue<0.001)

Correlation between University Output and Dependence on Competitive Grants



(coef=-542.1, pvalue=0.021)

Table 4: Correlation between budget and university governance, and research performance*

Characteristics	Correlation coefficient
Budget per student	+0.61
University governance:	
Public status [†]	-0.35
Budget autonomy [§]	+0.16
Building autonomy [§]	-0.01
Hiring autonomy [§]	+0.20
Wage setting autonomy [§]	+0.27
Faculty with in-house PhD	-0.08

* Measured by the (logarithm of the) Shanghai ranking

[†] 1 if public, 0 if private. [§] 1 if yes, 0 if no.

Table 5: Effect of budget and autonomy on research performance*

Variable	Effect on research performance
Size of the university	+
Age of the university	+
Budget per student	+
Budget autonomy	+
Interaction between budget and autonomy	+

* Measured by the (logarithm of the) Shanghai ranking

Gouvernance: économétrie sur données américaines

Mesurer l'autonomie des universités

- Pourcentage d'universités privées dans l'Etat
 - Les universités privées sont supposées être plus autonomes que les universités publiques

Mesurer l'autonomie des universités

- Une université publique est plus autonome si...
 - Indépendance budgétaire à l'égard de l'Etat
 - Libre de décider de ses achats d'équipements
 - Libre de décider de sa politique de ressources humaines (embauche, séparation, salaires,..)

Mesurer l'autonomie des universités

- Deux mesures d'autonomie
 - Pourcentage d'universités de recherche privées dans l'Etat
 - Indice d'autonomie pour les universités publiques
 - Analyse en composantes principales

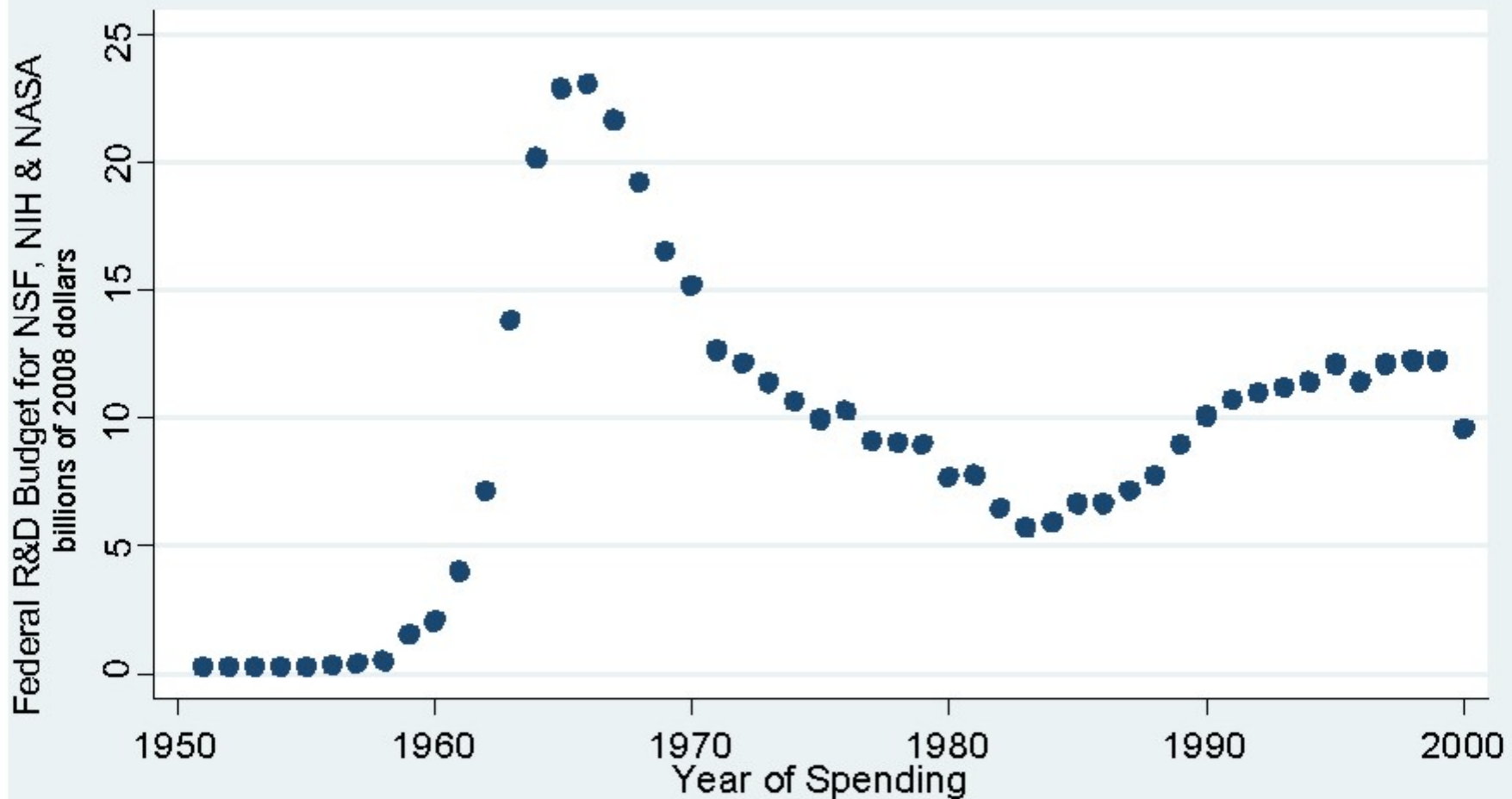
Table 1
The Effect of a State's Education Investment on Its Patents^a,
the Effect Allowed to Vary with the Autonomy of and Competition Facing its Universities
(for interpretation of coefficients, see Figures 12-14)

Dependent Variable: Patents per Person in the State
(higher education investment variables are instrumented, see notes)

	coeff.	std.err
Expenditure (thousands) on research universities per person in the cohort ^b	-0.173	(0.102)
Expenditure (thousands) on 4-year colleges per person in cohort ^b	-0.334	(0.051)
Expenditure (thousands) on 2-year colleges per person in cohort ^b	0.557	(0.123)
Expenditure (thousands) on K-12 public schools per person in the cohort	0.194	(0.044)
Autonomy Index ^c \square Exp. (thousands) on research univ per person in cohort	0.029	(0.008)
Autonomy Index ^c \square Exp. (thousands) on 4-year colleges per person in cohort	0.009	(0.002)
Autonomy Index ^c \square Exp. (thousands) on 2-year colleges per person in cohort	-0.013	(0.004)
%Universities Private ^d \square Exp. (thousands) on research univ per person in cohort	0.110	(0.038)
%Universities Private ^d \square Exp. (thousands) on 4-year colleges per person in cohort	0.141	(0.011)
%Universities Private ^d \square Exp. (thousands) on 2-year colleges per person in cohort	-0.216	(0.031)
Proximity to the Frontier ^e \square Exp. (thousands) on research univ per person in cohort	0.242	(0.157)
Proximity to the Frontier ^e \square Exp. (thousands) on 4-year colleges per person in cohort	0.504	(0.078)
Proximity to the Frontier ^e \square Exp. (thousands) on 2-year colleges per person in cohort	-0.796	(0.178)
Proximity to the Frontier ^e \square Exp. (thousands) on K-12 public schools per person in cohort	-0.310	(0.070)
contemporaneous political variables ^f		yes
state indicator variables, cohort indicator variables (equivalent to year indicator variables)		yes
state-specific linear time trends		yes

Le rôle de la concurrence

Federal Research & Development Budget for Merit-Based Grants from NSF, NIH & NASA*



*NSF=National Science Foundation
NIH=National Institutes of Health
NASA=National Aeronautics & Space Admin

Table 2
The Effect of a State's Education Investment on Its Patents^a,
the Effect Allowed to Vary with the Autonomy of and Competition Facing its Universities
(for interpretation of coefficients, see Figure 16)

Dependent Variable: Patents per Person in the State
(higher education investment variables are instrumented, see notes)

	coeff.	std.err.
Expenditure (thousands) on research universities per person in the cohort ^b	-0.208	(0.072)
Expenditure (thousands) on 4-year colleges per person in cohort ^b	-0.151	(0.026)
Expenditure (thousands) on 2-year colleges per person in cohort ^b	0.348	(0.069)
Expenditure (thousands) on K-12 public schools per person in the cohort	0.014	(0.030)
Autonomy Index ^c \square Exp. (thousands) on research univ per person in cohort	-0.042	(0.015)
Autonomy Index ^c \square Exp. (thousands) on research univ per person in cohort	0.006	(0.002)
Autonomy Index ^c \square Exp. (thousands) on research univ per person in cohort	-0.007	(0.004)
%Universities Private ^d \square Exp. (thousands) on research univ per person in cohort	-0.232	(0.046)
%Universities Private ^d \square Exp. (thousands) on 4-year colleges per person in cohort	0.017	(0.011)
%Universities Private ^d \square Exp. (thousands) on 2-year colleges per person in cohort	-0.123	(0.018)
Proximity to the Frontier ^e \square Exp. (thousands) on research univ per person in cohort	0.265	(0.109)
Proximity to the Frontier ^e \square Exp. (thousands) on 4-year colleges per person in cohort	0.252	(0.037)
Proximity to the Frontier ^e \square Exp. (thousands) on 2-year colleges per person in cohort	-0.481	(0.095)
Proximity to the Frontier ^e \square Exp. (thousands) on K-12 public schools per person in cohort	-0.030	(0.045)
Competitive Research Grants (billions) ^f \square Autonomy Index ^c \square Exp. (thousands) on research univ per person in cohort ^b	0.004	(0.001)
Competitive Research Grants (billions) ^f \square %Universities Private ^d \square Exp. (thousands) on research univ per person in cohort ^b	0.029	(0.003)
contemporaneous political variables ^g		yes
state indicator variables, cohort indicator variables (equivalent to year indicator variables)		yes
state-specific linear time trends		yes

Conclusion

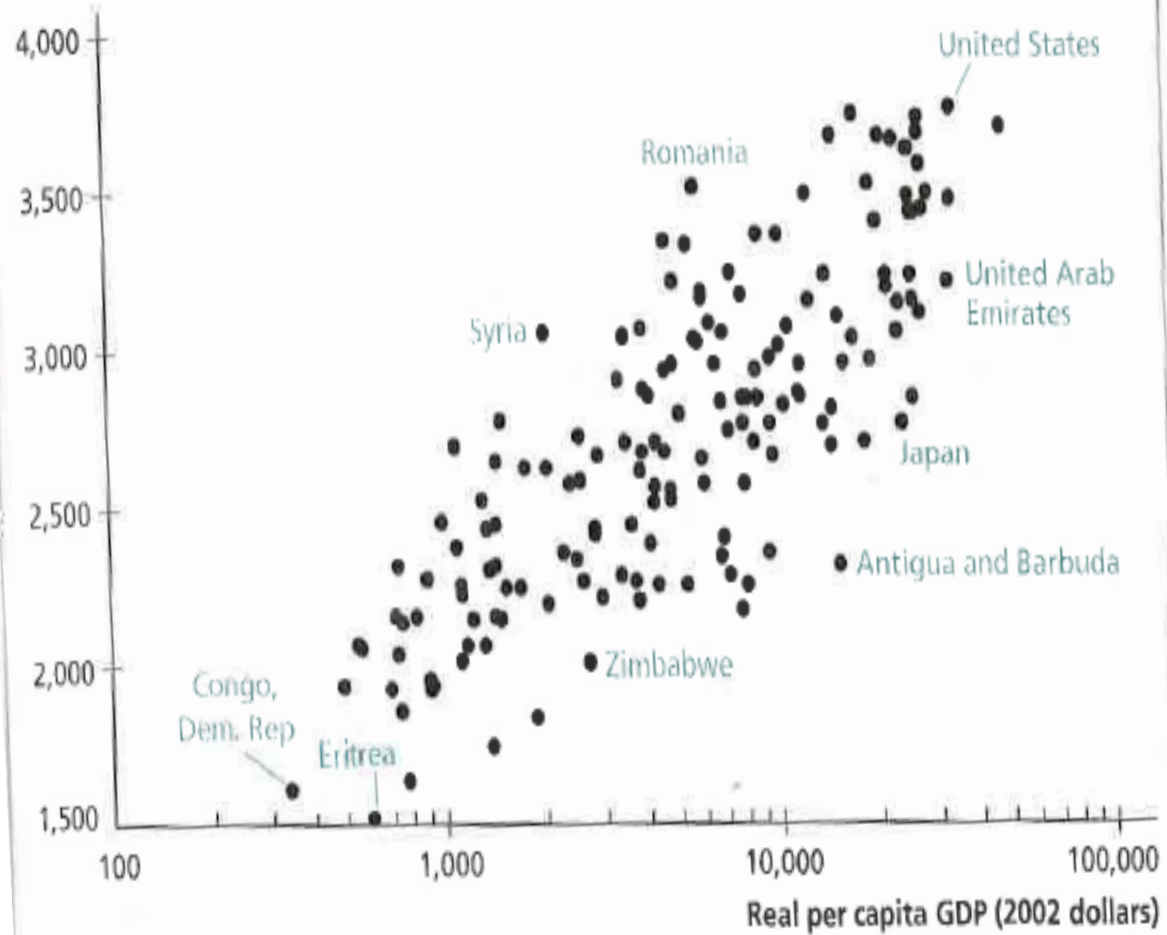
- La croissance dans les pays plus avancés bénéficie davantage de l'existence d'universités plus performantes
- La performance repose sur la combinaison entre un bon financement et une bonne gouvernance

Santé et croissance

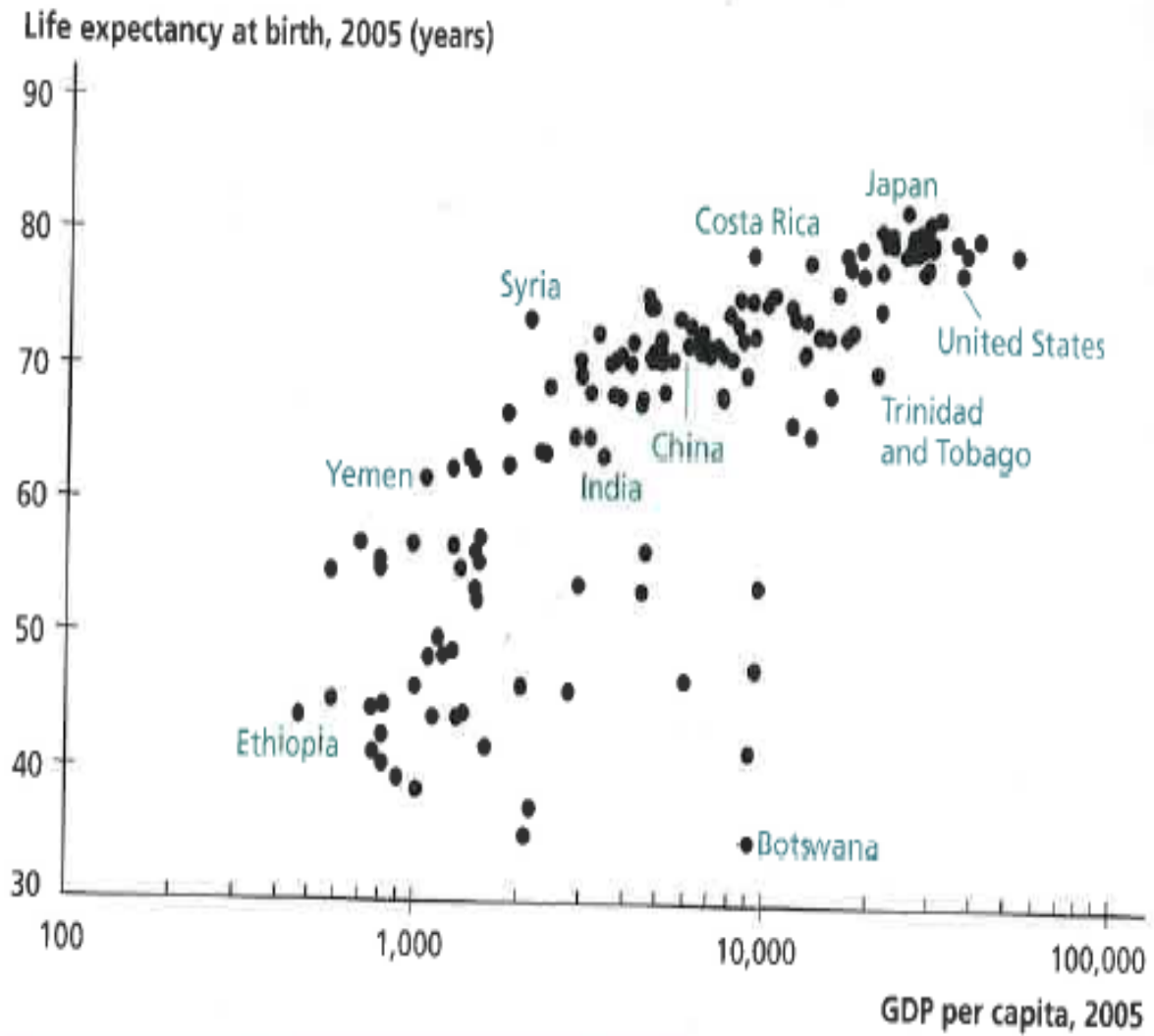
FIGURE 6.1

Nutrition versus GDP per Capita

Daily per-capita supply of calories, 2002

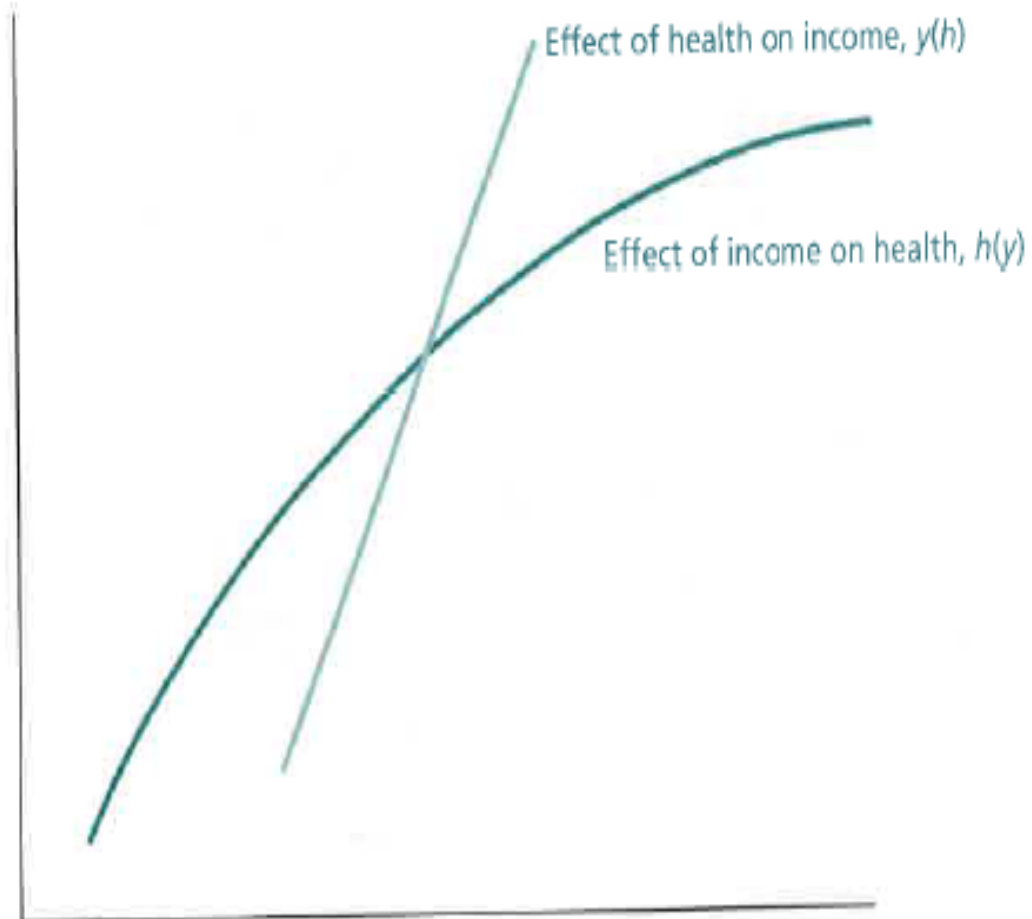


Life Expectancy Versus GDP per Capita



How Health Interacts with Income

Health, h



Income per capita, y

Effect of an Exogenous Shift in Income

