



Impact evaluation using experimental or quasi-experimental setups

Examples from education, social cohesion and innovation policy

Marc van der Steeg (CPB)

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Dutch newspaper: “Antidepressants harmful for fetus”

- Researchers compared three groups:
 - A: depressive symptoms during pregnancy without use of antidepressants
 - B: depressive symptoms during pregnancy AND use of antidepressants
 - C: no depressive complaints
- Findings:
 - Head of fetus grows a little bit slower in group A as compared to C
 - Head of fetus grows two bits slower in group B compared to C
- Research leader: do not prescribe antidepressants during pregnancy
- Problem: without use of antidepressants, group B members would possibly have been much more depressive and thereby smaller growth head of fetus. Group A does not give a good counterfactual for group B!

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Problem of evaluation

- Outcomes are often correlated
 - People with higher income are often healthier
 - People with higher education are less often unemployed
 - Unemployed participating in activating labour market policy (ALMP) find a job sooner than unemployed not participating
- Correlations often say little about causal effects!
 - Does extra income lead to better health?
 - Does higher education attainment reduce chance of unemployment?
 - Does an unemployed find a job sooner after participation in ALMP?
- Why may correlations and causal effects differ from each other?
 - Reverse causality, e.g. healthier people earn more
 - Unobserved characteristics, e.g. genes (natural ability) have an impact on both income and health

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Policy evaluation

- What is the causal effect of a certain treatment on (future) outcomes?
- Models for treatment/policy evaluation describe causal effects
- Often only one outcome is observed, the unobserved outcome is the *counterfactual*
- Most important problem is (self-)selection
- **Solution: search for exogenous variation in assignment of the treatment**
- Various methods: randomized experiments, instrumental variables, regression discontinuity, difference-in-difference


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Benefits and risks of social randomized experiments

- **Benefits:**
 - Treatment is randomly assigned, therefore treatment status is independent of potential outcomes
 - No selection problem!
 - Difference in outcomes can be assigned to treatment
- **Risks**
 - Substitution: individuals in control group search for alternative treatment
 - Attrition: individuals in control group disappear
 - Small sample size: low precision of estimates
 - Spillover effects: individuals in control group do also profit from experiment
 - Sample not representative for total population



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Randomized experiment: Dutch innovation voucher

- **Goal: “Lead them to water and pay them to drink”**
 - Stimulate knowledge questions SME’s to (semi-) public knowledge institutes
 - More market orientation knowledge institutes
- **What is it?**
 - Gift voucher , worth max 7500 euro, no own contribution required
 - Application oriented research questions
 - Only for SME’s
 - Valid for half a year
- **Assignment of vouchers to SME’s**
 - first pilot 2004, 100 vouchers available
 - first come, first served
 - **lottery if demand larger than supply**



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Evaluation strategy

- General problem: relation between making use of instrument and innovation is two-way and difficult to disentangle
 - making use of instrument may lead to more innovation
 - innovative firms make more use of innovation policy instruments
- Solution:
 - make use of random assignment of vouchers
 - 1044 applicants on first day, only 100 vouchers available
 - differences in outcomes between voucher winners and voucher losers is causal effect of voucher
 - try to control for fixed or pre-treatment background characteristics , e.g. firm size, prior use of innovation policy instruments

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Outcomes impact evaluation

- Substantial positive effect of vouchers on science-industry interaction during voucher period
 - 87% of winners commissioned a project
 - 8% of losers commissioned a project
 - 79% (=87-8%) additional projects due to voucher
 - Conclusion: 8 out of 10 vouchers additional, 1 not used, 1 not additional
 - no indications for effect on size of project
- One-off effect, no long-term effect on interaction with public knowledge institutes
- Effect on innovation output mixed: only effect on proces improvement
- Indications for crowding out effect on own R&D of SME's

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Difference-in-difference: Neighborhood policy

- Dutch government introduced plans in 2007 to improve worst 83 neighborhoods of Netherlands
- Substantial budget of 350 million euro per year
- Neighborhood action plans with targets for general liveability, housing quality, education results, integration of immigrants, safety and employability
- Assignment: 83 worst neighborhoods selected on the basis of a weighted average on 18 socio-economic characteristics



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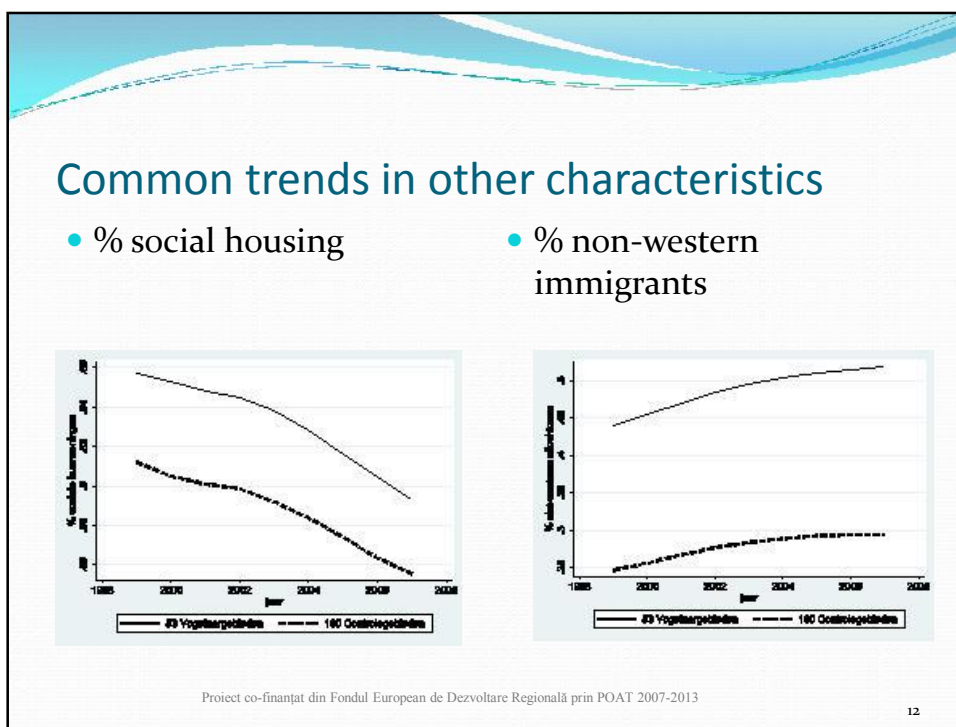
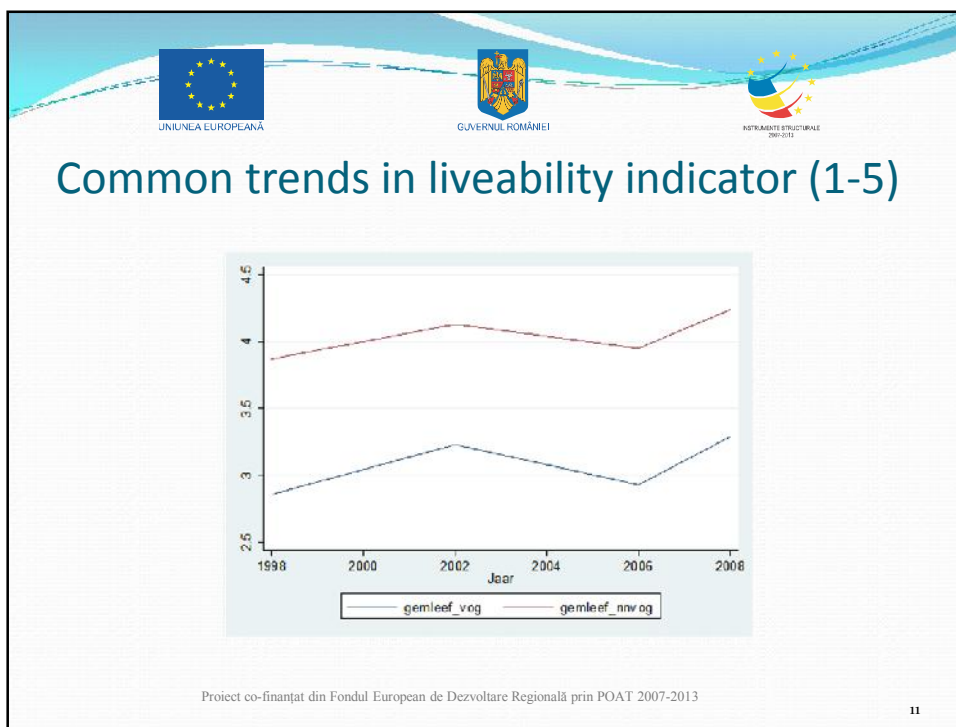


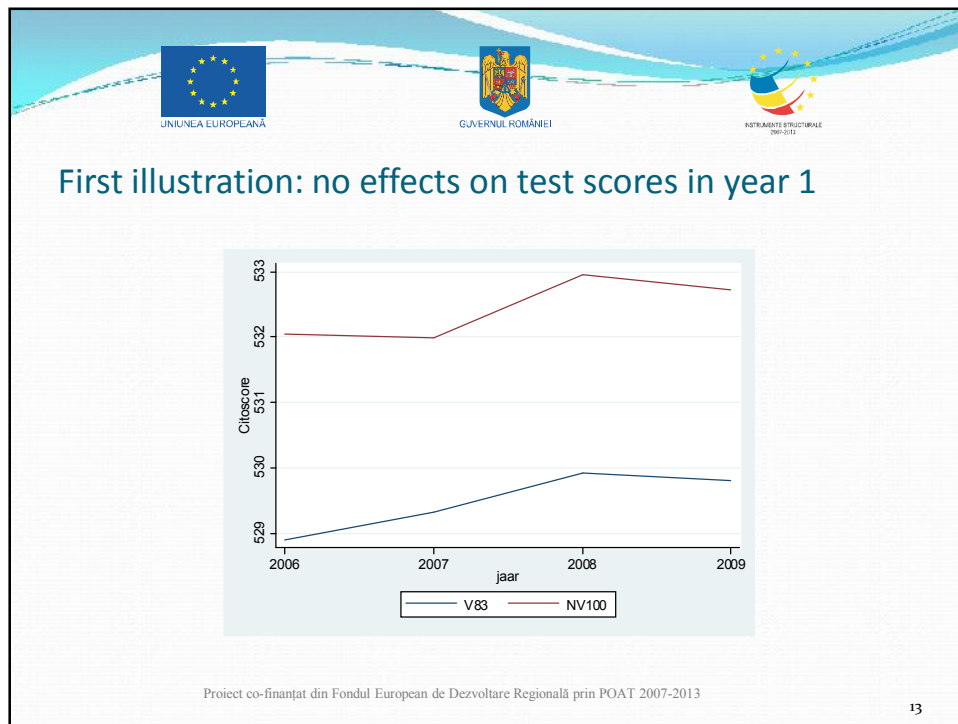
Evaluation strategy

- Exploit ranking with cut-off at neighborhood 83
- Exploit rich set of information on pre-treatment outcome indicators
- Diff-in-diff approach: compare development pre-post in neighborhood 1-83 with that in 84-183
- Local diff-in-diff: compare 63-83 with 84-104
- Control for ranking separately
- Crucial assumption is that of common trends:
 - in absence of treatment, both groups would have followed the same trend
- Check pre-trends: how comparable are trends before start treatment?

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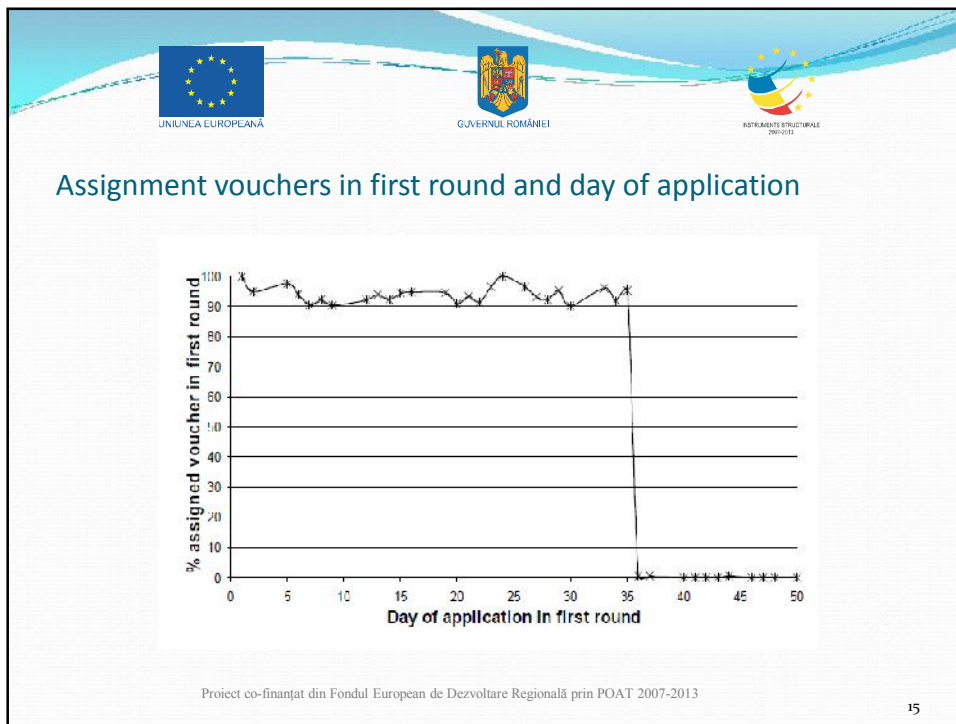
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Instrumental variable: Teacher schooling vouchers

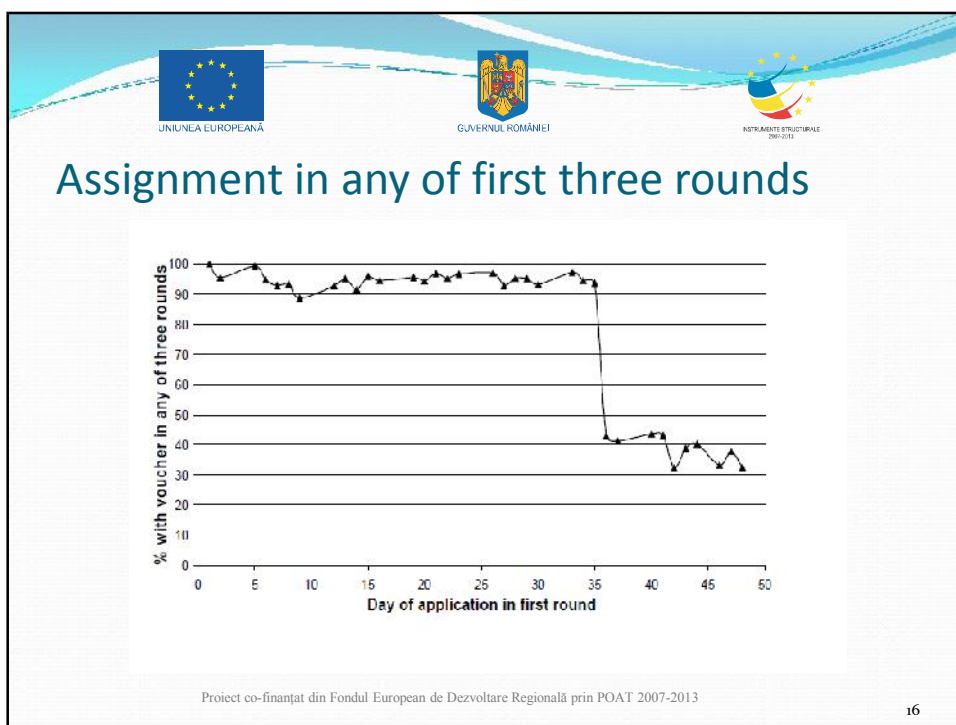
- Large scale voucher program for teacher schooling
- Goal: For higher degree, degree in other subject or extra skills
- Budget: 20 mln euro in 2008, up to 80 mln euro in 2013
- Assignment:
 - Three rounds: July-Aug 2008, Jan-Feb 2009 and May-June 2009
 - First come first served
 - Provided application fulfilled requirements

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Evaluation strategy

- **Problem: no random assignment of vouchers**
 - selectivity due to early - late application, not fulfilling requirements or re-application in second or third round
- **Solution**
 - Exploit cutoff date as instrument for sudden variation in chance of receiving voucher in any of first three rounds
 - Control separately for day of application in first round
 - Control for large set of background characteristics of applicant (e.g. sector, sex, age) and applications (e.g. length planned education program)

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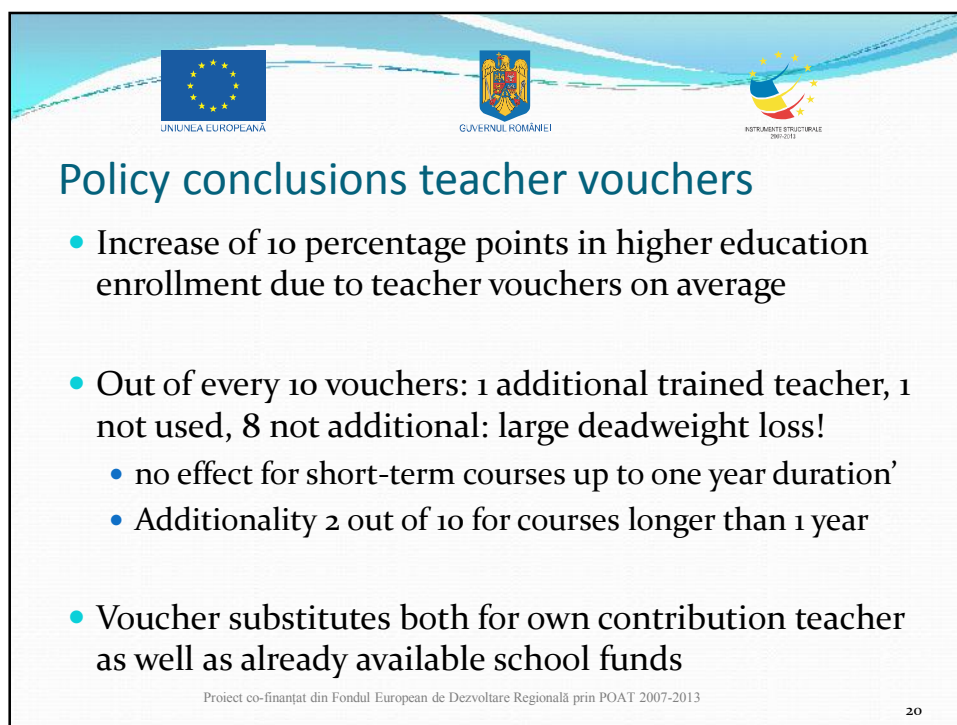
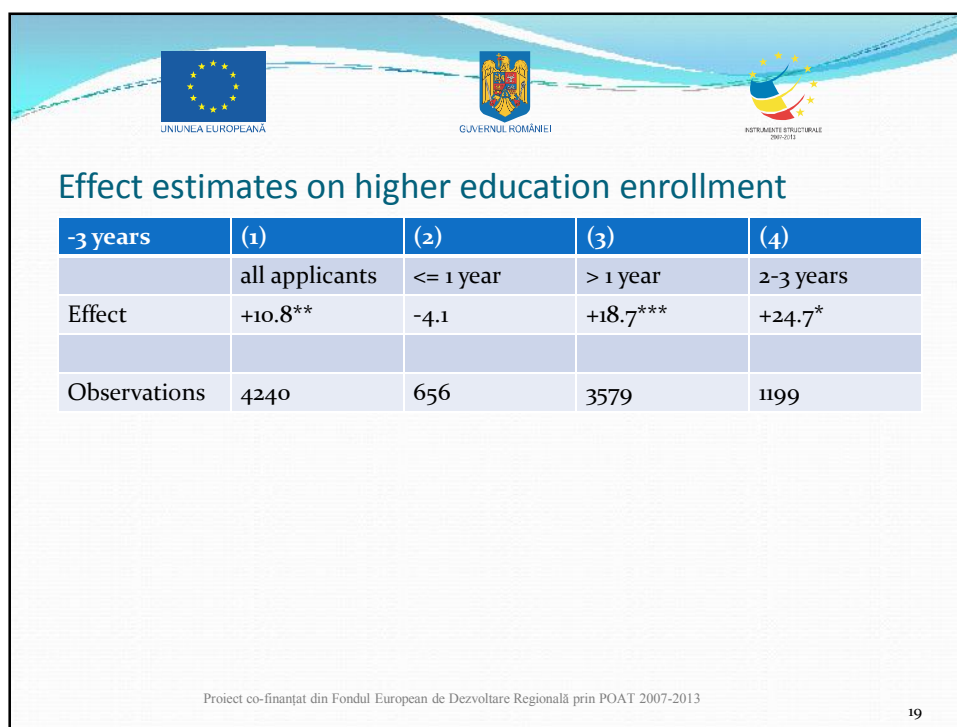



Descriptive characteristics

	Voucher	No voucher	P-value	Before cut-off	After cut-off date	P-value	Cut-off - 12 days	Cut-off + 12 day	P-value
Voucher in First Round (%)	85	0		93	0		92	0	
Second/ Third Round (%)	15	0		1	39		3	39	
Age	37.7	37.3	0.352	37.6	37.6	0.847	37.7	37.6	0.765
Female (%)	75	73	0.195	75	75	0.915	75	75	0.265
Education level(%)									
- Primary	44	47		44	47		47	47	
- Special	12	15		12	14		16	14	
- Secondary	44	37		43	39		38	39	
Application characteristics									
Duration of training (years)	2.3	2.2	0.006	2.3	2.2	0.001	2.2	2.2	0.383
Duration= 1 year (%)	13	25	0.000	13	21	0.000	17	21	0.005
Started before application	19	34	0.000	23	21	0.242	22	21	0.510
Parttime education (%)	54	51	0.056	53	54	0.920	56	51	0.510
Higher Education Partici	87	73	0.000	86	80	0.000	86	80	0.000
Observations	3378	890		3088	1180		1183	1180	

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Advice for setup of policy

- Create some exogenous variation in assignment
 - e.g. make use of limited budget for pilot phase
 - e.g. create a clear cut-off

- Ensure sufficiently large scale of (natural) experiment in terms of treatment as well as control group

- Possible to create more than 1 experimental group
 - e.g. high innovation subsidy, low innovation subsidy, no subsidy

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Advice for policy evaluation

- Ensure availability of measurable outcome indicators
 - preferably via administrative data


- Ensure availability of as many relevant control variables as possible
 - particularly pre-treatment outcome variables
 - effect estimates more precise
 - measure heterogeneous effects
 - e.g. via application forms

- Ensure commitment of control group to co-operate with research

- Measure (un-)desirable side effects of treatment
 - e.g. crowding out of own R&D (innovation vouchers)

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Other examples of our evaluation work

- Grants to young researchers (Veni, Vidi, Vici)
 - exploit ranking of proposals with cut-off for assignment
- Extra tax deductibility of wage costs of R&D workers for start-ups
 - compare developments in R&D wage expenditure of young versus just-not-young firms
- Effects of randomized experiments in education
 - extra coaching against school dropout
 - extra language instruction in vocational education

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Contact?

- m.w.van.der.steeg@cpb.nl
- www.cpb.nl



CPB Netherlands Bureau for Economic Policy Analysis

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