EVALUATION THAT MATTERS.
WAYS TO IMPROVE PUBLIC POLICIES.

XII INTERNATIONAL EVALUATION CONFERENCE WROCŁAW, 21-22 JUNE 2017

European Funds

DOLNY ŚLĄSK

The National Centre for Research and Development

PARP

MINISTRY OF ECONOMIC DEVELOPMENT

European Union
European Structural and Investment Funds

KU LEUVEN

KU LEUVEN

„Evaluating Enterprise Support of Cohesion Policy 2007-2013 – focus on results”

Dirk Czarnitzki
KU Leuven, Belgium
ZEW Mannheim, Germany

Introduction

- During the last decade, mircoeconometric econometric
  „counterfactual impact evaluations“
  have become an important tool in the area of public (enterprise) support policies.
- It became popular to use methods, such as
  - Matching estimators
  - (Conditional) Difference-in-Difference regressions
  - Instrumental variable regressions
  - More recently: Regression Discontinuity Designs
  - randomized control trials
  - „quasi-natural“ experiments
- Today I report some results of selected studies

KU LEUVEN

A typical application: “difference-in-difference” to Polish data

Project level descriptives (in thsd)

		Total Value PLN		Qualified Expenses PLN		Co-financing Contribution PLN		EU Co-financing	
Year	Freq.	Avg. per project	Total	Avg. per project	Total	Avg. per project	Total	Avg. per project	Total
2007	4246	37,771	160,400,000	28,155	119,500,000	24,545	104,200,000	22,363	94,950,000
2008	7109	8,768	62,330,000	6,705	47,670,000	4,831	34,340,000	4,489	31,910,000
2009	14862	4,466	66,370,000	3,626	53,890,000	2,513	37,350,000	2,299	34,160,000
2010	13489	3,990	53,820,000	3,223	43,480,000	2,223	29,990,000	2,040	27,520,000
2011	9670	3,129	30,250,000	2,465	23,830,000	1,679	16,230,000	1,524	14,740,000
2012	9234	3,558	32,850,000	2,826	26,100,000	1,907	17,610,000	1,704	15,730,000
2013	9067	2,957	26,810,000	2,497	22,640,000	1,752	15,880,000	1,567	14,210,000
2014	7215	2,409	17,380,000	2,061	14,870,000	1,369	9,876,000	1,224	8,830,000
2015	1196	1,725	2,063,000	1,554	1,859,000	1,162	1,390,000	1,074	1,285,000
Total	76088	7,641	452,273,000	5,901	353,839,000	4,665	266,866,000	4,254	243,335,000

KU LEUVEN

Different projects

- Invested in 86 different themes:
  - Enterprise support for R&D and innovation
  - R&D activities in research centers,
  - R&D infrastructure,
  - Railways,
  - highways,
  - urban transport,
  - electricity,
  - renewable energy,
  - infrastructure health,
  - …

KU LEUVEN

Descriptives over projects (in mln)

	Theme	Total Value PLN		Qualified Expenses PLN		Co-financing contribution PLN		EU Co-financing	
2	R&D infrastructure (including physical plant, instrumentation and high-speed networks linking research centers) and centers of technological competence	13,750	3.04%	12,650	3.58%	12,090	4.53%	10,580	4.35%
7	Investment in firms directly linked to research and innovation (innovative technologies, establishment of new firms by universities, existing R&D centers and firms, etc.).	50,110	11.08%	39,580	11.19%	18,890	7.08%	16,090	6.61%
8	Other investment in firms	21,140	4.67%	16,710	4.72%	8,727	3.27%	7,650	3.14%
16	Railways	10,680	2.36%	7,711	2.18%	7,200	2.70%	6,352	2.61%
17	Railways (TEN-T)	16,200	3.58%	11,520	3.26%	11,450	4.29%	9,448	3.88%
20	Highway	11,050	2.44%	8,845	2.50%	8,845	3.31%	7,518	3.09%
21	Motorways (TEN-T)	60,840	13.45%	42,320	11.96%	41,810	15.67%	35,970	14.78%
23	Regional / local roads	25,880	5.72%	23,210	6.56%	17,180	6.44%	16,810	6.91%
44	Management of municipal and industrial	9,997	2.21%	6,085	1.72%	4,505	1.69%	4,486	1.84%
46	Wastewater Treatment	29,420	6.50%	19,190	5.42%	15,530	5.82%	15,530	6.38%
52	Promotion of clean urban transport	21,260	4.70%	16,590	4.69%	11,840	4.44%	11,820	4.86%
total		270,327	59.77%	204,411	57.77%	158,067	59.23%	142,254	58.46%

(This table includes themes that received more than 2% of total funding)

KU LEUVEN

Data

- Orbis Database from Bureau Van Dijck
  - Information comes from local provider InfoCredit
    - They collect information from
      - National Court Registry
      - journals for entities and cooperatives
      - Judicial and Business Journal ("Monitor Sądowy i Gospodarczy“),
      - directly from the companies, as well as other alternative sources (if necessary)
  - Data we use from Orbis:
    - Outcome variables: Employees, Sales, and Total Fixed Assets
    - Controls (conditional DiD): Foundation Year, Rentability (ROA), Solvability (leverage), Liquidity (Current assets/current liabilities)

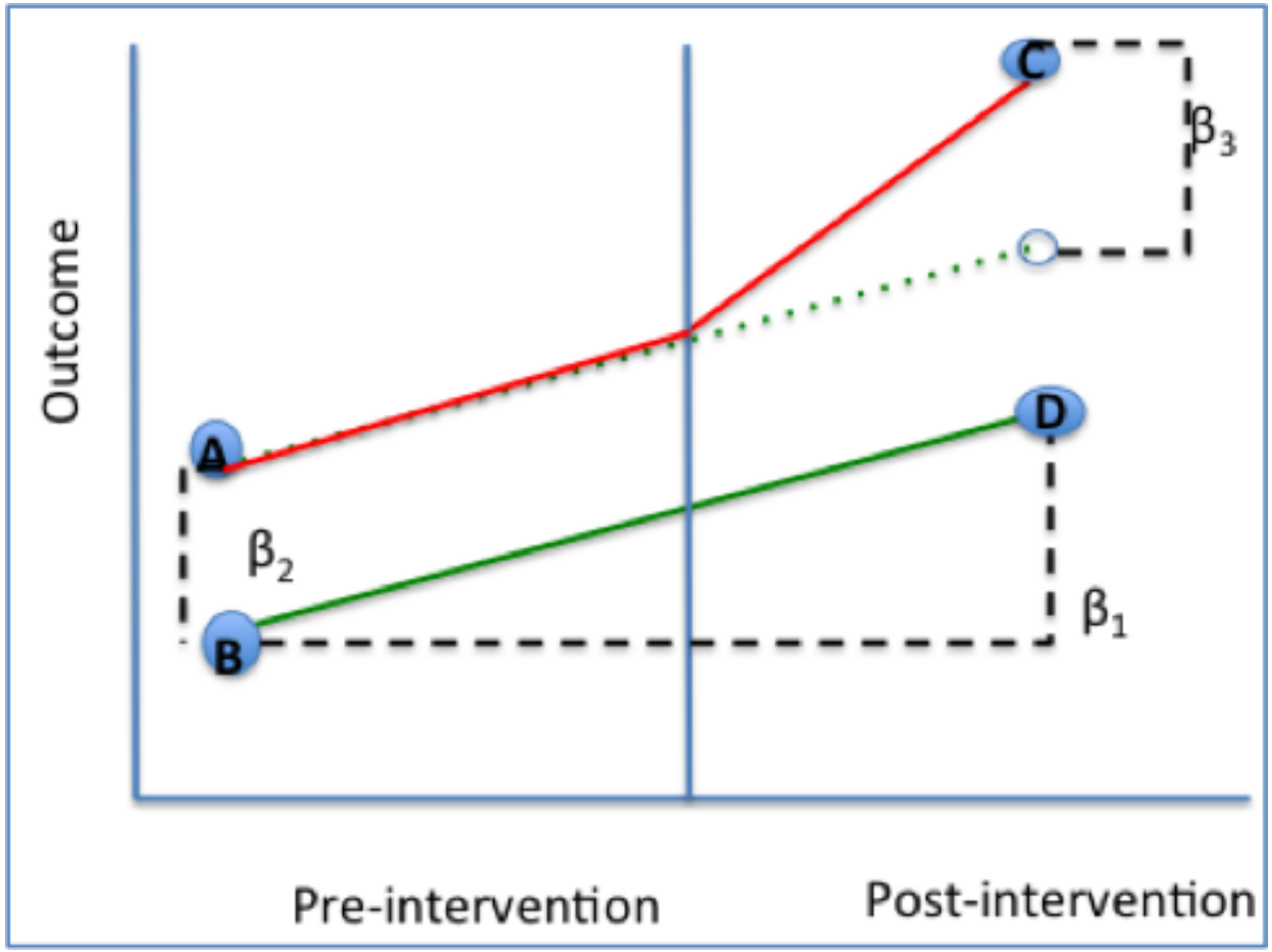
KU LEUVEN

Descriptive Statistics (about 11,000 different firms)

	Treated N: 7,792				Non-treated N: 34,903			
Outcome Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Sales	12600000	17500000	111991	305000000	17200000	28000000	734.000	308000000
LogSales	15.861	0.955	11.626	19.535	15.893	1.260	6.600	19.544
Emp	144.529	135.656	1	850.000	127.441	146.931	1.000	850.000
LogEmp	4.603	0.909	0.693	6.746	4.253	1.161	0.693	6.746
Tfas	15600000	25400000	0.000	332000000	14200000	29600000	0.000	396000000
LogTfas	15.767	1.426	0.000	19.621	15.054	2.119	0.000	19.797
Controls:								
Age	21.708	22.507	1	228.000	18.759	20.615	1.000	251
LogAge	2.855	0.674	0.693	5.434	2.729	0.638	0.693	5.529
Rentability$_{(t-1)}$	1.661	0.899	0.139	8.178	2.037	1.175	0.140	8.414
Solvability$_{(t-1)}$	0.066	0.094	0.000	0.561	0.049	0.092	0.000	0.570
Liquidity$_{(t-1)}$	1.906	1.785	0.250	21.576	2.085	2.066	0.248	21.652

KU LEUVEN

Difference-in-Difference



KU LEUVEN

Effect of Subsidies

	Log Sales	Log Emp (Employees)	Log TFAS (Total Fixed Assets)
N	Obs. 42,695 Firms. 9,743	42,695 Firms. 9,743	42,695 Firms. 9,743
Treated * Post time dummy	**0.061***** **(0.008)**	**0.033***** **(0.006)**	**0.285***** **(0.019)**
Firm fixed effects Year fixed effects	Yes Yes	Yes Yes	Yes Yes

KU LEUVEN

Effect of Subsidies

	Log Sales	Log Emp	Log TFAS
N	Obs. 42,695 Firms. 9,743	Obs. 42,695 Firms. 9,743	Obs. 42,695 Firms. 9,743
Treated * Post time dummy	**0.067***** **(0.008)**	**0,037**** **(0,006)**	**0.270***** **(0,019)**
Rentability$_{(t-1)}$	0.041*** (0.004)	-0,002 (0,002)	-0,143*** (0,007)
Solvability$_{(t-1}$	-0.036 (0.031)	0,0178 (0,219)	0,652*** (0,0687)
Liquidity$_{(t-1)}$	-0.023*** (0.001)	-0,004*** (0,001)	-0,023*** (0,003)
Log Age	0.331*** (0.025)	0,412*** (0,017)	0,595*** (0,055)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

KU LEUVEN

	Small Firms (Employment < 50)			Medium Firms (Empl >= 50 & Empl < 250)		
	Log Sales	Log Emp	Log TFAS	Log Sales	Log Emp	Log TFAS
N	Obs. 14,427 Firms. 4,199	Obs. 14,427 Firms. 4,199	Obs. 14,427 Firms. 4,199	N: 21,671 Firms: 5,239	N: 21,671 Firms: 5,239	N: 21,671 Firms: 5,239
Treated * Post time dummy	0,0596*** (0,022)	0,0438*** (0,012)	0,387*** (0,056)	0,060*** (0,010)	0,017*** (0,006)	0,261*** (0,020)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Large Firms (Empl >= 250)

	Log Sales	Log Emp	Log TFAS
N	N: 5801 Firms: 1,452	N: 5801 Firms: 1,452	N: 5801 Firms: 1,452
Treated * Post time dummy	0,020 (0,351)	-0,010 (0,010)	0,154*** (0,038)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

KU LEUVEN

KU LEUVEN

Conceptual/Methodological extensions and discussion:

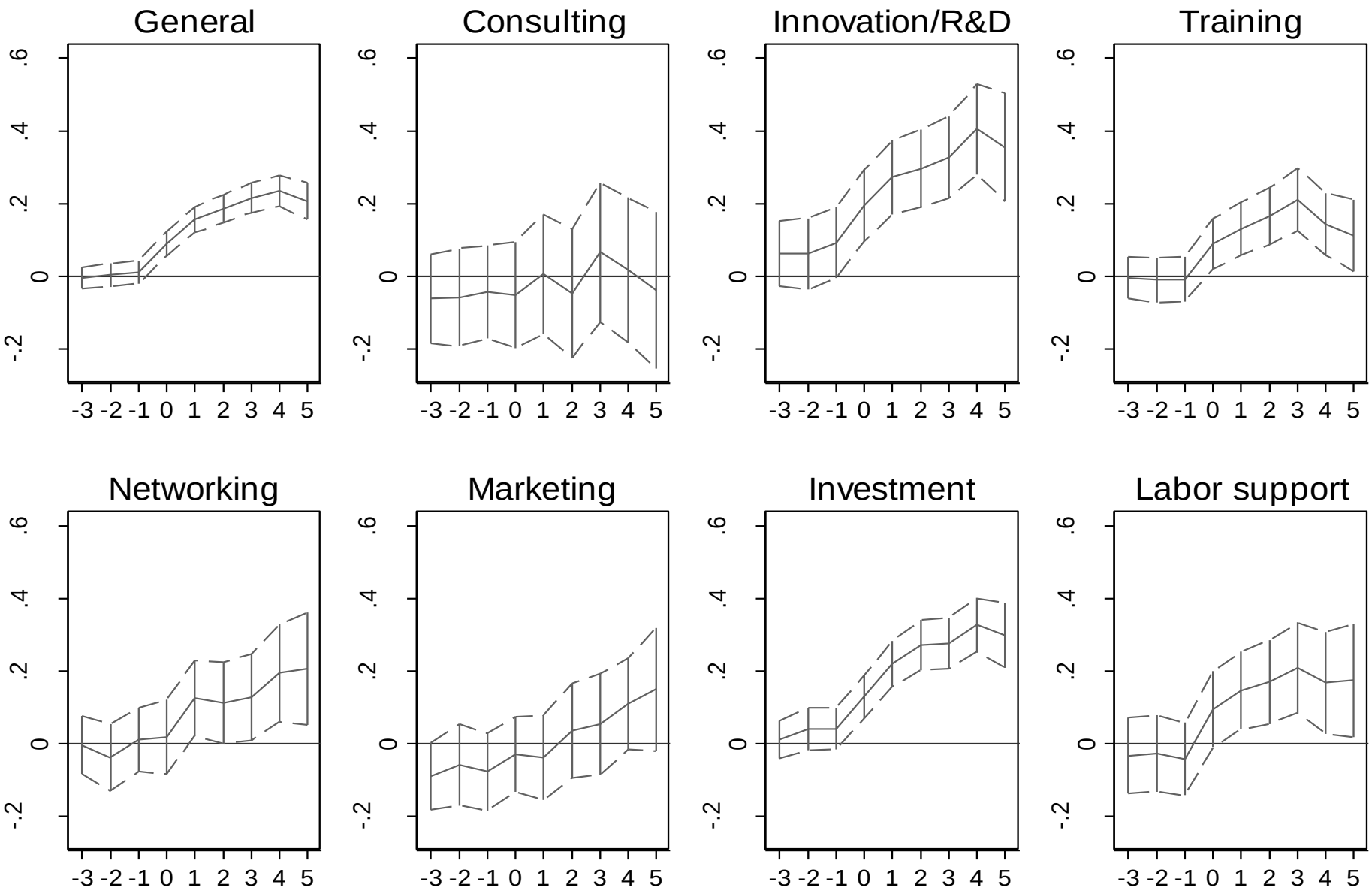
Heterogeneous treatments and their effects *across* policy instruments

Example:
Cohesion Policy in Germany

Heterogeneous treatments

- it is possible to search for heterogenous effects *across* schemes
  - Problem: very „data hungry“
  - E.g. Czarnitzki et al. (2017): enterprise support in German Cohesion Policy schemes
  - Here: about 45,000 projects categorized
  - Control group: Matched non-funded firms
- Also: „dynamic“ treatment effects
  - Treatment effect could evolve over time rather than occuring in a single period

Treatment effect over time for ln(employment) by grant type



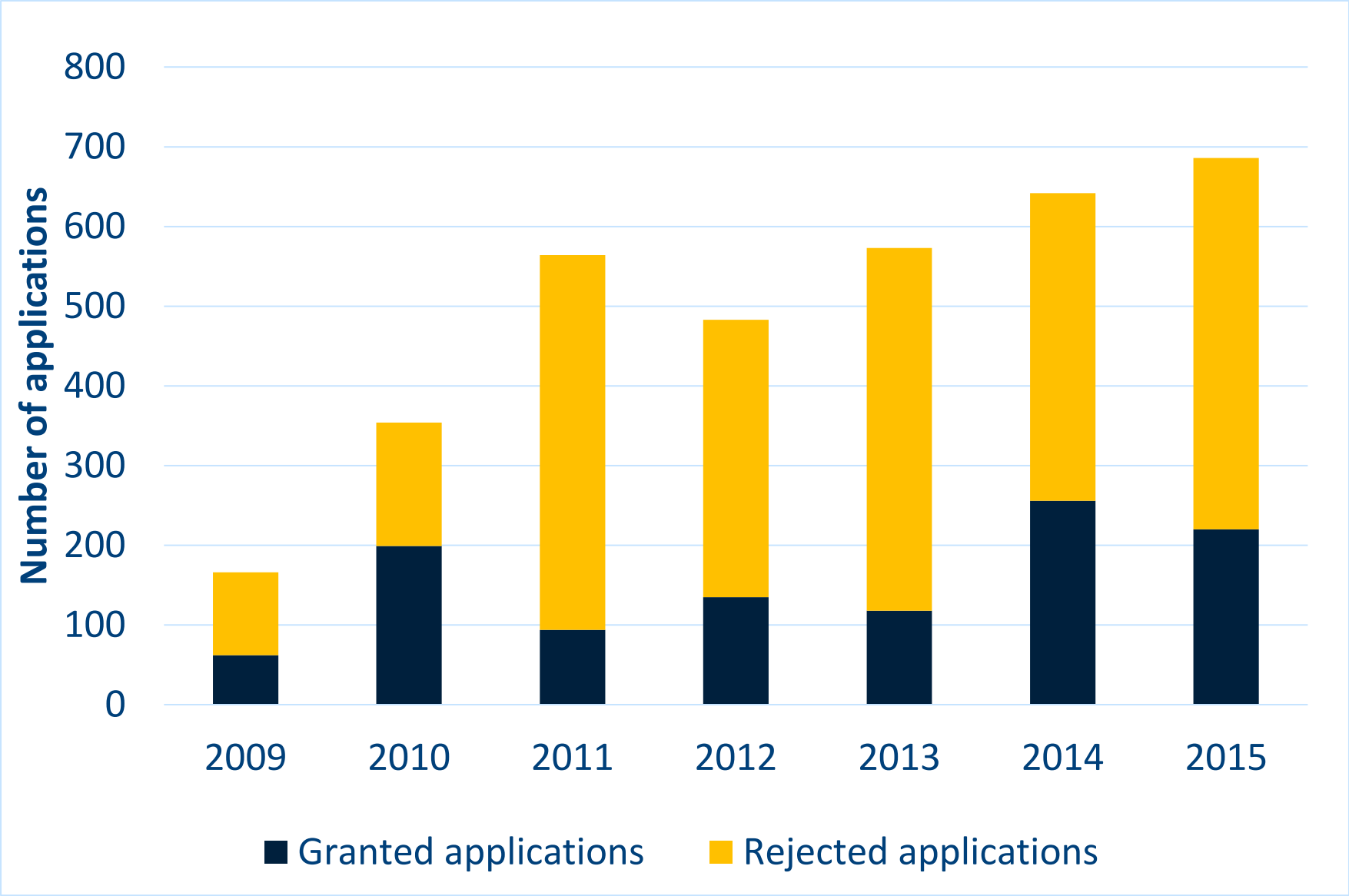
95% confidence interval

KU LEUVEN

Conceptual/methodological extensions:

Using non-successful applicants as control group

Example:
innovation/entrepreneurship funding in Bosnia and Herzegovina


800
700
600
500
400
300
200
100
0
Number of applications
2009
2010
2011
2012
2013
2014
2015
Granted applications
Rejected applications

KU LEUVEN

DiD regressions; full sample of participants and non-successful applicants, 2009-2015 (96% are smaller than 50 employees)

	Dependent variable	
	Employment	log(Employment)
	Coeff. (Robust Std. Err)	Coeff. (Robust Std. Err)
Treatment effect	2.80** (1.29)	0.12 *** (0.03)
Time dummies	Included	Included
F-Statistic (9, 1927)	6.94***	33.39***
Number of firms	1,928	1,928
Number of obs.	13,821	13,821
	Dependent variable	
	Sales	log(Sales)
	Coeff. (Robust Std. Err)	Coeff. (Robust Std. Err)
Treatment effect	202.90*** (67.24)	0.13*** (0.04)
Time dummies	Included	Included
F-Statistic (9, 1909)	30.82***	36.07***
Number of firms	1,913	1,913
Number of obs.	12,593	12,593

KU LEUVEN

KU LEUVEN

Conceptual/methodological extensions:

Heterogeneous treatment effects *within* a policy scheme

Example: EUREKA's Eurostars

Policy scheme

- Cross-national funding for Hi-tech SME‘s with products/services close to the market.
- Control group here: matched non-successful applicants
- Evaluation of Eureka‘s Eurostars programme* (total budget 500 million EUR - co-financed by EC = 100 million EUR)
- Dirk estimated:
  - treatment effect of Eurostars with respect to job creation amounts to a **3.1% higher average annual employment growth-rate** when compared to the counterfactual situation of no Eurostars grant
  - Extrapolation from regression sample to total programme impact yields about 7,800 jobs created

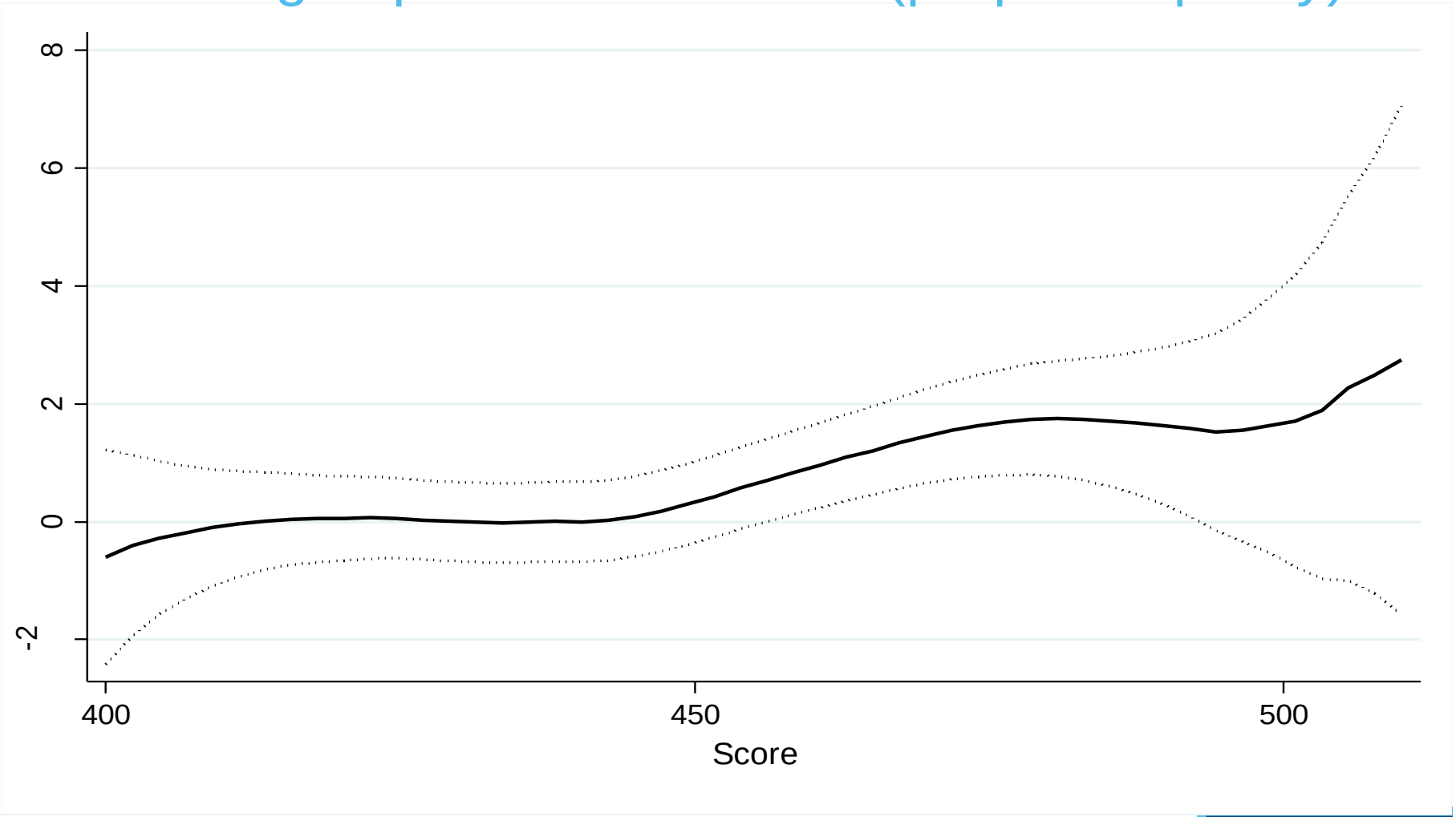
* http://ec.europa.eu/research/sme-techweb/pdf/ejp_final_report_2014.pdf

Heterogeneous treatment effects

- Monetary value of grant
- Subsidy rate
- Firm size
- Heterogeneity of consortia
  - start-ups, large firms, universities
- Proposal quality (Peer-review score)
- Multiple grants

- Hünermund/Czarnitzki (2016) find that treatment effect varies with the peer-review score. Better proposals also yield higher treatment effects (but effect is not linear)
  - Note: LATE in RDD vs. ATT obtained with other estimators.

Heterogeneous treatment effects in Eurostars according to peer-review score (proposal quality)



KU LEUVEN

KU LEUVEN

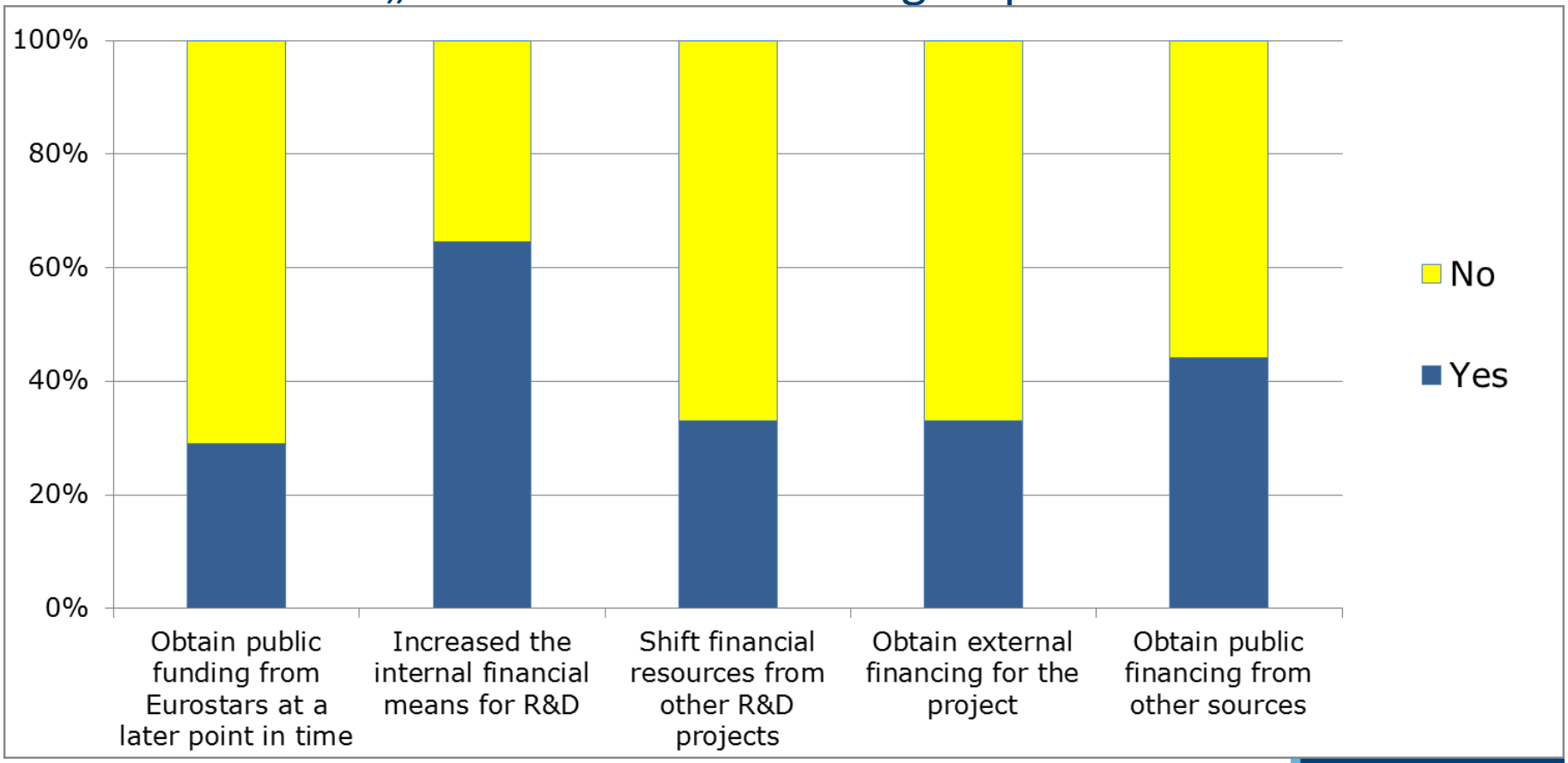
Conceptual/methodological extensions:

indirect incentive effects and „contaminated control groups“

Example: also EUREKA’s Eurostars

Indirect effects

- Policy scheme may have indirect effects
- Example Eurostars: even rejected applications may have effects
  - Beware: „contaminated control group“



KU LEUVEN

Conclusions

- The use of appropriate econometrics methods increased significantly in the last decades.
- There is still room for improvement with respect to „identification“
  - Exploit discontinuities, instruments, randomized control trials, experiments
- apply methods in a more useful way for policy making (i.e. beyond homogenous „treatment effects on the treated“ of a single programme)
  - Design of policy schemes
  - Selection of policy schemes

Conclusions

- Positive results are found frequently
- However:
- often lack of heterogeneous treatment effects
- Interdependencies between schemes are almost never investigated (complentary vs. substitutive effects)
- Indirect effects often neglected
  - Could bias results both positively and negatively!!!

KU LEUVEN