Evaluation of State Aid

John Van Reenen
Centre for Economic Performance, LSE

DG-COMP, April 23rd 2013

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

MOTIVATION

- Many issues behind evaluation of business support/state aid from perspective of DG-COMP and Member States
- One basic issue is: **does it work**? Do the subsidies have a positive effect on the recipients?
- But many other issues in addition to private benefit
  - Costs
  - Effects on consumers
  - Negative competitive effects on rivals
  - Wider effects on area (supply chains, employment & wages)
  - Heterogeneity of the effects (e.g. large/small)
- Answers require considering the world “but for” the subsidies

The Evaluation Problem

Institutional Setting

Results

Conclusions & Implications

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

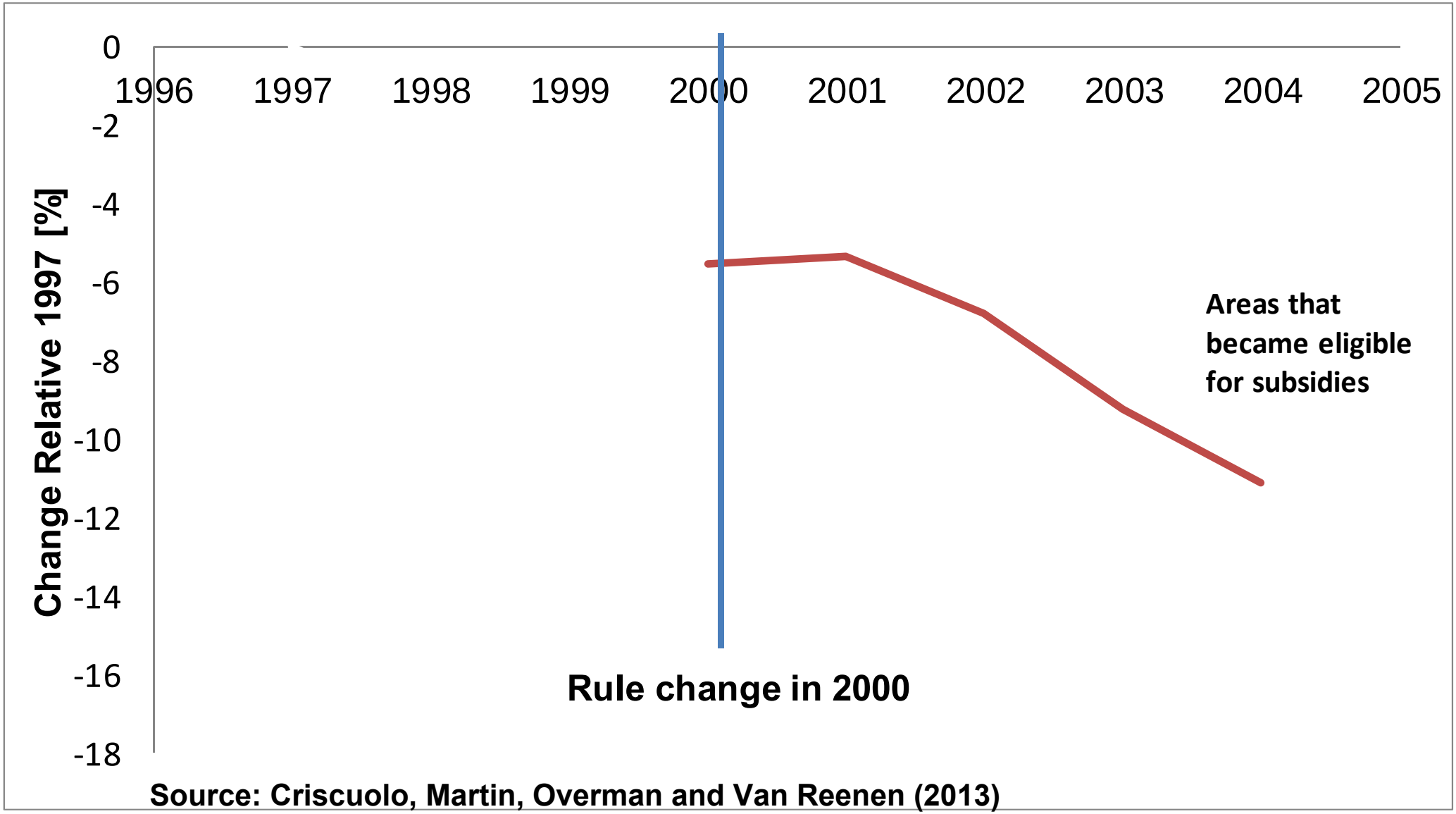
EVALUATION PROBLEM: CONSTRUCTING THE BUT-FOR WORLD

- Ex post qualitative surveys – what did you do with the money?
  - An IQ test. Pretty useless for evaluation
- Need to consider evaluation when designing/implementing schemes
  - Get quantitative baseline data before (as well as after) intervention. Ideally from administrative sources
  - Consider who is the control/counterfactual group prior to implementation. Key to understanding the “but-for” world Build in to scheme
- Question is whether firm would have done what it did without subsidy (e.g. big firms may have more spillovers, but is there a causal effect of the subsidy?)

EVALUATION PROBLEM: CONSTRUCTING THE BUT-FOR WORLD

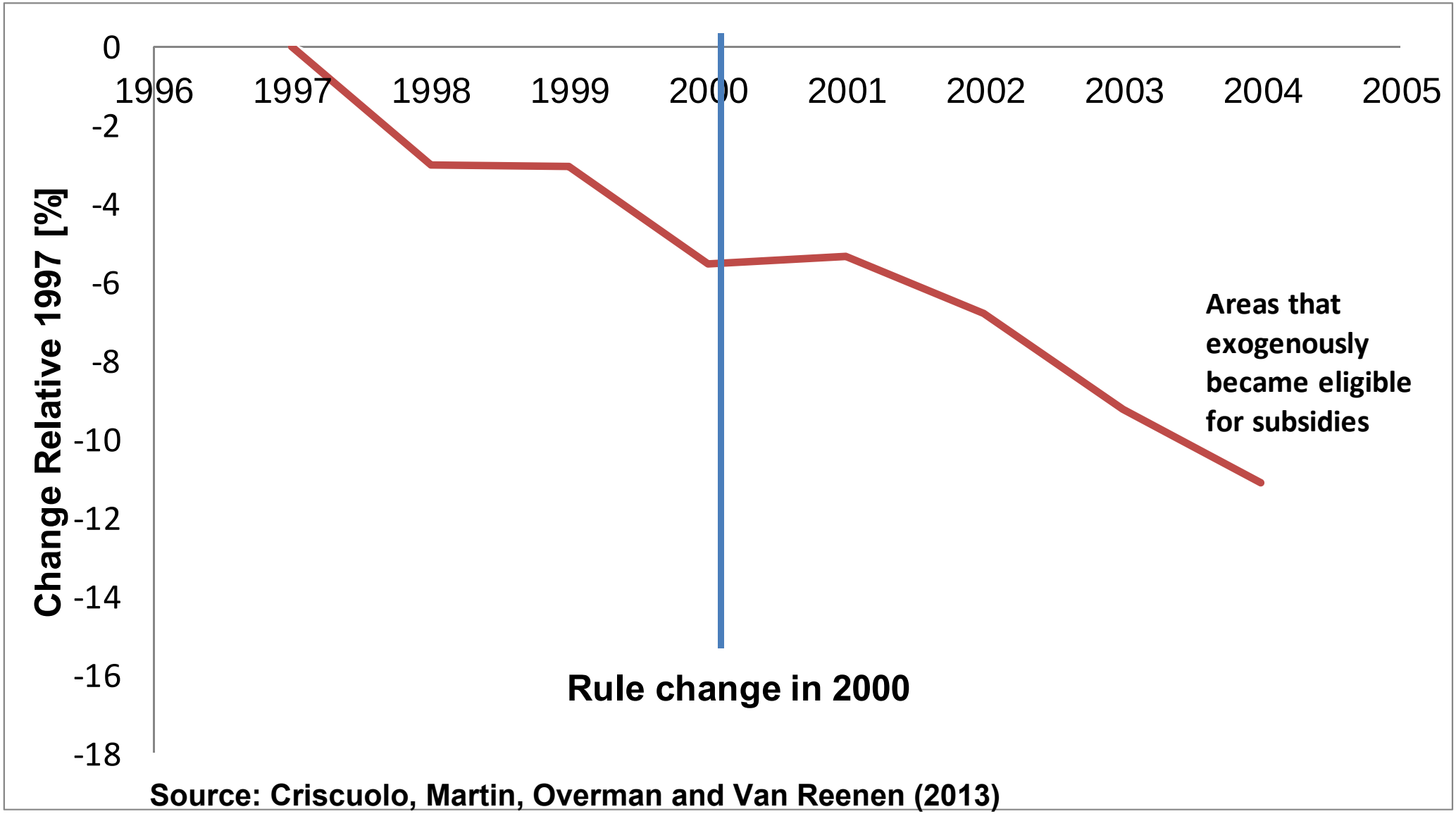
- Simple difference before & after the scheme
  - But would firms have done the same regardless?
- Difference in differences
  - Look at how a control/comparison group did over the same period: e.g. same industry/area/size, etc. “matching”
  - Takes out the common effect to construct counterfactual
  - But maybe we’re still not comparing like with like (can check by looking pre-policy, etc.)
  - Need something exogenous that randomises a firm into treatment vs. control

LOOKING AT JOBS AFTER A POLICY OF INVESTMENT SUBSIDIES IMPLEMENTED - CHANGE IN JOBS SINCE 1997



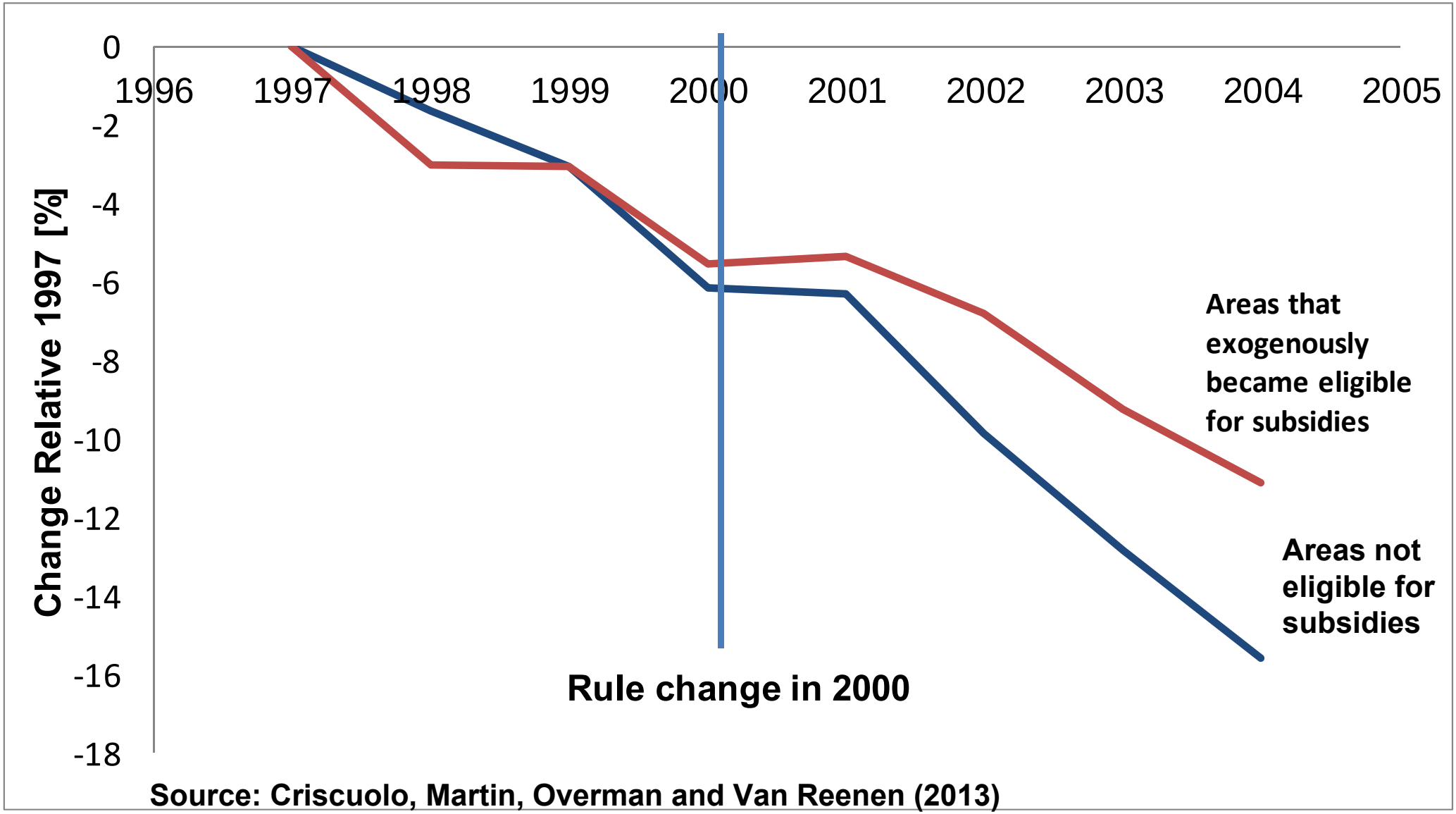
Source: Criscuolo, Martin, Overman and Van Reenen (2013)

LOOKING AT SIMPLE DIFFERENCE BEFORE AND AFTER THE SCHEME (CHANGE IN JOBS SINCE 1997)



Source: Criscuolo, Martin, Overman and Van Reenen (2013)

RULE CHANGES TO GENERATE EXOGENOUS REASONS FOR AREAS BECOMING ELIGIBLE (CHANGE OF EMPLOYMENT RELATIVE TO 1997)



Source: Criscuolo, Martin, Overman and Van Reenen (2013)

DIFFERENT COUNTERFACTUAL GROUPS

- **Randomised Control Trials (RCT)**
  - Gold standard like clinical trials & increasingly used
  - Too many equally good applicants? Decide by lottery
  - More ethical & fair
- **Regression Discontinuity Design (RDD)**
  - Score applicants. Usually budget will mean a threshold
  - Look at those who “just missed” compared to those which “just won” above & below threshold. The just missed a good control group
- Other quasi-experiments to make **Instrumental Variable (IV)**
  - Example: Criscuolo et al (2013) Key is exogenous variation

The Evaluation Problem

Institutional Setting

Results

Conclusions & Implications

CRISCUOLO, MARTIN, OVERMAN & VAN REENEN (2013)
"The causal effects of an industrial policy"

- Estimate effects of business support program in UK **Regional Selective Assistance (RSA)** on jobs, investment, productivity, entry/exit & unemployment
  - Selected firms are given investment subsidies in disadvantaged geographical areas (mainly manufacturing)
- Rich panel data for non-treated and treated plants & firms
  - administrative data on population of all RSA recipients matched to population of plants (2.2m observations over 350k plants)
- **Quasi-experiment:** EU-wide definition of a "disadvantaged area" determined by EU State Aid rules & revised every 6-9 years.
  - In sample period 1986-2004 there were two changes in eligibility and maximum subsidy in 1993 & 2000

REGIONAL SELECTIVE ASSISTANCE: RSA

- Provides investment grants to firms in “eligible” areas. The grants cover between 10% to 35% of capital expenditure.

Location determines eligibility & size of grants.

- Different types of Assisted Areas:
  - **Development Area/ Tier 1**: grant can cover 20% to 35% net grant equivalent (NGE) of investment project costs
  - **Intermediate Area /Tier 2**: grants can cover 10% to 30% project costs
- In our sample period major map changes in 1993 & 2000: Map of assisted areas changed because of EU-wide rules.

CHANGES IN AREA ELIGIBILITY

- RSA is a form of State Aid to industry that could distort competition between EU Member States

- State aid illegal except under restrictive conditions. Changes in area eligibility depend on:
  - Changes in eligibility **criteria** (& weights given to them)
  - Changes in EU wide **values**; e.g. one criteria is area's GDP/capita relative to EU average GDP/capita . When Poland & other A8 countries joined EU, EU GDP/capita fell so some UK areas exogenously lost eligibility
  - Changes in area's **characteristics** (potentially endogenous)

EXAMPLES OF CRITERIA ON AREA ELIGIBILITY

The 1993 rules

- Peripherality
- Population Density
- GDP per capita relative to EU average
- Relative unemployment (level and long-term)
- Activity Rates
- Occupational Structure
- New business growth

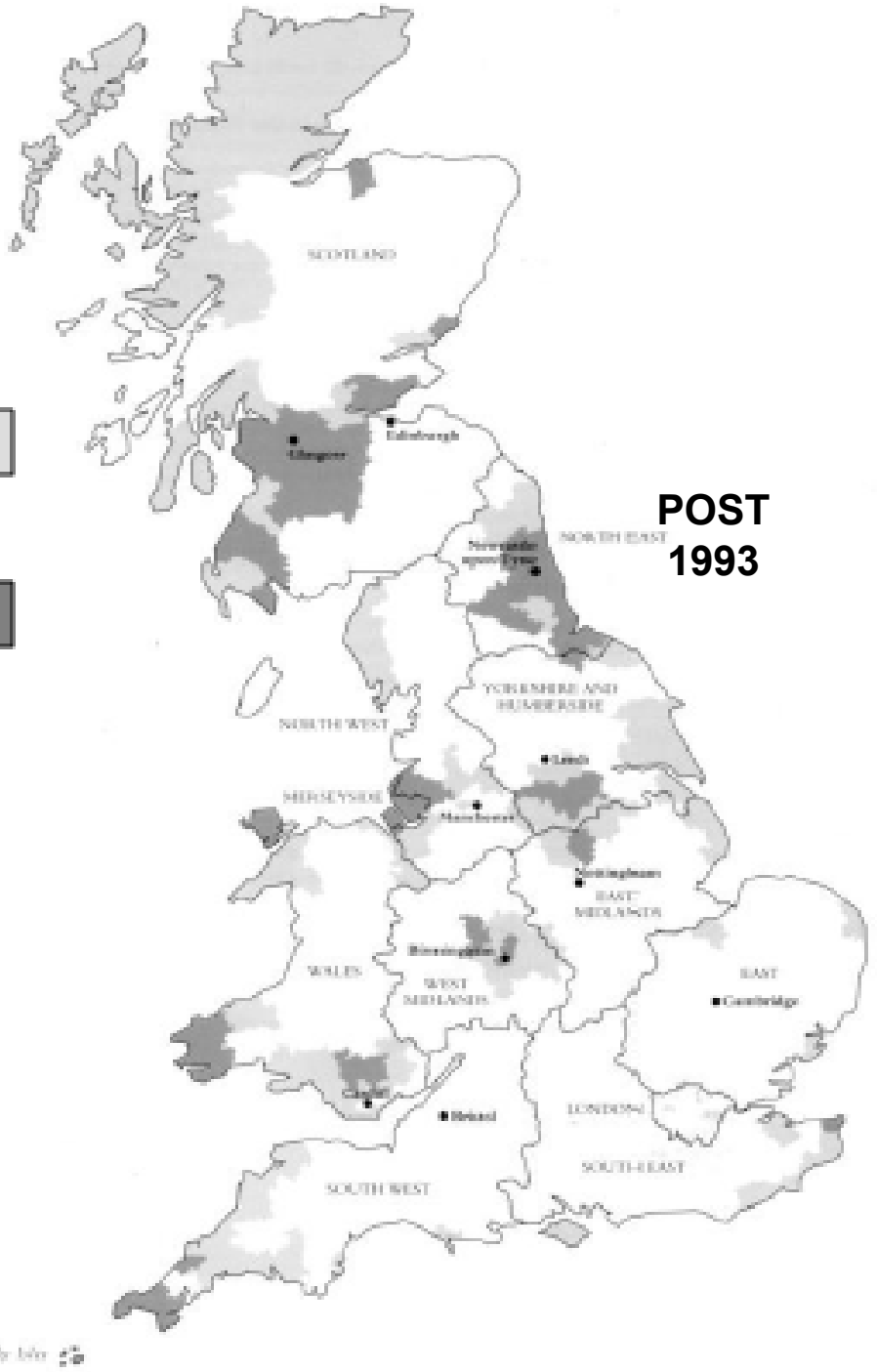
The 2000 rules

- Peripherality
- Population Density
- GDP per capita relative to EU average
- Relative unemployment (level and long-term)
- Activity Rate
- Manufacturing share of employment

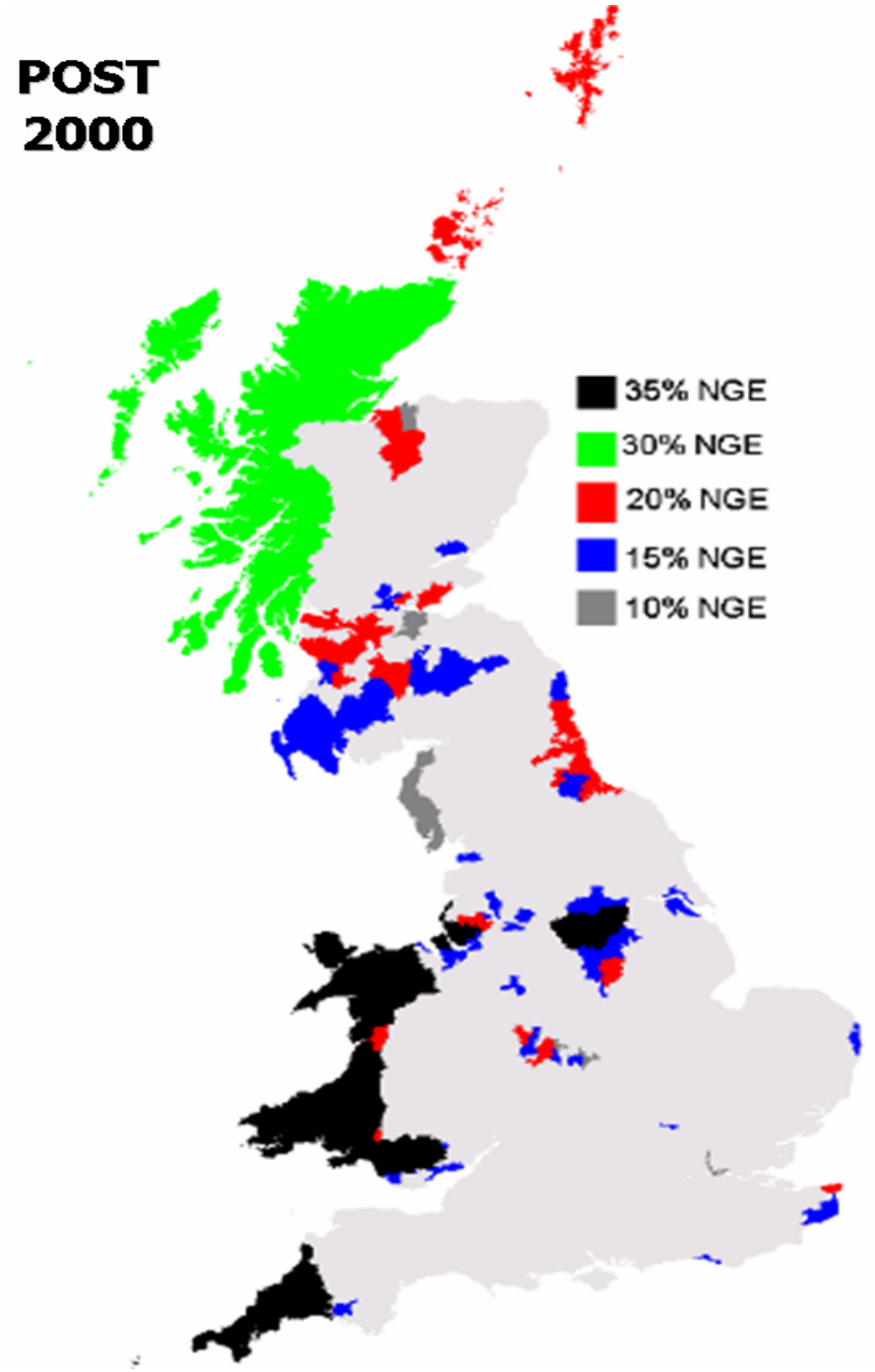
PRE 1993

INTERMEDIATE AREA (20% NGE)

DEVELOPMENT AREA (30% NGE)



POST 1993



- With the different rates reflecting the seriousness of the disadvantage

PROBLEM WITH IV: CHANGING AREA CHARACTERISTICS

- Changes in area's values of GDP, unemployment, etc. These could be endogenous, but:
  - Would bias treatment effects probably downwards (areas with worse trends more likely to get treated)

- **Construct an IV based solely on the rule changes & ignore any changes in area characteristics**
  - Exogenous to firm/area changes

The Evaluation Problem

Institutional Setting

Results

Conclusions & Implications

AREA LEVEL ANALYSIS: POSITIVE EFFECT ON JOBS & NET ENTRY, NO EVIDENCE OF DISPLACEMENT

Dependent Variable	**ln(Employ-ment)**	**ln(#Plants)**	**ln(Employ-ment)**	**ln(#Plants)**
Level of aggregation	**Wards**	**Wards**	**TTWA**	**TTWA**
Years	**1986-2004**	**1986-2004**	**1986-2004**	**1986-2004**
NGE (invest subsidy)	0.287**	0.171***	0.355***	0.248***
	(0.118)	(0.049)	(0.133)	(0.083)
Observations	177,794	177,794	6,001	6,001
#Fixed effects/Clusters	10,737	10,737	322	322

PLANT LEVEL FIXED EFFECT REGRESSIONS: LN(EMPLOYMENT)

	OLS	Red. Form	First Stage	IV
A. ALL Plants; 2,258,571 obs; 353,626 plant Fixed Effects				
RSA (Participant)	0.108***			0.358***
	(0.008)			(0.135)
NGE (investment subsidy)		0.086***	0.240***	
		(0.033)	(0.018)	

PLANT LEVEL FIXED EFFECT REGRESSIONS: LN(EMPLOYMENT)

	OLS	Red. Form	First Stage	IV
A. ALL Plants; 2,258,571 obs; 353,626 plant Fixed Effects				
RSA (Participant)	0.108***			0.358***
	(0.008)			(0.135)
NGE (investment subsidy)		0.086***	0.240***	
		(0.033)	(0.018)	
B. Plants in SMALL Firms (under 150 employees); 2,151,881 obs; 339,767 plant Fixed Effects				
RSA (Participant)	0.117***			0.484***
	(0.008)			(0.140)
NGE (investment subsidy)		0.115***	0.237***	
		(0.034)	(0.018)	

PLANT LEVEL FIXED EFFECT REGRESSIONS LN(EMPLOYMENT)

	OLS	Red. Form	First Stage	IV
A. All Plants; 2,258,571 obs; 353,626 plant Fixed Effects				
RSA (Participant)	0.108***			0.358***
	(0.008)			(0.135)
NGE (investment subsidy)		0.086***	0.240***	
		(0.033)	(0.018)	
B. Plants in SMALL Firms (under 150 employees); 2,151,881 obs; 339,767 plant Fixed Effects				
RSA (Participant)	0.117***			0.484***
	(0.008)			(0.140)
NGE (investment subsidy)		0.115***	0.237***	
		(0.034)	(0.018)	
C. Plants in LARGE Firms (over 150 employees); 106,690 obs; 13,859 plant Fixed Effects				
RSA (Participant)	0.130***			-0.157
	(0.024)			(0.563)
NGE (investment subsidy)		-0.042	0.268***	
		(0.150)	(0.062)	

The Evaluation Problem

Institutional Setting

Results

Conclusions & Implications

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE *for* ECONOMIC PERFORMANCE

MAGNITUDES (1986-2004)

- Estimate the implied aggregate increase in jobs every year using reduced form coefficients and Investment subsidy (NGE)
  - A subsidy of 10% creates 3% more jobs
  - Including costs **Euro €4,700** per job in 2010 prices
- Other results
  - Big effect on entry of new firms
  - Positive effects on investment
  - No effect on productivity

CONCLUSIONS

- Importance of designing a good evaluation strategy. Using quasi-experiment of EU driven changes in eligibility for UK areas
- **Results:**
  - **positive effect** on jobs, investment and net entry (simple diff-in diffs badly underestimates)
  - **No evidence** of large displacement effects from other areas.
  - **No effect on larger firms**. Probably gaming the system (also could be financial constraints). Implication is that policy should be targeted to SMEs/entrants
- **No effect on Total Factor Productivity** & possibly negative aggregate effect because recipients tend to be large & low productivity
- **Cost per job of ~ €4,700** seems good value for money, especially since this seems to come from falls in unemployment

…Are you still wondering whether RSA was a "sound Investment"

McCallum Bagpipes Ltd

based in Kilmarnock (Scotland) established in 1998 manufactures Scottish bagpipes, blow pipes & mouth pieces.

November 2002: receives a RSA grant of £13k for £61k project of producing new types of bagpipes: Breton and Spanish pipes and Bombards. The company has a current total employment of 20 and is one of the world's best known manufacturers of bagpipes.

http://www.mccallumbagpipes.com/products/bagpipes/

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

Back Up

Full paper available http://cep.lse.ac.uk/pubs/download/dp1113.pdf

NEXT STEPS

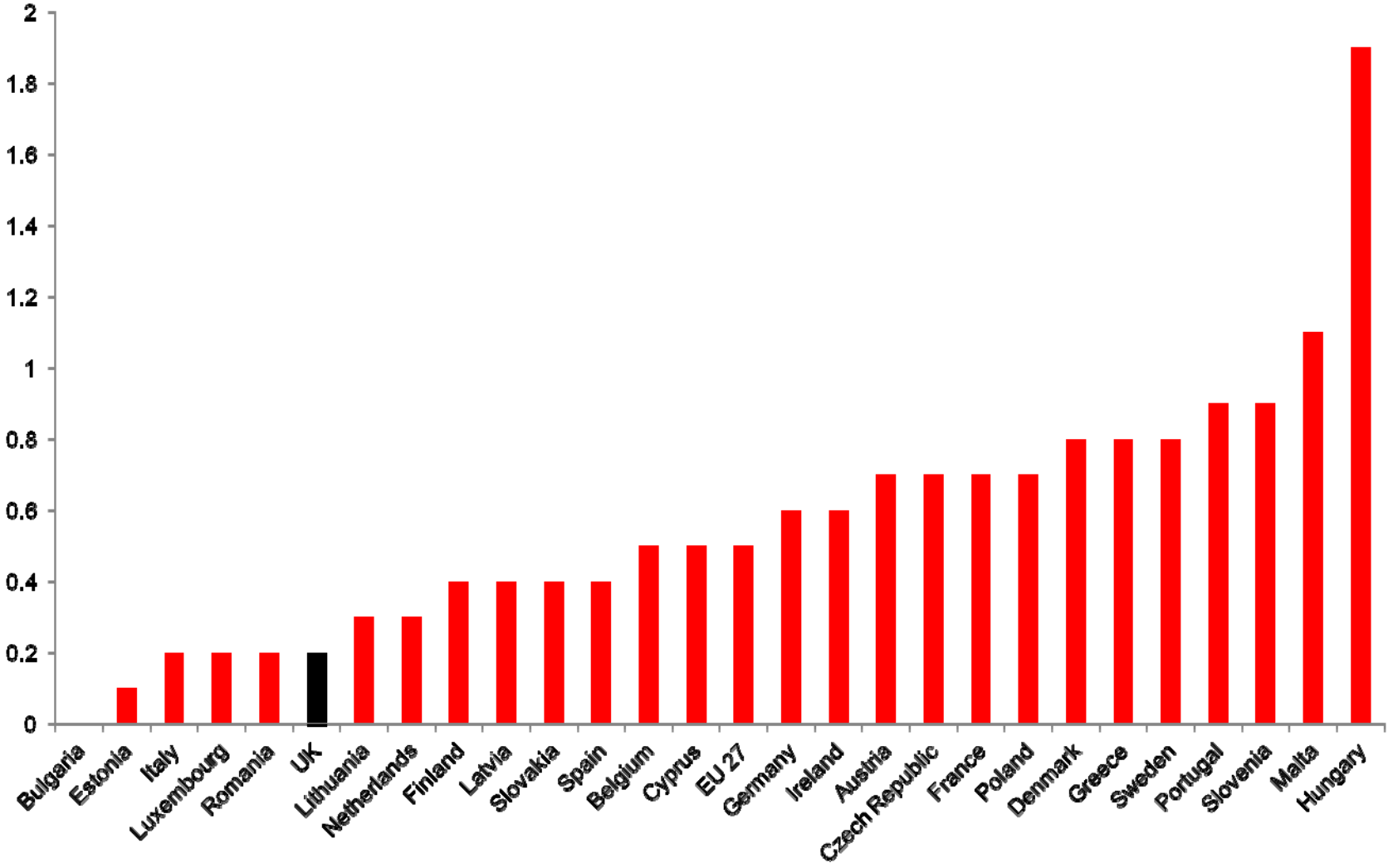
- Longer run evaluation of the place-based policy (cf Kline and Moretti, 2012 on TVA)

- Why such a larger effect on small firms than large firms
  - Gaming
  - Financial constraints
  - Selection
  - Interaction with other parts of policy system

- Welfare & productivity

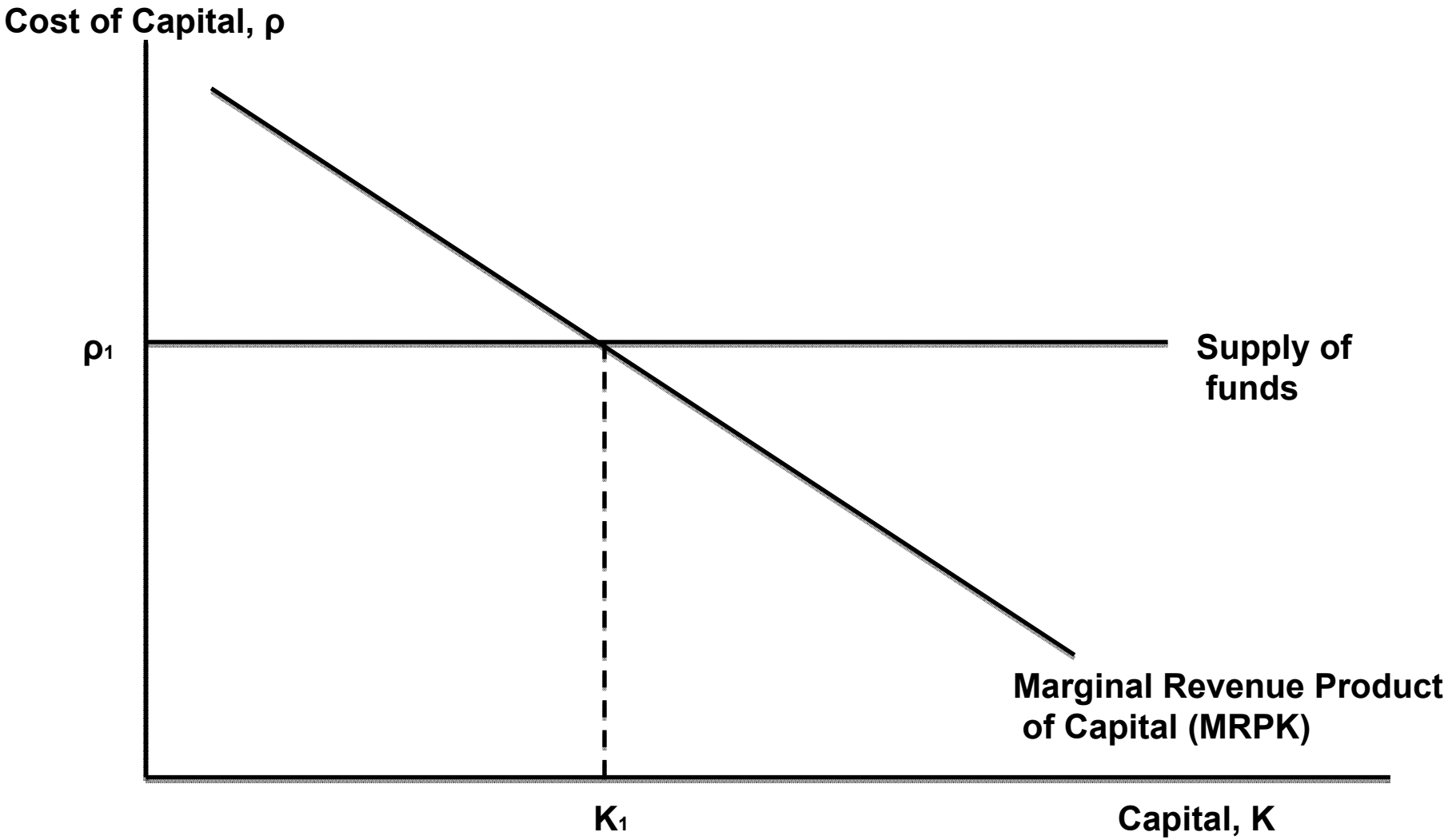
- Heterogeneity across industries and areas

NON-CRISIS STATE AID FOR BUSINESS IN THE EU, 2010 (AS % OF GDP)



Source: Confederation of British Industry (2013)

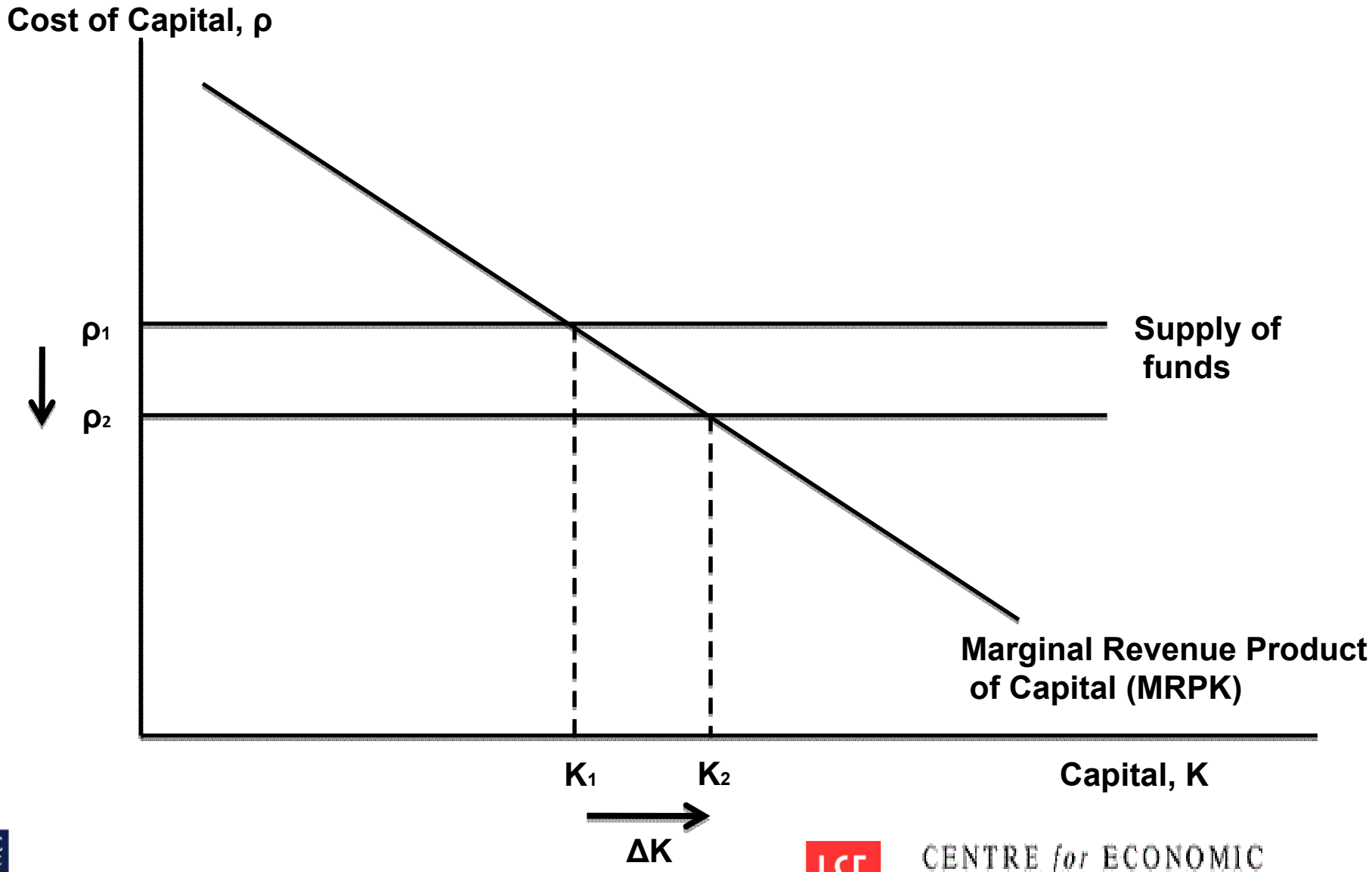
WHAT IS THE EFFECT OF AN INVESTMENT GRANT?



E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

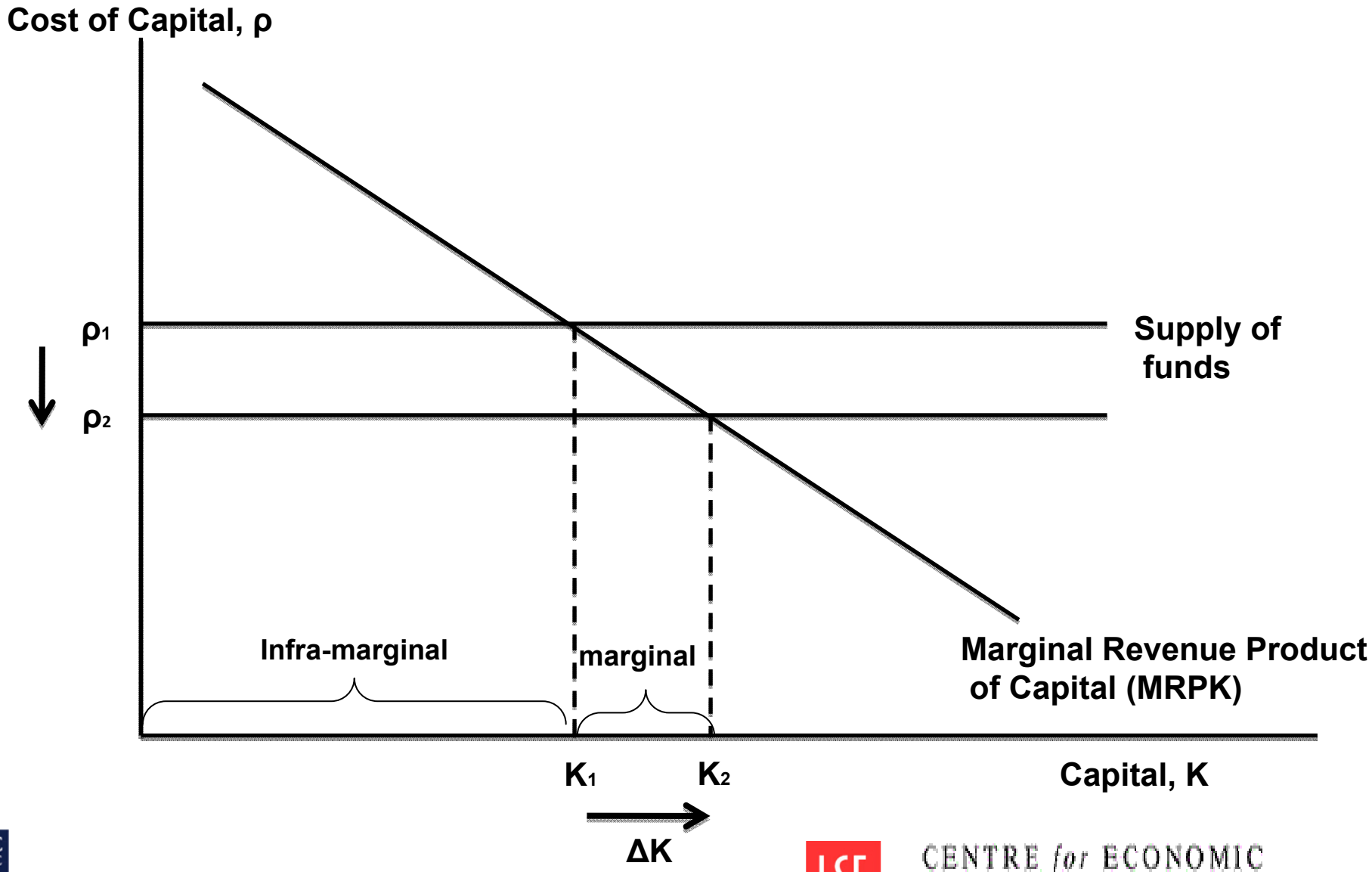
WHAT IS THE EFFECT OF AN INVESTMENT GRANT?



E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

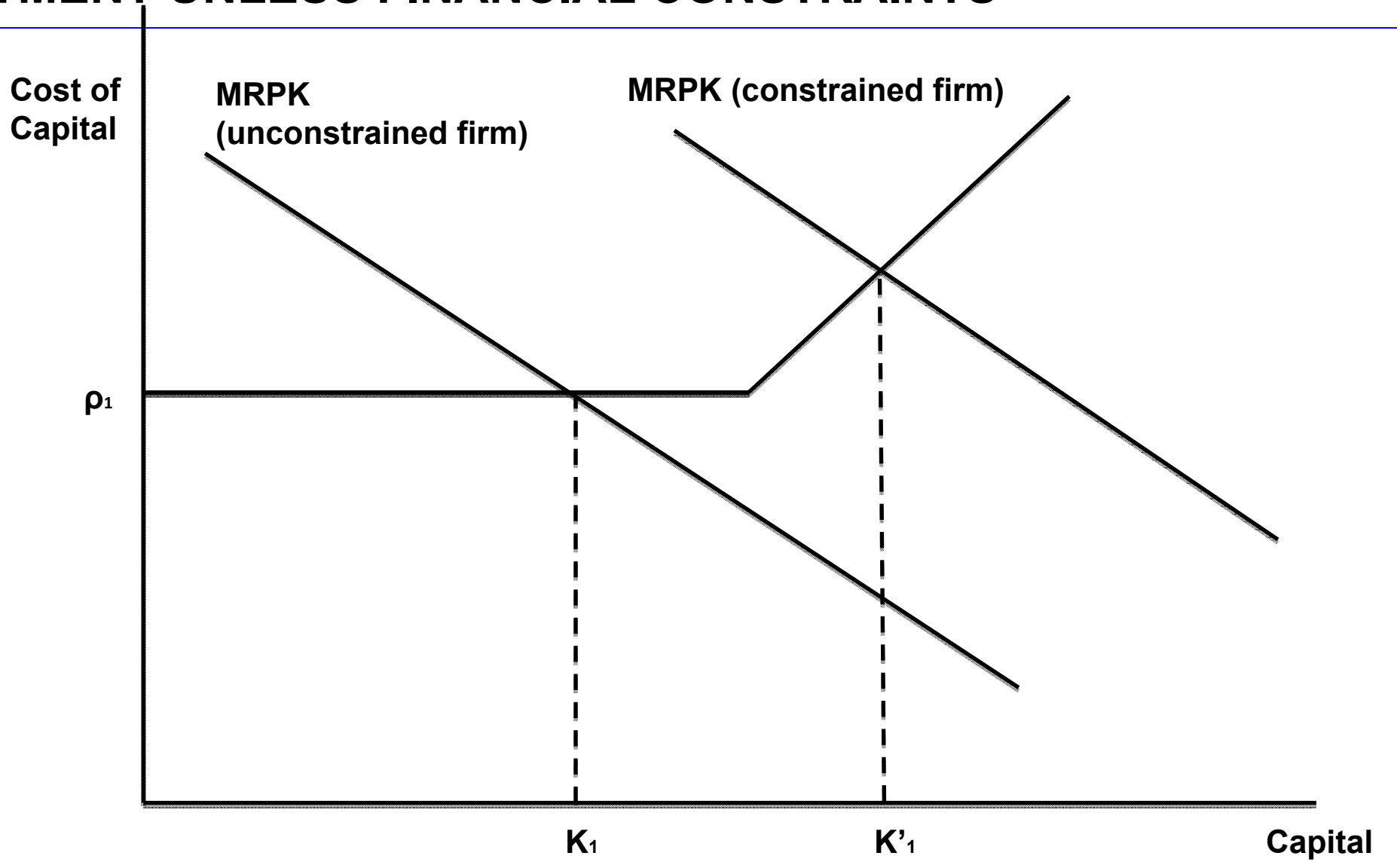
EFFECTS DEPEND ON MONITORING MARGINAL INVESTMENT: HARDER IF FIRM IS LARGE?



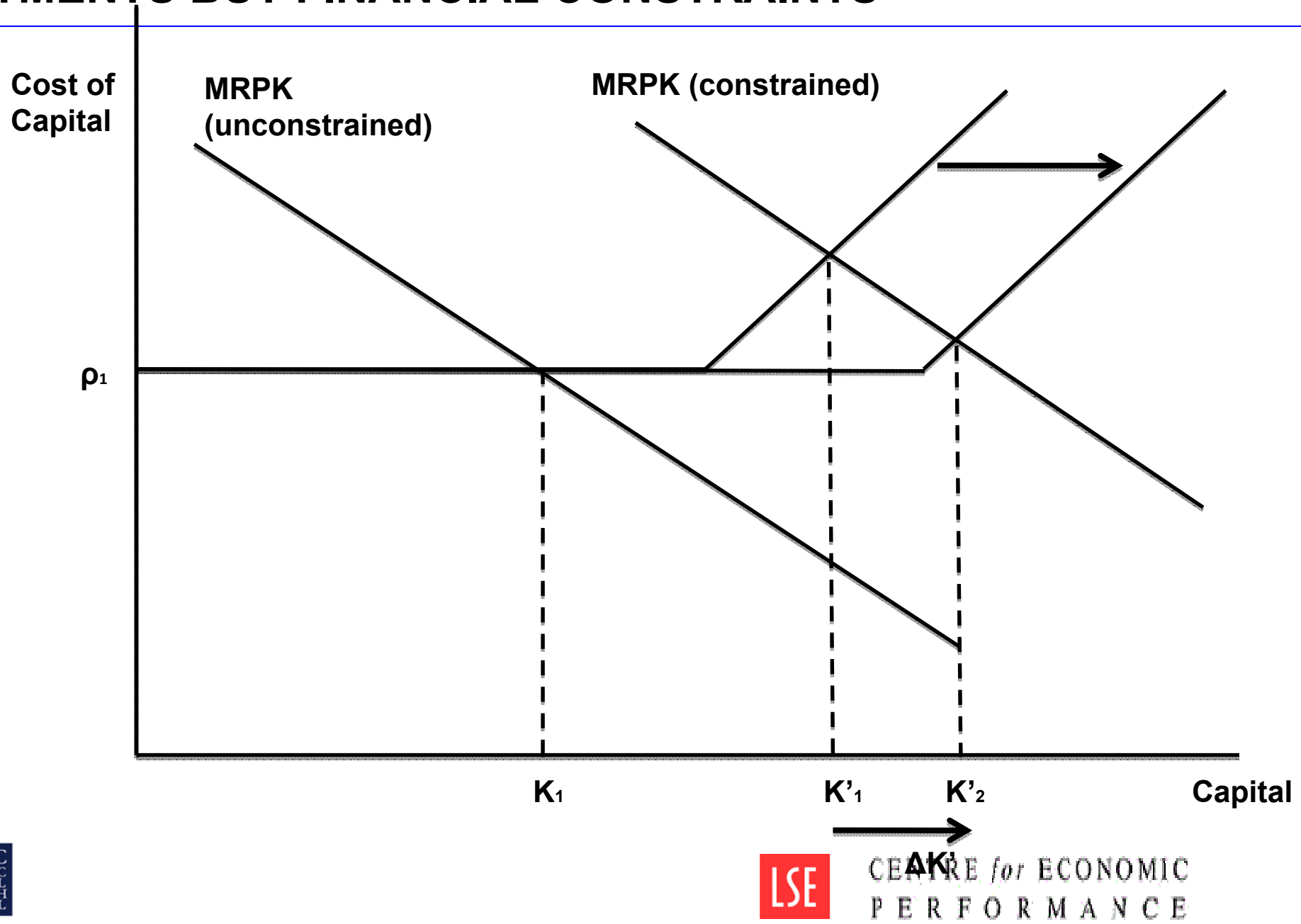
E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

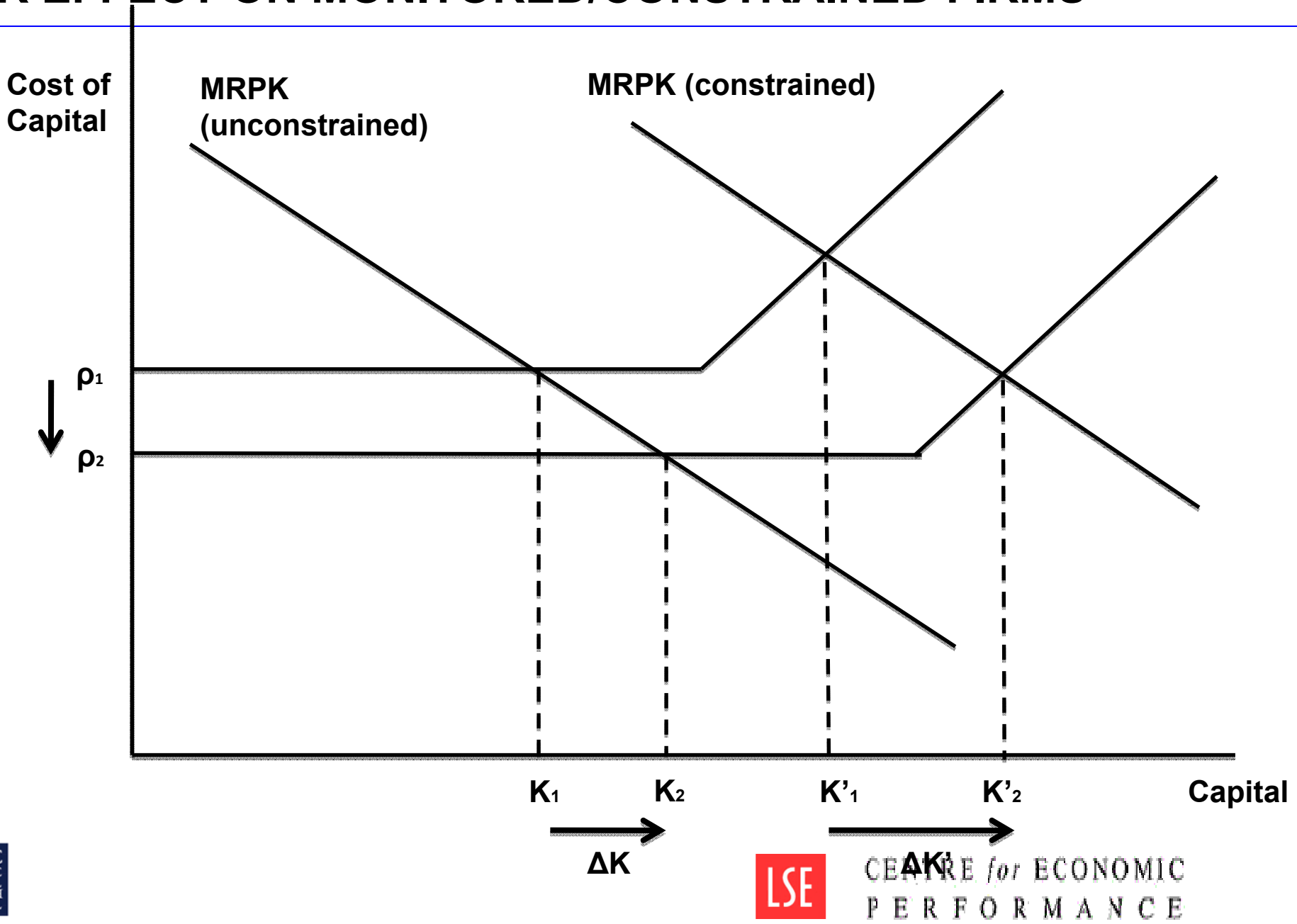
IF AGENCY HAS ZERO MONITORING ABILITY NO EFFECT ON INVESTMENT UNLESS FINANCIAL CONSTRAINTS



INVESTMENT GRANT – AGENCY CANNOT TARGET MARGINAL INVESTMENTS BUT FINANCIAL CONSTRAINTS



GENERAL CASE: AGENCY HAS IMPERFECT TARGETING SO BIGGER EFFECT ON MONITORED/CONSTRAINED FIRMS



E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

LSE CENTRE for ECONOMIC PERFORMANCE

RELATED LITERATURES

- **Industrial Subsidies**
  - Rodrik (2007), Lawrence & Weinstein (2001), Beason & Weinstein (1996)
  - Lending programs (e.g. Banerjee and Duflo, 2008)
- **Place-based policies**
  - US Empowerment Zones (Busso et al, 2010; Neumark & Kolko, 2010)
  - Tennessee Valley Authority (Kline and Moretti, 2012)
  - Tax-based (Holmes, 1998; Albouy, 2009)
  - French Enterprise Zones (Gobillon et al, 2010; Mayer et al, 2011)
  - Regional policy in EU (Wren and Taylor, 1999; Bronzini & Del Basio, 2008)
- **RSA & similar UK regional policies**
  - National Audit Office (2003) "Industrial Survey" methods
  - Devereux et al (2007). Multinationals, no quasi-experiment
  - Other UK regional schemes (Gibbons et al, 2011; Eino & Overman, 2011)
- **Innovation subsidies (grants)**
  - David et al (2000) survey. Wallsten (2000), Lach (2002), Gonzalez et al (2005)
  - RDD Bronzini and Iachini (2010) and Jacob and Lefgren (2010)
  - R&D Tax credits (Hall & Van Reenen, 2000; Bloom et al, 2002, 2012))

TABLE A1: IDENTIFICATION

Unit of Observation	Year	Total Number of Units	Units which changed their eligibility to RSA	Increase in eligibility	Decrease in eligibility
Areas (wards)	1993	10,737	1,893	1,034	859
	2000	10,737	4,048	1,424	2,624
Plants	1993	146,420	23,225	14,369	8,856
	2000	163,796	50,920	14,967	35,953
Firms	1993	125,444	19,866	12,505	7,361
	2000	148,598	45,692	13,520	32,172

TABLE 1: DESCRIPTIVE STATISTICS - PARTICIPATING FIRMS TEND TO BE LARGER AND LESS PRODUCTIVE THAN NON-PARTICIPANTS

Variable		mean		Sd	median	Obs.
Plant Employment	non treated	22.25		118.92	2	3,193,504
	Treated before	79.39	***	241.45	6	136,488
Firm Employment	non treated	253		737	111	145,389
	Treated before	417	***	957	171	8,209
Real Value added per worker	non treated	31.05		162.51	24.27	136,524
	Treated before	26.32	**	23.51	22.38	7247
Total Factor Productivity	non treated	0.02		0.33	0.01	134,755
	Treated before	-0.03	***	0.29	-0.03	7,925

TABLE 5: FIRM INVESTMENT REGRESSIONS (ARD SAMPLE)

Method	OLS	Red. Form	First Stage	IV
Dependent variable	**Ln(INV)**	**Ln(INV)**	**RSA**	**Ln(INV)**
A. All Firms (129,584 obs)				
RSA (Participant)	0.227***			0.621
	(0.030)			(0.426)
NGE (investment subsidy)		0.290	0.462***	
		(0.198)	(0.060)	
B. Small Firms (87,765 obs)				
RSA (Participant)	0.222***			0.973*
	(0.040)			(0.501)
NGE (investment subsidy)		0.500*	0.514***	
		(0.259)	(0.066)	
C. Large Firms (41,819 obs)				
RSA (Participant)	0.233***			-0.148
	(0.045)			(0.761)
NGE (investment subsidy)		-0.050	0.361***	
		(0.274)	(0.105)	

WHAT DO WE FIND?

- **Overall program effects (ATT):**
  - Increases investment & employment on intensive (incumbent) & extensive (net entry of plants) margins.
  - A 10 percentage point investment subsidy in area generates ~3% higher employment
  - Reduces unemployment, little displacement from other areas
  - OLS has large downward bias
- Zero effect for large firms – suggestive of "gaming"
- No effect on Total Factor Productivity & recipients mainly low productivity
- **Cost per job around €4,700, so relatively cheap**
- Doesn't mean policy good, but a necessary condition

TABLE 5: FIRM PRODUCTIVITY REGRESSIONS (ARD SAMPLE)

Method	OLS	Red. Form	First Stage	IV
Dependent variable	**Ln(PROD)**	**Ln(PROD)**	**RSA**	**Ln(PROD)**
A. All Firms (129,584 obs)				
RSA (Participant)	0.000			0.009
	(0.004)			(0.057)
NGE (investment subsidy)		0.004	0.434***	
		(0.024)	(0.059)	
B. Small Firms (87,765 obs)				
RSA (Participant)	0.004			0.026
	(0.005)			(0.067)
NGE (investment subsidy)		0.012	0.474***	
		(0.031)	(0.070)	
C. Large Firms (41,819 obs)				
RSA (Participant)	-0.008			-0.090
	(0.007)			(0.109)
NGE (investment subsidy)		-0.030	0.352***	
		(0.038)	(0.095)	

TABLE 6 –CONT.: AREA LEVEL ANALYSIS – UNEMPLOYMENT & SERVICE EMPLOYMENT

Dependent Variable	ln(Employ-ment)	ln(Unemploy-ment)	ln(Service Employment)
Level of aggregation	**Wards**	**Wards**	**Wards**
Years	**1996-2004**	**1996-2004**	**1996-2004**
NGE (invest subsidy)	0.210*	-0.700***	0.090
	(0.109)	(0.044)	(0.061)
Observations	73,896	73,284	73,829
#Fixed effects & clusters	10,737	10,716	10,737