

---

# Evaluation of State Aid

**John Van Reenen**

**Centre for Economic Performance, LSE**

*DG-COMP, April 23<sup>rd</sup> 2013*

# 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

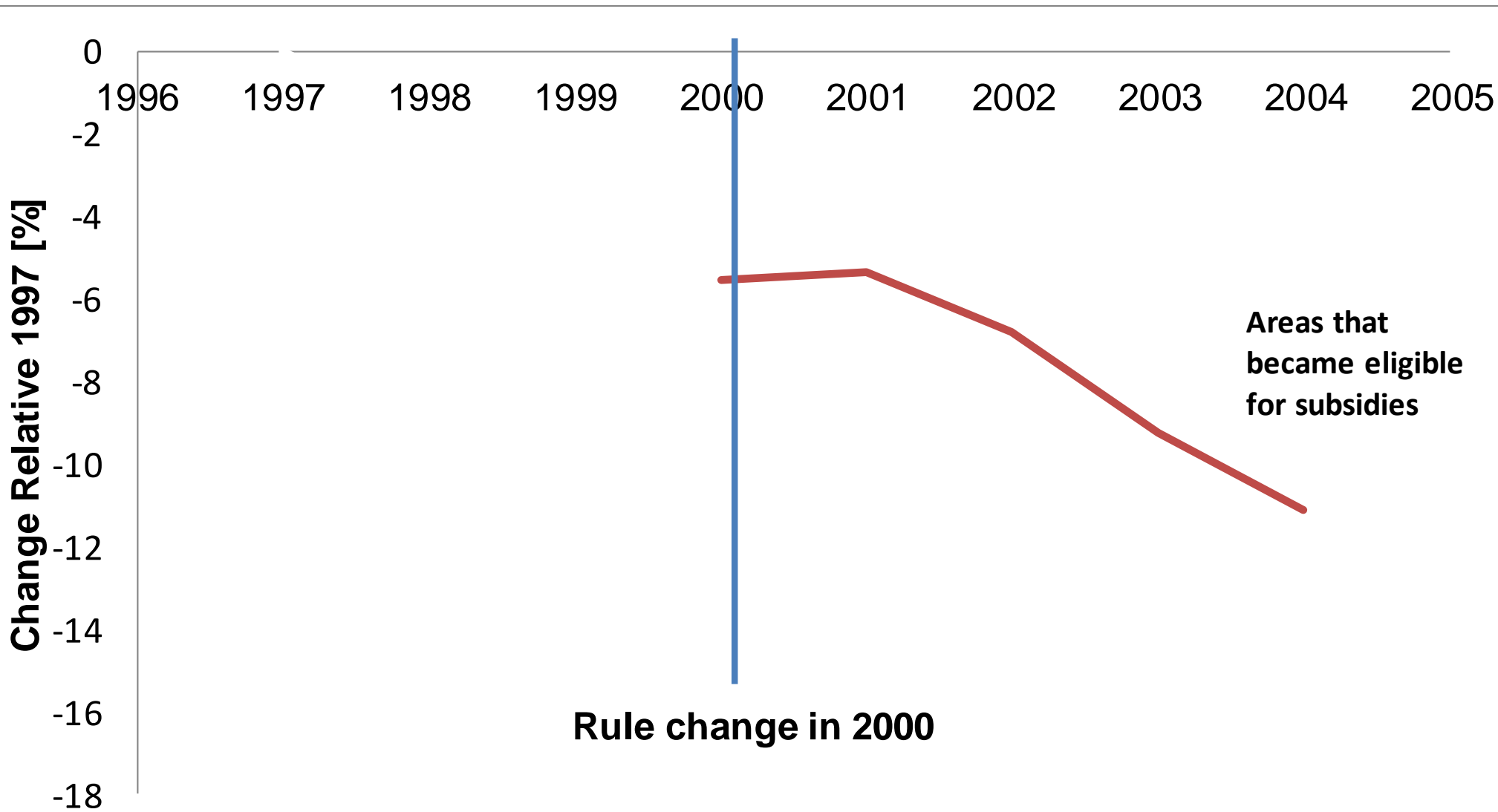
# EVALUATION PROBLEM: CONSTRUCTING THE BUT-FOR WORLD

- 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

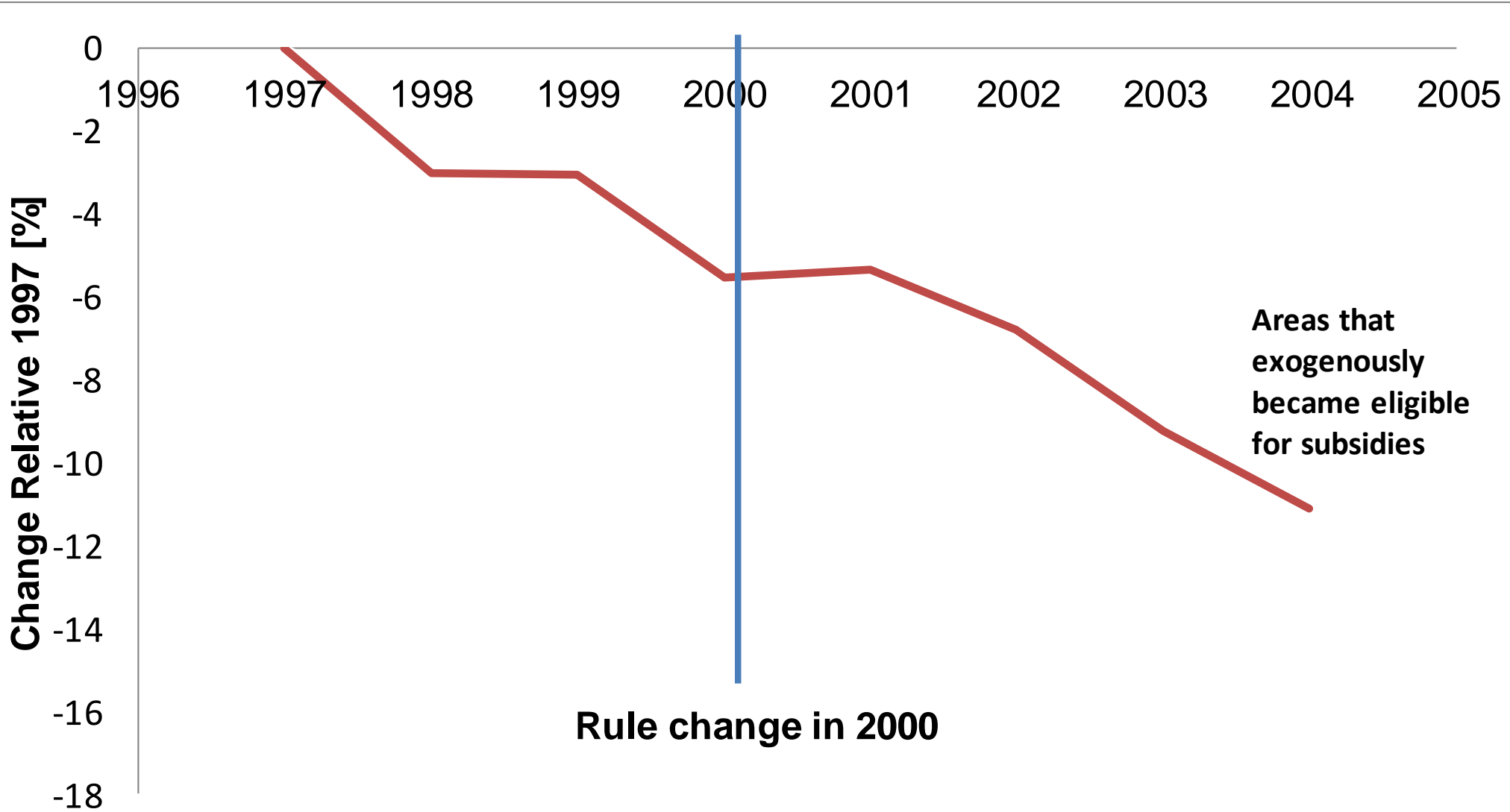
- Simple difference before & after the scheme
  - But would firms have done the same regardless?
- Difference in differences
  - Look at how a control/comparison group did over the same period: e.g. same industry/area/size, etc. “matching”
  - Takes out the common effect to construct counterfactual
  - 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



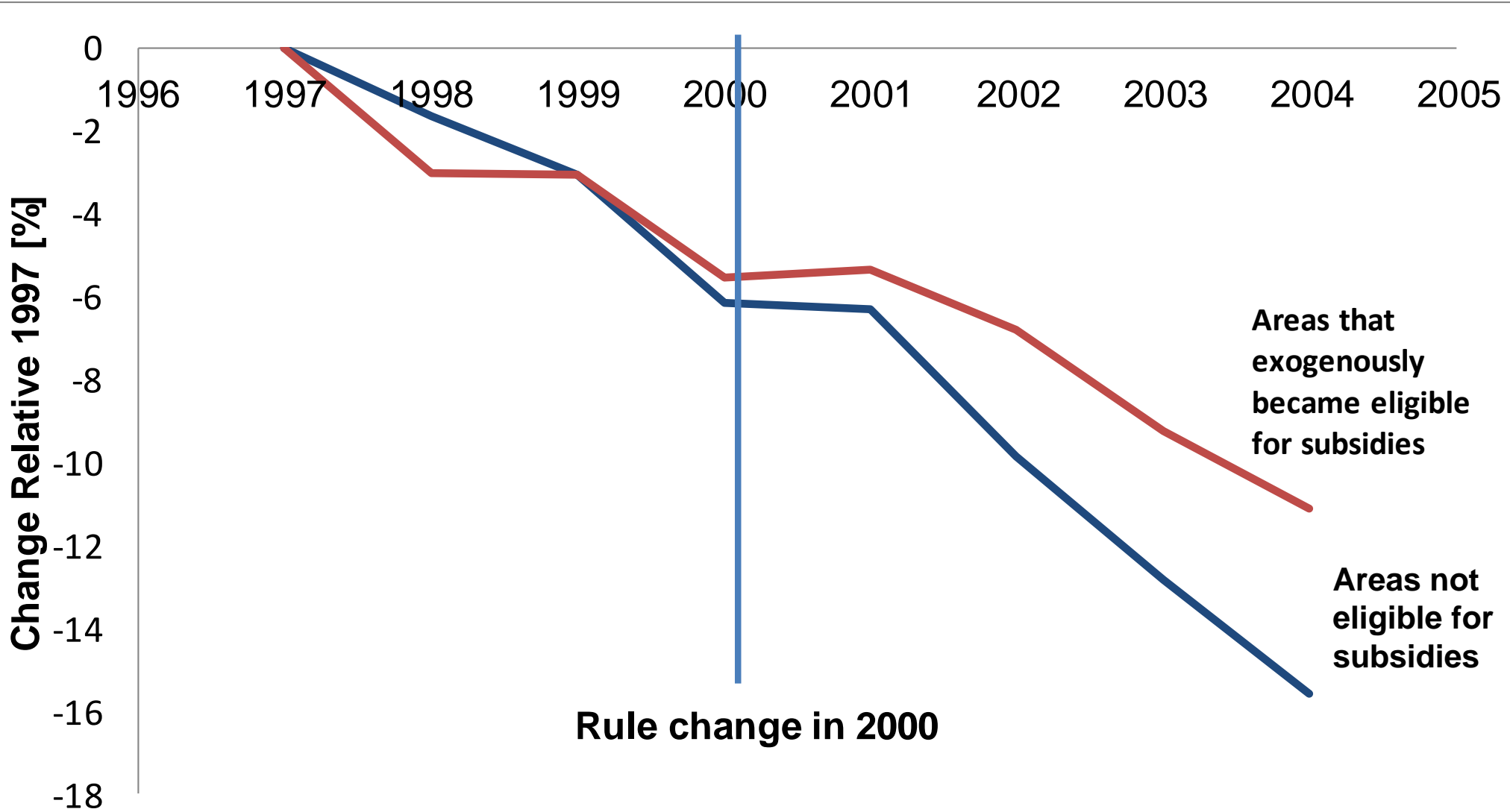
Source: Criscuolo, Martin, Overman and Van Reenen (2013)

# 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

## “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)

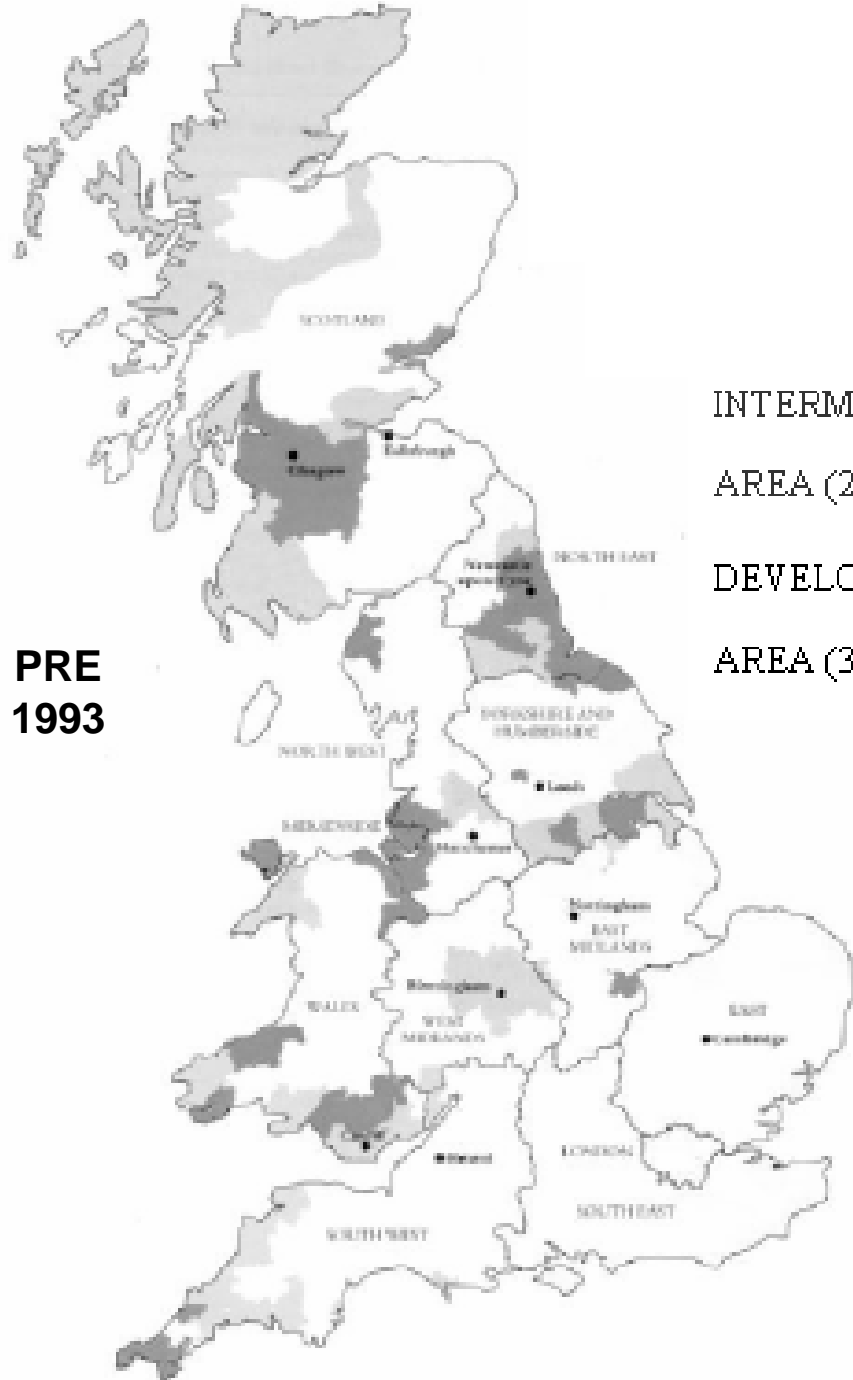
# EXAMPLES OF CRITERIA ON AREA ELIGIBILITY

## 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

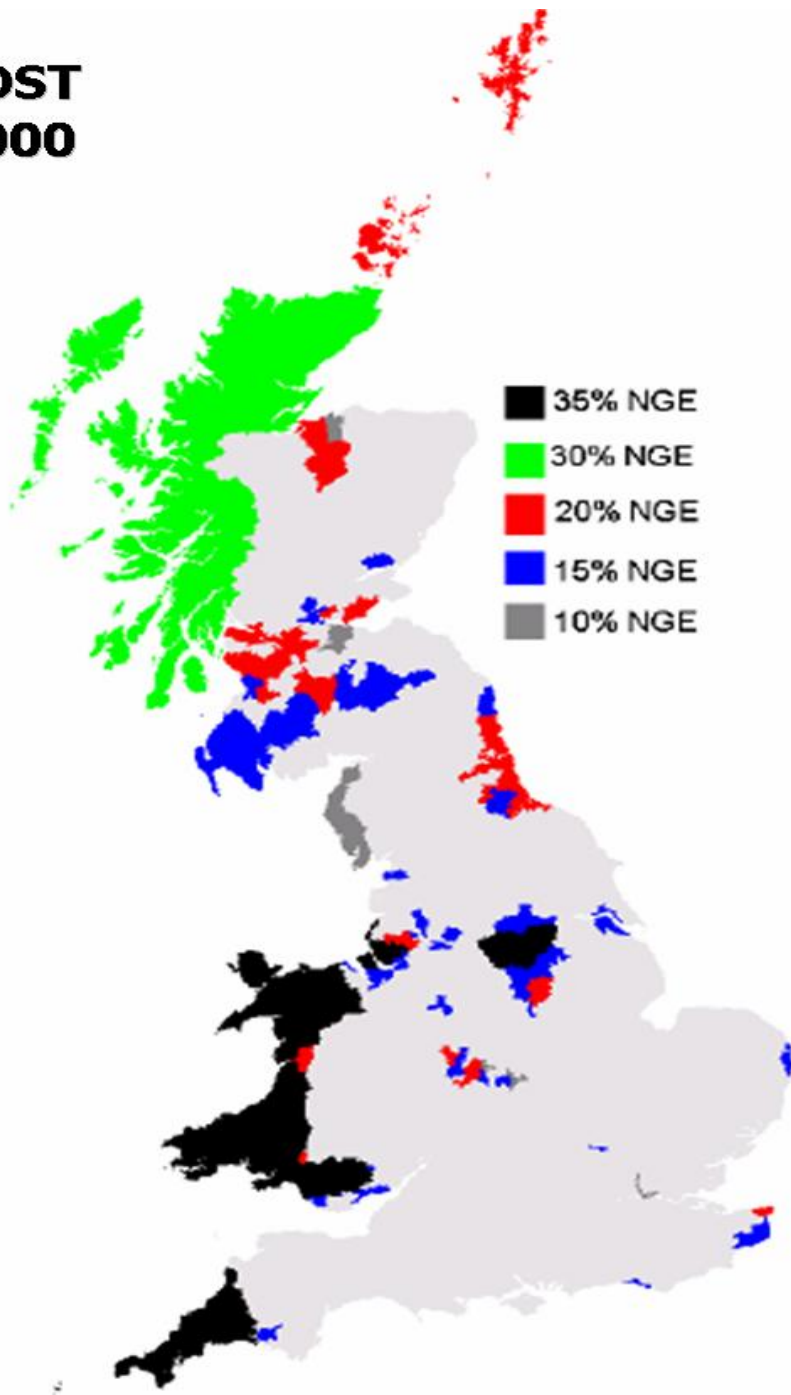


INTERMEDIATE  
AREA (20% NGE)

DEVELOPMENT  
AREA (30% NGE)



**POST  
2000**



- 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

<b>Dependent Variable</b>	<b>ln(Employment)</b>	<b>ln(#Plants)</b>	<b>ln(Employment)</b>	<b>ln(#Plants)</b>
Level of aggregation	<b>Wards</b>	<b>Wards</b>	<b>TTWA</b>	<b>TTWA</b>
Years	<b>1986-2004</b>	<b>1986-2004</b>	<b>1986-2004</b>	<b>1986-2004</b>
<b>NGE (invest subsidy)</b>	0.287** (0.118)	0.171*** (0.049)	0.355*** (0.133)	0.248*** (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\*\*\*

(0.008)

0.358\*\*\*

(0.135)

**NGE** (investment subsidy)

0.086\*\*\*

(0.033)

0.240\*\*\*

(0.018)

# PLANT LEVEL FIXED EFFECT REGRESSIONS: LN(EMPLOYMENT)

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

# PLANT LEVEL FIXED EFFECT REGRESSIONS LN(EMPLOYMENT)

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

---

The Evaluation Problem

Institutional Setting

Results

**Conclusions & Implications**

# 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/>



---

# Back Up

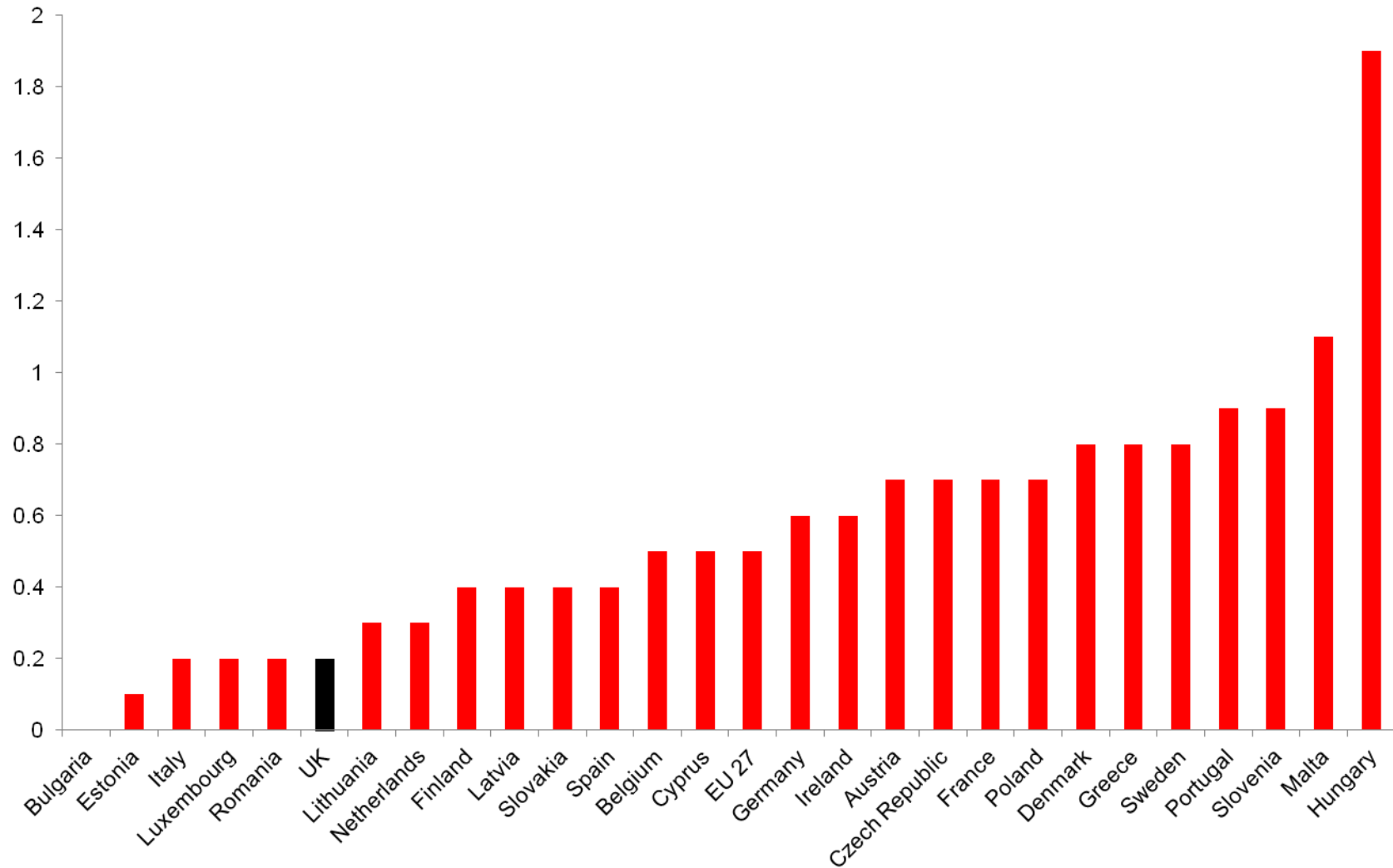
Full paper available <http://cep.lse.ac.uk/pubs/download/dp1113.pdf>

# NEXT STEPS

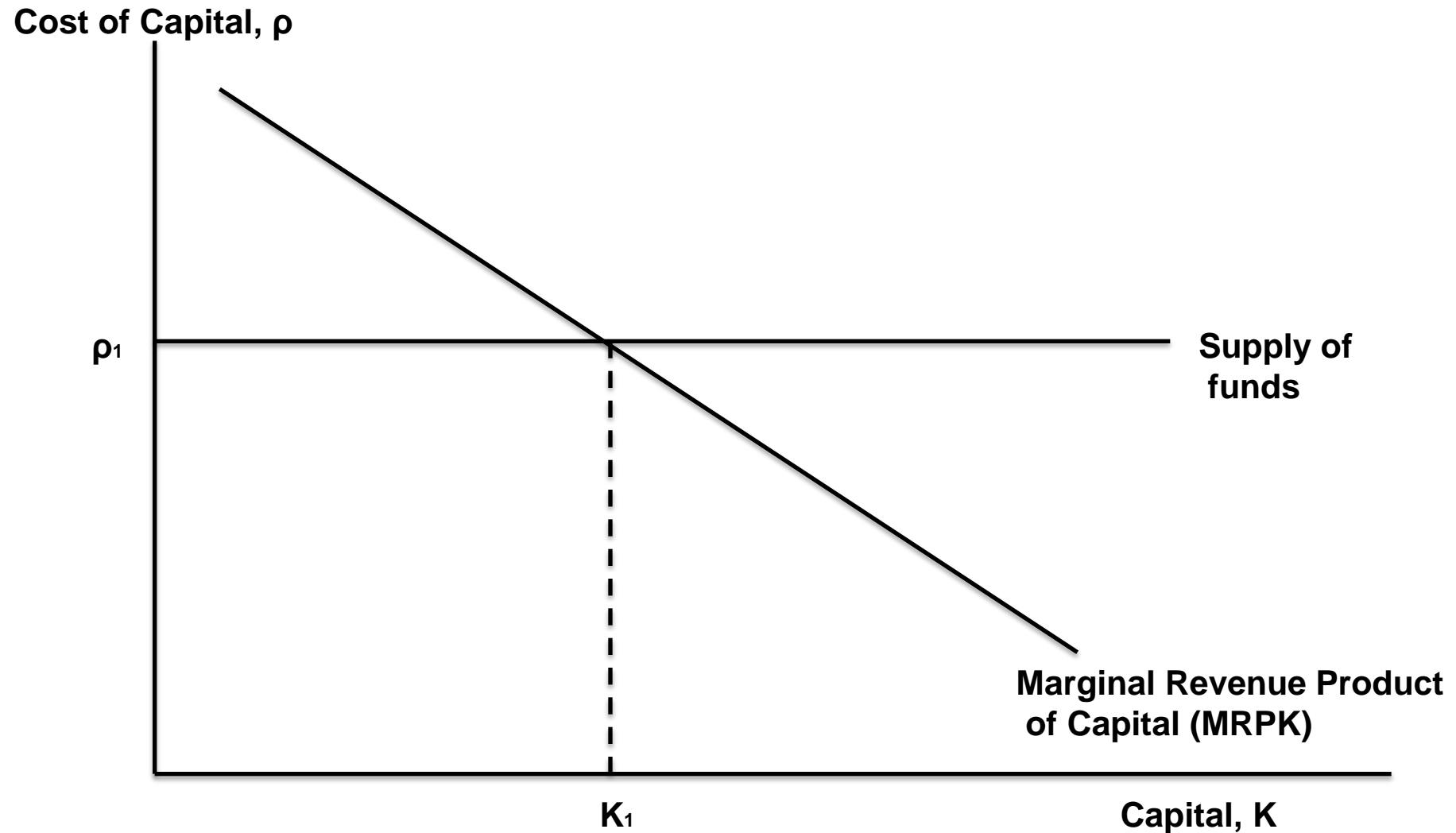
---

- 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

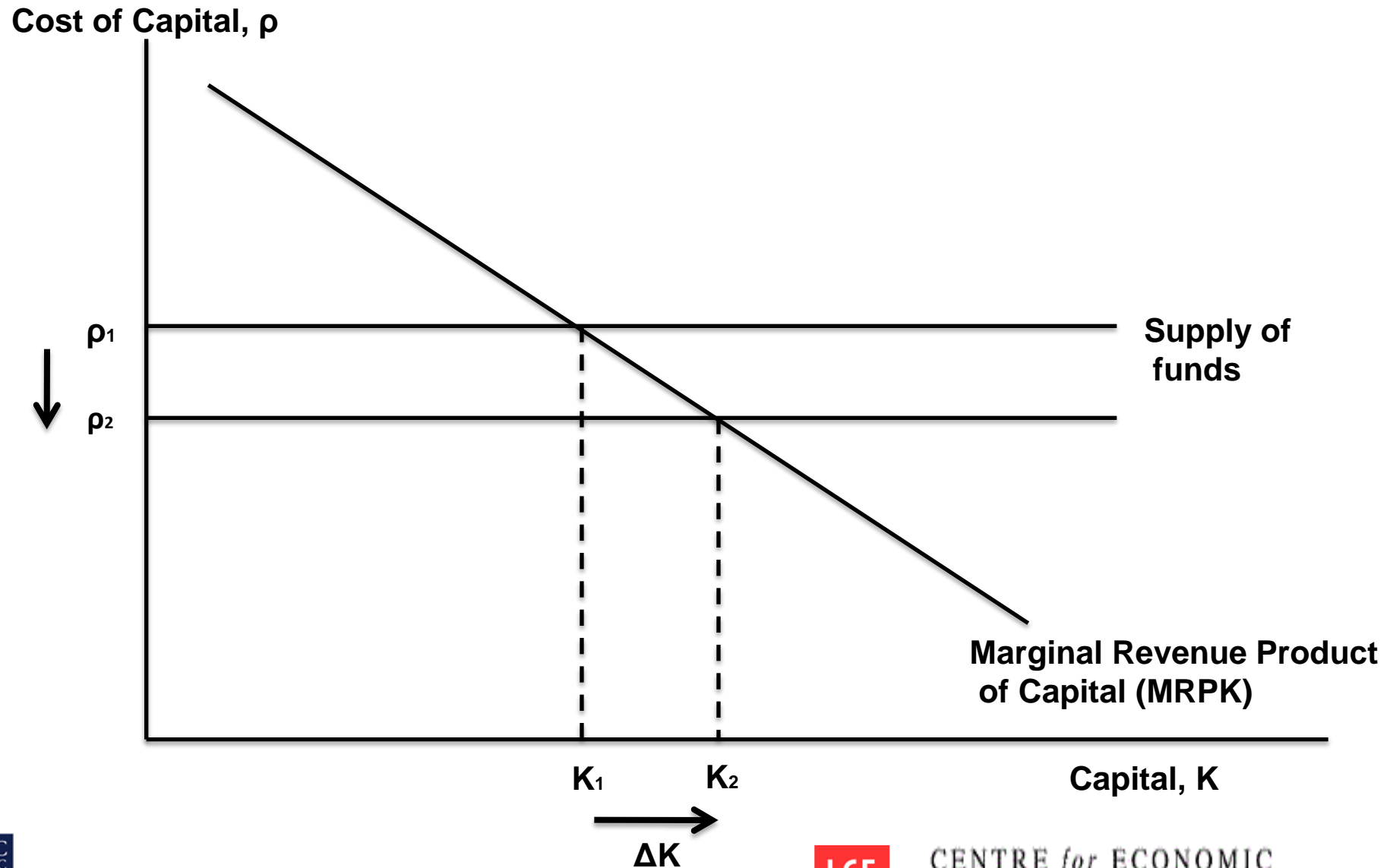
# NON-CRISIS STATE AID FOR BUSINESS IN THE EU, 2010 (AS % OF GDP)



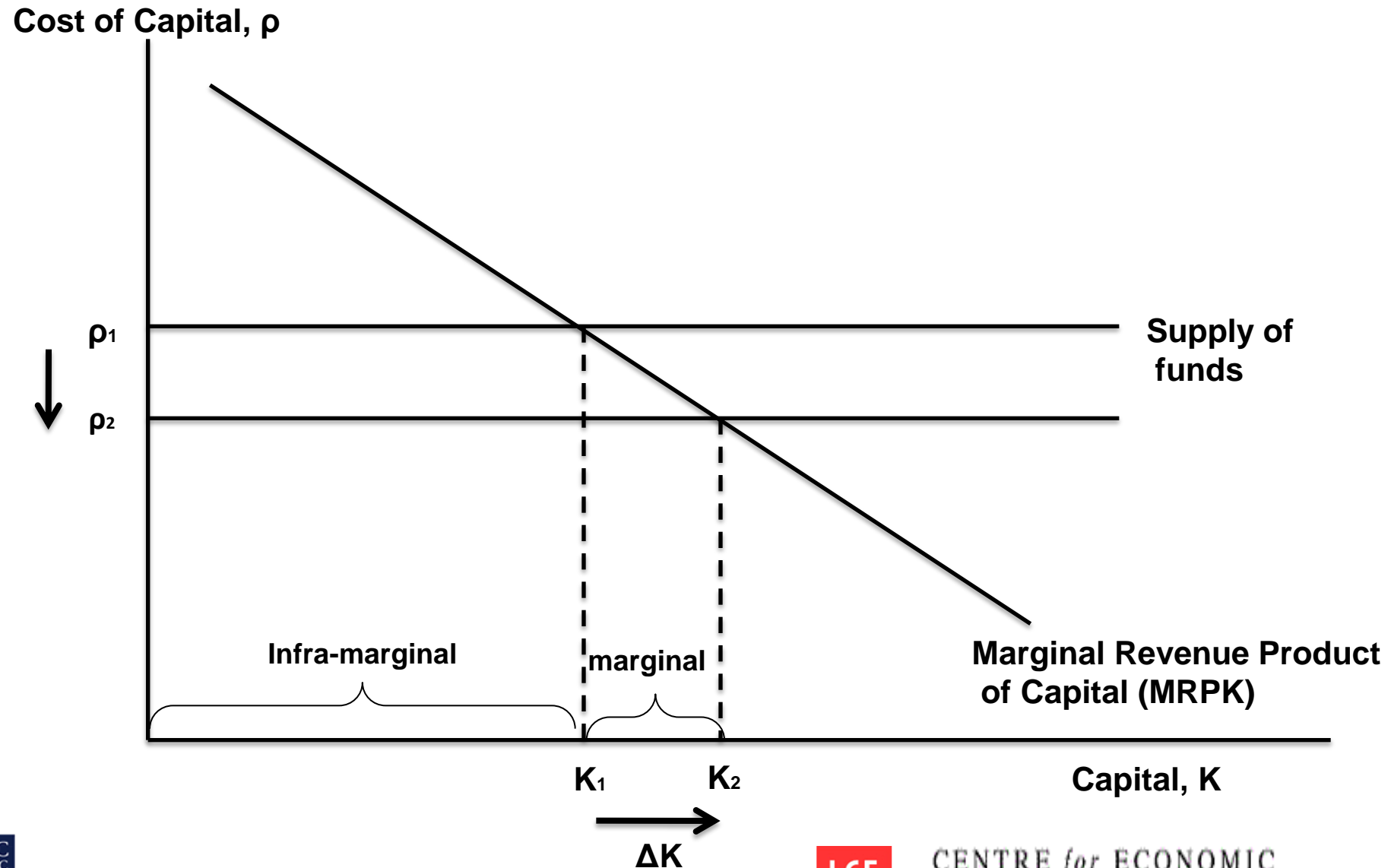
# WHAT IS THE EFFECT OF AN INVESTMENT GRANT?



# WHAT IS THE EFFECT OF AN INVESTMENT GRANT?

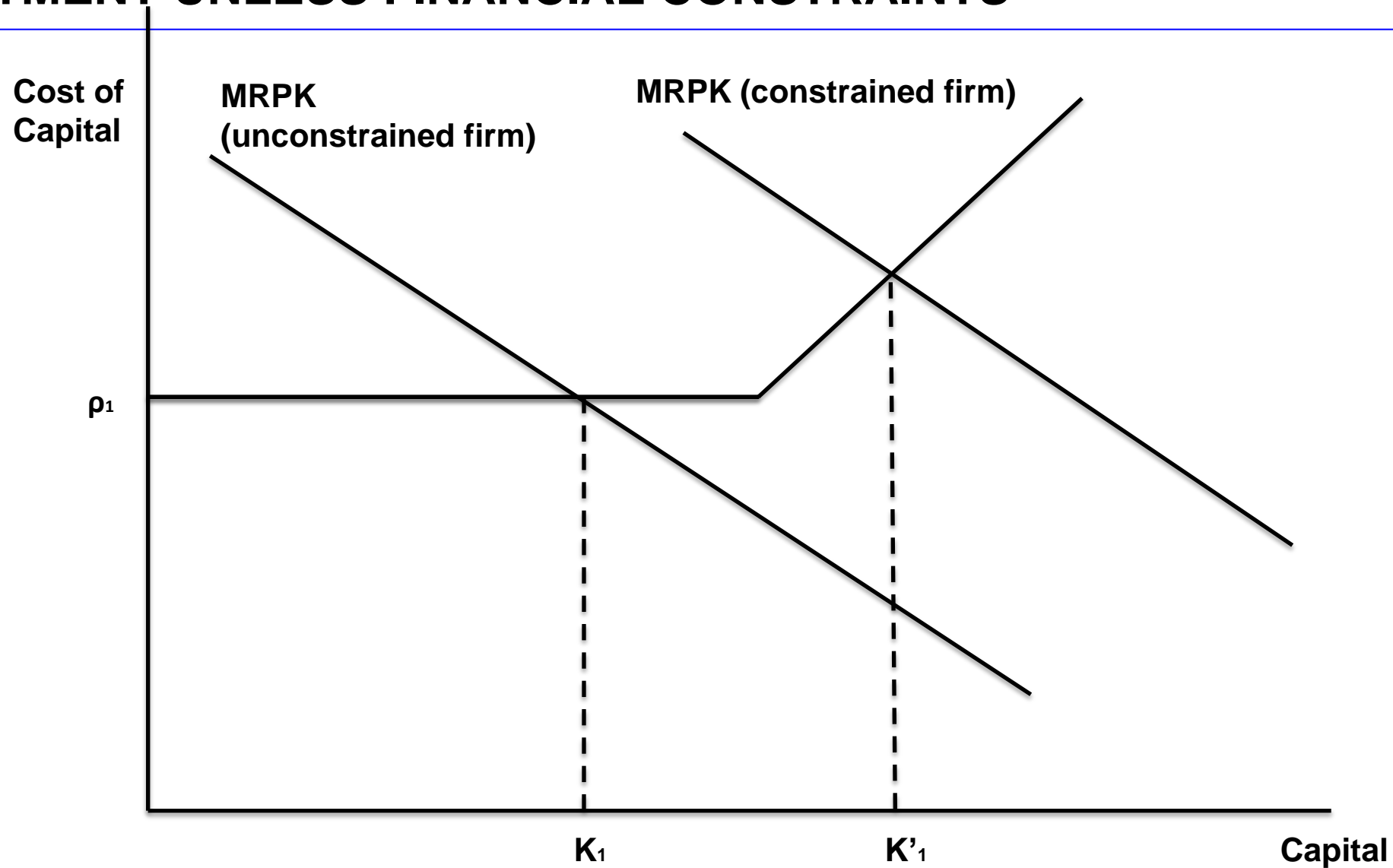


# EFFECTS DEPEND ON MONITORING MARGINAL INVESTMENT: HARDER IF FIRM IS LARGE?

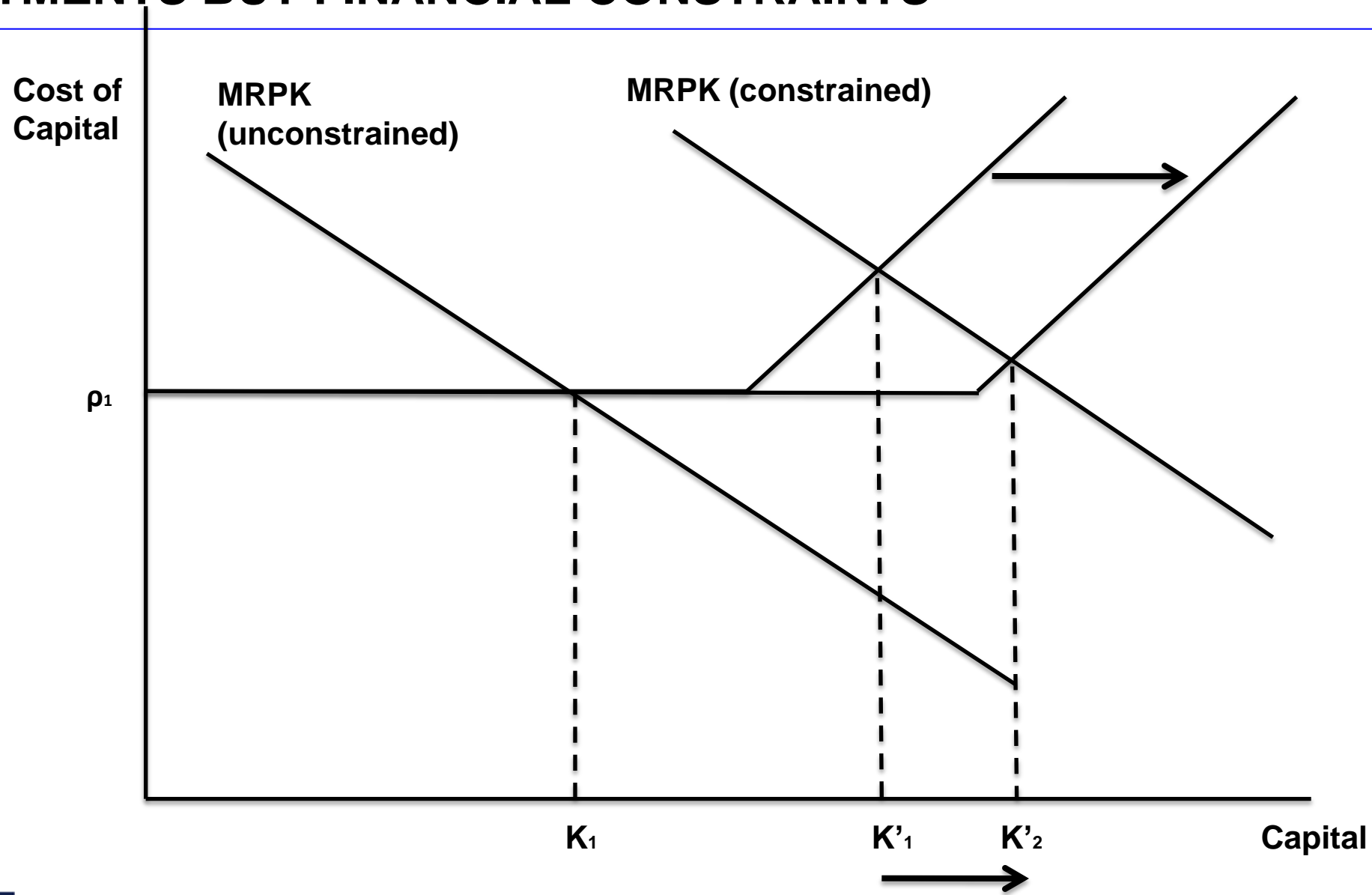




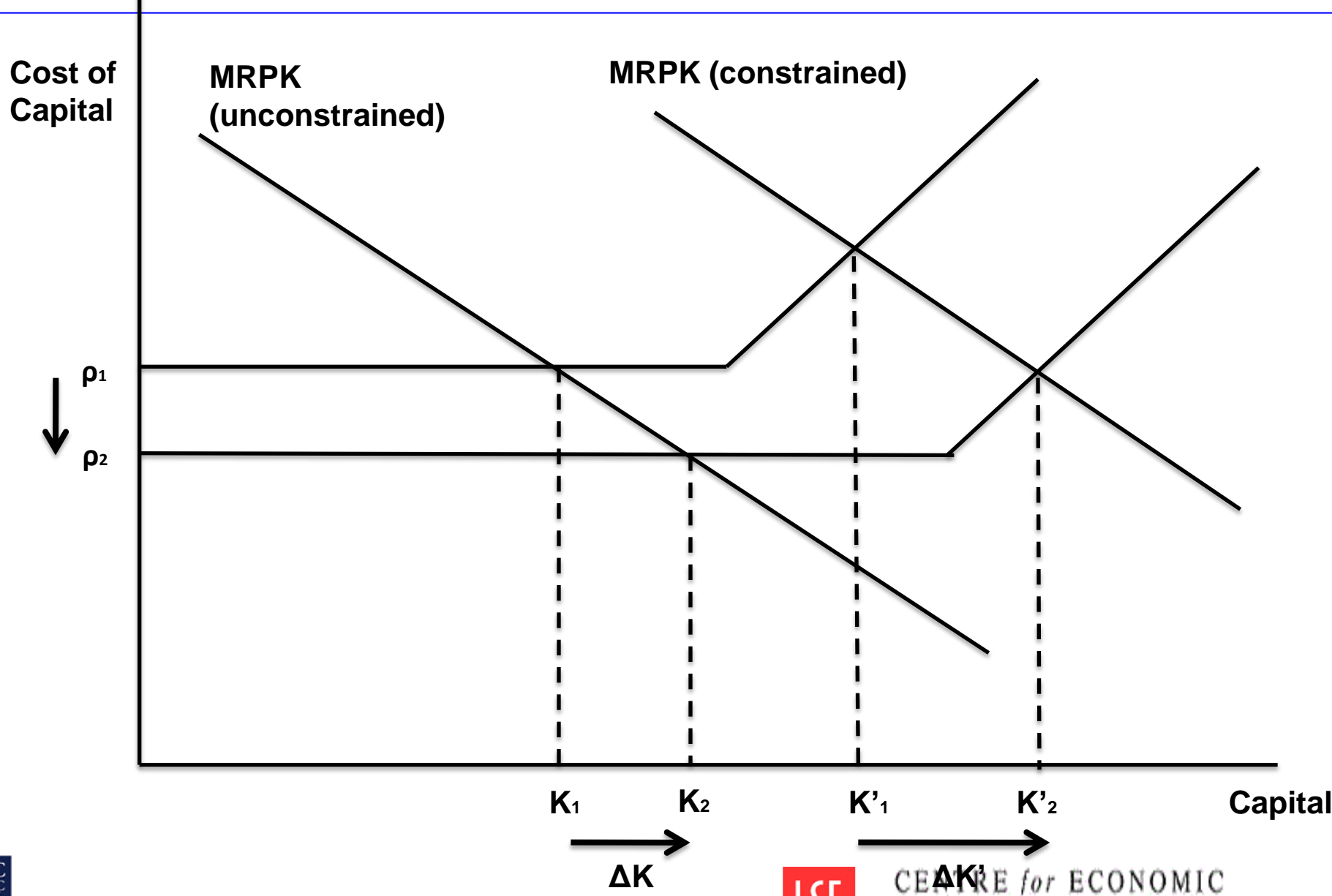
# IF AGENCY HAS ZERO MONITORING ABILITY NO EFFECT ON INVESTMENT UNLESS FINANCIAL CONSTRAINTS



# INVESTMENT GRANT – AGENCY CANNOT TARGET MARGINAL INVESTMENTS BUT FINANCIAL CONSTRAINTS



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



# 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

<b>Unit of Observation</b>	<b>Year</b>	<b>Total Number of Units</b>	<b>Units which changed their eligibility to RSA</b>	<b>Increase in eligibility</b>	<b>Decrease in eligibility</b>
<b>Areas (wards)</b>	1993	10,737	1,893	1,034	859
	2000	10,737	4,048	1,424	2,624
<b>Plants</b>	1993	146,420	23,225	14,369	8,856
	2000	163,796	50,920	14,967	35,953
<b>Firms</b>	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
<b>Dependent variable</b>	<b>Ln(INV)</b>	<b>Ln(INV)</b>	<b>RSA</b>	<b>Ln(INV)</b>
<b>A. All Firms (129,584 obs)</b>				
<b>RSA (Participant)</b>	0.227*** (0.030)			0.621 (0.426)
<b>NGE (investment subsidy)</b>		0.290 (0.198)	0.462*** (0.060)	
<b>B. Small Firms (87,765 obs)</b>				
<b>RSA (Participant)</b>	0.222*** (0.040)			0.973* (0.501)
<b>NGE (investment subsidy)</b>		0.500* (0.259)	0.514*** (0.066)	
<b>C. Large Firms (41,819 obs)</b>				
<b>RSA (Participant)</b>	0.233*** (0.045)			-0.148 (0.761)
<b>NGE (investment subsidy)</b>		-0.050 (0.274)	0.361*** (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)
<b>A. All Firms (129,584 obs)</b>				
RSA (Participant)	0.000 (0.004)			0.009 (0.057)
NGE (investment subsidy)		0.004 (0.024)	0.434*** (0.059)	
<b>B. Small Firms (87,765 obs)</b>				
RSA (Participant)	0.004 (0.005)			0.026 (0.067)
NGE (investment subsidy)		0.012 (0.031)	0.474*** (0.070)	
<b>C. Large Firms (41,819 obs)</b>				
RSA (Participant)	-0.008 (0.007)			-0.090 (0.109)
NGE (investment subsidy)		-0.030 (0.038)	0.352*** (0.095)	

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

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