The Causal Effects of an Industrial Policy

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MOTIVATION

- Industrial & business support policies ubiquitous
- But do they work? Rodrik vs sceptical economists.
  - Do subsidies have a positive effect on the recipients' jobs, investment, productivity?
  - What about spillover effects on other firms (positive or negative)
  - How do effects vary – e.g. large firms vs SMEs?
- Useless surveys "What did you do with the money?" IQ test. Instead need to evaluate counterfactual world but for the policy
- **This paper**: we use "natural experiment" on UK **Regional Selective Assistance policy**
  - based on changing EU wide rules. Areas are randomized in and out of eligibility for investment subsidies:

FINDINGS

- Big effects that are underestimated if we ignore endogeneity. Policy good for:
  - Reducing unemployment
  - Increasing jobs, output & investment
  - Doesn’t just cause a shifting from neighbouring areas
  - But no productivity effect
- SMEs respond, large firms do not
  - Gaming rather than financial constraints
- “Cost per job” reasonable: below £7,000 per job created

Institutional Setting

Data & Rule Estimation

Main Results

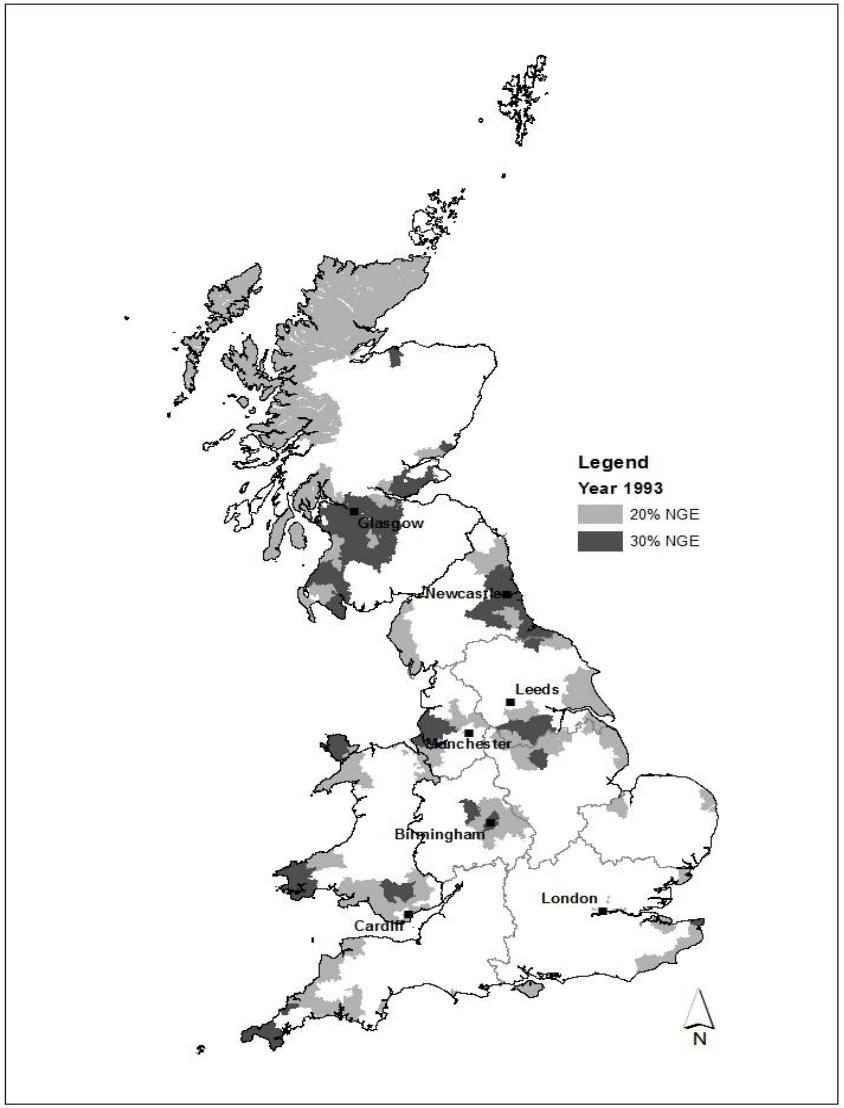
Magnitudes & Policy Implications

REGIONAL SELECTIVE ASSISTANCE: RSA

- Provides investment grants to firms in “eligible” areas. The grants cover between 10% to 35% of capital expenditure
- Firms apply for grants & agency govt. approves/rejects
- Various criteria (e.g. additionality; job creation, etc.), but **location** is key objective determinant for eligibility & maximum grant size (NGE)
- Different types of Assisted Areas:
  - **Tier 1**: grant can cover 20% to 35% net grant equivalent (NGE) of investment project costs
  - **Tier 2**: grants can cover 10% to 30% project costs
- Map of assisted areas changed because of EU-wide rules.

HOW MAPS OF ASSISTANCE CHANGED IN 2000

Area Eligibility in 1993



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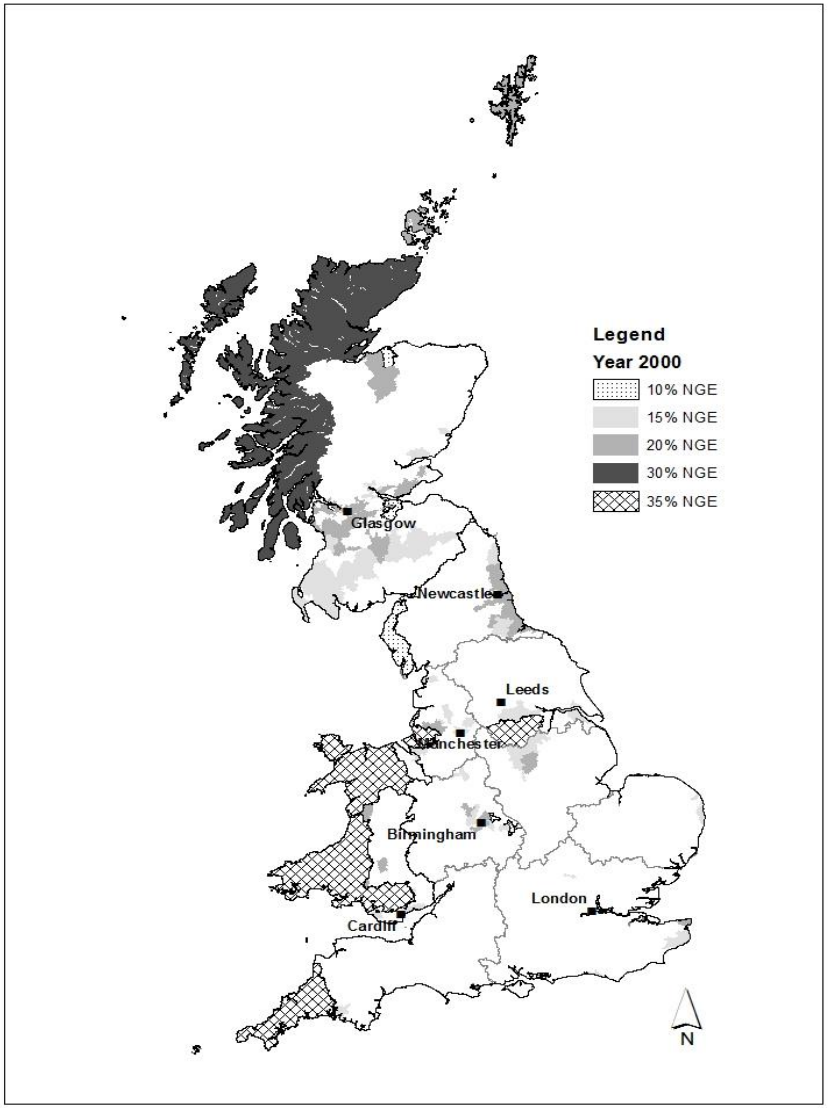

CHANGES IN AREA ELIGIBILITY

- 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)

PROBLEM WITH JUST LOOKING AT JOBS & CHANGES IN LEVELS OF INVESTMENT SUBSIDY IN AREA

- Areas which switch to more generous subsidies are those which are doing badly, thus confounding the impact of the policy
  - Will tend to bias treatment effects downwards (areas with worse trends more likely to get treated)

- **Construct an Instrumental Variable (IV) based solely on the rule changes & ignore any changes in area characteristics**
  - Exogenous to changes in area characteristics

POLICY BASED INSTRUMENTAL VARIABLE

Level of maximum subsidy in area *r*:

$$S^*_{r,00} = \theta_{00} X_{r,00} \qquad S^*_{r,93} = \theta_{93} X_{r,93}$$

Change in maximum subsidy

$$S^*_{r,00} - S^*_{r,93} = \theta_{00} X_{r,00} - \theta_{93} X_{r,93} = (\theta_{00} - \theta_{93}) X_{r,93} + (X_{r,00} - X_{r,93}) \theta_{93} + (\theta_{00} - \theta_{93})(X_{r,00} - X_{r,93})$$

$$(\theta_{00} - \theta_{93}) X_{r,93}$$

Importance of area Characteristic in eligibility Rule from 2000 onwards

Importance of area Characteristic in eligibility Rule 1993-2000

Vector of area characteristics (measures of disadvantage)

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DATA

SAMIS database: since 1972 information on RSA applicants; name; address (postcode); how much they receive and when.

IDBR: list of all UK plants & firms with names, address, industry, ownership; **employment**, entry and exit dates.

ARD: Government survey of a stratified sample of businesses with info on employment, investment, output, materials, etc. Info recorded at **firm** level (same as **plant** for 80% of the time)

EU official documents to gather information on eligibility rules and maps

We use matched data from these sources 1986 to 2004 (focus on 1997-2004)

TABLE 2: ESTIMATING THE EFFECT OF POLICY RULES

	Main specification	
Year	**1993**	**2000**
Dependent Variable: level of NGE ordered variable		
GDP per capita	-0.022***	-0.047***
	(0.002)	(0.003)
Population density	-0.028***	-0.042***
	(0.002)	(0.002)
Share of high skilled workers	-0.586***	
	(0.139)	
Start-up rate	-2.483***	
	(0.194)	
Structural unemployment rate	83.079***	
	(2.354)	
Activity rate	-1.129***	
	(0.257)	
Employment rate		-9.134***
		(0.462)
Current unemployment rate	-9.163***	62.192***
(claimant count)	(3.209)	(2.244)
ILO unemployment rate		-6.364***
		(0.847)
Long-duration unemployment	0.421	
Rate	(1.246)	
Share of manufacturing workers		-0.263
		(0.193)
Observations (wards)	10,737	10,737

Figure 3: *Unemployment* fell more quickly in areas with increasing probability of business support

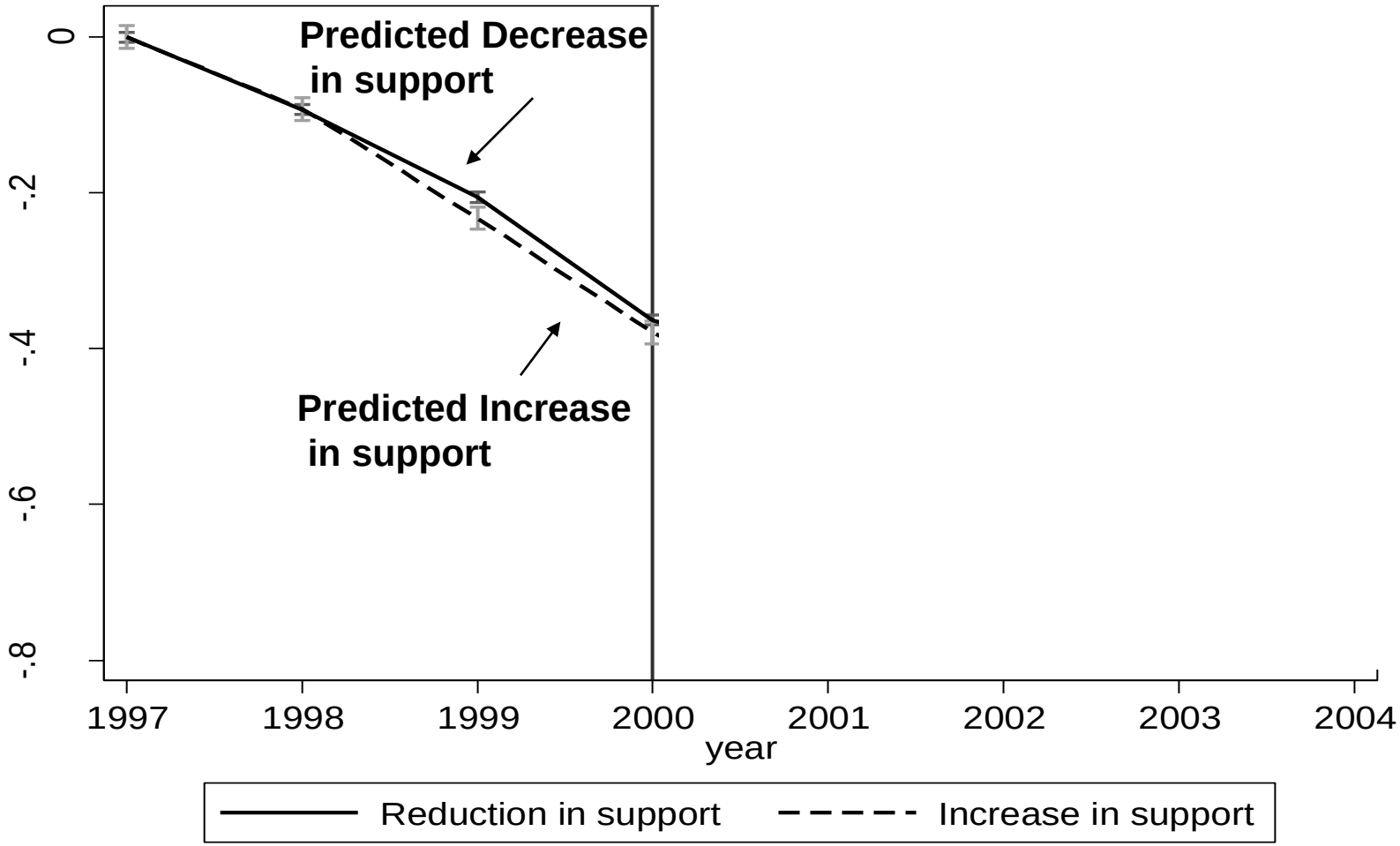

Figure 3: *Unemployment* fell more quickly in areas with increasing probability of business support

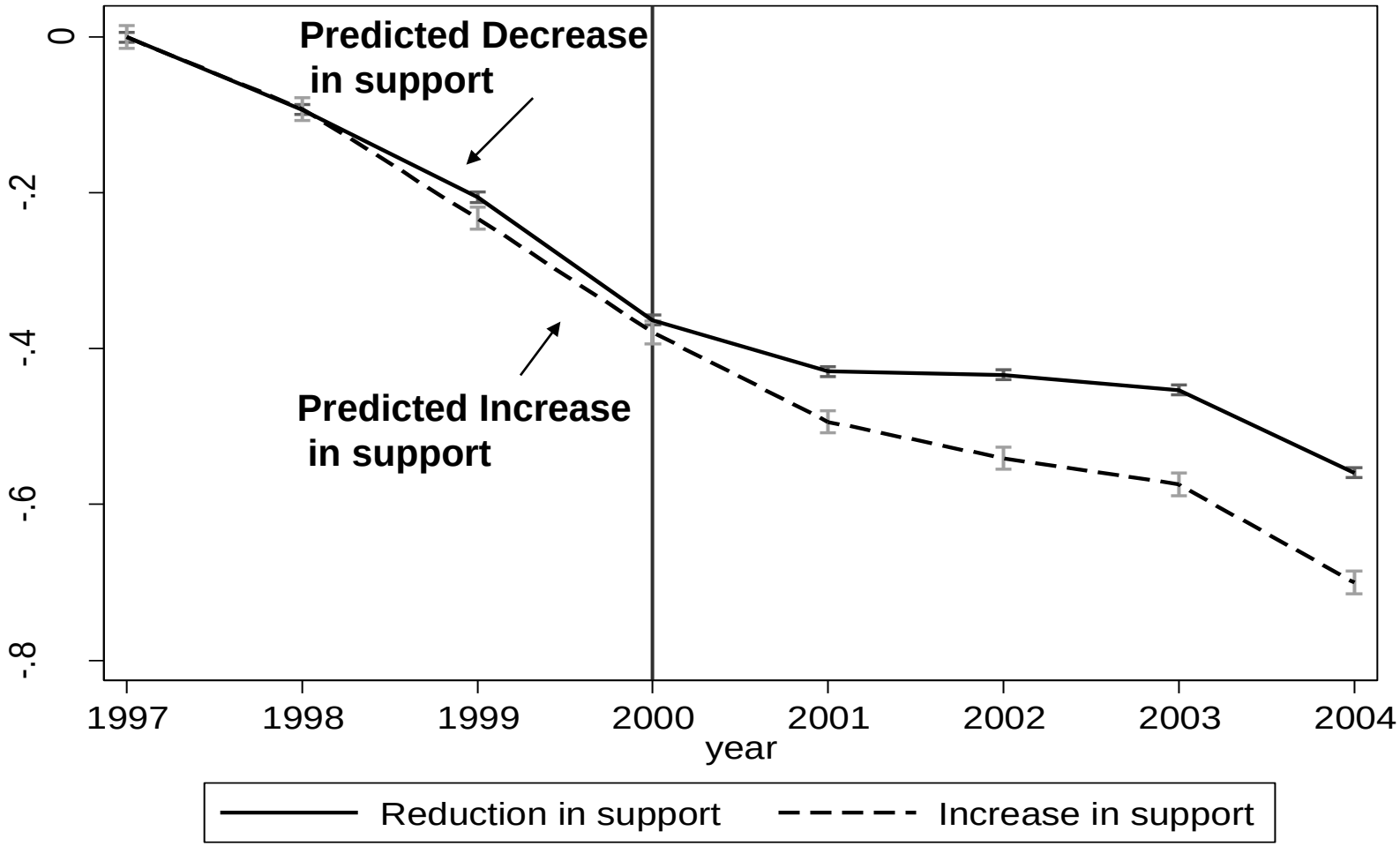

Figure 4: Manufacturing employment rose more in areas with increasing business support probability

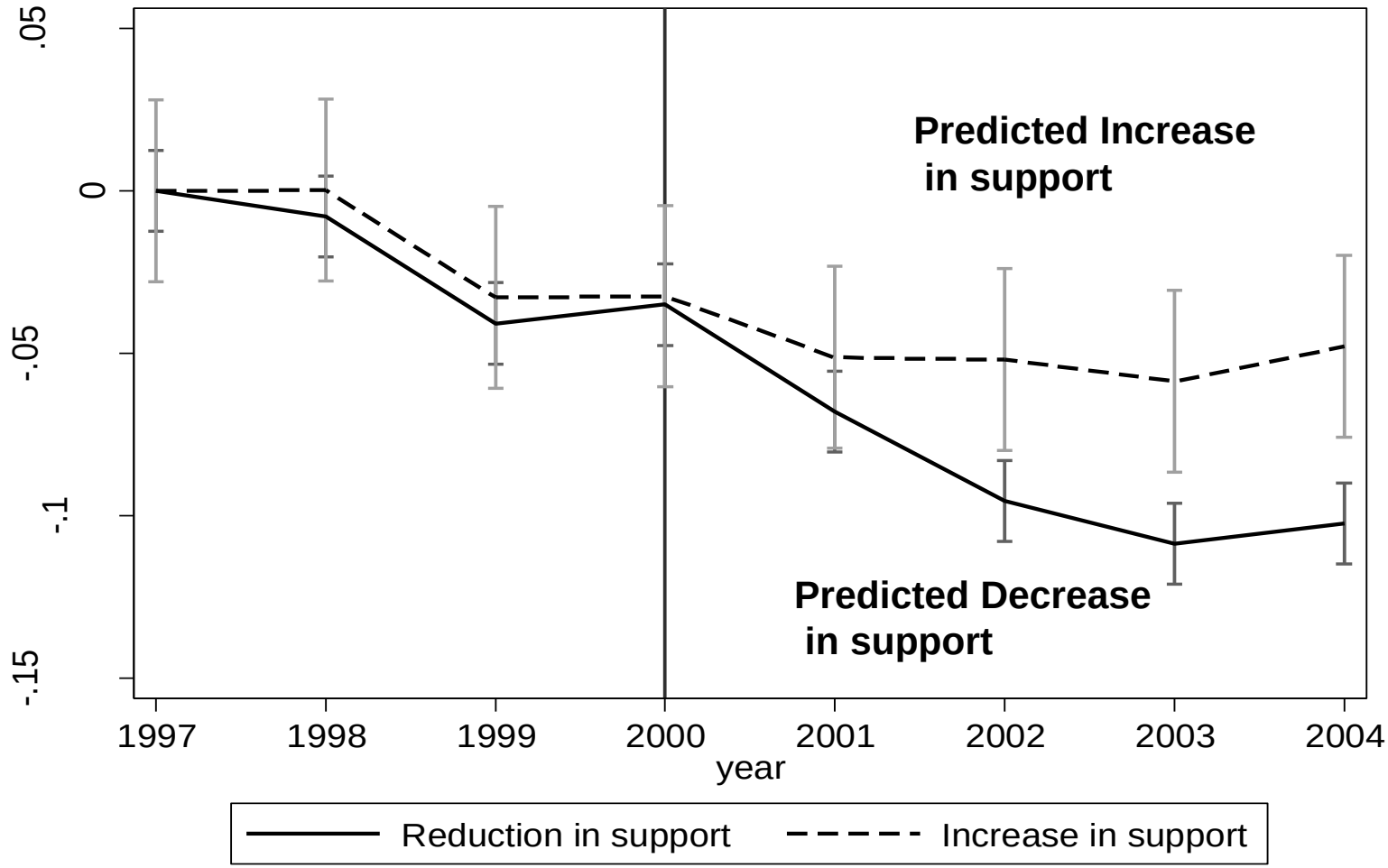

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TABLE 3: AREA LEVEL REGRESSIONS WITH FIXED EFFECTS – IV MAX INVESTMENT SUBSIDY WITH RULE CHANGE

Method	OLS	Reduced Form	First Stage	IV
A. Dependent variable: ln(Unemployment)				
Maximum investment subsidy	-0.169***			-0.318***
NGE	(0.020)			(0.064)
Policy Rule Instrument		-0.273***	0.859***	
		(0.055)	(0.031)	
Number of areas (wards)	10,737	10,737	10,737	10,737
Observations	85,896	85,896	85,896	85,896

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B. Dependent variable: ln(Employment)				
Maximum investment subsidy	0.169***			0.831***
NGE	(0.057)			(0.202)
Policy Rule Instrument		0.713***	0.859***	
		(0.174)	(0.031)	

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Policy Rule Instrument		0.713***	0.859***	
		(0.174)	(0.031)	
C. Dependent variable: ln(Number of Plants)				
Maximum investment subsidy	0.014			0.215***
NGE	(0.027)			(0.083)
Policy Rule Instrument		0.185***	0.859***	
		(0.071)	(0.031)	
Number of areas (wards)	10,737	10,737	10,737	10,737

EXTENSIONS (AREA LEVEL)

- Use actual subsidies & IV (Table 4)
- Look for spillovers/displacement by estimating at higher level of aggregation (TTWA, Table 5)
  - No evidence of displacement

TABLE 6: PLANT LEVEL FIXED EFFECT REGRESSIONS: LN(EMPLOYMENT)

	OLS	Red. Form	First Stage	IV
A. Pooled across all plants, 792,091 observations on 139,796 plants				
ln(Maximum investment subsidy)	0.021			0.416***
	(0.021)			(0.073)
NGE				
Policy Rule Instrument		0.282***	0.676***	
		(0.049)	(0.034)	

TABLE 6: PLANT LEVEL FIXED EFFECT REGRESSIONS: LN(EMPLOYMENT)

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ln(Maximum investment subsidy)	0.021			0.416***
	(0.021)			(0.073)
NGE				
Policy Rule Instrument		0.282***	0.676***	
		(0.049)	(0.034)	
B. Small (Plants in Firm with under 50 employees), 720,151 observations on 126,508 plants				
ln(Maximum investment subsidy)	0.011			0.343***
	(0.023)			(0.079)
NGE				
Policy Rule Instrument		0.232***	0.678***	
		(0.053)	(0.035)	

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ln(Maximum investment subsidy)	0.011			0.343***
NGE	(0.023)			(0.079)
Policy Rule Instrument		0.232***	0.678***	
		(0.053)	(0.035)	
C. Large Plants (in Firms with over 50 employees), 71,940 observations, on 13,288 plants				
ln(Maximum investment subsidy)	0.027			0.098
NGE	(0.044)			(0.155)
Policy Rule Instrument		0.064	0.661***	
		(0.103)	(0.043)	

ROBUSTNESS

- Absence of effects on large firms not because they get proportionately less subsidies
  - Use actual subsidies received (Tab 7)

- Is bigger SME effect due to credit constraints?
  - But no age (better proxy for asymmetric information than size) interaction with policy
  - More likely large firms can “game” the system & pretend they creating extra jobs

TAB 8: PLANT LEVEL FIXED EFFECT REGRESSIONS: OTHER OUTCOMES

Method	OLS	Reduced Form	First Stage	IV
C. Dependent variable: ln(Capital Investment), ARD sub-sample (45,545 observations, 21,404 firms)				
NGE	0.161			1.255*
	(0.261)			(0.688)
Policy Rule Instrument		0.934*	0.744***	
		(0.512)	(0.029)	
D. Dependent variable: ln(Output), ARD sub-sample (45,545 observations, 21,404 firms)				
NGE	0.051			0.450***
	(0.055)			(0.159)
Policy Rule Instrument		0.335***	0.744***	
		(0.117)	(0.029)	
E. Dependent variable: ln(TFP), ARD sub-sample (45,545 observations, 21,404 firms)				
NGE	-0.014			-0.072
	(0.029)			(0.073)
Policy Rule Instrument		-0.054	0.744***	
		(0.055)	(0.029)	

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MAGNITUDES

- Estimate the implied aggregate increase in jobs every year using reduced form coefficients and Investment subsidy (NGE)
  - A subsidy of 10% creates 7.1% more jobs
  - 176,000 extra jobs per year
  - **Cost per job** £1,636 (IV) to £6,885 (OLS), 2010 prices
- Don't find asymmetries/dynamic effects. So no evidence for "Big Push" to generate agglomerations

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 & 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 ~£6,885** 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.

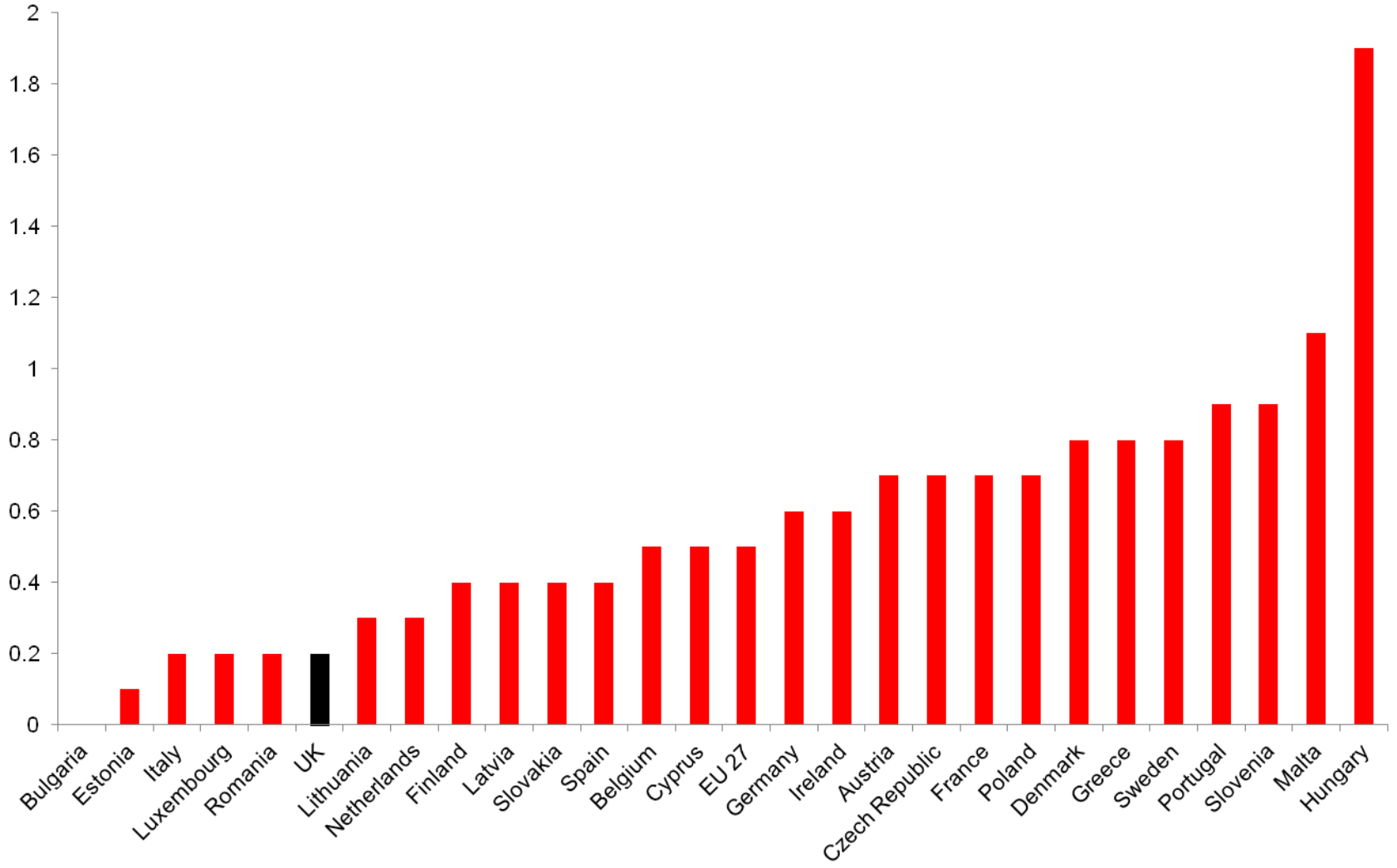
November 2002: receives a RSA grant of £13k for £61k project of producing new types of bagpipes: Breton and Spanish pipes and Bombards. The company has a current total employment of 20 and is one of the world's best known manufacturers of bagpipes.

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

Back Up

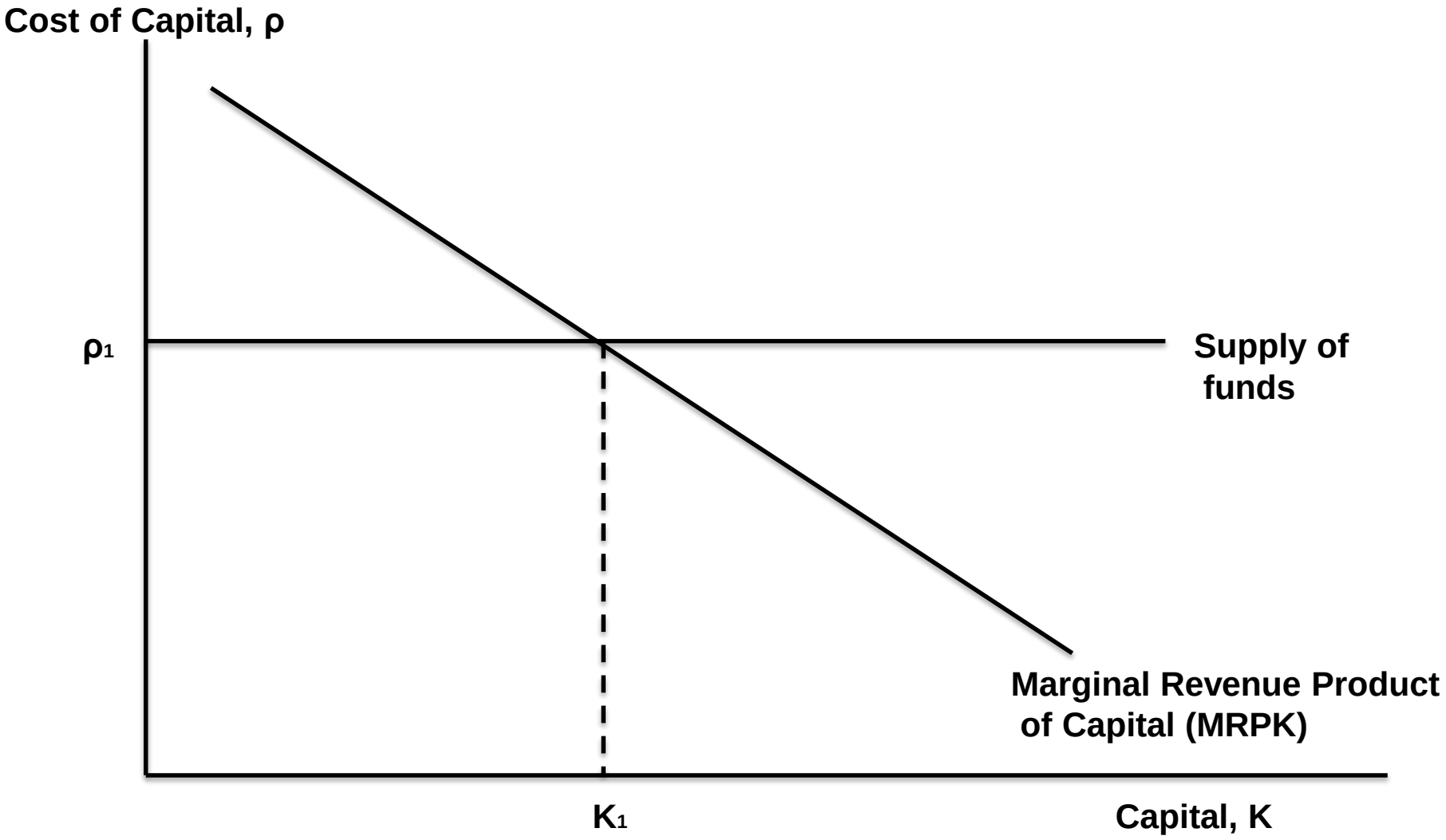
Full paper available http://cep.lse.ac.uk/pubs/download/dp1113.pdf

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?



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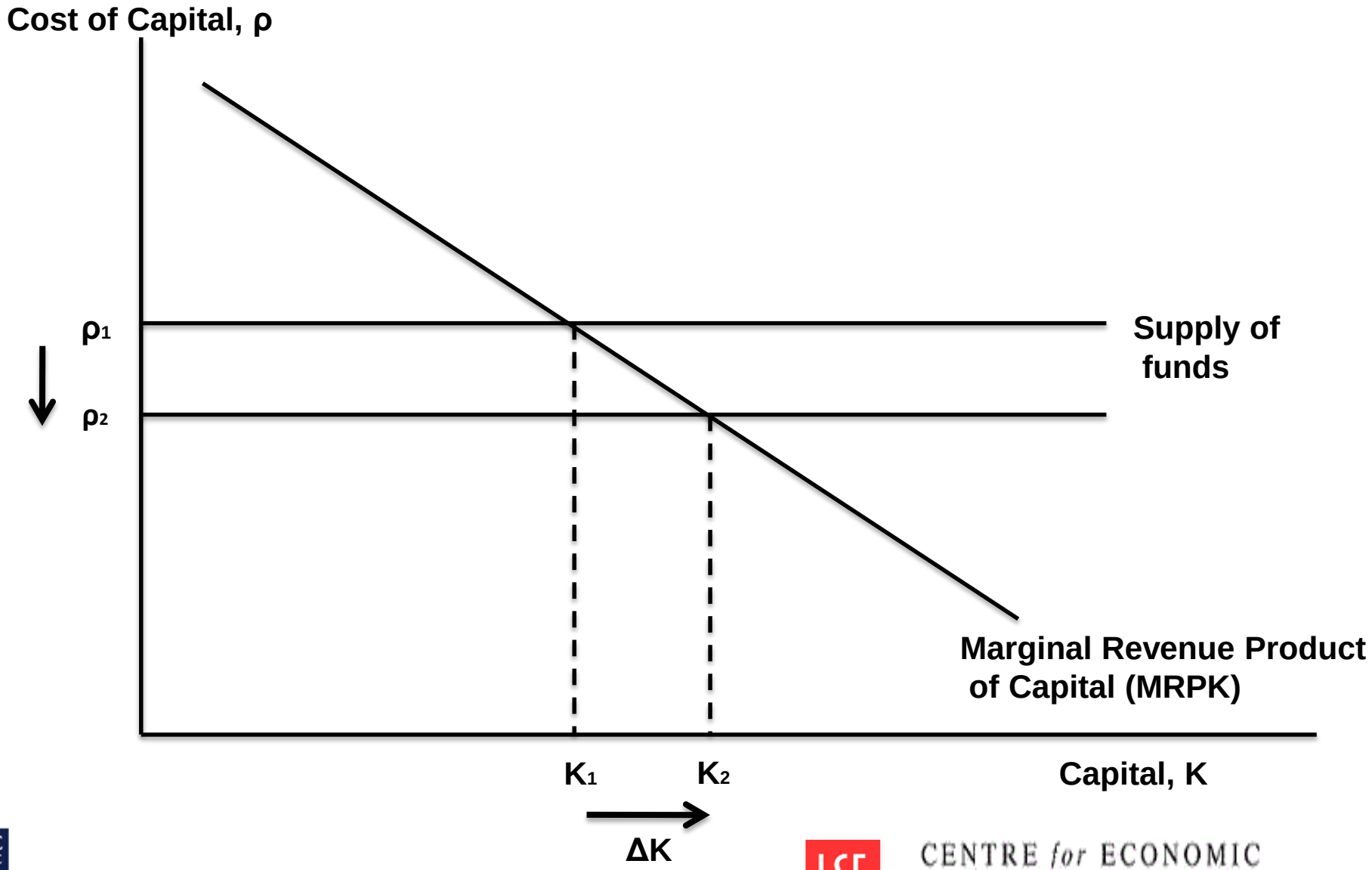

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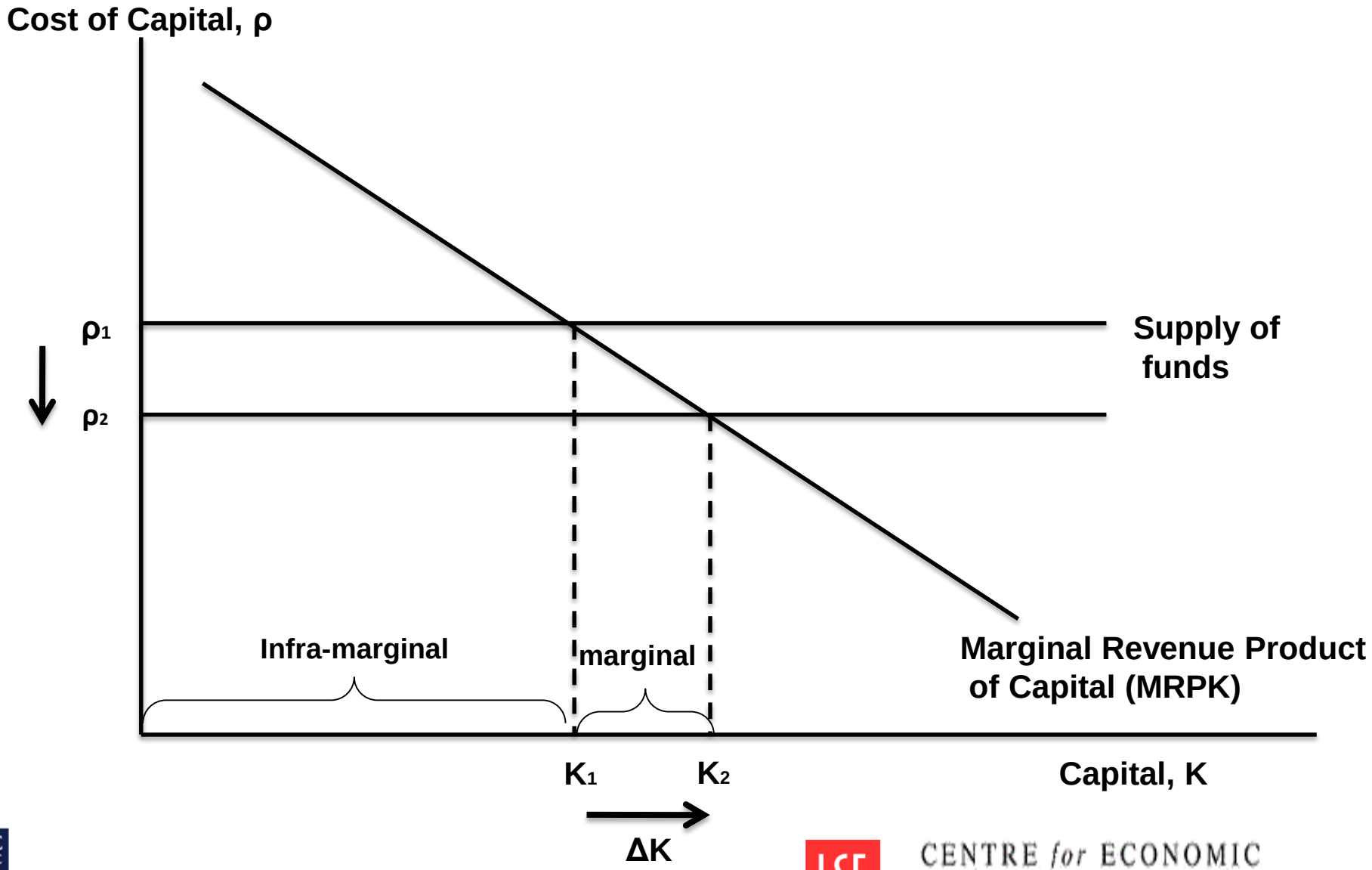
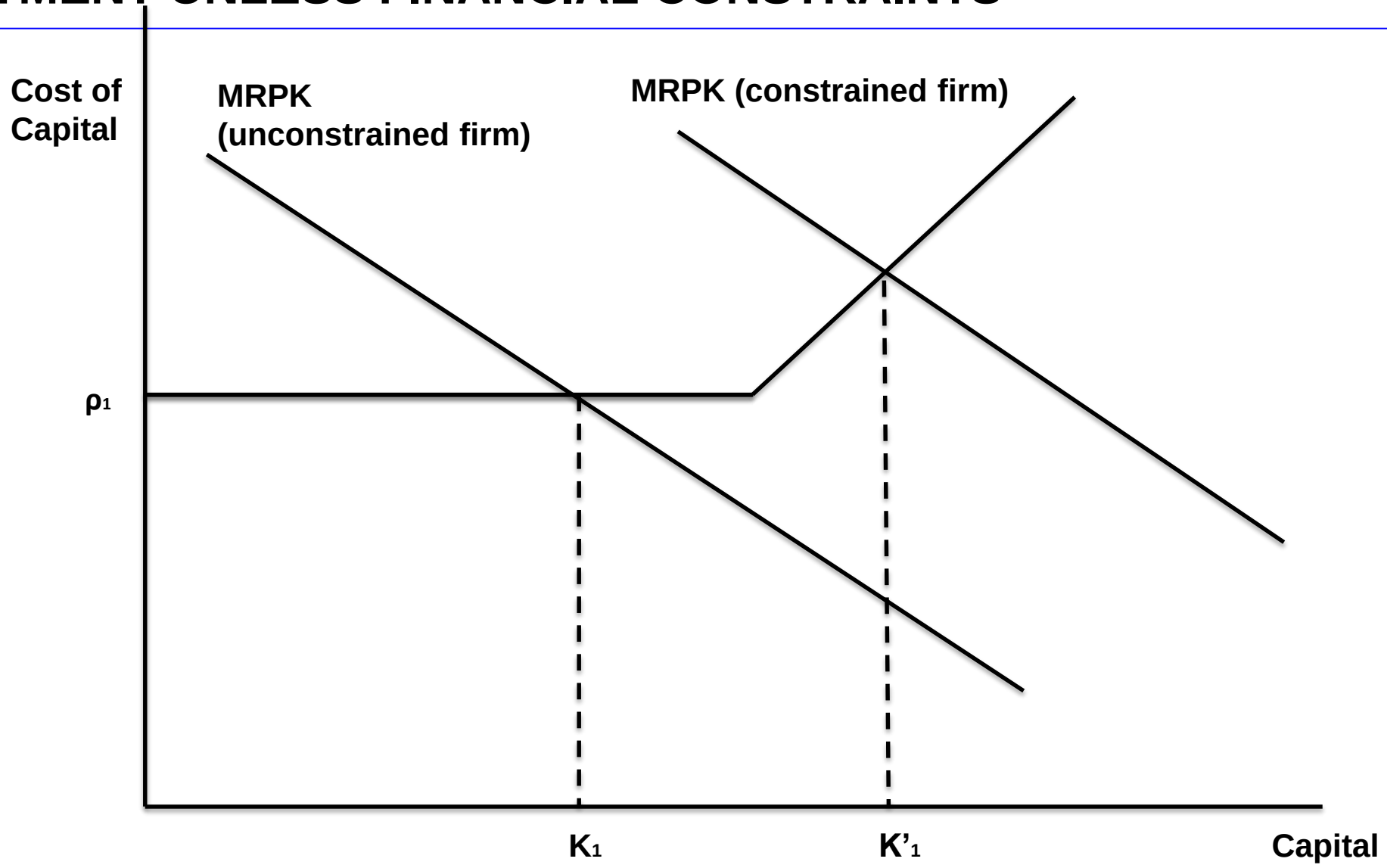
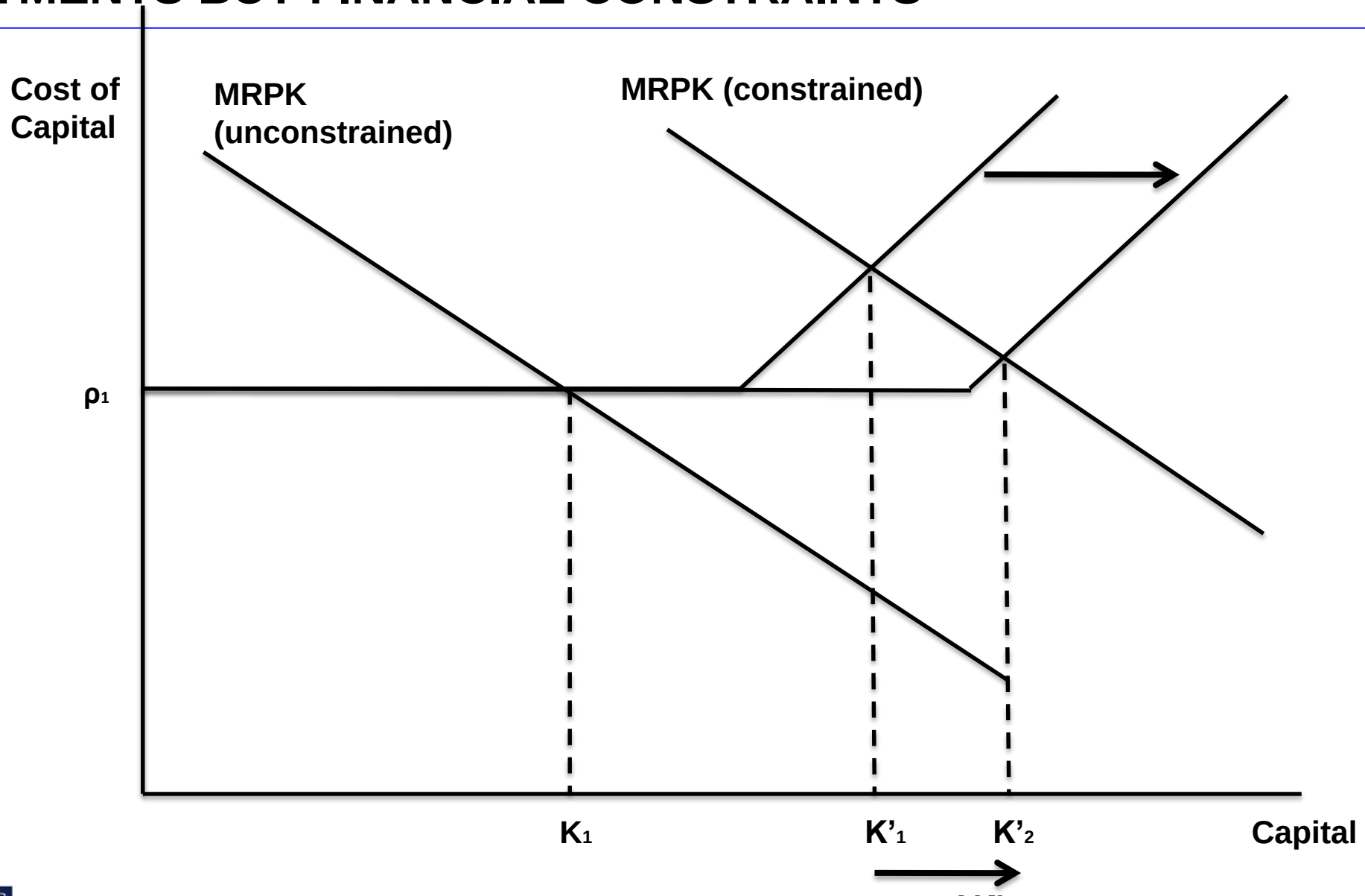
EFFECTS DEPEND ON MONITORING MARGINAL INVESTMENT: HARDER IF FIRM IS LARGE?



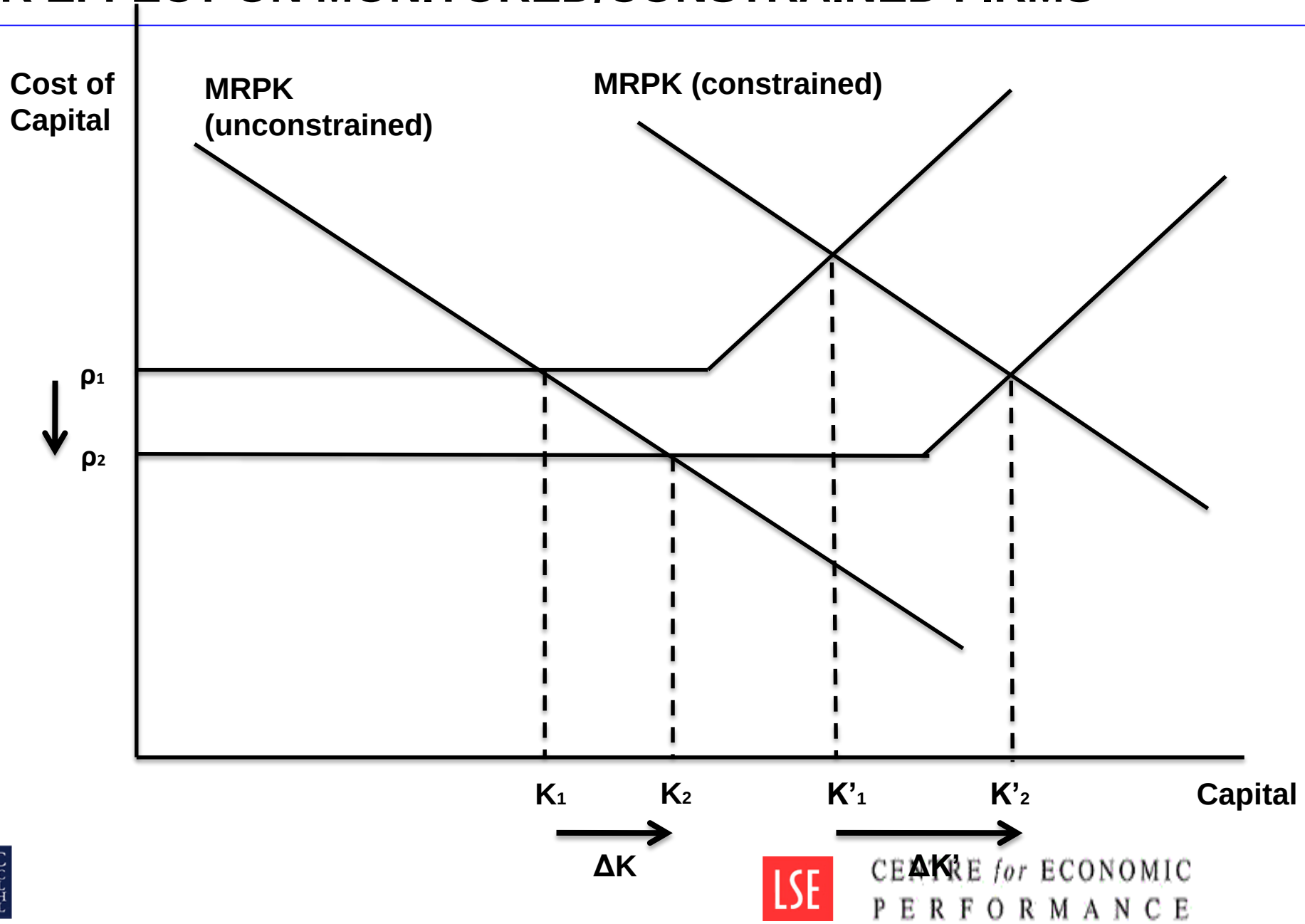
IF AGENCY HAS ZERO MONITORING ABILITY NO EFFECT ON INVESTMENT UNLESS FINANCIAL CONSTRAINTS



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 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