The causal effects of an industrial policy

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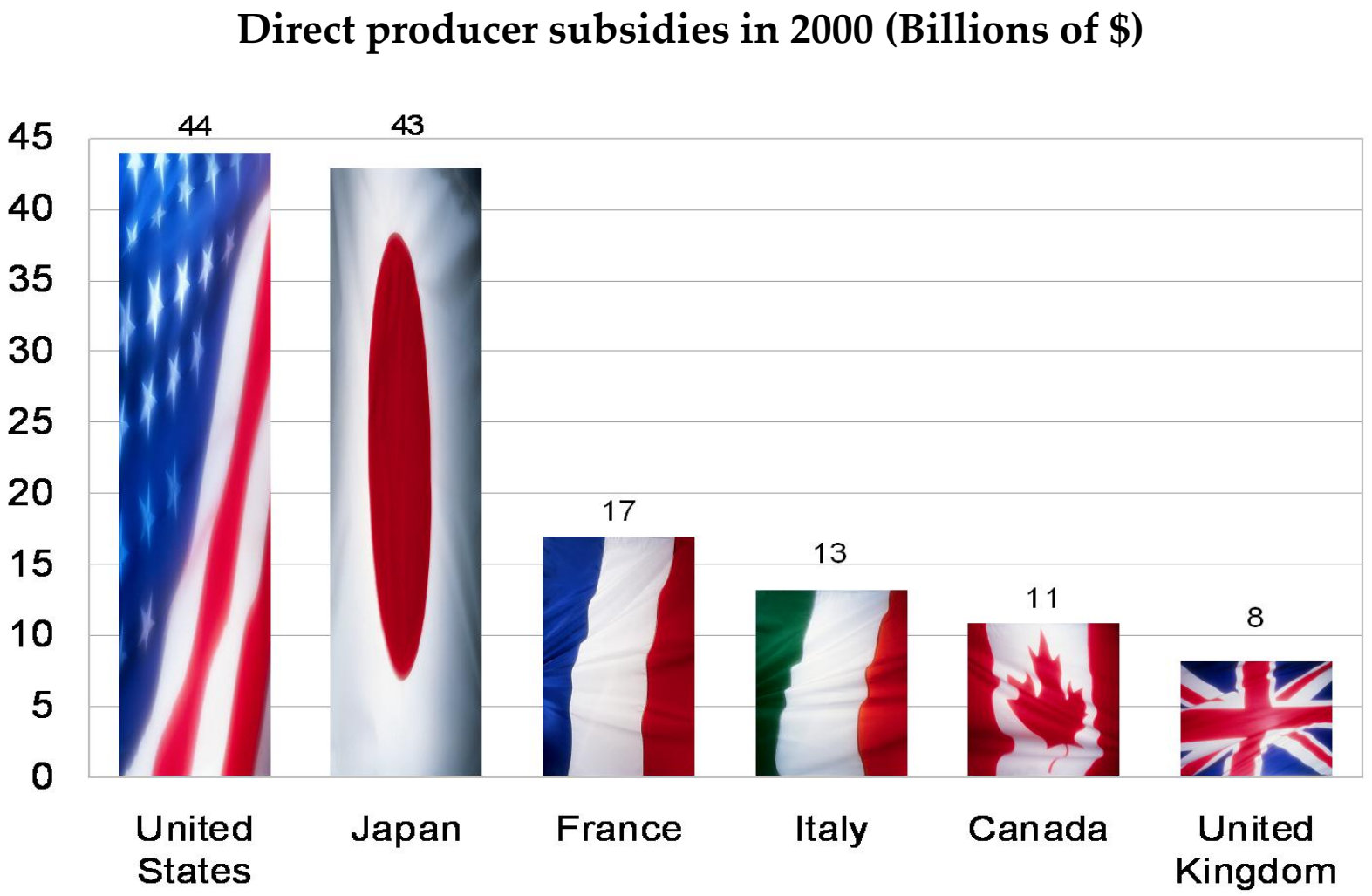
CENTRE *for* ECONOMIC PERFORMANCE

Motivation

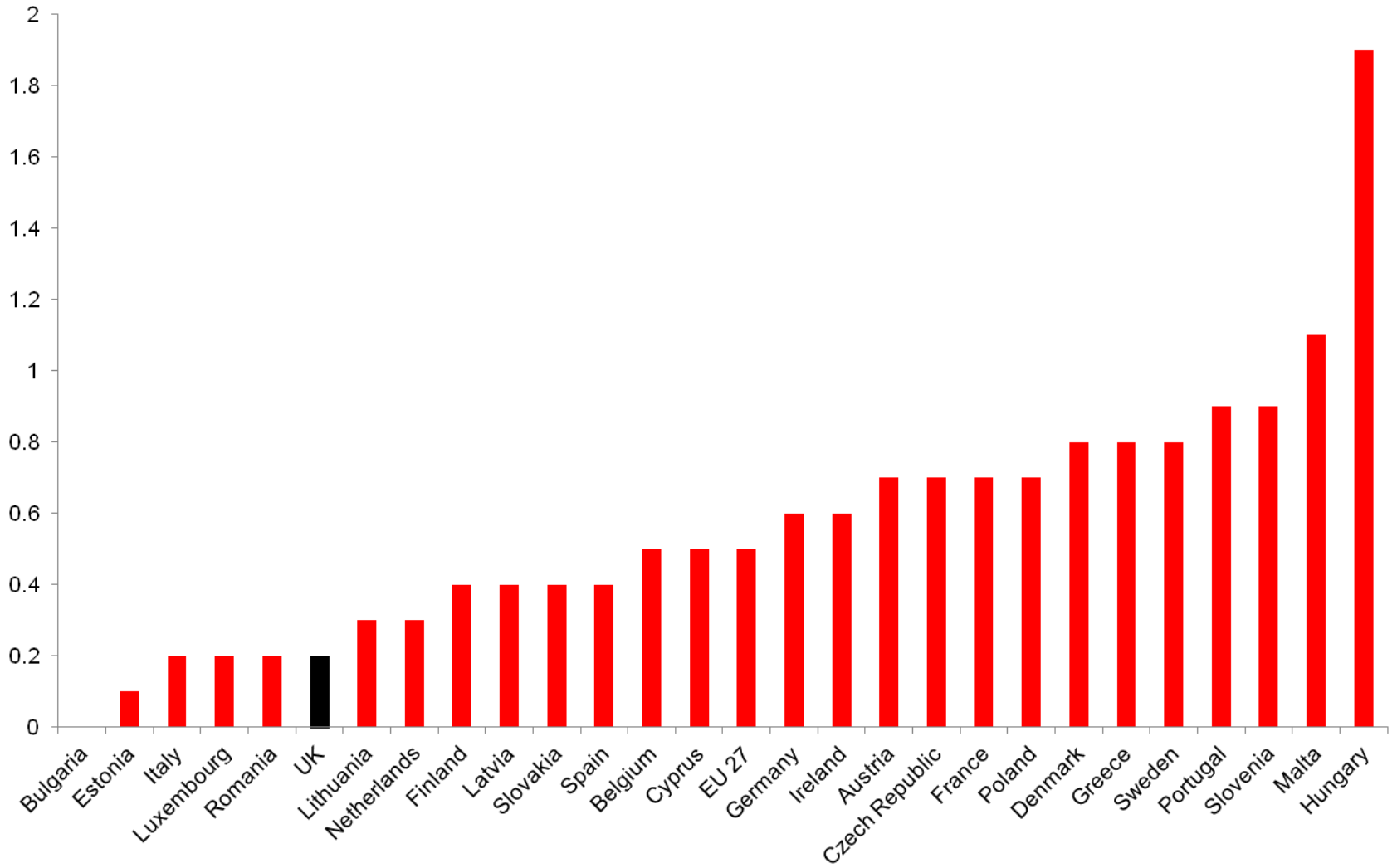
- Industrial policies pervasive both in developed and developing economies and involve large sums of tax payers money
- Current revival of industrial strategies to support growth: e.g. direct subsidies to auto and banking sector; loan guarantees; export support; FDI support; special enterprise zones, etc.
  - 2008/09 Fiscal Stimulus: USA 5.8% of GDP; Germany 3.1%; Canada and Japan 2%; UK 1% (*The Economist 2009*)

Motivation: to how much do they amount?



Source: OECD, 2002

Non-crisis State Aid for business in the EU, 2010 (AS % OF GDP)



Source: Confederation of British Industry (2013)

Motivation: Do they work?

- Econometric evaluations of the causal impact of industrial policies rare
- Instead common: Ex-post surveys of supported firms

Obstacles in conducting solid evaluation:

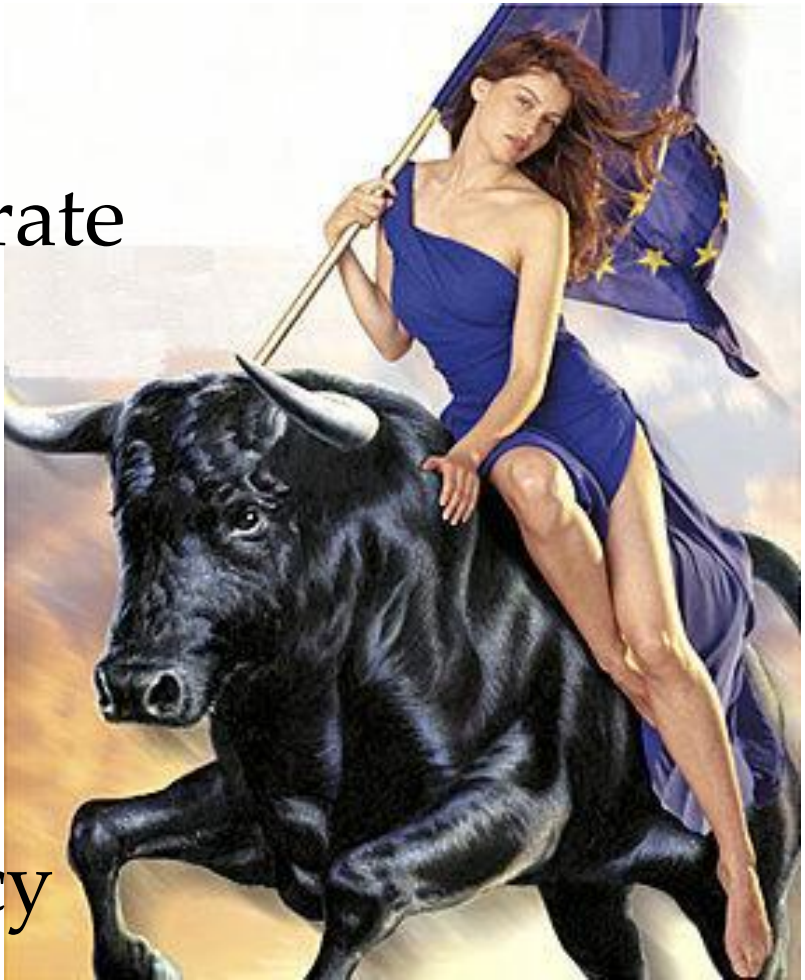
- Difficulty in accessing relevant data (Gov co-operation)
- Identification
  - Upward bias? Firms take subsidy as windfall
  - Downward bias? Policies are designed to help losers (Rodrik 2007)

So what to do?

Randomized Trials would be ideal….

…. but probably fatal for bureaucrats and government

Hence: pray to the gods to generate natural experiments



Our goddess of choice = Europa

Changing EU rules lead to exogenous variation of UK policy

The policy

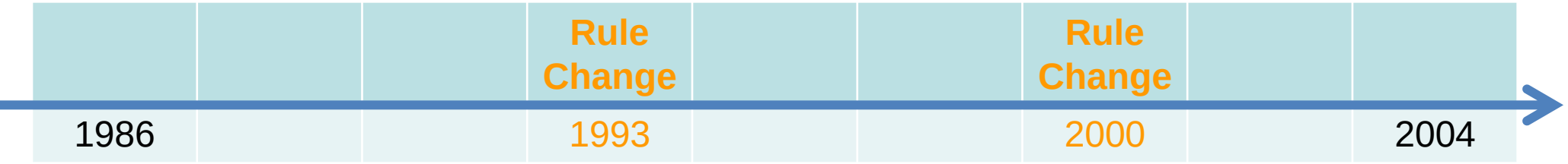
UK Regional Selective Assistance (RSA)

Discretionary subsidy

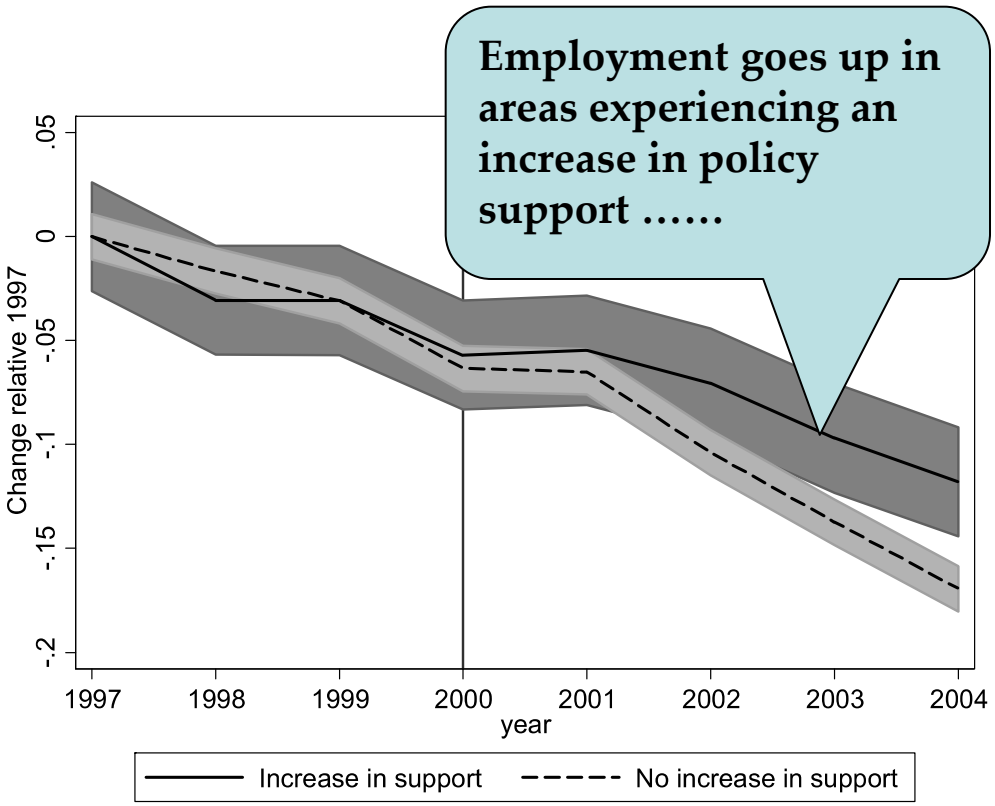
- Program gives firms investment grants "to safeguard or create jobs" (up to 35%)
- Main UK firm subsidy scheme: 1991-01 12,889 grants £3.2 bn
- On average 200m per year

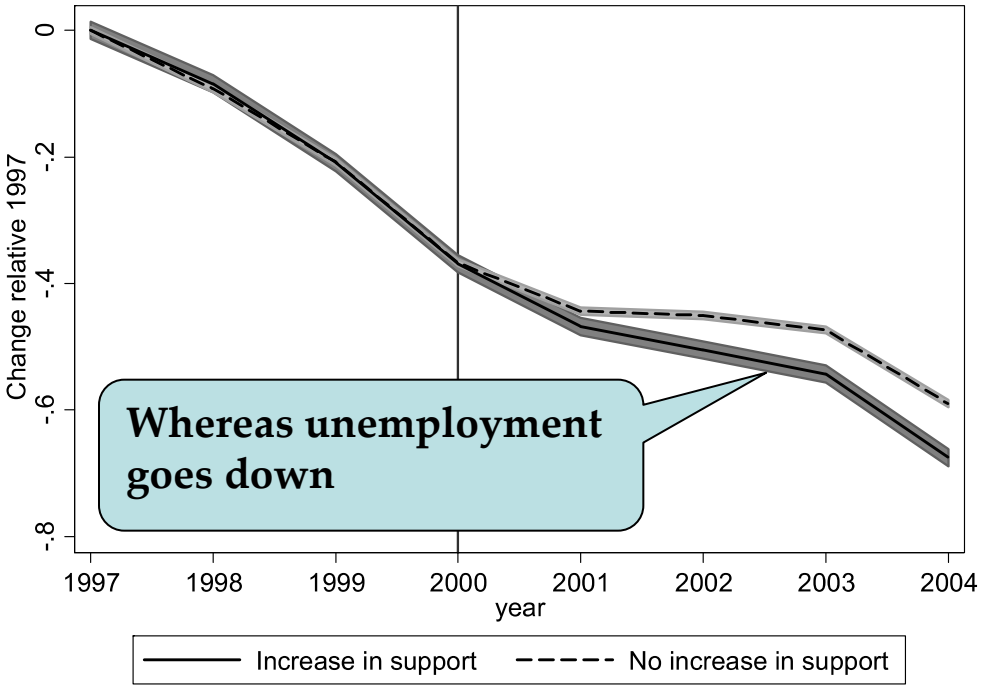
The Experiment

- Firms can only get support if they are in a "disadvantaged area"
- Definition depends on EU rules which change every 7 years
- 2 changes in Sample period



Summary of findings





- Effects heterogeneous: no effect for large firms.
- No effect on productivity
- Cost per job approx. £5000

Structure

Policy details

Empirical Strategy

Results

Summary and Conclusions

Dis-advantaged Areas

RSA is subject to European state aid rules
➜Prevent distortion of competition

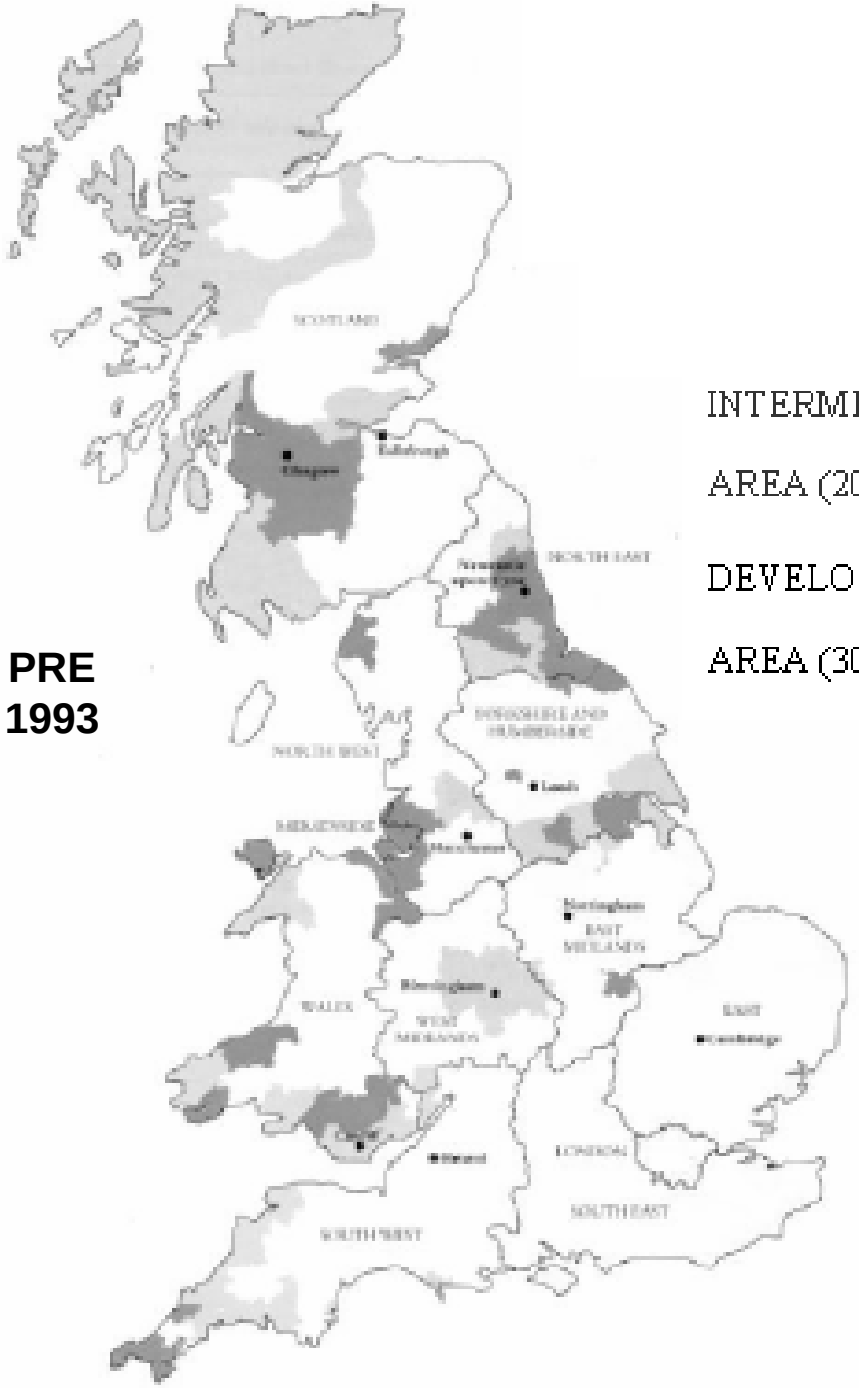
Support only allowed in dis-advantaged areas
Criteria include

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

Changes in Eligibility

- 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)
- Changes on extensive and intensive margin (changes in Net Grant Equivalent , **NGE**)

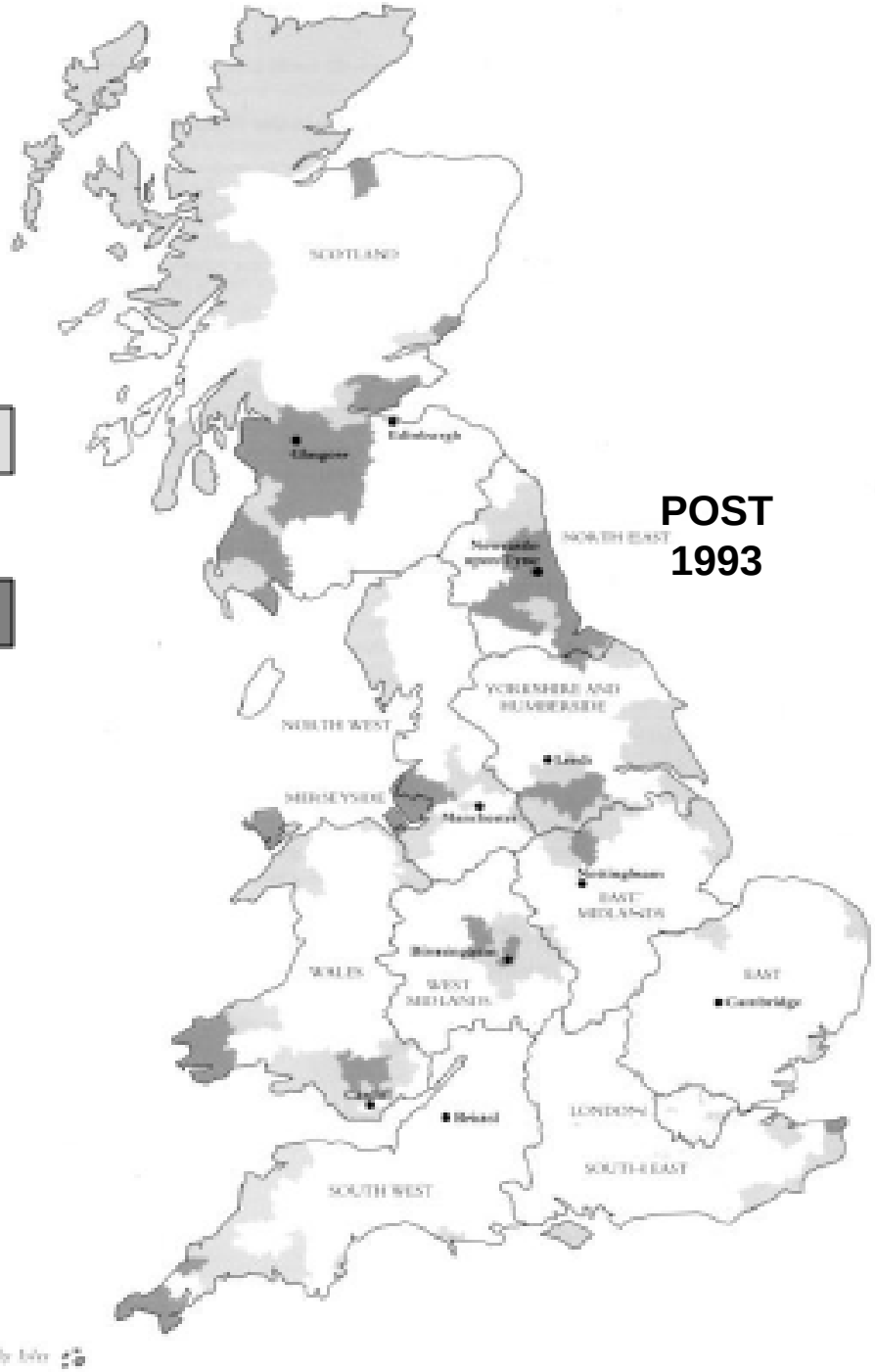
Max. share of support allowed



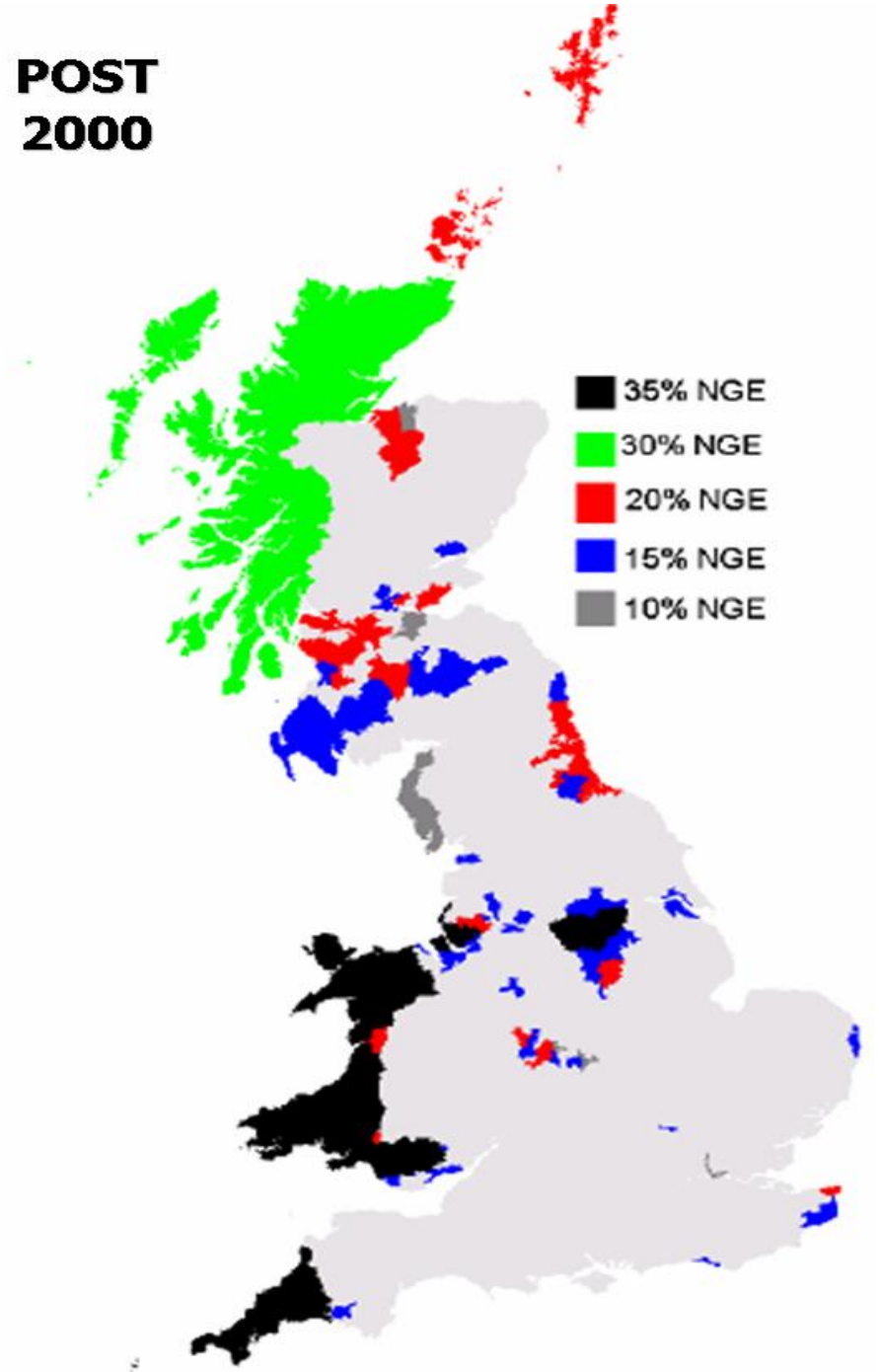
PRE 1993

INTERMEDIATE AREA (20% NGE)

DEVELOPMENT AREA (30% NGE)



POST 1993



- With the different rates reflecting the seriousness of the disadvantage

Number of changes

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

Isolating rule changes

- 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

EU rule

$$SupportLevel_{Post\,00} = f_{00}\left(X_{93\text{-}99}\right)$$

$$SupportLevel_{93\text{-}99} = f_{93}\left(X_{\text{-}92}\right)$$

$$DInstrument = \hat{f}_{00}\left(X_{<93}\right) - \hat{f}_{93}\left(X_{<93}\right)$$

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Empirical strategy – Plant level

Fixed effect models at various aggregation levels

Plant level

Endogenous
Instrument with NGE
Or pure rule change instrument

$$l_{it} = \beta RSA_{it} + \alpha_i + \alpha_t + \epsilon_{it}$$

Reduced form = Intent to treat

$$l_{it} = \gamma IV_{it} + \alpha_i + \alpha_t + \epsilon_{it}$$

Empirical strategy – Area Level

Area = Ward (about 10,000)

Level at which policy is defined

$$l_{wt} = \gamma IV_{wt} + \alpha_w + \alpha_t + \epsilon_{wt}$$

Advantages of ward level:

- Can uncover exit and entry response
- Substitution between supported and non supported firms?

Substitution between supported & non-supported Wards?➜Higher aggregation level (TTWA)

Data

Outcome data

– ONS business micro data (>300,000 plants from ARD, IDBR, etc): Employment, Plants
– Area level Unemployment (Claimant Count)

RSA participation data

- SAMMIS data base from BIS

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Area Level Analysis (1985-2004)

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**
Support level (NGE)	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	1	322	322

- **Positive effects on employment and net entry**
- **No evidence of displacement**

Plant Level regressions: ln(Employment) 1985-2004

	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)	

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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***	
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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)	

Rule Change Instrument 96-04

	(1) Un -employ -ment ln(UNEMP)	(2) Employment ln(EMP)	(3) Firms ln(Firms)	(4) Plants ln(Plants)
Rule Change	-0.768***	0.818***	0.307***	0.335***
	'(0.084)	'(0.187)	'(0.081)	'(0.081)
NGE	-0.855***	0.241**	0.118**	0.132**
	'(0.047)	'(0.117)	'(0.054)	'(0.054)
Observations	85896	85896	85896	85896
Wards	10737	10737	10737	10737
Fixed effects	yes	yes	yes	yes

Effects very similar for unemployment

Effects become larger for employment and net entry

Further Results and Robustness

- Controlling for other EU regional support
- Common support sample
- Firm rather than plant level regression
- Looking at productivity: no effects
- Effects on investment consistent with employment effects

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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 **~£5000** per job in 2010 prices
  - ~100,000 jobs
- 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

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

…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/

Thanks –
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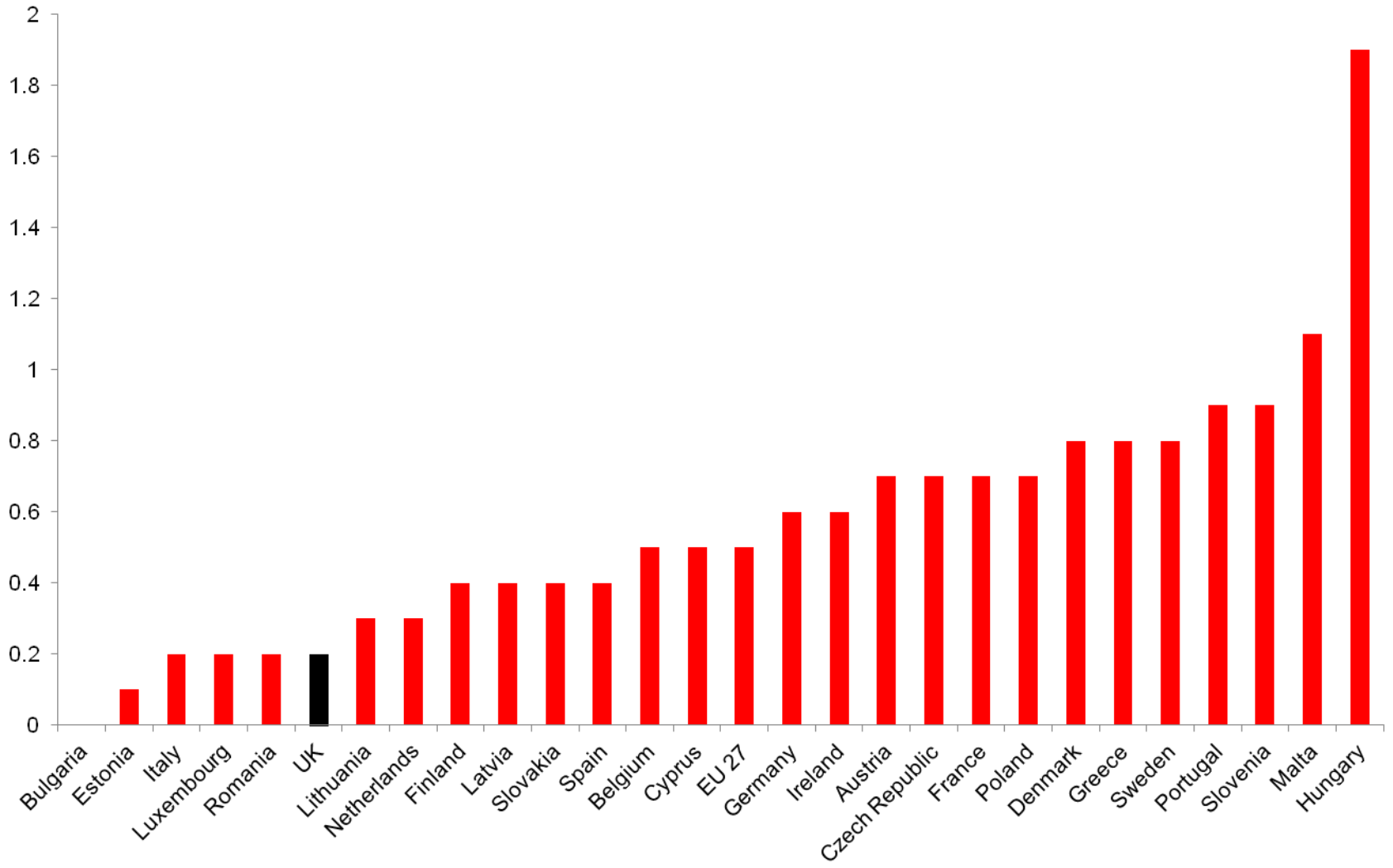
Back Up

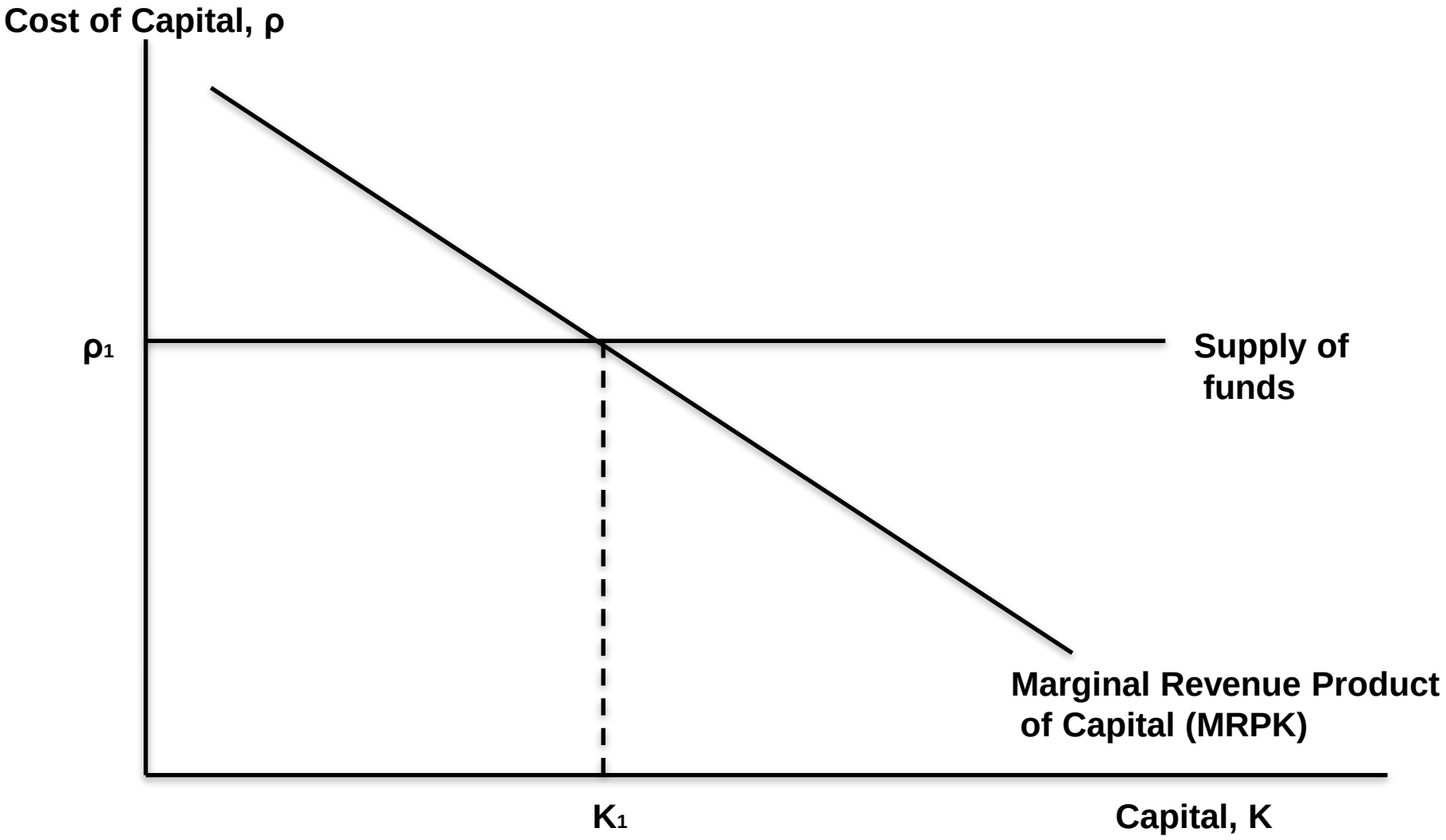
Full paper available http://cep.lse.ac.uk/pubs/download/dp1113.pdf

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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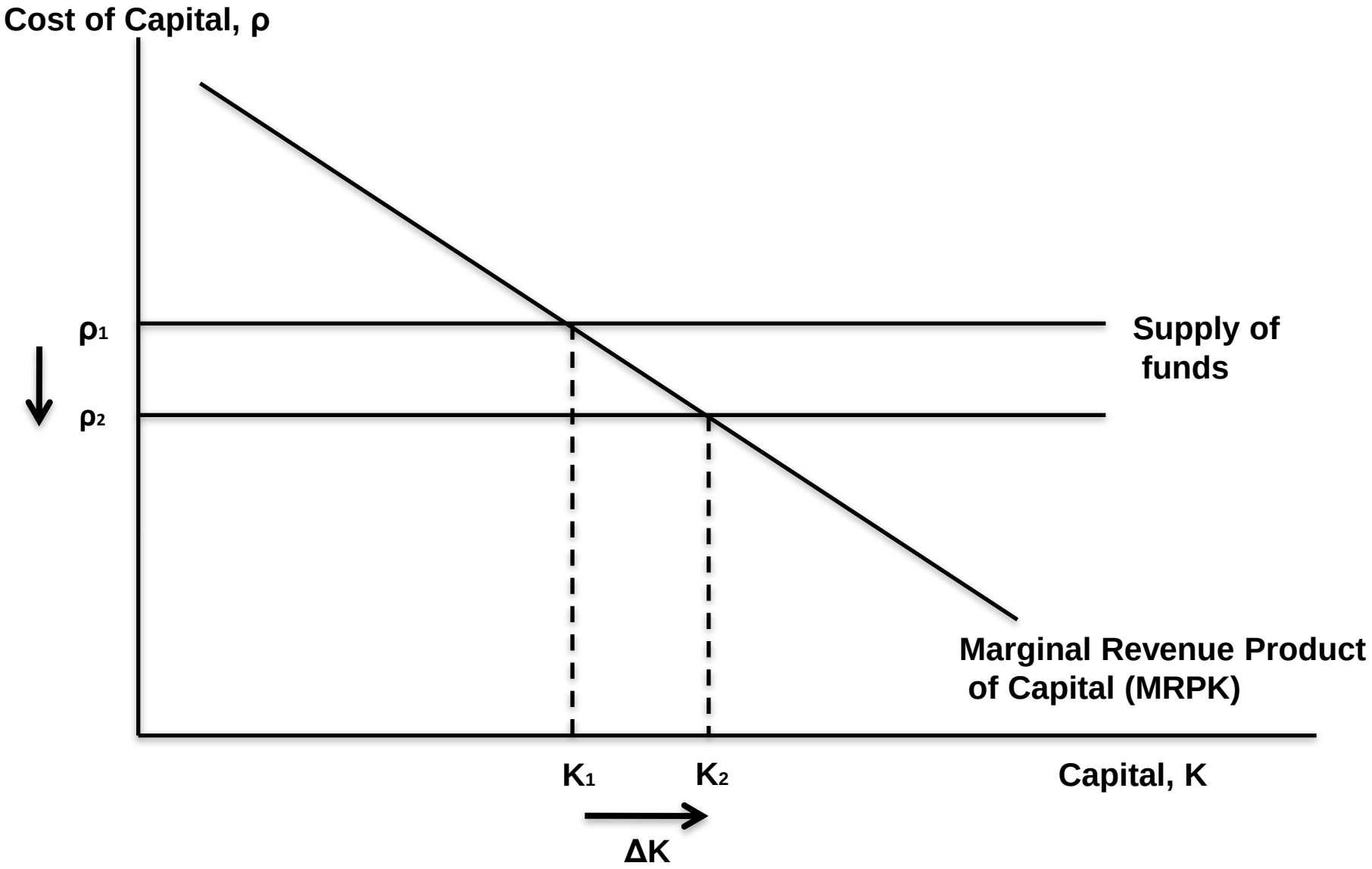
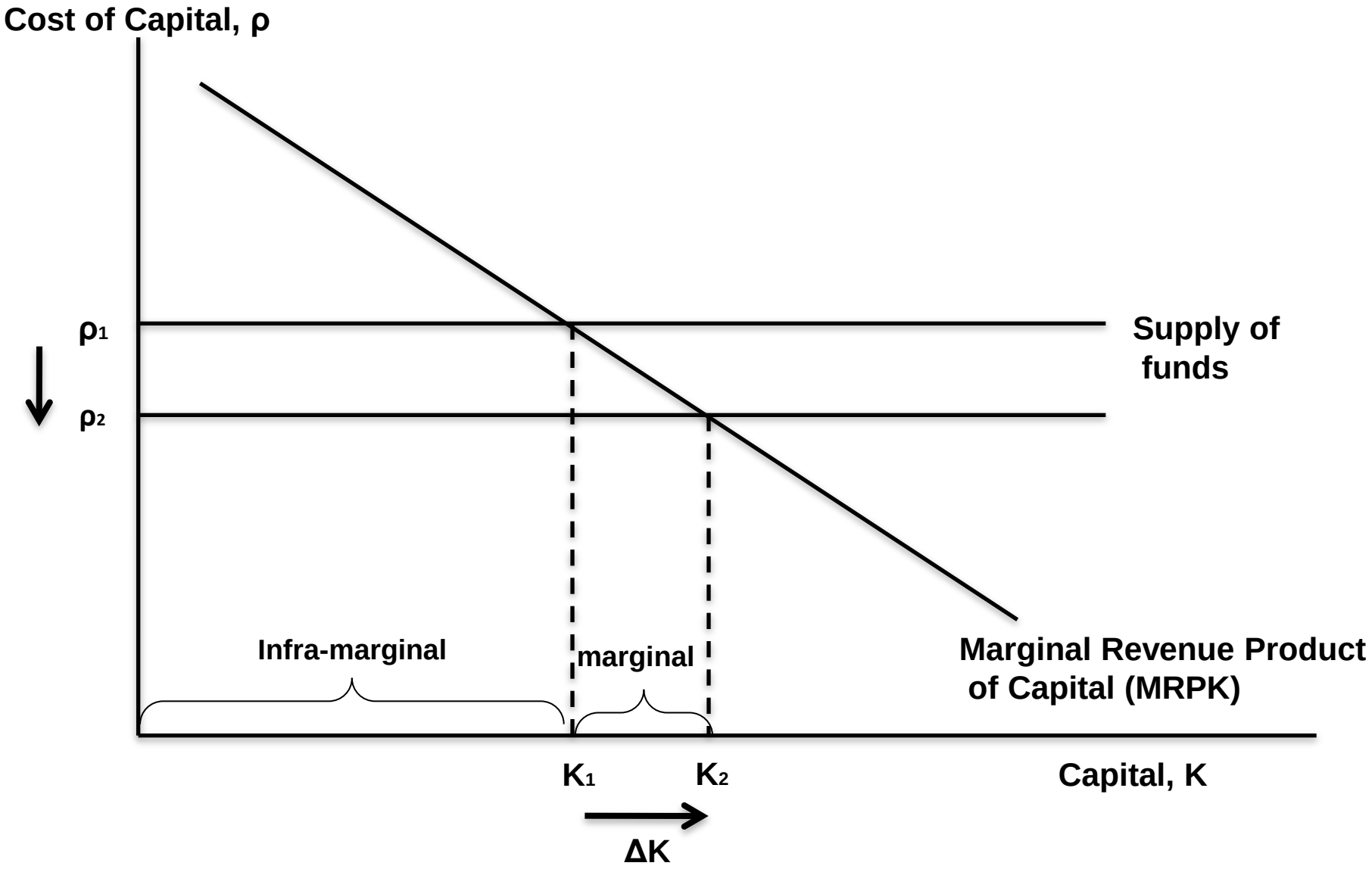
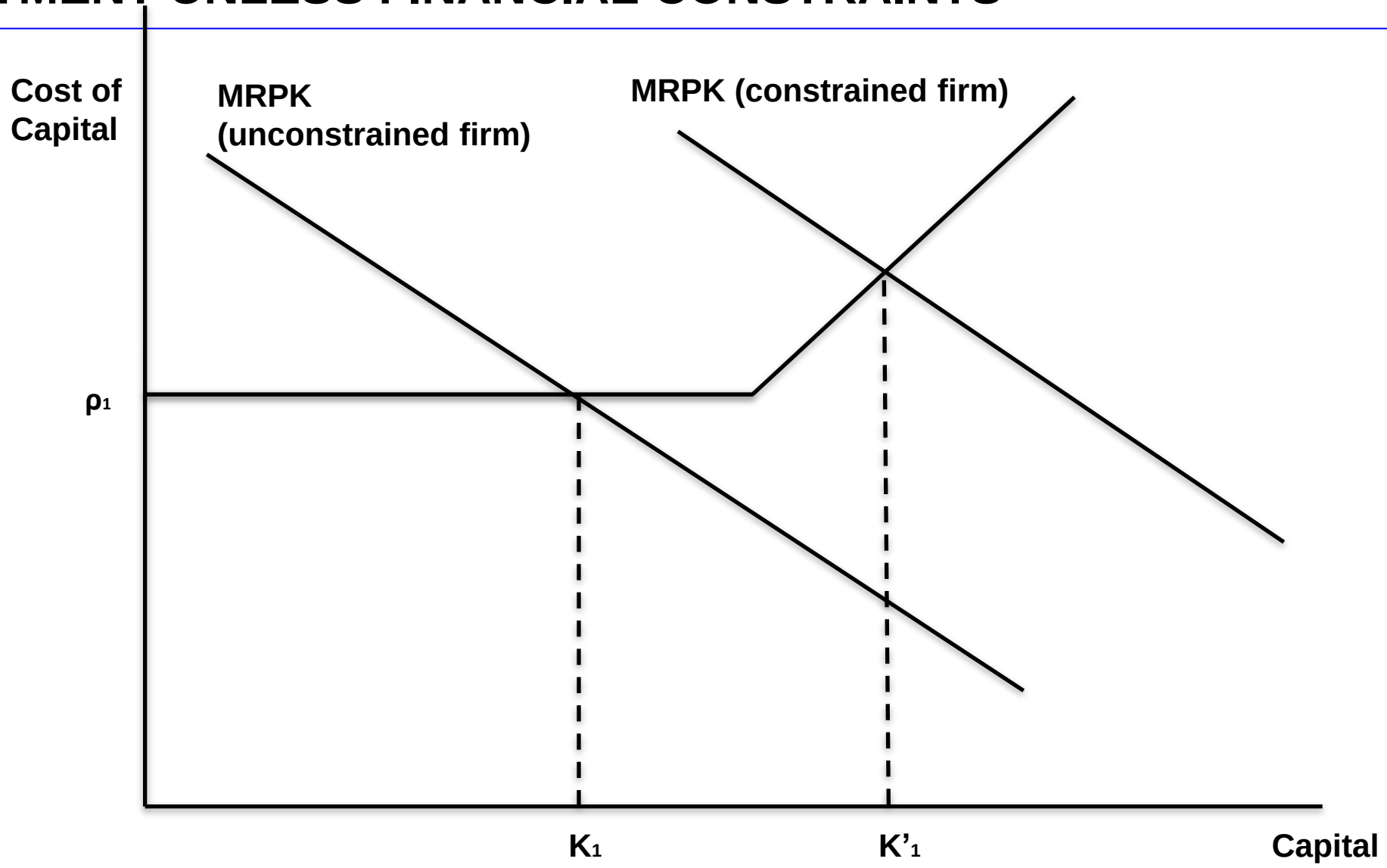


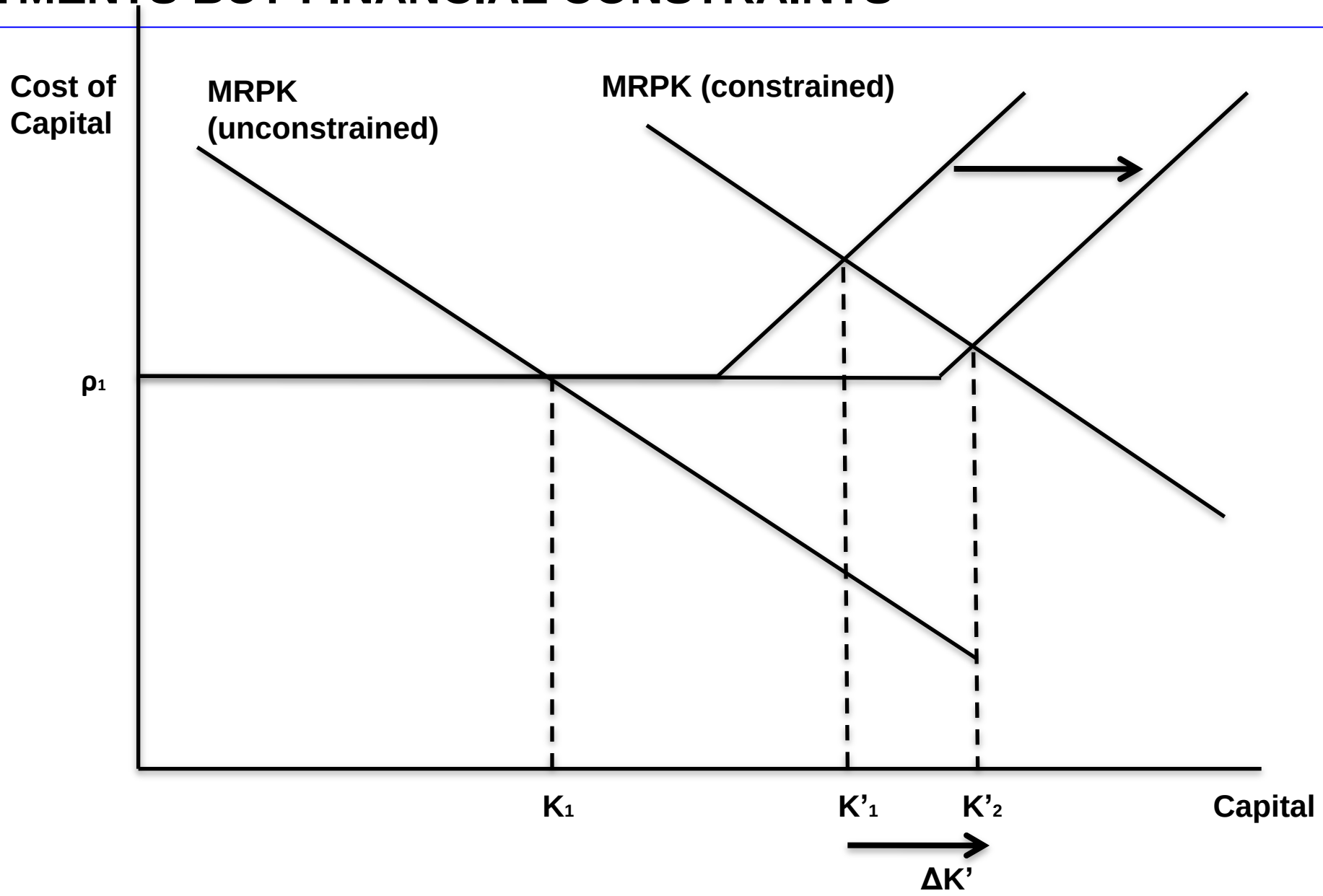
EFFECTS DEPEND ON MONITORING MARGINAL INVESTMENT: HARDER IF FIRM IS LARGE?



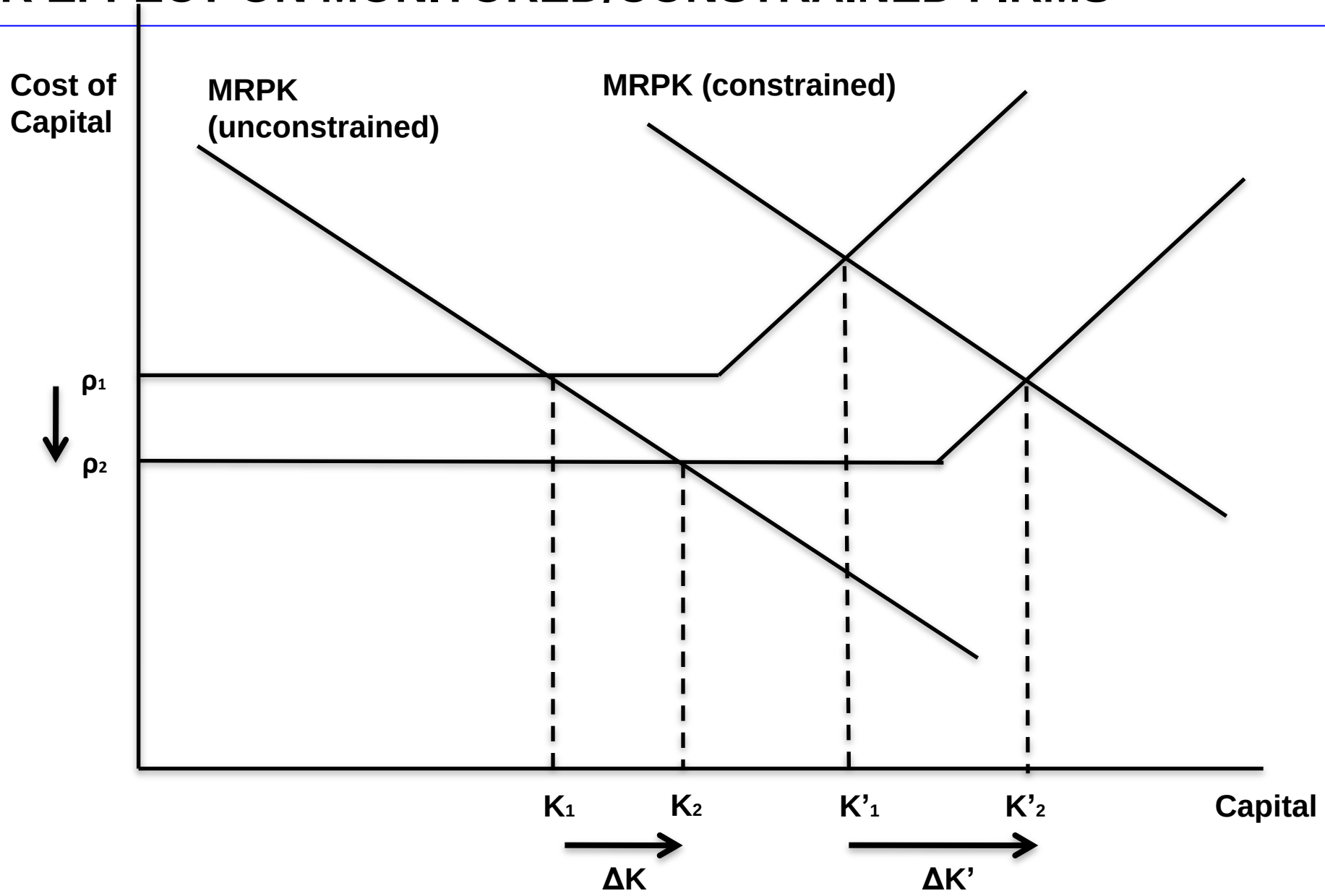
IF AGENCY HAS ZERO MONITORING ABILITY NO EFFECT ON INVESTMENT UNLESS FINANCIAL CONSTRAINTS



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

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