



Road Transport Improvements: the effects on firms

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Motivation

- Road transport dominates passenger and goods transportation
- UK: 90% of passenger and 65% goods
- Intra EU: 92% of passenger and 47% of goods
- Considerable road infrastructure investment
- 2500 miles (1%) added to UK stock 2000-2010; Up from 185,000 in 1950 (+33%)
- £1.5 billion spent in England on infrastructure improvement in 2007/8

Motivation

- Many proposed economic (and social) benefits
- Employment, productivity, wages, labour supply, local and national economic performance, development etc.
- Widespread cost-benefit analysis of projects based on ex-ante 'appraisal'
- But almost no large scale ex-post evaluations
- This research fills this gap
- Research presented here relates to effects on firms

Theoretical effects for firms

- Transport cost reductions: complex impacts
- Direct effects due to lower output transport costs, input costs, business travel. Input substitution, increases in scale.
- Agglomeration benefits, and 'wider benefits' e.g. better matching of firms needs and worker skills, knowledge spillovers
- Aggregate effects (sorting, selection) e.g. competition forces out less efficient firms, or amenity value attracts better firms and workers

Scope of this study

- Not modelling the theoretical linkages
- Focus on key policy-relevant firm outcomes
- Employment: local (ward) and at plant level
- Numbers of local (ward) businesses (i.e. entry-exit)
- Output, value-added, output per worker
- Estimate the effect of transport improvements on these outcomes from firm micro data
- Policy evaluation methods based on actual infrastructure changes 1998-2007 in Britain

Road improvements

— Type 1

— Type 2





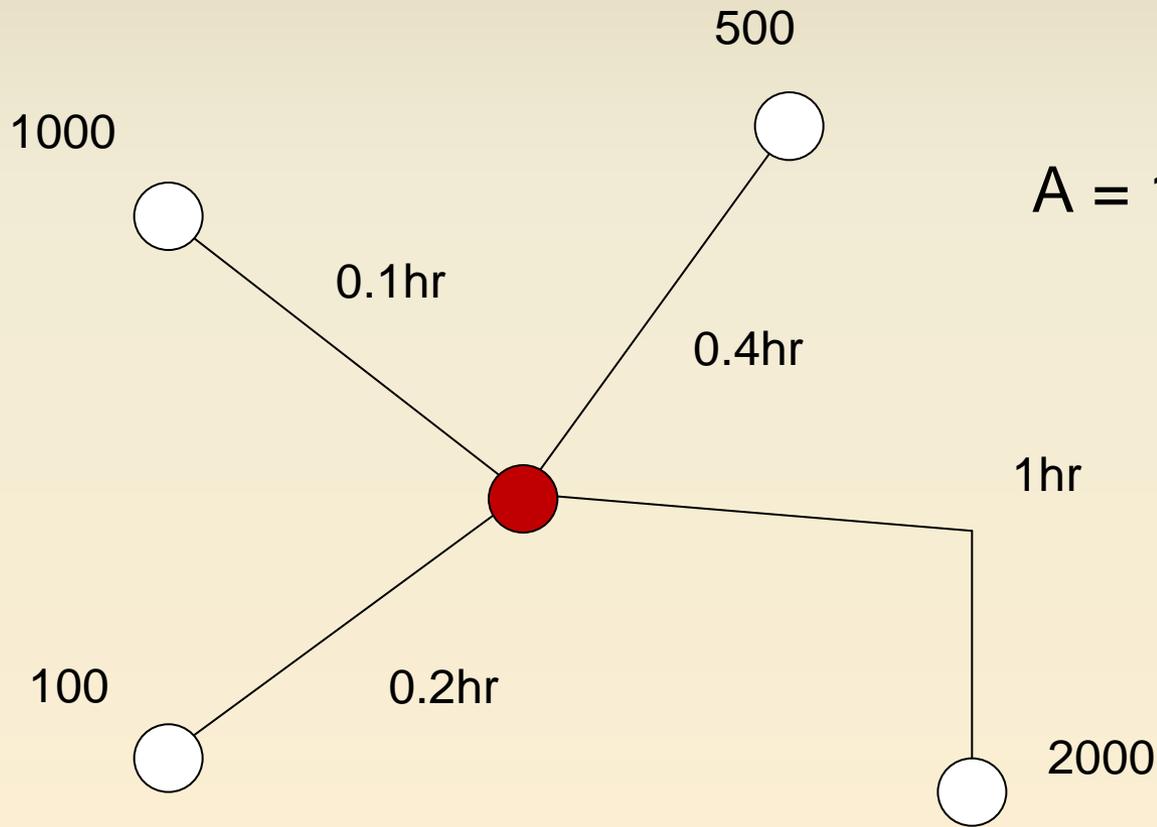
Measuring firms' exposure

- We want to know how much firms are influenced by road transport changes
- But no data on firms' use of road transport
- Potential exposure to road transport improvements imputed from 'employment accessibility' at plant location
- 'Employment accessibility' = 'market potential' = 'effective density'
- Computed from employment and road network data at 'electoral ward' level

Measuring firms' exposure

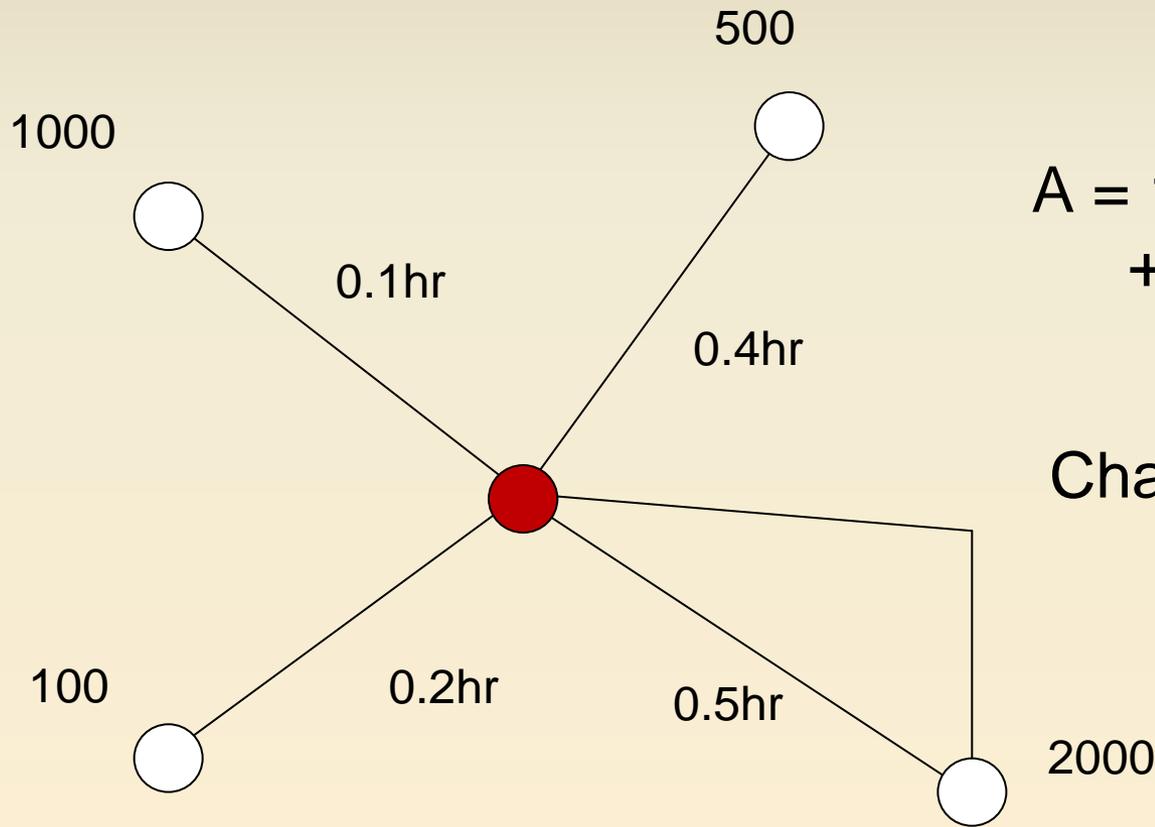
- 'Accessibility': how much economic activity can be reached per unit of travel time along the road network from a given firm location
- Accessibility changes can be caused by relocation of employment or changes in the road network
- Our research design predicts accessibility changes caused by specific road network improvements.
- Initial (1997) employment used to construct accessibility indices

Employment accessibility



$$A = 1000/0.1 + 500/0.4 + 100/0.2 + 2000/1 = \mathbf{13750}$$

Employment accessibility



$$A = 1000/0.1 + 500/0.4 + 100/0.2 + 2000/0.5 = \mathbf{15750}$$

$$\text{Change} = \mathbf{15750 - 13750 = 2000}$$

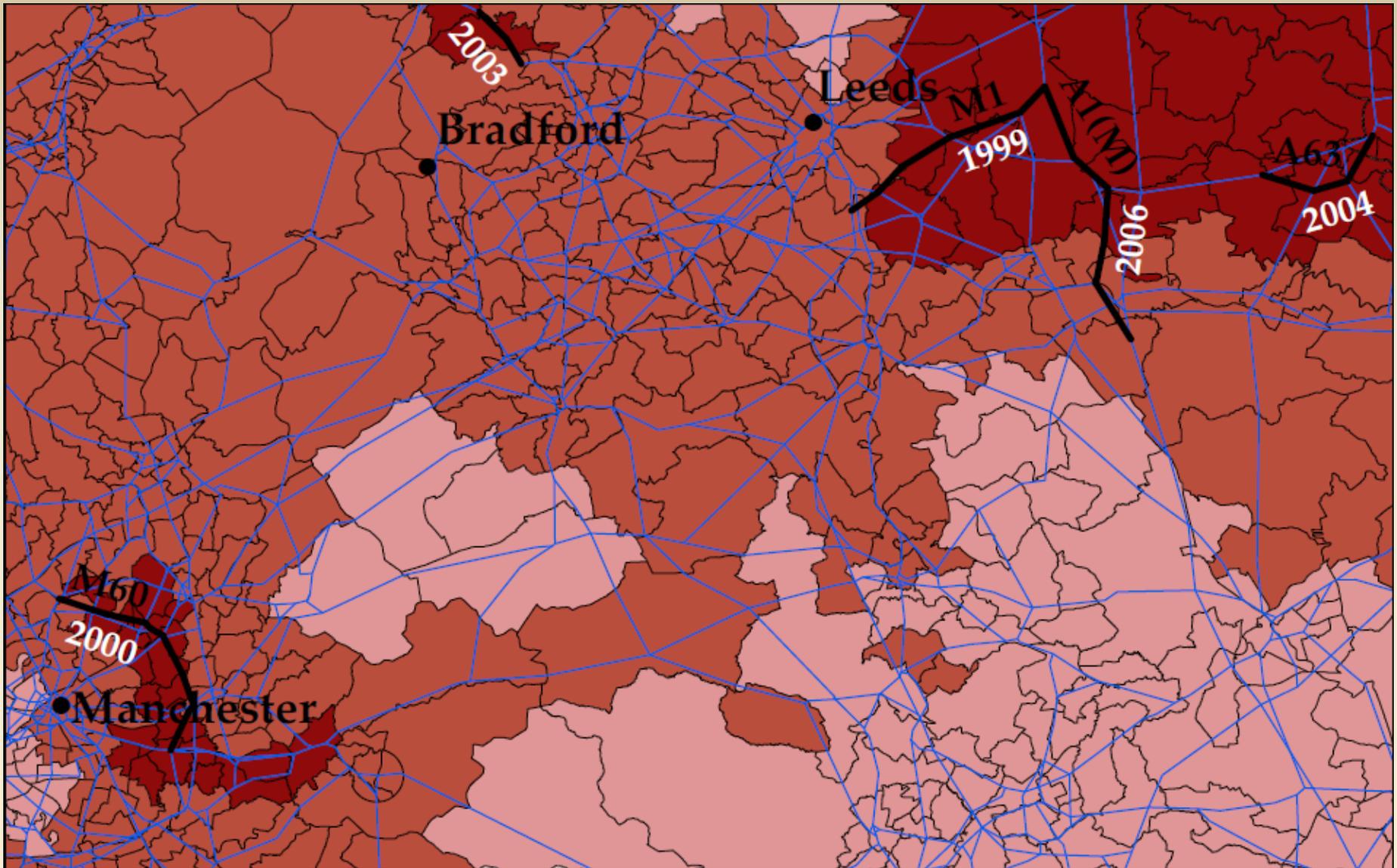
Or **14.5%**

Data used: firms

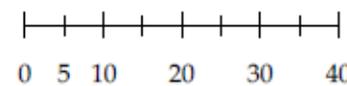
- Office for National Statistics Business Structure Database (BSD): administrative register of businesses, including location, industry, employment. 98% coverage
- Used for accessibility indices and ward-aggregate analysis
- Annual Respondents Database: large sample of firms: information on outputs and input costs. Smaller sample, but better quality
- Used for plant level analysis

Data used: road network

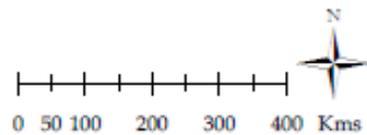
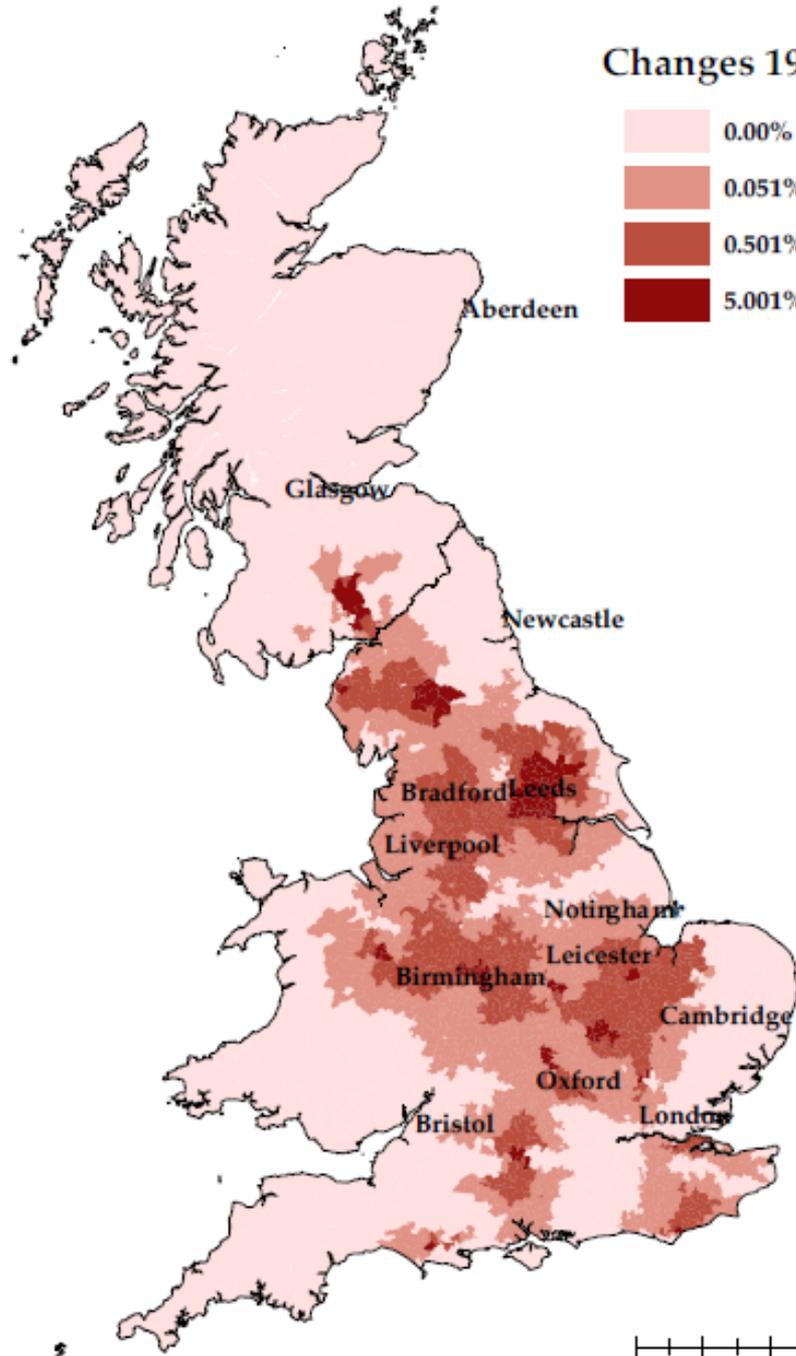
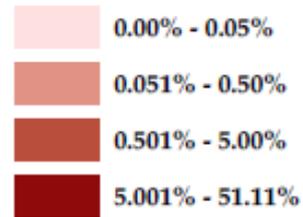
- Generalised primary road network from Department for Transport, 2008
- 'A-roads' and motorways, 12.8% of total road length, 63.8% of traffic
- Uncongested link travel times (for 2003) from traffic data via DfT National Transport Model
- 31 major road schemes 1998-2007 with significant new infrastructure (318km)
- Recreate 1997-2006 network by deleting links.
- Origin-destination travel time matrix from GIS



Changes 1998-2008



Changes 1998-2008



Potential biases

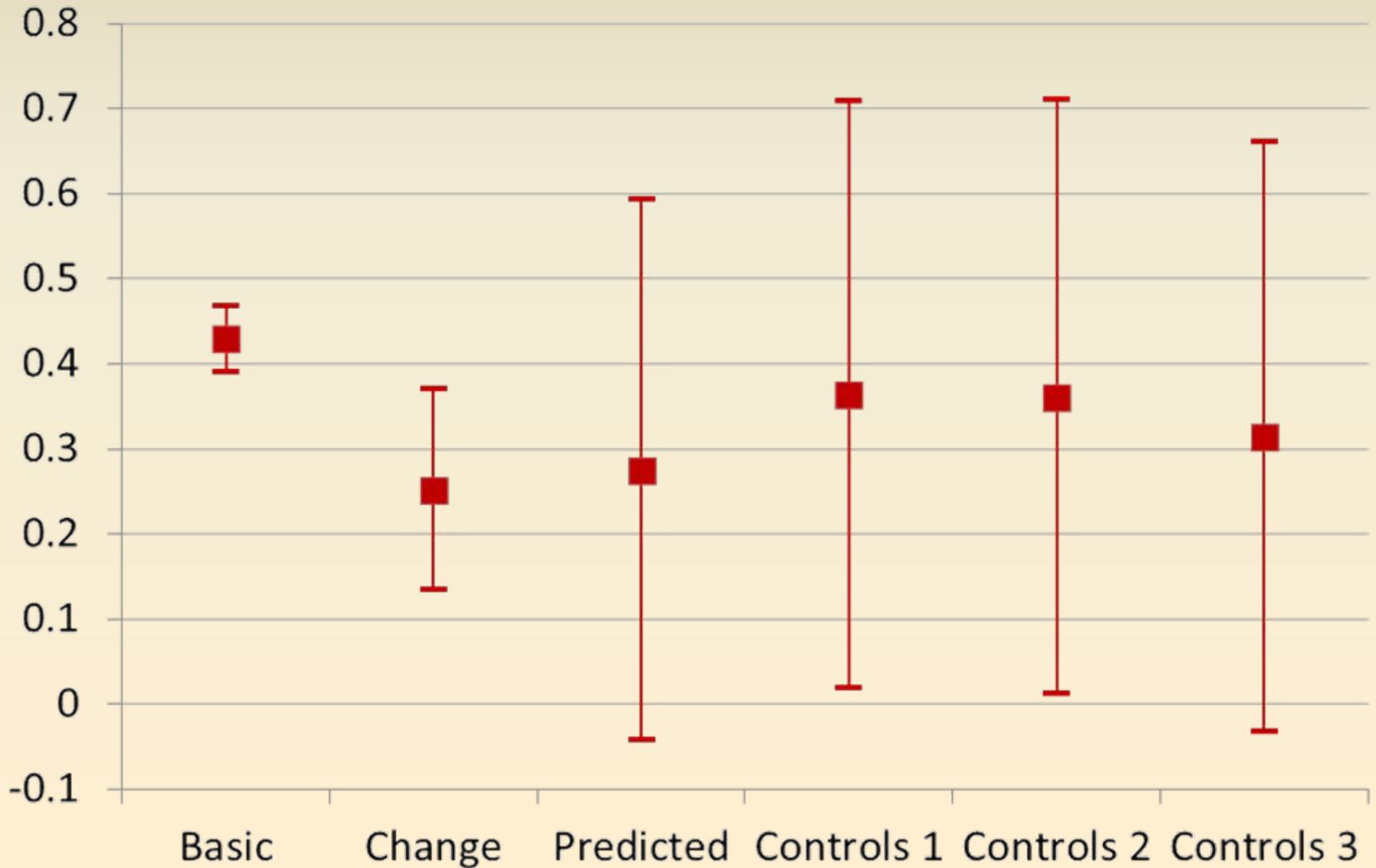
- Transport improvements potentially targeted at places with growing/declining productivity or employment
- Compare firms that are relatively local to the projects – within various distance buffers 10km, 20km, 30km
- Accessibility improvements to local firms are incidental to main aims of projects – trunk road improvements, bypasses
- Various other controls for pre-existing employment/productivity trends

Results

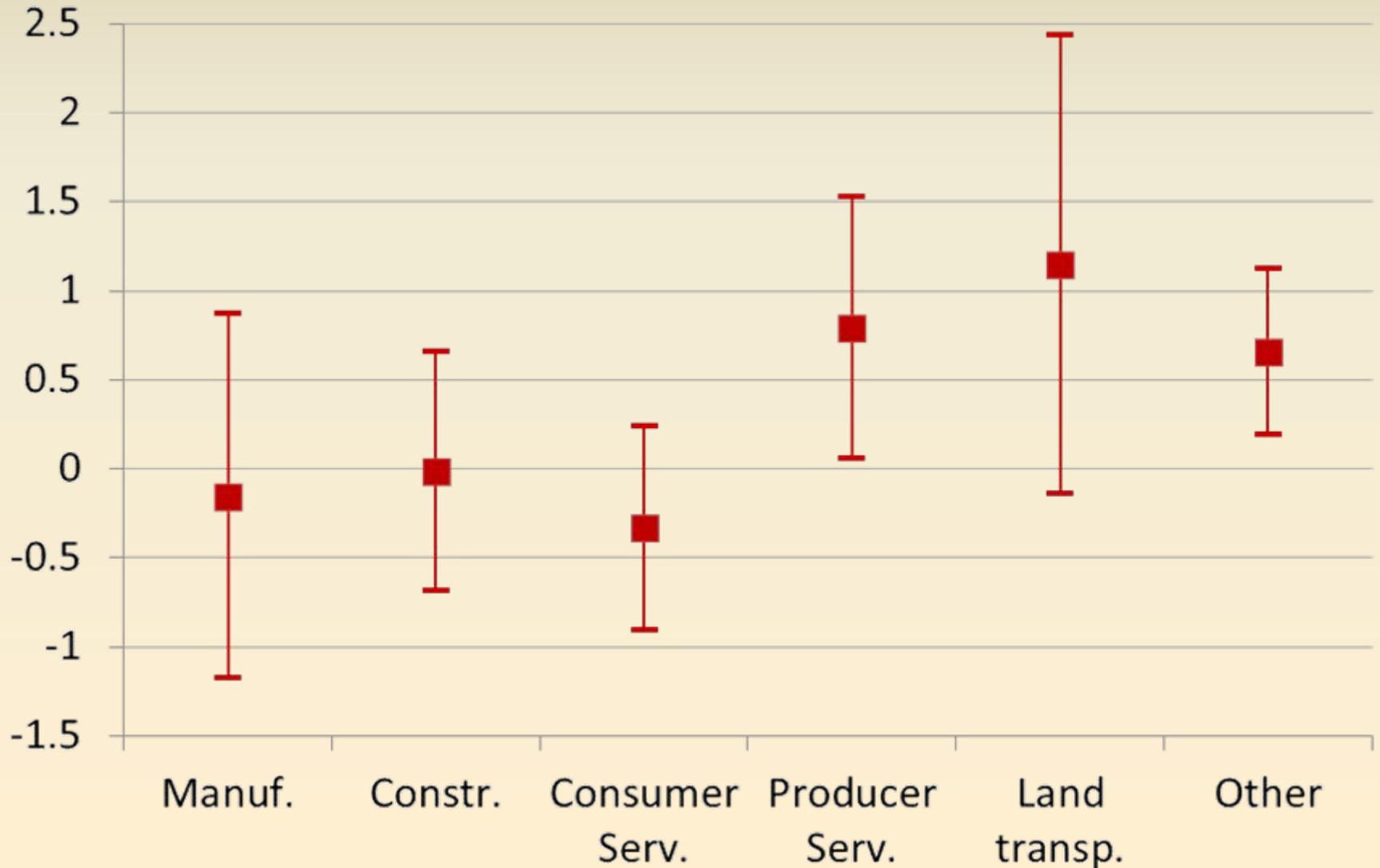
Accessibility changes

	Wards	Mean	Std. Dev	90th percentile	Max	Proportion of zeroes
All	10318	0.34%	1.22%	0.79%	31.37%	32.52%
10kms	1514	1.18%	2.45%	3.16%	31.37%	5.28%
20kms	3487	0.83%	1.97%	1.91%	31.37%	6.05%
30kms	4903	0.66%	1.71%	1.57%	31.37%	6.00%

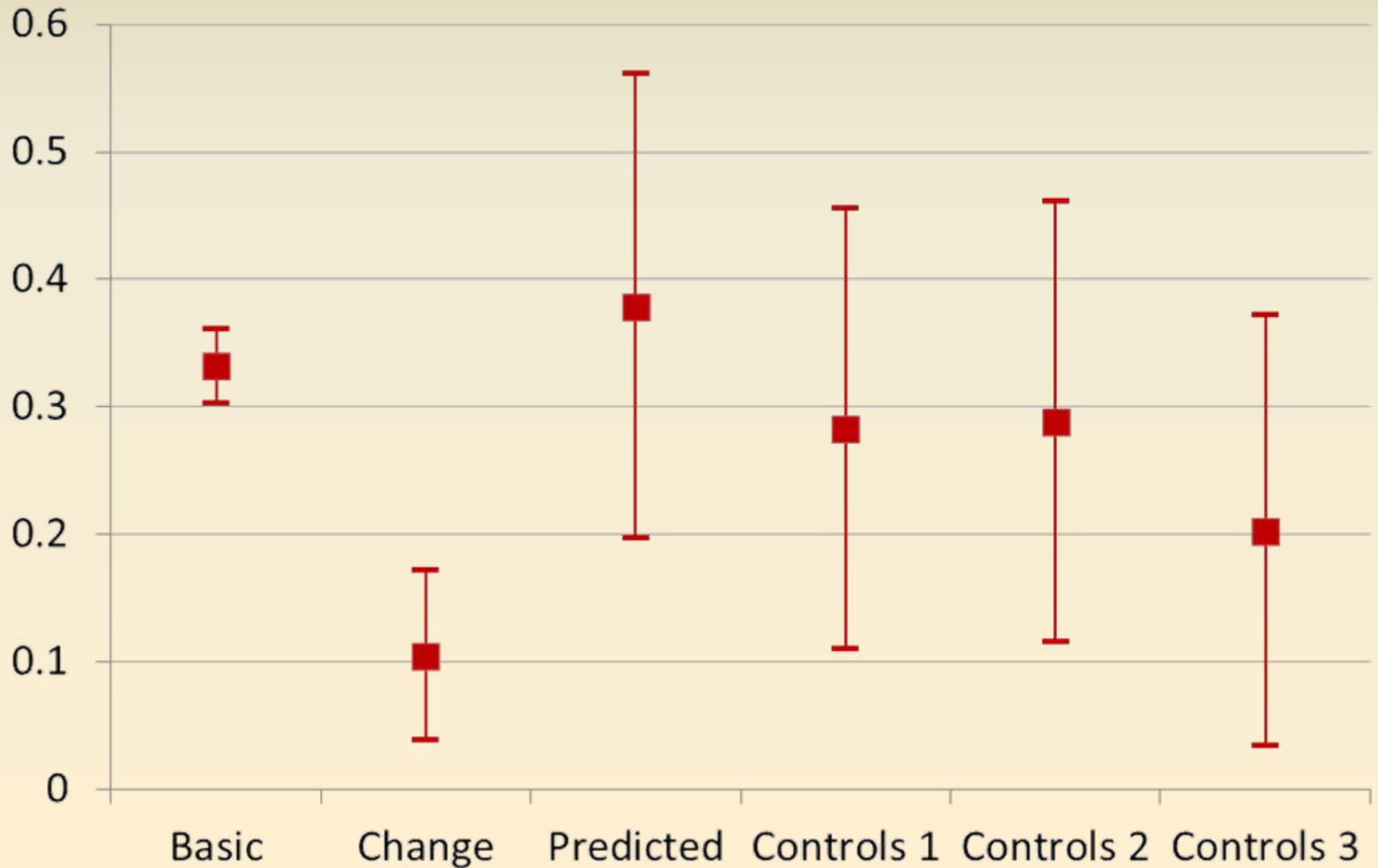
Ward employment: % response



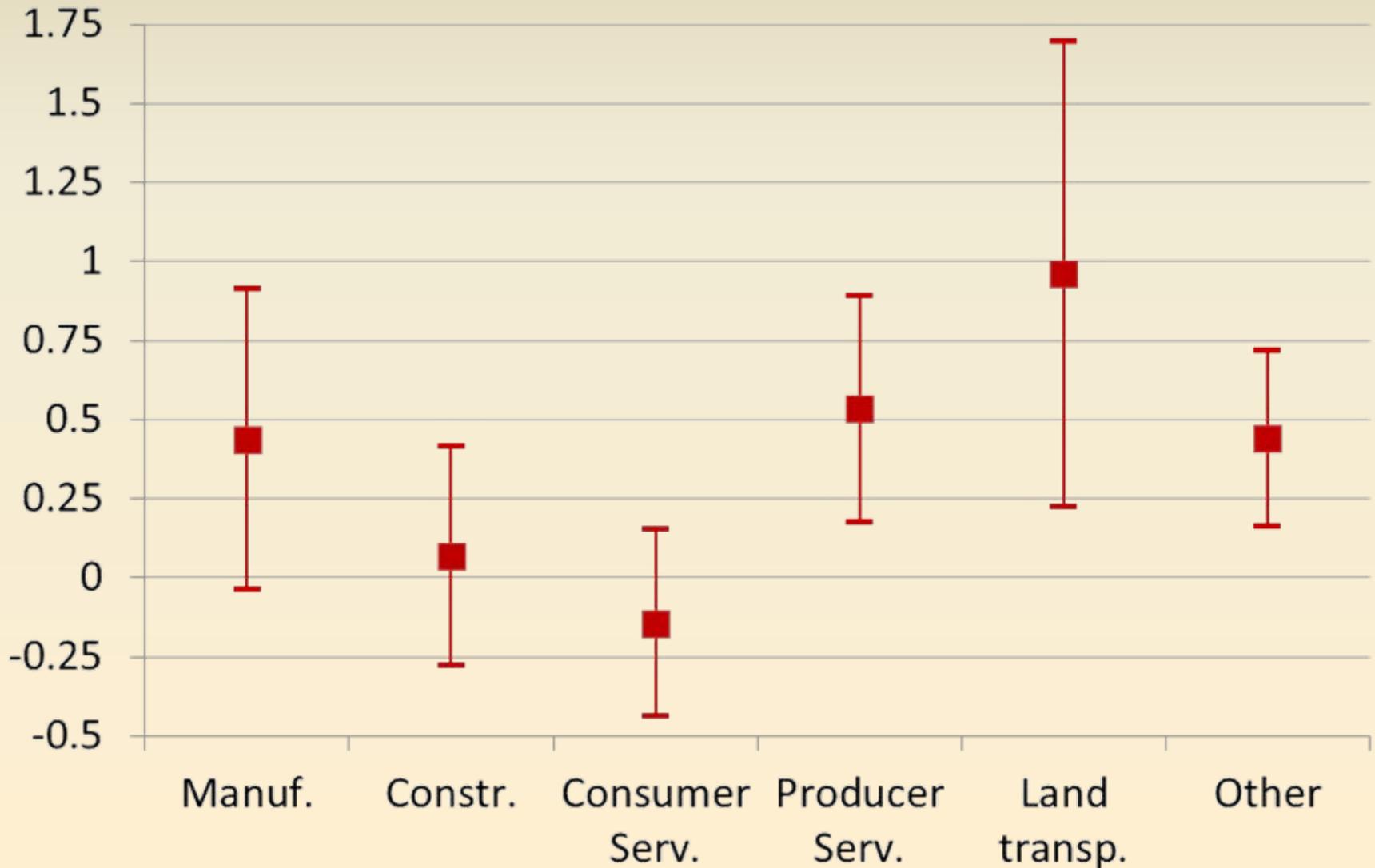
Ward employment: by sector



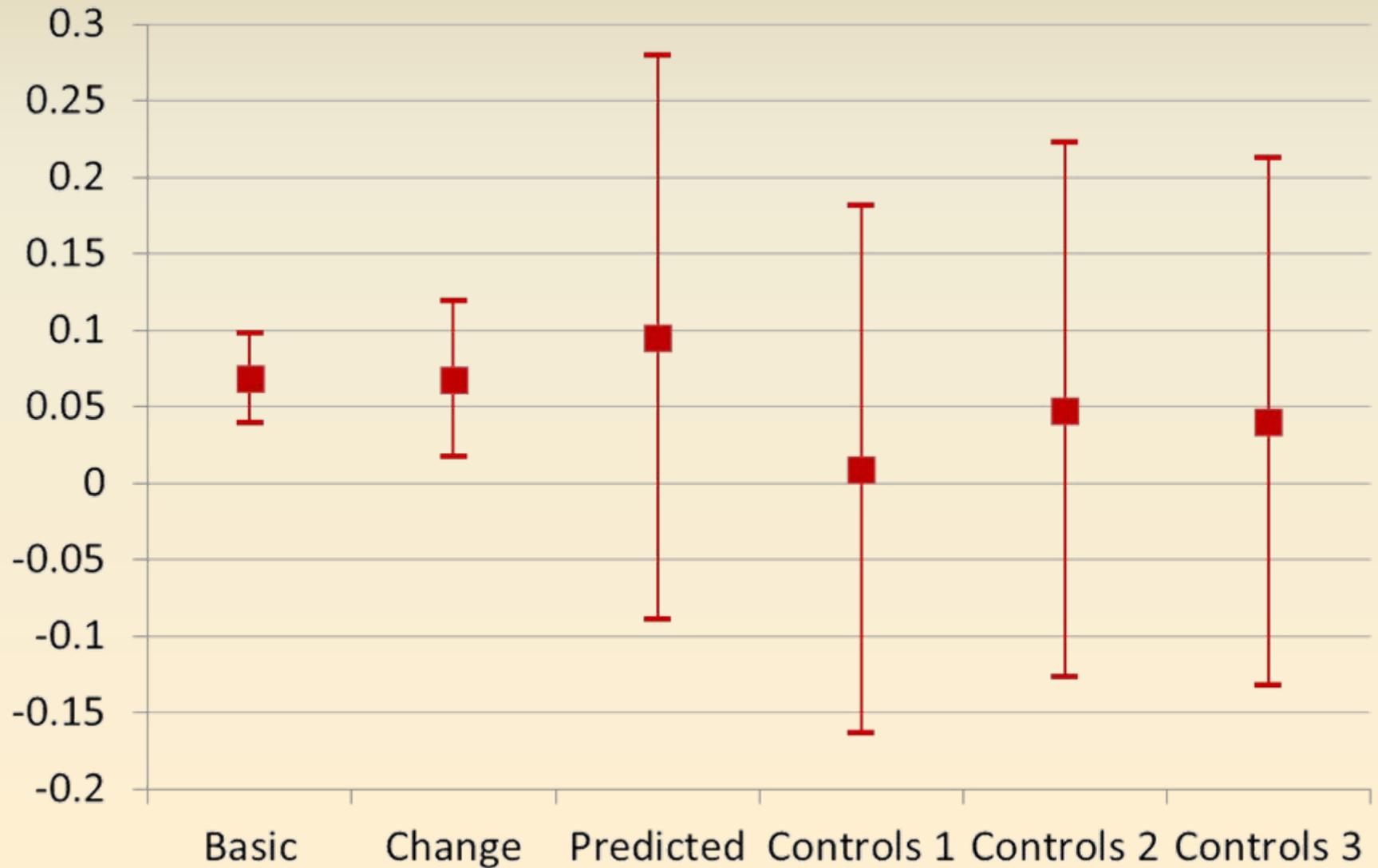
Ward businesses: % response



Ward businesses: by sector



Plant employment: % response

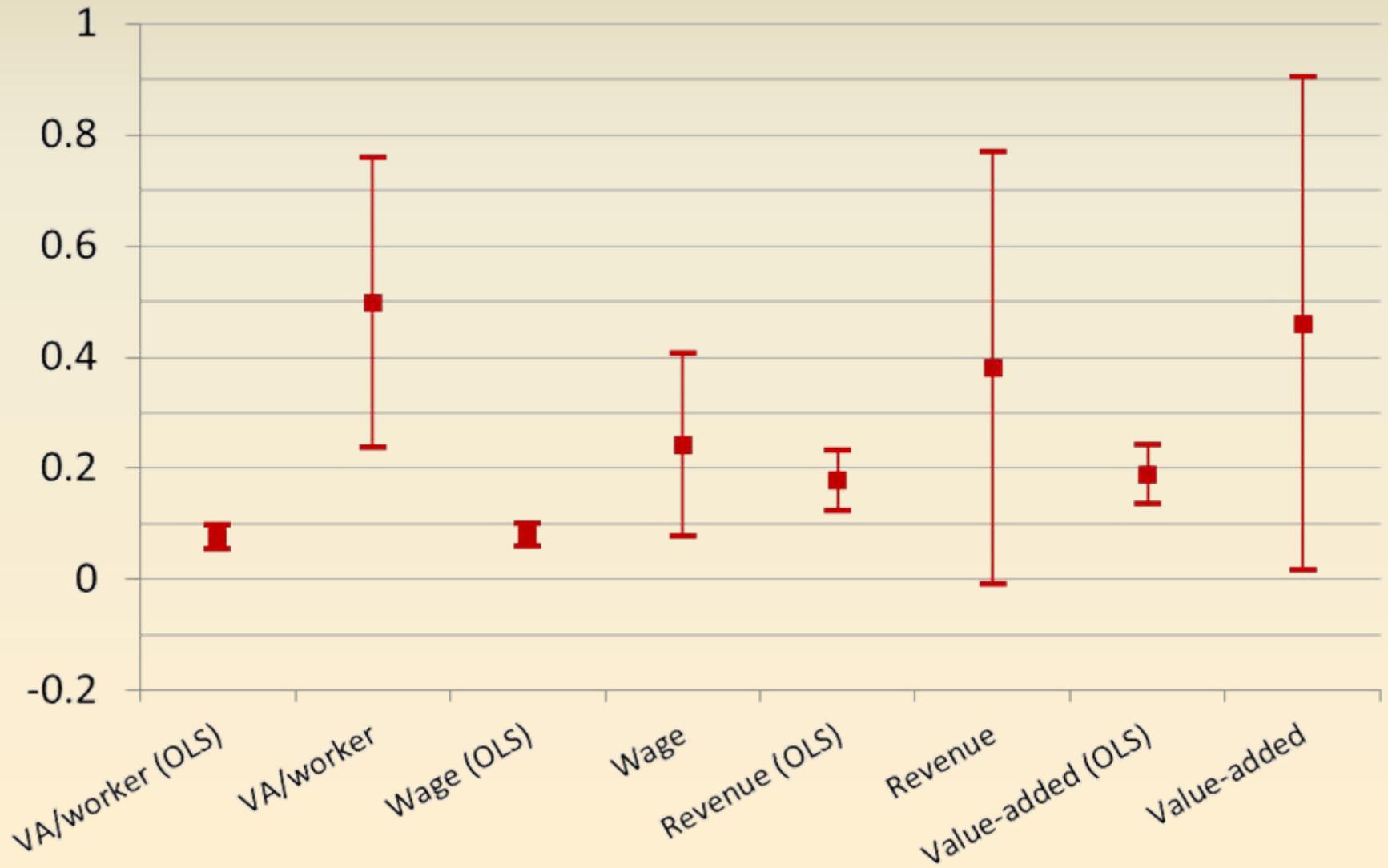


Employment results (ward level)

- Evidence of positive effects on ward total employment
- Roughly 0.3% increase in total employment for 1% increase in accessibility
- Implied gain from these schemes nationally is about 27000 jobs.
- No evidence of increases in employment within businesses – all the gains are from new plants

Results on output

Plant outputs: % response



Output results

- Evidence of plant level effects on productivity and output
- The plant level productivity effects imply implausibly (?) large aggregate gains
- £41000 per year average gva per worker in Britain in 2008, so transport improvements between 1998-2008 generated £62 per person per year.
- £1.8 billion per year in total (compared with costs of £1.5 billion in 2007/8)

Output results

- But sadly, no evidence of this at aggregate ward level, or when weighting plants by size (employment)
- Suggests gains to small plants only, so the plant level effects do not translate into large aggregate gains
- Further work required to investigate differences by plant size
- Sector-specific results uninformative (imprecise)

Robustness

- Alternative 'accessibility' measures – population, plants, different travel time weightings. Similar findings.
- Similar effects exist within distance bands – 1-10km, 10km-20km, 20km-30km, though employment effects weak within 10km. Suggests impacts not caused by displacement to sites close to improvements
- Cannot completely answer whether effects are due to displacement to sites that experience accessibility growth, within these bands

Conclusions

- Major road transport infrastructure improvements in Britain generated local changes in employment accessibility
- Increased businesses and employment in local areas through firm entry/exit
- No effect on plant level employment
- Output and productivity effects at plants, but these do not show up at local aggregate level
- Crude CBA implies rather large net benefits