

Does productivity vary with accessibility?

A firm-level analysis

Don J Webber

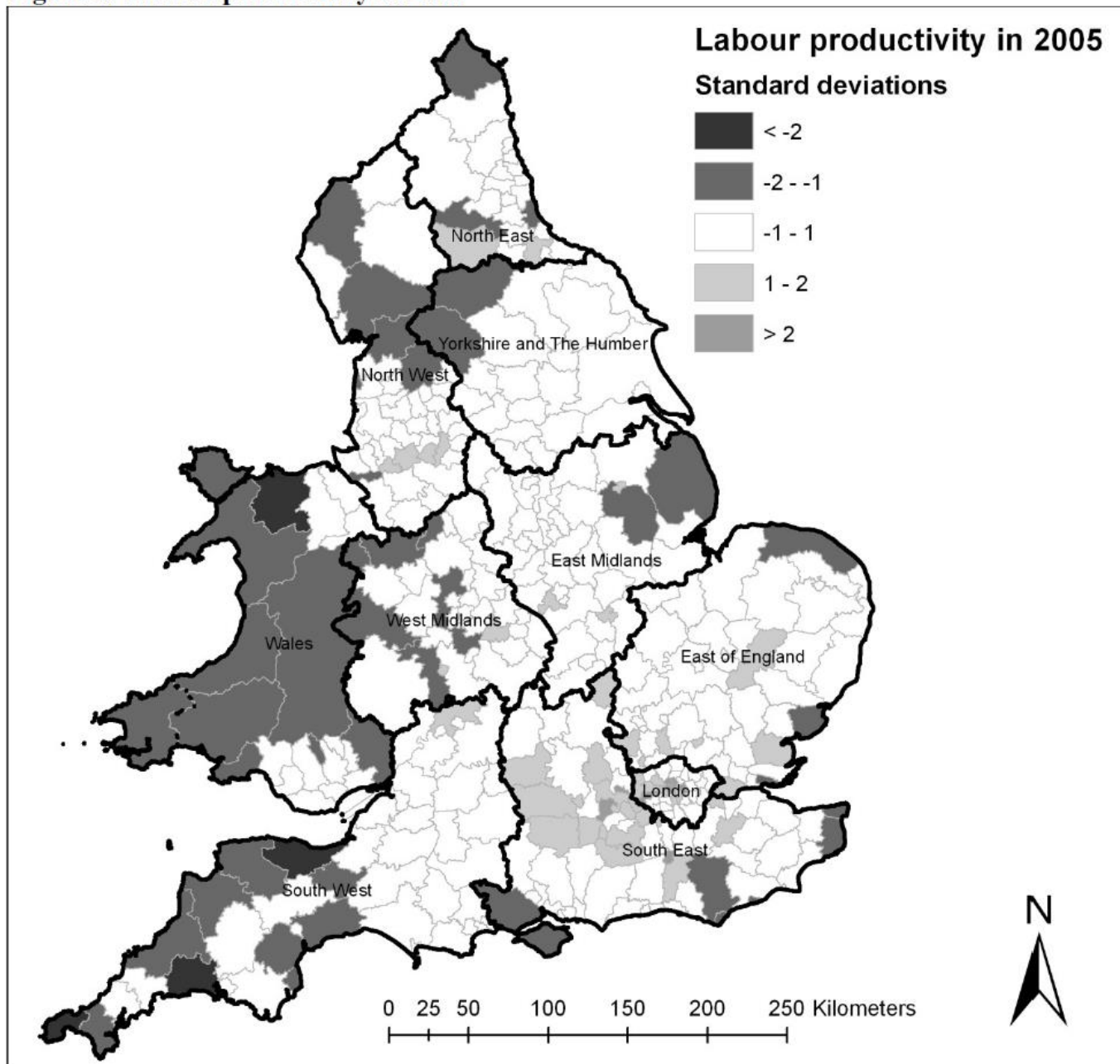
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UWE, Bristol

- Motivation
 - Productivity is believed to reflect prosperity
 - Infrastructure investment known to boost productivity
 - Should we see a spatial pattern of productivity at a point in time?
 - And how does that pattern evolve over time when infrastructure investments are relatively minor?
 - 2004, 2012, 2014
- Standard theory
- Data
- Results
- Conclusion

Figure 1: Labour productivity in 2005



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Source: Webber and Horswell (2009)

- Motivation
- Standard theory
 - H M Treasury (2001) detailed productivity drivers
 - skills, investment, innovation, enterprise, competition
 - all vary spatially
 - Clustering of large firms in urban areas
 - Association between firm size and productivity is debatable, with many conflicting results
 - Rice et al. (2006) showed association between productivity and economic mass disappears beyond 80mins to centre of London (Reading)
 - Graham et al. (2006) estimated elasticities of productivity wrt accessibility for 28 sectors and found +ve, -ve and insig estimates
 - Webber et al. (2017) showed areas with low productivity have managers that lack focus on raising prices and experience low sales volume due to low levels of demand
- Data
- Results
- Conclusion

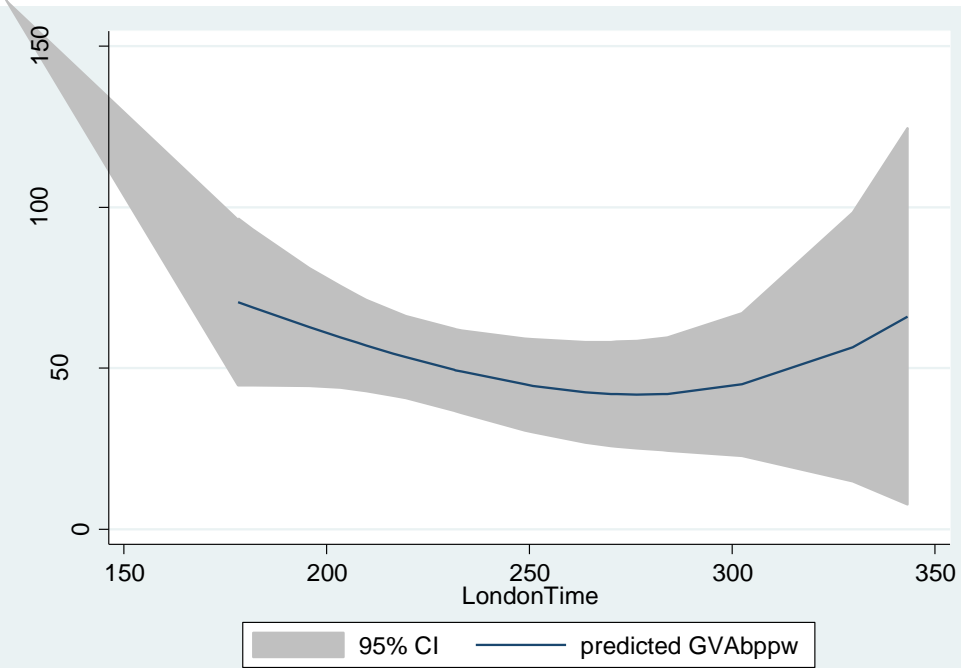
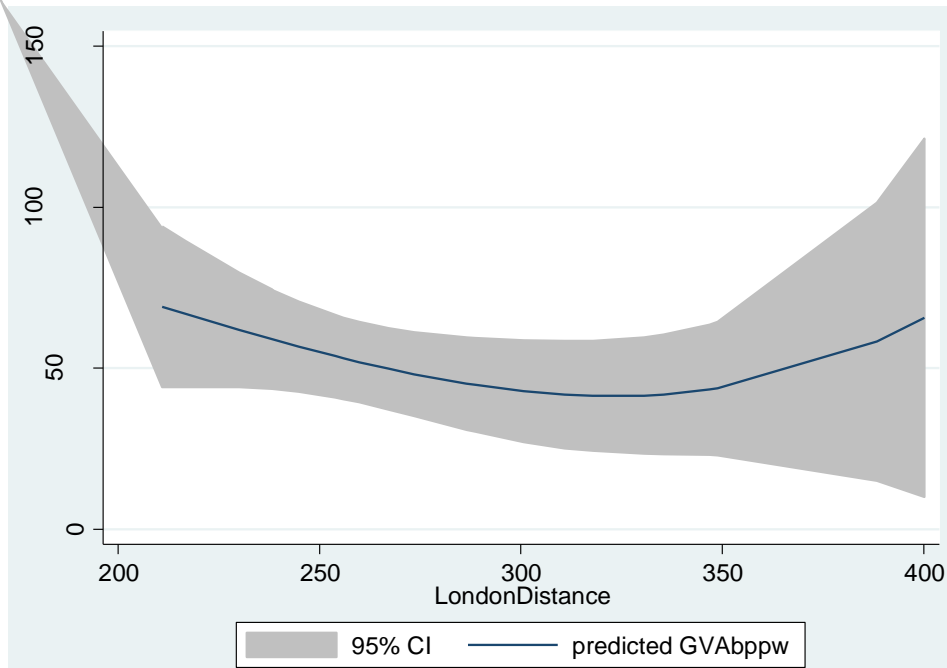
- Motivation
- Standard theory
- Data and results
 - ABS (2014)
 - Plant level data
 - GVA at basic prices per FTE employee
 - Single plants
 - Multi plants data reflect methods of apportionment to branches rather than genuine information on productivity at the local level
 - Small firms more numerous than large plants, generator of ideas and can drive local economy
 - Sampling frame of ABS. Only 10% of SMEs with fewer than 250 employees surveyed each year, on a random basis
 - Merge in area level data, incl. accessibility indicators
 - Excluded London and South East
- Results
- Conclusion

Productivity gap between Wales and England (excl. L&SE)

	% point gap
Initial estimate	13.7
Including industry controls	11.3
Including ownership controls	12.1
Including population density control	10.8
Including education quality of local labour force	11.4

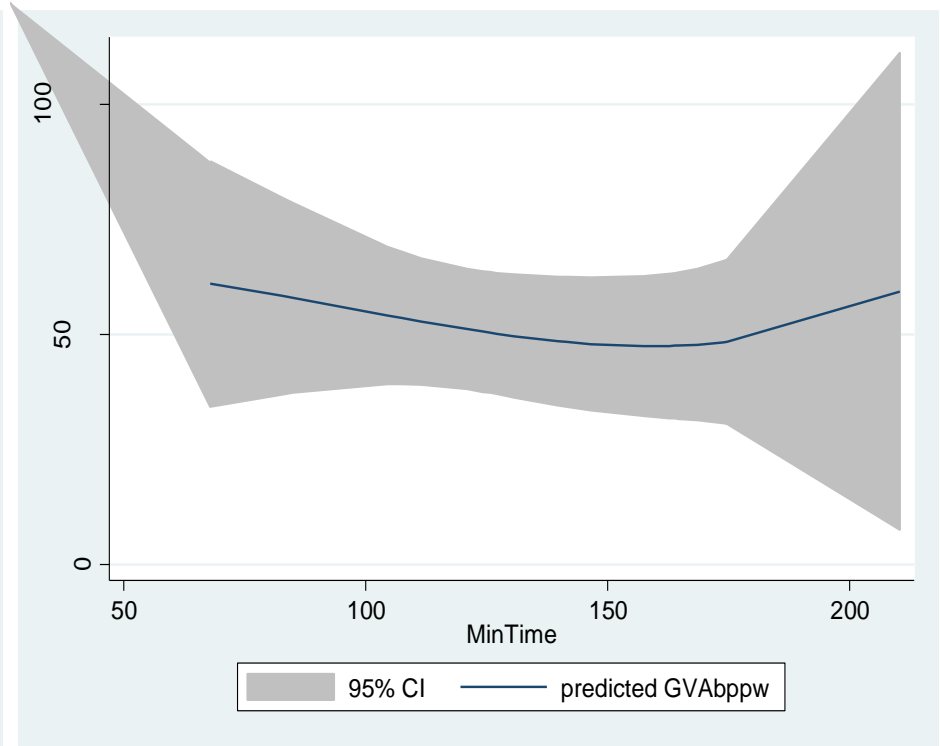
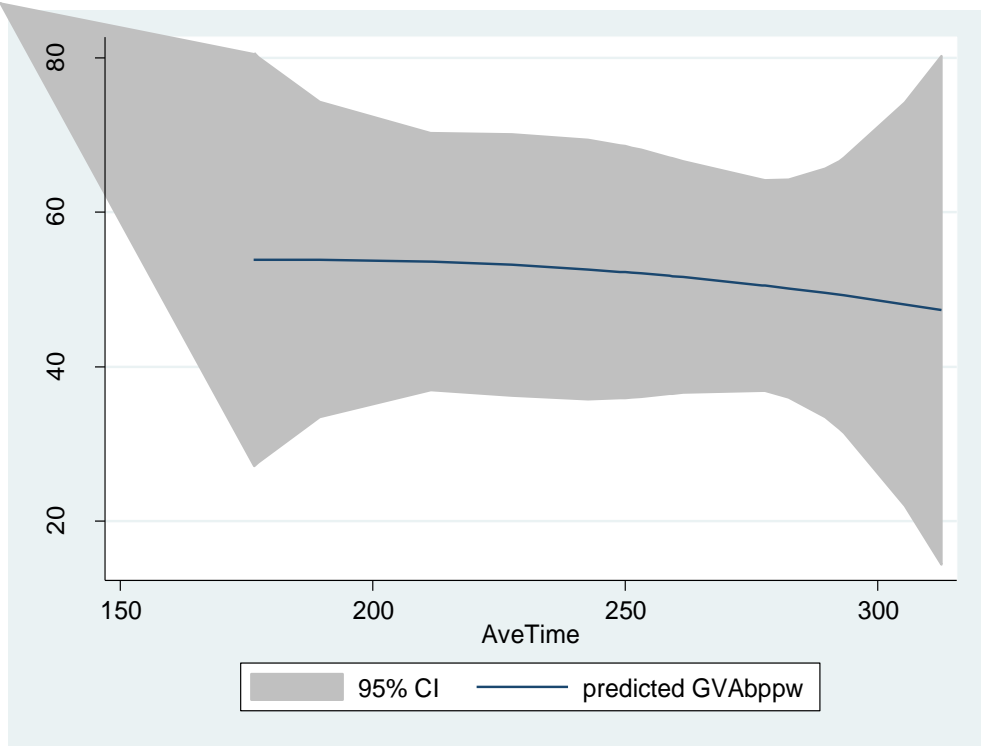
Time to London	<p>= the time it takes by road, using legal speed limits, to travel between the centroid of a district in which the firm is located to City of London.</p> <p>Source: authors' estimations</p>
Distance to London	<p>= the distance by road between the centroid of a district in which the firm is located to the City of London.</p> <p>Source: authors' estimations</p>

Manufacturing productivity for single plant firms in Wales & distance/time to London



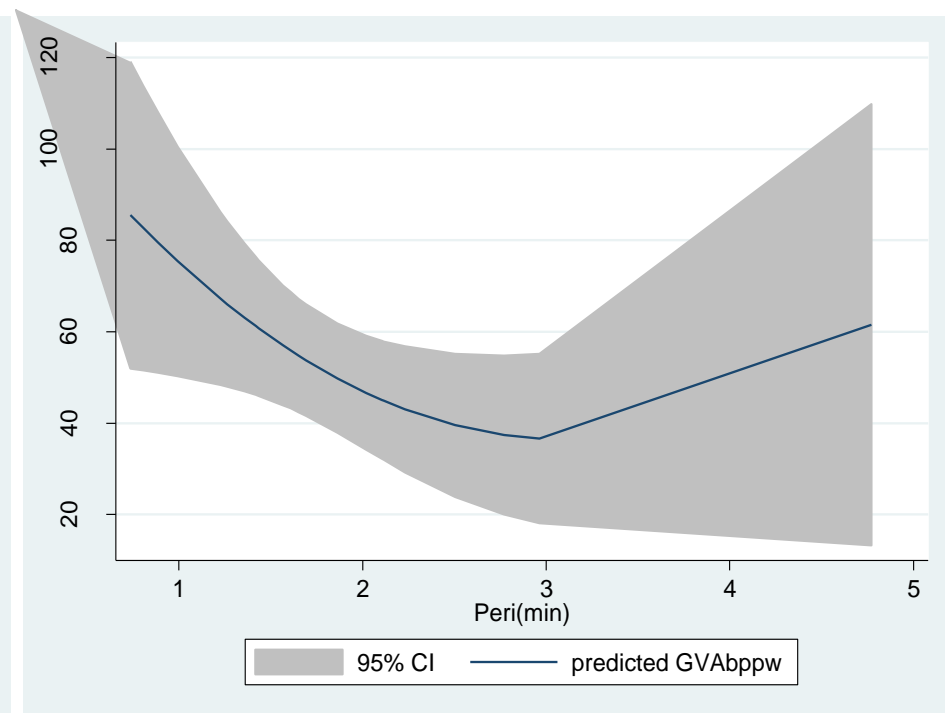
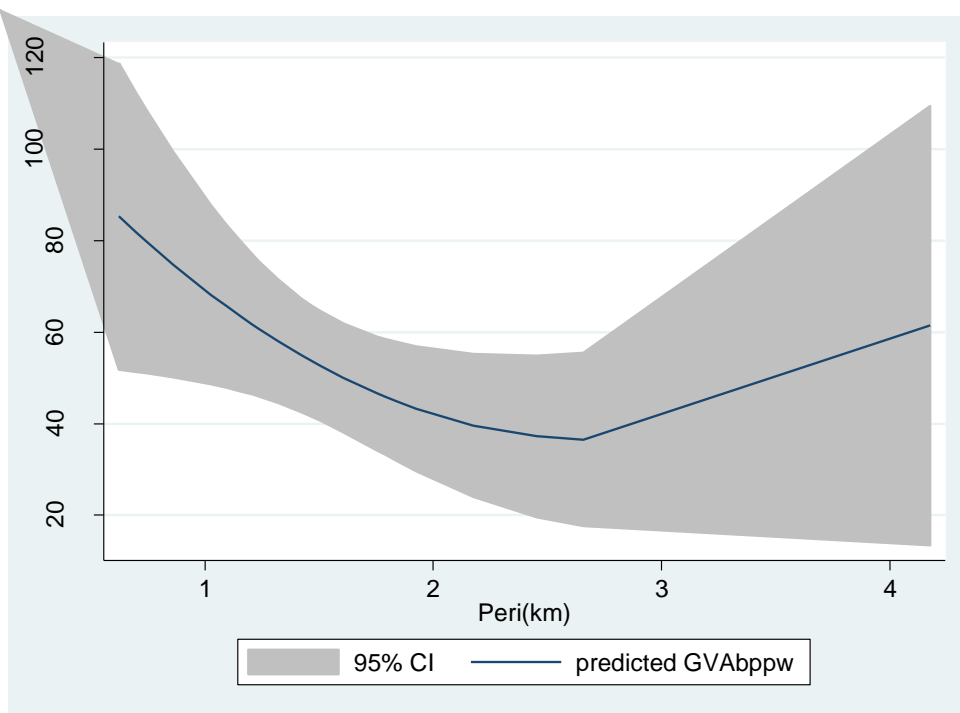
Ave Time	= the average time it takes by road, using legal speed limits, to travel between the centroid of a district in which the firm is located to the centroid of the five cities of Birmingham, Glasgow, Leeds, Manchester and Westminster. Source: authors' estimations
Min Time	= the time it takes by road, using legal speed limits, to travel between the centroid of a district to the nearest centroids of either of the five cities of Birmingham, Glasgow, Leeds, Manchester and Westminster. Source: authors' estimations

Manufacturing productivity for single plant firms in Wales & AveTime and MinTime



Peripherality (kms)	Population weighted gravity model using distance in kms. Source: authors' estimations following Keeble et al. (1981).
Peripherality (mins)	Population weighted gravity model using distance in travel time, based on legal speed limits. Source: authors' estimations following Keeble et al. (1981)

Manufacturing productivity for single plant firms in Wales & Peri(km) and Peri(min)

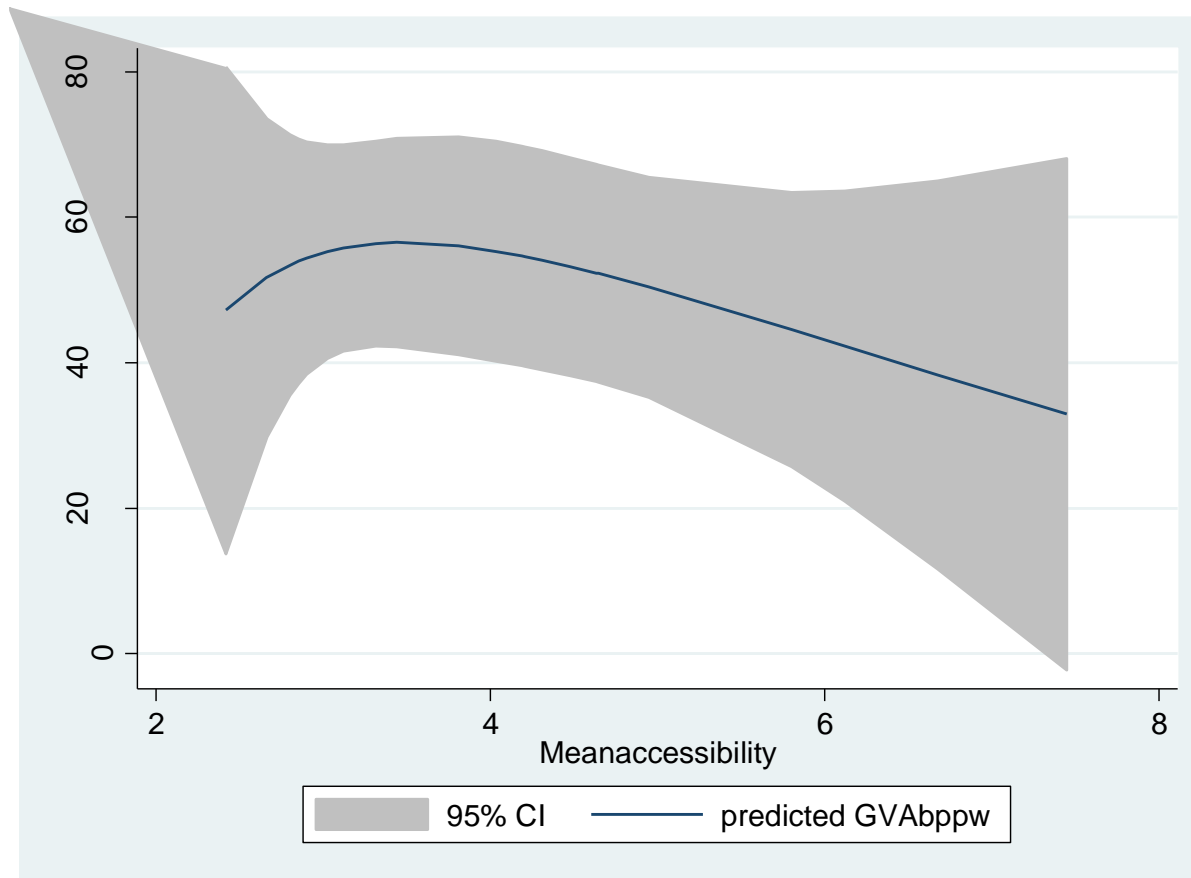


**Mean
accessibility**

An area-weighted average time-based accessibility index combining access to towns (15 minute [5] and 30 minute [1] thresholds) and cities (15 [5], 30 [4], 45 [3], 60 [2] and 90 [1] minutes thresholds). The values in square brackets indicate how areas within each distance threshold are scored. These were summed giving a maximum potential score of 10. The value represents the area-weighted average of the combined (town and city) surface of the accessibility.

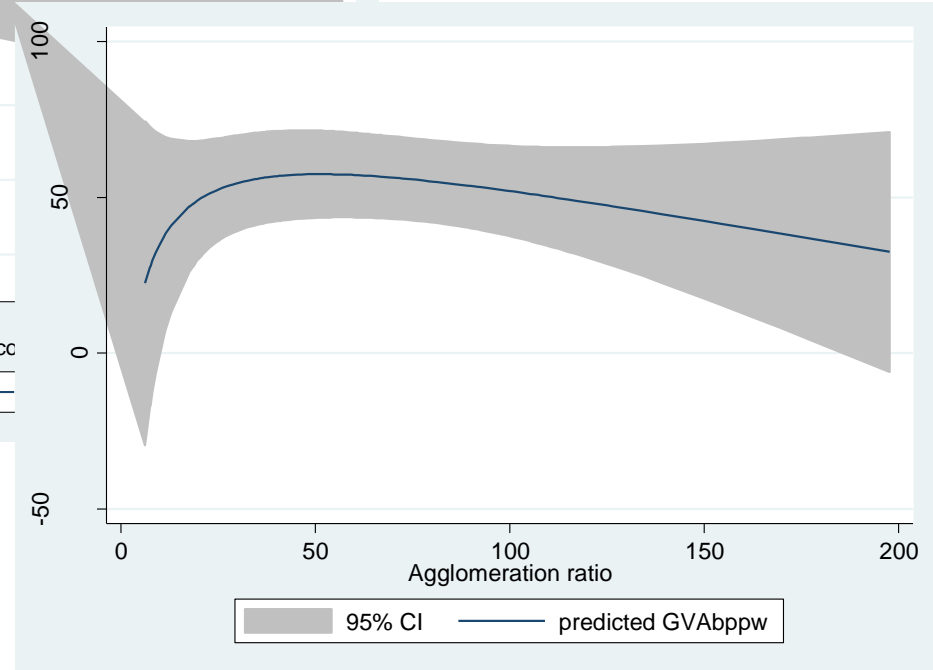
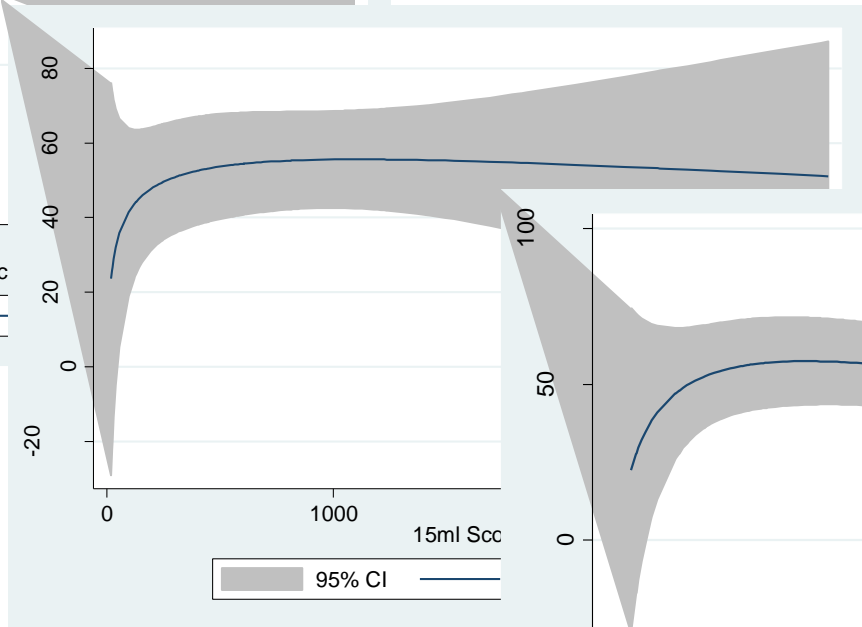
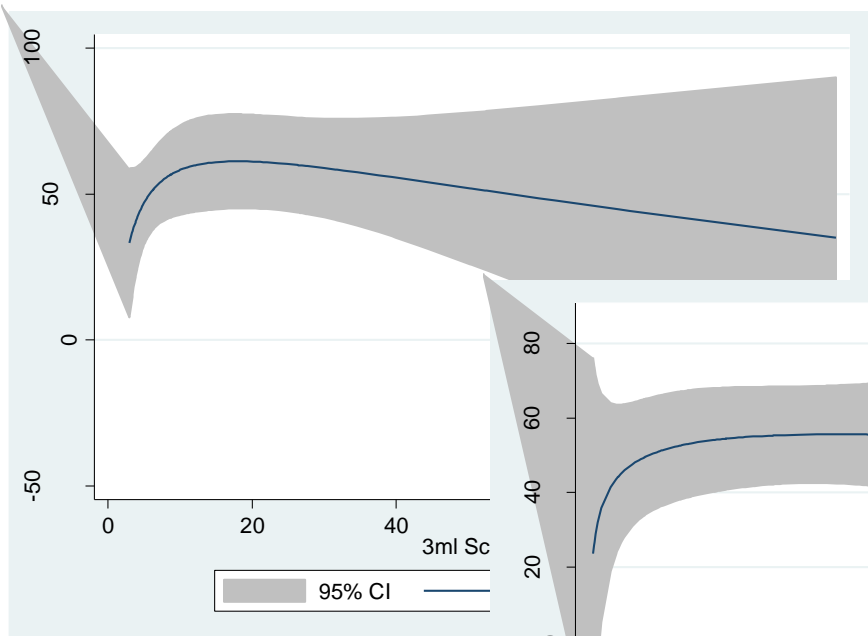
Source: authors' estimations.

Manufacturing productivity for single plant firms in Wales & Mean accessibility



3ml agglomeration	<p>The number of 5-digit postcode areas within 3 miles weighted by the distance to get there given the local road infrastructure. This reflects the potential economic footprint of each 5-digit postcode area.</p> <p>Source: authors' estimations following Fraser et al. (2012).</p>
15ml agglomeration	<p>The number of 5-digit postcode areas within 15 miles weighted by the distance to get there given the local road infrastructure. This reflects the potential economic footprint of each 5-digit postcode area.</p> <p>Source: authors' estimations following Fraser et al. (2012)</p>
Agglom. ratio	<p>The ratio between 3ml agglomeration and 15ml agglomeration.</p> <p>Source: authors' estimations following Fraser et al. (2012)</p>

Manufacturing productivity for single plant firms in Wales & 3ml/15ml/agglom.ratio



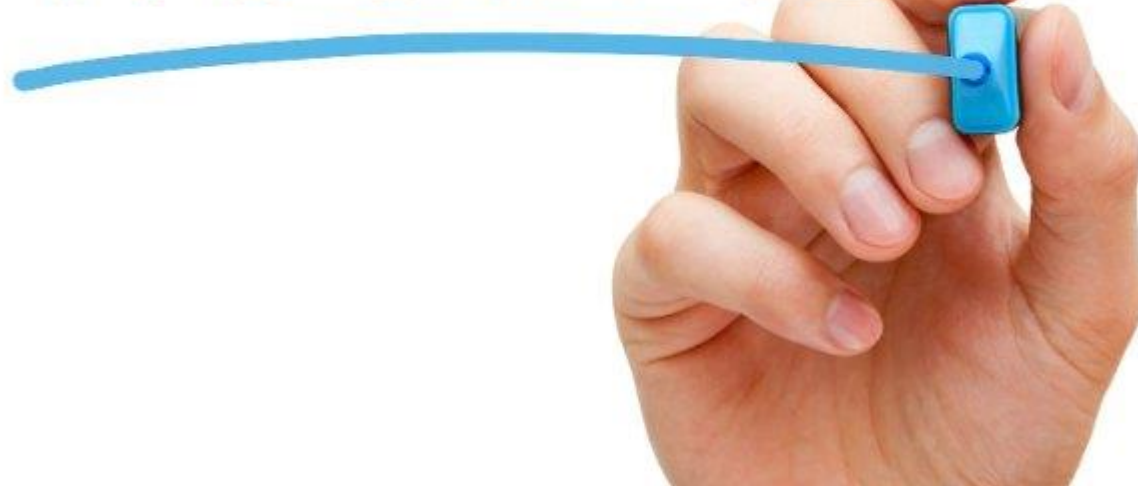
Perhaps the weakening spatial effect due to...

- Growth of digital communications, reducing need for physical proximity
- Growth of e-sourcing with associated disappearance of geographically determined freight charge differentials
- Reduced labour and business relocation rates following financial crisis
- Persistence of low productivity “zombie” firms obscuring impact of productivity drivers
- Increased congestion costs with apparent high accessibility
- Less competition in remote areas, reducing input costs and increasing output prices compared with accessible locations
- Artis et al. (2012) showed the association disappears when intangible knowledge / human capital is included

Conclusions

- Aggregate productivity gaps exist (E.g. 14% between Wales and E (excl. London and SE))
- Sector, ownership, population density and local labour quality differences explain part of this gap (E.g 14% falls to 11%)
- Accessibility variables do not offer a stat. sig. explanation of gap
 - Single plants not found to be disadvantaged in terms of productivity by relative remoteness from centres of economic activity
- Perhaps gap due to variations in managerial objectives or other issues not included in estimated model
- Follow up: weakening effect of accessibility not new. But does the effect of accessibility on productivity vary over the business cycle, and if so then why?

THANK YOU



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Q1: what do we think productivity means?



Answers?

- A measure of the **efficiency** of converting inputs into outputs
 - “The UK economy, like any other, is a system which converts work into the output of goods and services. Productivity measures this rate of conversion” (Davies, 2017)
- The **effectiveness** of effort as measured in terms of the rate of producing output per unit of input
 - Accomplishing what the firm intended to do

- Productivity is a measure of the *efficiency* of production
 - **Efficiency is the ability to avoid wasting time, effort, energy and materials** in doing something or in production (Dictionary definition)
 - Efficiency is about making the best possible use of resources. Efficient firms ***maximise outputs from given inputs***, and so ***minimise their costs***.
- Productivity “is a measure of total efficiency of a production process and as such the **objective to be maximised in production process**” (Wiki)
- **“Productivity isn’t everything, but in the long run it is almost everything.** A country’s ability to improve standard of living over time ***depends almost entirely*** on its ability to raise its output per worker” (Krugman, 1992, p.9)