Productivity effects of an exogenous improvement in transport infrastructure

Accessibility and the Great Belt Bridge

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Improvements in transport infrastructure reduce the importance of distance

- Better transportation possibilities (better access to markets):
  - decrease the production and logistic costs per unit (Shirely and Winston (2004), Datta (2012), Li and Li (2013))
  - opens possibilities for better matches between supply and demand on output as well as input markets (Helsley and Strange (1990))
  - facilitate knowledge spillovers through formal and informal contacts (Duranton and Puga (2004), Rosenthal and Strange (2004), Puga (2010), Gaubert (2018)).
- The benefits associated with proximity are generally referred to as **agglomeration effects** (Rosenthal and Strange (2004))
- Agglomeration effects are expected to show up in the productivity of firms, but:
  - may lead to expansion of production and lower output prices
  - expose less efficient firms to fiercer competition

Changes in wages and productivity following improved transportation possibilities are related in at least two ways

1. Better transportation possibilities may facilitate efficient allocation of workers to jobs (Helsley and Strange (1990))
    - results in higher wages for the better matched workers as well as higher productivity for the firms concerned
2. Productivity increases raise input prices (Greenstone, Hornbeck and Moretti (2010), Donaldson and Hornbeck (2016), and Gibbons et al. (2019))
    - with a competitive labor market, increasing employment leads to a higher local overall wage level
    - wages may change even in industries where productivity is not affected by the new transport infrastructure

This paper

- One of the first studies that focuses on **the productivity effects of a large and very localized infrastructure project (Great Belt bridge in Denmark)** $\Rightarrow$ ideally suited to identify the economic effects of transportation infrastructure
- We estimates productivity while taking into account the demand side of the market
- We investigate the reactions of labor markets in the years immediately following the opening of the bridge

This presentation

1. Empirical strategy
   - i) Estimating Total Factor Productivity (TFP)
   - ii) Accessibility and the opening of the bridge
   - iii) Estimating the impact of the bridge on productivity
   - iv) Estimating the impact of the bridge on wages
2. Data
3. Estimation results
   - i) Productivity
   - ii) The bridge, accessibility and productivity
   - iii) Wages

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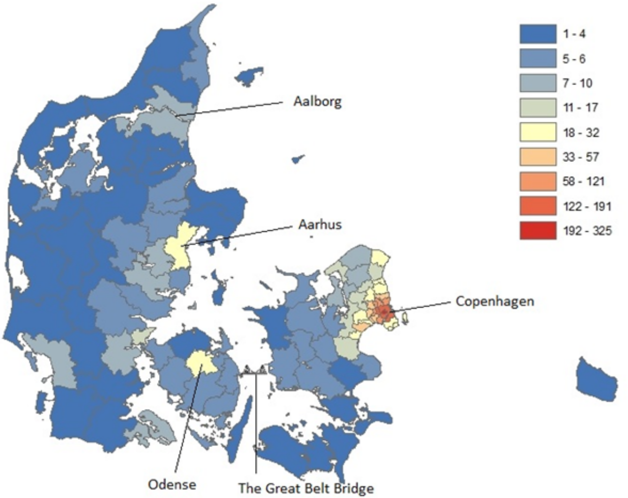
Estimating Total Factor Productivity (TFP)

- We adopt a two-step approach in which we first estimate total factor productivity for each firm and each year
- State-of-the-art techniques for estimating production function have been developed by Olley and Pakes (1996) and Levinsohn and Petrin (2003)
- Using revenues as an indicator for output might lead to biased estimates of the impact of the bridge because revenues are affected by price as well as quantity changes
  - productivity increases due to the bridge might induce firms to lower their prices so as to increase sales volumes and profits
- We avoid this by adopting the more recently developed methodology of De Loecker (2011) ⇒ it assumes monopolistically competitive markets to take the effect of price setting behavior into account

▸ TFP estimation

Number of firms per km^2 in 1995 (municipal level)



Accessibility and agglomeration

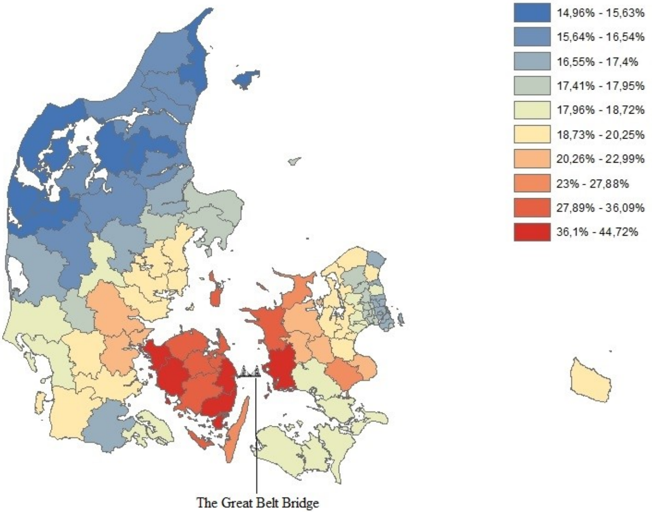
- The accessibility index (A) we use captures the proximity of a given location to other locations; it has its roots in the literature on agglomeration economies (Lucas and Rossi-Hansberg (2002); Hanson (2005); Redding and Rossi-Hansberg (2017))
- The value of A for municipality m is the weighted sum of full time equivalents (FTE's) in all municipalities (d denotes distance measured in travel time minutes between municipalities and δ is decay parameter)

$$A_m = \sum_{m'} FTE_{m'} e^{-\delta d_{m,m'}}$$

- Economic theory does not offer much guidance on how narrowly or how broadly regional effects should be measured $\Rightarrow$ we estimate δ

Decay parameter

Percentage changes in accessibility measure A between 1995 and 2002, $\delta = 0.017$



Estimating the impact of the bridge on productivity

- We regress the firm- and year-specific estimates of total factor productivity $\hat{tfp}_{i,t}$ on the log of the accessibility $a_{m(i),t}$

$$\hat{tfp}_{i,t} = \gamma_{i,0} + \gamma_1 a_{m(i),t}(\delta) + \gamma_t + \epsilon_{i,t}$$

  where $m(i)$ denotes the municipality in which firm i is located
- *Note the dependence of $a_{m(i),t}$ on the parameter δ (distance decay parameter)*

Endogeneity issues

- If the timing or the location of highway or rail extensions is selected according to trends and locational patterns in economic development, the improvements are not random (Holl (2016), Ahlfeldt and Feddersen (2018), Gibbons et al. (2019), Fretz et al. (2017))
- There are good arguments why neither the location nor the timing of the bridge are likely to be endogenous ▸ History
- However, the accessibility measure depends on the complete distribution of the evolution of local employment
- We instrument the accessibility index with an alternative accessibility index that artificially eliminates all variability except that which is due to the opening of the bridge (inspired by Ahlfeldt and Feddersen (2018)): **the calculated change in accessibility between 1995 and 2002 only reflects the impact of the travel time changes due to the bridge (keep employment fixed)**

The estimation of the proximity decay parameter δ

- We estimate δ jointly with the effect of accessibility on productivity $\Rightarrow$ we have to switch to NLS
- This does not combine with 2SLS, so we use the control function approach, in which the residual of the first-stage equation is added as an additional regressor
- We apply a grid-search over different values of δ

Estimating decay parameter

Estimating the impact of the bridge on wages

- We regress the log of hourly wages $w_{i,t}$ on the log of the accessibility $a_{m(i),t}$

$$w_{i,t} = \gamma_{i,0} + \gamma_1 a_{m(i),t}(\delta) + \gamma_t + \epsilon_{i,t}$$

  where $m(i)$ denotes the municipality in which firm i is located
- We use worker fixed effects and also here estimate the distance decay parameter jointly with the others using NLS, while taking account the issues associated with changing unemployment through a control function approach

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Firm level data

- The data used in the empirical analysis are derived from annual register data from Statistics Denmark for the years 1995 – 2002
- We use exhaustive accounts and balance sheet information at the company level: data on sales, investments, inputs, employment and capital stock (used to calculate firm-level productivity) as well as a detailed industrial disaggregation and geographical location (at the municipality level)
- We restrict the sample to single-plant firms (plant-level productivity cannot be estimated for multi-plant companies)
- We focus on three main sectors for which we observe balance sheets for the years 1995 – 2002, i.e. i) manufacturing, ii) construction, and iii) service (wholesale and retail trade)

Number of observations by sector (four-digit NACE sectors)

NACE one-digit sectors	NACE four-digit sectors	Number of observations
Manufacturing	Mfr. of food, beverages and tobacco	6,395
	Mfr. of textiles and leather	4,943
	Mfr. of paper prod.; printing and publish.	12,200
	Mfr. of chemicals	1,681
	Mfr. of other non-metallic mineral products	2,829
	Mfr. and processing of basic metals	16,026
	Mfr. of machinery and equipment	10,649
	Mfr. of electronic components	8,139
	Mfr. of transport equipment	2,542
	Mfr. of furniture; manufacturing n.e.c.	7,162
Construction	Construction	89,298
Retail	Wholesale and retail trade	38,313
Total		200,177

Segments

- To apply De Loecker's (2011) methodology we decomposed four-digit industries into a number of segments
- To give an example, for the construction industry we observed seven subsectors: i) general contractors, ii) bricklaying, iii) installing of electrical wiring and fittings, iv) plumbing, v) joinery installation, vi) painting and glazing, and vii) other construction works
- For the manufacturing industries we observed anywhere between three and six segments, with two exceptions: for transport equipment and furniture, we observed only two subsectors

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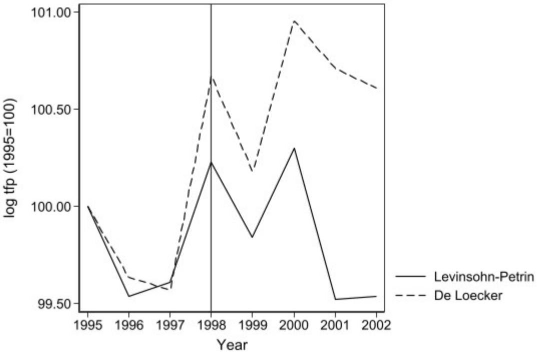
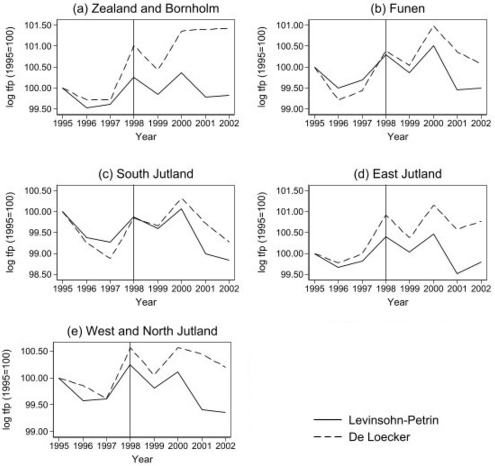
Index for means for the log tfp



Index for means for the log tfp, by region



▸ Simple DD

Accessibility affects productivity more strongly if demand effects are taken into account

Firm fixed effect models for accessibility impact on firm-level tfp

	Levinsohn-Petrin [1]	De Loecker [2]
log(A)	0.004***	0.011***
	(0.002)	(0.002)
e	0.012**	0.014***
	(0.005)	(0.006)
δ	0.012***	0.017***
	(0.005)	(0.005)
Year-fixed effect	Yes	Yes
Number of obs.	193,277	193,277

Note: Dependent variable is logarithm of tfp; the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively; standard errors are in parentheses.

On average across regions and sectors in the Danish economy

Accessibility $\uparrow$ 20.0% $\Rightarrow$ (De Loecker's) productivity $\uparrow$ 0.22%.

First stage

Different regions

Firm fixed effect models for accessibility impact on firm-level De Loecker tfp

	Zealand and Bornholm	Funen	South Jutland	East Jutland	West and North Jutland
	[1]	[2]	[3]	[4]	[5]
log(A)	0.008***	0.020**	0.010	0.002	0.007
	(0.002)	(0.008)	(0.009)	(0.014)	(0.017)
e	0.015	0.026	-0.009	-0.039	-0.009
	(0.010)	(0.021)	(0.015)	(0.037)	(0.028)
δ	0.006***	0.071**	0.013	0.072*	0.030
	(0.001)	(0.036)	(0.031)	(0.041)	(0.026)
Year-fixed effect	Yes	Yes	Yes	Yes	Yes
Number of obs.	76,632	17,261	28,044	29,452	41,888

Note: Dependent variable is logarithm of tfp; the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively; standard errors are in parentheses.

For Funen

Accessibility $\uparrow$ 34% $\Rightarrow$ productivity $\uparrow$ 0.68%.

Different sectors

Firm fixed effect models for accessibility impact on firm-level De Loecker tfp

	Manufacturing	Construction	Retail
	[1]	[2]	[3]
log(A)	0.006*	0.001	0.023***
	(0.004)	(0.003)	(0.005)
e	-0.020*	0.022***	0.031**
	(0.012)	(0.008)	(0.013)
δ	0.024	0.009***	0.021***
	(0.084)	(0.002)	(0.003)
Year-fixed effect	Yes	Yes	Yes
Number of obs.	69,642	86,564	37,071

Note: Dependent variable is logarithm of tfp; the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively; standard errors are in parentheses.

Small, medium and large firms

Firm fixed effect models for accessibility impact on firm-level De Loecker tfp

	<50 FTEs	50-250 FTEs	>250 FTEs
	[1]	[2]	[3]
log(A)	0.014***	-0.001	0.006
	(0.002)	(0.007)	(0.023)
e	0.021***	-0.012	0.012
	(0.006)	(0.017)	(0.027)
δ	0.017***	0.040	0.032
	(0.006)	(0.086)	(0.091)
Year-fixed effect	Yes	Yes	Yes
Number of obs.	144,603	41,764	6,910

Note: Dependent variable is logarithm of tfp; the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. Small firms have less than 50 FTEs, medium firms between 50 and 250 FTEs, and large firms more than 250 FTEs. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively; standard errors are in parentheses.

The potential effect on wages which has often been interpreted as reflecting that on productivity

- An increase in productivity will push up the value of *MPL* and on a competitive labor market this leads to an increase in the wage level
- The increased wage level also has an impact on firms whose productivity has not increased by the opening of the bridge if they use the same types of labor and will cause some reallocation (Greenstone et al., 2010)
- Depending on the size of the local labor markets, the spatial aspect of the wage increase may be different from that of the change in productivity
- The opening of the bridge may also have had a *matching* effect (Helseley and Strange, 1990) (*limited to the local labor market surrounding the location of the bridge*)

Wage data

- The wage data are derived from annual register data from Statistics Denmark for the years 1995–2002
- We observe the full population of firms and their workers
- For each year, we have information on workers' residence and workplace (both at the municipal level), we have data on hourly wages, and we have a range of explanatory variables for each worker: educational level, age, gender, full-time versus part-time, and the sector of employment.
- We select workers who have been employed for at least one year
- Our Mincerian wage regression is based on 1,990,619 workers

Minceriann wage regression (log hourly wage), worker fixed effects

	[1] All workers	[2] All workers	[3] Job and residence stayers
log(A)	0.009***	0.017***	0.006***
	(0.001)	(0.002)	(0.001)
e	0.010***	0.0003	0.004***
	(0.002)	(0.002)	(0.002)
δ	0.163***	0.787***	0.145***
	(0.021)	(0.138)	(0.028)
Time-variant controls	No	Yes	Yes
Sector-fixed effect (53 sectors)	No	Yes	No
Municipality-fixed effect	No	Yes	No
Year-fixed effect	Yes	Yes	Yes
Number of obs.	8,610,211	8,610,211	6,648,714

Note: Dependent variable is logarithm of hourly wage, the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. Time invariant controls: number of children (1, 2, 3 and >3) and family type (5). ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors are in parentheses.

Simple DD

Mincerian wage regression for different regions for job and residence stayers, worker fixed effect

	[1] Zealand and Bornholm	[2] Funen	[3] South Jutland	[4] East Jutland	[5] West and North Jutland
log(A)	0.011***	0.015***	0.003	0.026***	0.003
	(0.001)	(0.006)	(0.051)	(0.007)	(0.008)
e	0.002	0.006	-0.002	-0.004	0.008
	(0.002)	(0.008)	(0.019)	(0.007)	(0.013)
δ	0.641**	0.204*	0.550**	0.237	0.249
	(0.281)	(0.121)	(0.288)	(0.279)	(0.218)
Time-variant controls	Yes	Yes	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes	Yes	Yes
Number of obs.	3,031,573	550,148	921,929	969,331	1,175,733

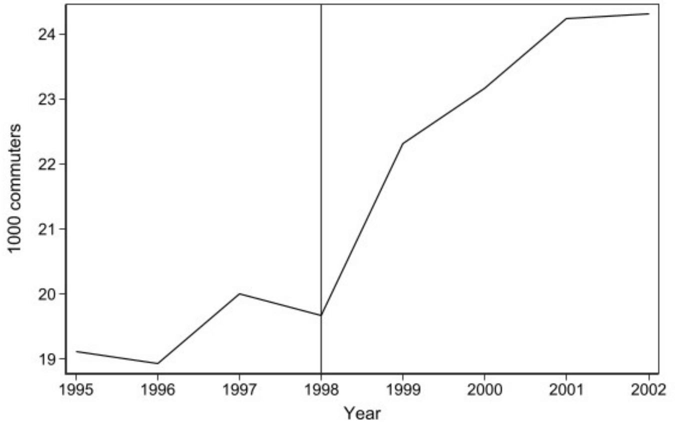
Note: Dependent variable is logarithm of hourly wage, the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors are in parentheses.

Mincerian wage regression for different sectors for job and residence stayers, worker fixed effect

	[1] Manufacturing	[2] Construction	[3] Service
log(A)	0.006***	0.011**	0.011***
	(0.002)	(0.005)	(0.003)
e	0.005	0.001	-0.018***
	(0.006)	(0.011)	(0.007)
δ	0.384***	0.690***	0.969***
	(0.043)	(0.120)	(0.211)
Time-variant controls	Yes	Yes	Yes
Year-fixed effect	Yes	Yes	Yes
Number of obs.	1,410,582	319,337	877,517

Note: Dependent variable is logarithm of hourly wage, the accessibility measure (A) is instrumented using the accessibility index that artificially eliminates all variability except that which is due to the change in infrastructure (the opening of the bridge), keeping employment fixed in all municipalities throughout Denmark. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors are in parentheses.

Number of commuters crossing the Great Belt, by year



▸ Descriptives

Minicerian wage regression for residence stayers and job movers after the bridge opening, worker fixed effects

	[1] log(w)	[2] log(w)	[3] log(w)
Dummy indicating job change cross the bridge	0.014*** (0.002)	0.010*** (0.002)	0.010*** (0.002)
Time-variant controls	No	No	Yes
Sector-fixed effect (53 sectors)	No	Yes	Yes
Municipality fixed effect (workplace)	No	Yes	Yes
Year-fixed effect	Yes	Yes	Yes
Number of obs.	358,920	358,920	358,920

Note: Dependent variable is logarithm of hourly wage, ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors are in parentheses. The results refer to workers who changed job after the opening of the bridge, did not use the ferry before the opening of the bridge, and did not change residence. All observations refer to the years 1999-2002.

Effects of the opening of the bridge on wages are substantially different from those we found on productivity

- The estimated impacts (elasticities) are mostly larger or of the same order of magnitude than those estimated for productivity
- The impact on wages is much more sensitive to distance to the bridge
- We found significant effects of the bridge on wages in industries where productivity did not show a significant effect
- A plausible explanation is that productivity increases, *possibly associated with better matches*, in some firms affects the demand for skills that are used in many firms, including some whose productivity is not improved by the opening of the bridge $\Rightarrow$ may result in higher wages for all workers having these skills

Conclusions

- We find positive impacts of the improved accessibility on the productivity of firms in the retail industry but not in the manufacturing sector
- The opening of the bridge has affected productivity most for firms in regions connected by the bridge
- We find systematic positive elasticities of wages of the same order of magnitude or even larger than those estimated for productivity, but with much stronger distance decay effects
- The wage effects manifest themselves also in industries where productivity remained unchanged by the opening of the bridge
- There appears to be a two-way interaction between productivity and the labour market

THANK YOU

FOR YOUR ATTENTION

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Identification of firm level TFP

Levinsohn and Petrin

- Levinsohn and Petrin (2003) identify TFP from *a dynamic model of firm behaviour*
- Firms make decisions to maximize the present discounted value of current and future profits where productivity is the (only unobserved) source of firm-specific uncertainty
- From a Cobb-Douglas production function (in logs) when output and inputs are observable; productivity is observed only by the firm; and the error term is not observable, either by the firm or by the analyst:

$$y_{i,t} = \alpha_l l_{i,t} + \alpha_k k_{i,t} + \alpha_m m_{i,t} + \omega_{i,t} + u_{i,t}$$

- Under the *monotonicity assumption*, the dynamic PMP can be solved and $\omega_{i,t}$ can be identified

Identification of TFP ($\omega_{i,t}$)

- Capital and the unobserved productivity shock are state variables, while labor and the intermediate inputs are freely variable in each period
- The demand for intermediate inputs is a function of the two state variables: $m_{i,t} = m_t(k_{i,t}, \omega_{i,t})$
- Levinsohn and Petrin (2003) show that under plausible conditions $\left(\frac{\partial m_t}{\partial \omega_{i,t}} > 0\right)$
- It follows that the right-hand side of the above equation can be reformulated as the sum of the labor term $\alpha_l l_{i,t}$, an unknown function φ_t of the two state variables, and the second error term:

$$y_{i,t} = \alpha_l l_{i,t} + \varphi_t(k_{i,t}, \omega_{i,t}) + u_{i,t}$$

- This equation is estimated by OLS using a third-order polynomial to approximate φ_t

Estimation of TFP ($\hat{\omega}_{i,t}$)

- An estimate of the natural log of total factor productivity can be computed as:

$$\hat{tfp}_{i,t} (= \hat{\omega}_{i,t}) = y_{i,t} - (\hat{\alpha}_l l_{i,t} + \hat{\alpha}_k k_{i,t} + \hat{\alpha}_m m_{i,t})$$

- Although output is the correct dependent variable when estimating the above relation, this is usually not reported in the data available to the researcher (only revenues or turnover are known)

De Loecker (2011)

- Demand for the output of the firm is specified as a CES function, where Y_s and P_s are the demand and price index for a segment of the sector to which the firm belongs (for example, clothing as a segment of the broader textile industry)

$$Y_{i,t} = Y_{s,t} \left(\frac{P_{i,t}}{P_{s,t}} \right)^{\eta_s} e^{\varepsilon_{i,t}}$$

  The demand depends on its own price, the average price in the segment, and overall demand in the relevant segment as a demand shifter

- This specification combined with the assumption of monopolistic competition gives a segment-specific markup of price over marginal cost equal to $\left(\frac{\eta_s}{\eta_s+1}\right)$; or alternatively, it implies a Lerner index equal to $\left(\frac{1}{|\eta_s|}\right)$

De Loecker (2011) - solution

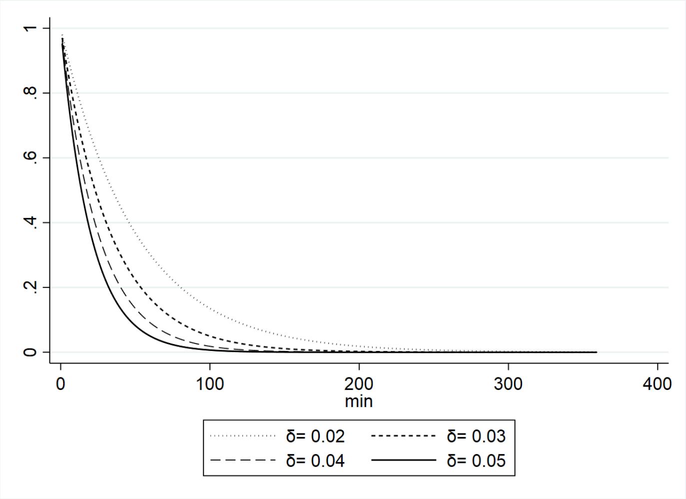
- Solving the CES demand function for the price $P_{i,t}$, defining revenue as $R_{i,t} = P_{i,t}Q_{i,t}$, and setting demand and supply equal:

$$(r_{i,t} - p_{s,t}) = \beta_l l_{i,t} + \beta_k k_{i,t} + \beta_m m_{i,t} + \beta_s q_{s,t} + \omega^*_{i,t} + \xi^*_{i,t} + u_{i,t}$$

- The coefficients are related to the original production and demand functions so the structural parameters can be identified

Go Back

Decay parameter δ



Go Back

A brief history of the development of the idea for the bridge

- The location was exogenous:
  - The bridge was situated where the distance between the islands it connects was shortest on the exact same location where a ferry service had been operating for several centuries
  - The first documented regular "vessel" route crossing the Great Belt was introduced in 1624
  - In the 18th century, the connection was improved both for passenger and delivery (post) services, and new vessels were operating the service
  - In the early 19th century, the link was serviced by steam-operated ships
  - As early as 1858 there was a proposal to connect the two Danish islands Zealand and Funen (*An engineer A.F. Tscherning proposed a tunnel under the Great Belt*)

The timing of the opening of the bridge can be considered exogenous as well

- In 1936 the first bridge-idea (a bridge with railway and road) came up, but the project was not realized due to the WW2
- In 1948 an expert group was appointed in order to explore the possibilities for a Great Belt bridge
- In 1965 the Danish government offered an award for the best bridge project
  - It announced 4 winners of the competition in 1967
  - However, due to political difficulties, the oil crises, and a number of new analyses, the bridge project was postponed again
- The Danish parliament finally adopted the Construction Act for the Great Belt link in June 1987
- Construction work began in August 1990
- The bridge opened in 1998

Go Back

Estimating decay parameter

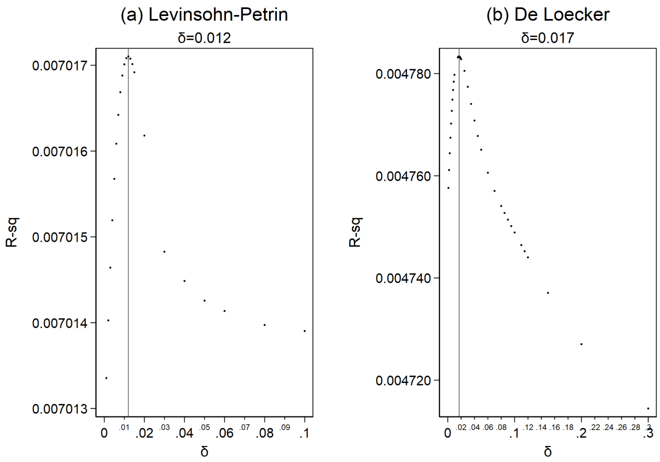
Firm fixed effect models for accessibility impact on firm-level De Loecker tfp

- We follow Cicone and Hall (1996), Graham et al. (2010) and Ahlfeldt and Feddersen (2018) and estimate the model coefficients by Nonlinear Least Squares (NLS) (Amemiya (1974))
- We regress the firm- and year specific estimates of total factor productivity $\hat{tfp}_{i,t}$ on the log of the accessibility $a_{m(i),t}$

$$\hat{tfp}_{i,t} = \gamma_{i,0} + \gamma_1 \left(\sum_{m'} FTE_{m'\,t} e^{-\delta d_{m,m'\,t}} \right) + \gamma_t + \epsilon_{i,t}$$

  where $m(i)$ denotes the municipality in which firm i is located
- We make use of the control function approach, in which the residual of the first-stage equation is added as an additional regressor (Blundell and Powell, 2003; Wooldridge, 2015)
- We apply a grid-search (maximizes R^2) over different values of δ

Grid search over decay-parameter space



Go Back

First stage – control function – estimation results (firm fixed effect models for accessibility impact on firm-level tfp)

Dep. var.	log(A)	log(A)
δ	0.012	0.017
	[1]	[2]
log[A (FTE's fixed at 1995 level)], instrument	1.050***	1.058***
	(0.001)	(0.001)
Firm-fixed effect	Yes	Yes
Year-fixed effect	Yes	Yes
F test of excluded instruments	1.4e+06	1.4e+06
Anderson canon. corr. LM statistic (χ^2)	1.8e+05	1.8e+05
Cragg-Donald Wald F statistic	1.4e+06	1.4e+06
Number of obs.	193,277	193,277

Note: ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels, respectively; standard errors clustered at the municipality level are in parentheses.

Go Back

Simple DD

$$\hat{tfp}_{i,t} = \theta T_t + \vartheta t + \gamma_i + \varepsilon_{i,t}$$

where $\hat{tfp}_{i,t}$ is the log of total factor productivity of firm i in year t, T_t is a dichotomous variable that is 1 for for firms located in Funen and Zealand/Bornholm for the period after the bridge opening and 0 otherwise, t is a time trend, γ_i denotes firm-fixed effects, and $\varepsilon_{i,t}$ is a random error term

The short run impact of the Great Belt Bridge on the total factor productivity based on De Loecker's (2011) method

	[1]	[2]	[3]
Dummy indicating bridge (T_t)	0.006***	0.008***	
	(0.001)	(0.003)	
Dummy indicating bridge (T_t) * Zealand and Bornholm and Funen			0.012***
			(0.002)
Firm fixed effects (γ_i)	Yes	Yes	Yes
Time trend (γ_t)	No	Yes	Yes
R-squared	0.0002	0.0001	0.0002
Number of obs.	193,277	193,277	193,277

Note: Dependent variable is logarithm of *tfp*. ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors care in parentheses.

Go Back

The short run impact of the Great Belt Bridge on the hourly wages (simple DD)

	[1]	[2]	[3]
Dummy indicating bridge (T_t)	0.015***	0.004***	
	(0.0001)	(0.0001)	
Dummy indicating bridge (T_t) * Zealand and Bornholm and Funen			0.008***
			(0.0001)
Time variant controls	Yes	Yes	Yes
Worker fixed effects (γ_i)	Yes	Yes	Yes
Time trend	No	Yes	Yes
R-squared	0.045	0.053	0.055
Number of obs.	8,610,211	8,610,211	8,610,211

Note: Dependent variable is logarithm of hourly wage. Time invariant controls: number of children (1, 2, 3 and >3) and family type (5). ***, **, * indicate that estimates are significantly different from zero at the 0.01, 0.05 and 0.10 levels respectively; standard errors clustered at the municipality level are in parentheses.

Go Back

Hourly wages, means and std. dev. in parenthesis

	All workers	Job and res. stayers	Residence movers	Job movers	Res. and job movers	Res. stayers and job movers cross the bridge
Hourly wage (DKK/hour)	167.081	161.291	186.941	191.792	198.495	192.259
	(55.300)	(52.019)	(61.640)	(62.535)	(65.173)	(64.579)
Hourly wage in 1995	151.125	148.279	172.245	165.852	174.469	167.367
	(45.702)	(42.957)	(52.930)	(48.645)	(49.956)	(52.672)
Hourly wage in 2002	194.417	188.352	213.302	215.415	229.469	226.326
	(58.7443)	(53.588)	(64.893)	(55.497)	(67.456)	(66.785)
Diff. 1995-2002	43.292	40.072	41.058	49.563	55.027	58.959
	(36.859)	(28.262)	(40.369)	(44.274)	(48.429)	(54.600)
t-test for the diff.	912.995	809.453	195.947	133.268	46.586	61.076
Number of obs.	8,610,211	6,648,714	624,083	1,639,533	302,119	46.454

Note: 1 DKK $\approx$ 0.13 EUR. The test hypothesis for t-test for the difference in hourly wages between 1995 and 2002 is H_0 : $mean(diff\ in\ hourly\ wages) = 0$.

Go Back