HEALTH CAPITAL AND LOCAL LABOUR PRODUCTIVITY IN ENGLAND

Spillovers through commuting networks

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What we are doing

USUAL APPROACH FOR DETERMINANTS OF LOCAL PRODUCTIVITY

Local productivity reflects the health, skills and employment structure of the area itself.

→

THE MISSING LINK

Workers often live in one local authority and contribute to output in another.

→

THE IMPLICATION

Health capital may matter for productivity both locally and through connected labour markets.

Research question **How is local health capital associated with local labour productivity?**

Study design

Cross-sectional analysis of local authority districts in 2019
Spatial approach

OUTCOMES

Log GVA per job
-
Log GVA per hour

Workplace-based productivity

307 LADs

EXPOSURE

ONS Health Index

Three domains:
People, Lives and Places

100 = England in 2015
10 points = 1 SD

CONNECTIVITY

Commuting flows

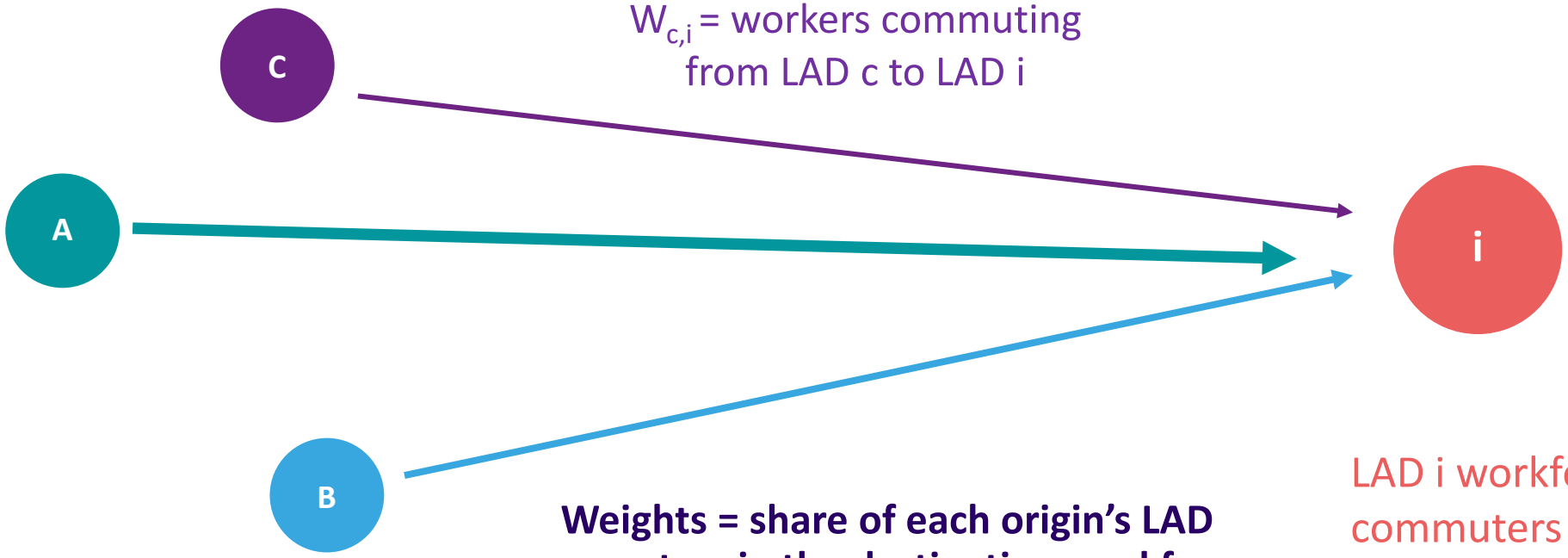
Census 2011 origin–destination links

Functional labour markets

Commuting defines the economic geography of interest

Health is measured where people live

Productivity is measured where jobs are located



$W_{c,i}$ = workers commuting from LAD c to LAD i

Weights = share of each origin's LAD commuters in the destination workforce

LAD i workforce = non-commuters from LAD i + commuters from other LADs

e.g. $s_{c,i} = W_{c,i}$ / LAD i workforce

Stronger commuting link → greater potential spillover

A spatial model to separate local and spillover associations

Spatial regression – general spatial model

$$y_i = \beta_s X_i^s + \beta_c X_i^c + \eta W X_j + \lambda W y_j + \mu_i$$

$$\mu_i = \rho W \mu_j + v_i$$

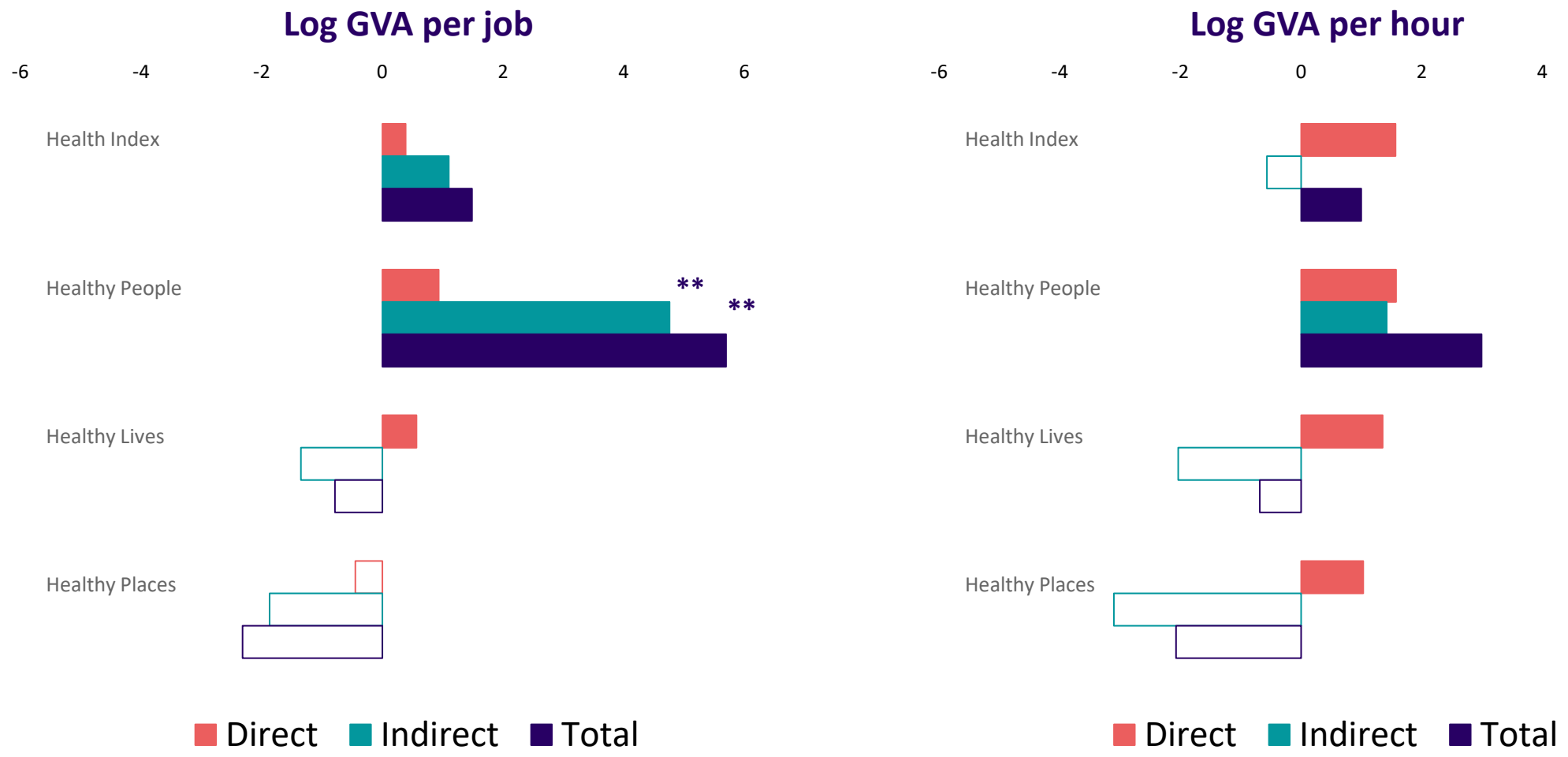
- Spatial lag independent variables – health index
- Spatial lag dependent variable
- Spatially lagged error term

Controls **working-age population**, population aged 0 to 14, population older than 65 **qualifications**, employment rate, sector mix, region

DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
Association between health and productivity within the same LAD	Association transmitted through commuting links to other LADs	Approx. direct plus indirect effects

MAIN RESULTS

2019 estimates from the spatial models with commuting-flow spatial weights matrix



Coefficients × 10 × 100. * p < 0.10, ** p < 0.05, *** p < 0.01

Different results depending on health dimension

HEALTHY PEOPLE	Health outcomes	**Positive spillover for GVA per job**	**Positive total effect for GVA per job**
HEALTHY LIVES	Behaviours and personal circumstances	**Mix of imprecise positive direct and negative indirect**	**No statistically significant total effect**
HEALTHY PLACES	Wider determinants and environment	**Negative imprecise spillovers**	**Negative imprecise total effects**

PUTTING INTO PERSPECTIVE WITH EDUCATION

- **Education indirect effect is positive and significant**
  - In all models, for both GVA per job and GVA per log
  - The direct effect is positive but not significant
- **Potential interpretation of association**
  - Causal effect of population health (healthy people domain) on local labour productivity
  - Unobservables characteristics of areas are both related to higher local labour productivity and healthier people
  - Selection of healthy people to work in places with high local labour productivity
  - Places with high local labour productivity attract more educated individuals which are also more healthy

Exploring selection – panel regressions (2015-2019) Outcome: qualification index

Variables	(1) Healthy Places	(2) Healthy People	(3) Healthy Lives
Healthy Domain	**0.0077*** **	**0.0017** **	**0.0028***
	(0.0022)	**(0.0009)**	**(0.0015)**
GVA per Job (log)	-0.0956	-0.0917	-0.0994
	(0.0970)	(0.0974)	(0.0974)
Observations	1,535	1,535	1,535
LAD Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes

OTHER RESULTS

In 2015

- **GVA per job: qualitatively the same**
- **GVA per hour**
  - **Healthy people indirect effect positive and significant**
  - Qualification index indirect effect positive and significant – except in regressions with healthy people -> not significant

Contiguity matrix

- GVA per job
  - No significant association with health indexes (direct or indirect)
  - Significant positive association with qualification index (direct and indirect)
- GVA per hour
  - No significant association with health indexes (direct or indirect)
  - Only direct significant positive association with qualification index

WHAT DOES THIS MEAN FOR PRODUCTIVITY POLICY?

1 **Think in functional labour markets**

Administrative boundaries may not match where health capital contributes to output.

2 **Account for cross-area spillovers**

Place-based health investments may have consequences beyond the investing area.
Potential cross-area associations should be assessed rather than assumed.

3 **Avoid treating health as one input**

Health outcomes, behaviours and wider determinants show different spatial patterns.

The geography of health policy and the geography of productivity policy need to be connected.

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TAKEAWAYS

1. **Local health and productivity are spatially connected.**

2. **Commuting networks reveal spillovers hidden by administrative boundaries.**

3. **The direction and magnitude differ across health domains and labour productivity measure.**
   Evidence is strongest for Healthy People spillovers in GVA per job; other estimates are imprecise.

Thank you

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STRUCTURE OF THE HEALTH INDEX

Health Index	Domain	Subdomain
Health Index	Healthy People	Difficulties in daily life
		Mental health
		Mortality
		Personal well-being
		Physical health conditions
	Healthy Lives	Behavioural risk factors
		Children and young people
		Physiological risk factors
		Protective measures
	Healthy Places	Access to green space
		Access to services
		Crime
		Economic and working conditions
		Living conditions

General Spatial Model Results 2019 - Log GVA per job – commuting matrix

General Spatial Model Results 2019 - Log GVA per job Spatial weights: Commuting matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	0.00038 (0.00153)	0.00093 (0.00133)	0.00056 (0.00155)	-0.00045 (0.00148)
Health measure - Indirect	0.00110 (0.00285)	0.00476** (0.00237)	-0.00135 (0.00296)	-0.00187 (0.00240)
Health measure - Total	0.00148 (0.00333)	0.00569** (0.00274)	-0.00079 (0.00312)	-0.00232 (0.00269)
Qualification index - Direct	0.01114 (0.05900)	0.00423 (0.05245)	0.00645 (0.06235)	0.02927 (0.05186)
Qualification index - Indirect	0.36867*** (0.09183)	0.30265*** (0.08837)	0.41798*** (0.09748)	0.39438*** (0.07860)
Qualification index - Total	0.37981*** (0.09706)	0.30688*** (0.08914)	0.42442*** (0.09932)	0.42365*** (0.07994)
Observations	307	307	307	307

Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

General Spatial Model Results 2019 - Log GVA per hour – commuting matrix

General Spatial Model Results 2019 - Log GVA per hour Spatial weights: Commuting matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	0.00156 (0.00145)	0.00157 (0.00127)	0.00135 (0.00149)	0.00103 (0.00142)
Health measure - Indirect	-0.00057 (0.00268)	0.00142 (0.00231)	-0.00204 (0.00274)	-0.00310 (0.00236)
Health measure - Total	0.00100 (0.00311)	0.00299 (0.00268)	-0.00069 (0.00284)	-0.00207 (0.00263)
Qualification index - Direct	0.03071 (0.05615)	0.03728 (0.05039)	0.03158 (0.05960)	0.05630 (0.04953)
Qualification index - Indirect	0.25145*** (0.08711)	0.21870*** (0.08374)	0.28483*** (0.09354)	0.25116*** (0.08016)
Qualification index - Total	0.28216*** (0.09162)	0.25599*** (0.08536)	0.31641*** (0.09478)	0.30746*** (0.08236)
Observations	307	307	307	307
Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.				

General Spatial Model Results 2015 - Log GVA per job – commuting matrix

General Spatial Model Results 2015 - Log GVA per job Spatial weights: Commuting matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	-0.00048 (0.00163)	-0.00089 (0.00131)	0.00022 (0.00166)	-0.00085 (0.00153)
Health measure - Indirect	0.00343 (0.00282)	0.00704*** (0.00259)	0.00143 (0.00293)	-0.00127 (0.00249)
Health measure - Total	0.00295 (0.00332)	0.00615** (0.00277)	0.00165 (0.00311)	-0.00212 (0.00298)
Qualification index - Direct	-0.03776 (0.05419)	-0.03630 (0.04826)	-0.05221 (0.05816)	-0.04012 (0.04779)
Qualification index - Indirect	0.27170*** (0.08475)	0.20554** (0.08480)	0.29681*** (0.09053)	0.32003*** (0.07597)
Qualification index - Total	0.23394*** (0.08926)	0.16924* (0.08680)	0.24460*** (0.09394)	0.27991*** (0.07902)
Observations	307	307	307	307

Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

General Spatial Model Results 2015 - Log GVA per hour – commuting matrix

General Spatial Model Results 2015 - Log GVA per hour Spatial weights: Commuting matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	0.00081 (0.00157)	0.00010 (0.00128)	0.00113 (0.00162)	0.00020 (0.00149)
Health measure - Indirect	0.00171 (0.00254)	0.00434* (0.00243)	-0.00006 (0.00268)	-0.00285 (0.00250)
Health measure - Total	0.00251 (0.00295)	0.00444* (0.00257)	0.00107 (0.00281)	-0.00265 (0.00293)
Qualification index - Direct	-0.04169 (0.05239)	-0.02986 (0.04700)	-0.05181 (0.05658)	-0.03127 (0.04646)
Qualification index - Indirect	0.17221** (0.08550)	0.12823 (0.08437)	0.19062** (0.09229)	0.18978** (0.08539)
Qualification index - Total	0.13053 (0.08858)	0.09837 (0.08579)	0.13881 (0.09479)	0.15851* (0.08866)
Observations	307	307	307	307

Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

General Spatial Model Results 2019 - Log GVA per job – contiguity matrix

General Spatial Model Results 2019 - Log GVA per job Spatial weights: Contiguity matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	-0.00063 (0.00179)	0.00124 (0.00153)	-0.00077 (0.00181)	-0.00167 (0.00170)
Health measure - Indirect	-0.00155 (0.00315)	0.00210 (0.00293)	-0.00409 (0.00313)	-0.00177 (0.00270)
Health measure - Total	-0.00217 (0.00370)	0.00334 (0.00347)	-0.00486 (0.00340)	-0.00343 (0.00306)
Qualification index - Direct	0.14732** (0.06159)	0.12048** (0.05603)	0.15259** (0.06530)	0.15493*** (0.05495)
Qualification index - Indirect	0.21606** (0.10373)	0.14303 (0.09584)	0.28530*** (0.10829)	0.19918** (0.08409)
Qualification index - Total	0.36338*** (0.11430)	0.26351** (0.10314)	0.43789*** (0.11580)	0.35411*** (0.09204)
Observations	307	307	307	307

Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

General Spatial Model Results 2019 - Log GVA per hour – contiguity matrix

General Spatial Model Results 2019 - Log GVA per hour Spatial weights: Contiguity matrix				
Effect	**Health Index**	**Healthy People**	**Healthy Lives**	**Healthy Places**
Health measure - Direct	0.00084 (0.00169)	0.00167 (0.00144)	0.00037 (0.00170)	0.00013 (0.00160)
Health measure - Indirect	-0.00295 (0.00308)	-0.00051 (0.00293)	-0.00546* (0.00310)	-0.00361 (0.00264)
Health measure - Total	-0.00211 (0.00363)	0.00116 (0.00348)	-0.00509 (0.00339)	-0.00348 (0.00306)
Qualification index - Direct	0.13472** (0.05750)	0.12638** (0.05218)	0.14387** (0.06109)	0.15208*** (0.05157)
Qualification index - Indirect	0.14562 (0.09987)	0.09028 (0.09049)	0.21265** (0.10618)	0.11826 (0.08576)
Qualification index - Total	0.28033** (0.11014)	0.21666** (0.09821)	0.35653*** (0.11410)	0.27034*** (0.09398)
Observations	307	307	307	307

Notes: Standard errors in parentheses. Controls include working-age population, population aged 0 to 14, population older than 65, qualification index score, employment rate, distribution of employment across sectors, and region fixed effects. * p < 0.10, ** p < 0.05, *** p < 0.01.