Organisational capital and hospital performance: Analysis for three countries

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AIMS

- The main aim is to explore the impact of intangible organisational capital on hospital performance in three countries, Germany, Hungary and the UK
- To do so we measured investments in organisational capital in terms of expenditures on personnel who generated this asset
- Hospital performance is measured as an index of overall output based on activities undertaken by general (rather than specialised) hospitals.

Specifications

- A hospital production function including inputs and a number of control variables was estimated for each country.
- The analysis employs a broad common framework but allows flexibility in terms of how variables are measured and the variables included in the regressions
  - Each country has different ways of producing health services and unique data sources so estimating identical specifications for each country is not feasible.
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General Model

For a sample of hospitals, I, we estimate:

$$\ln Y_{it} = \alpha + \Sigma\beta_j \ln L_{jjt} + \Sigma\gamma_k \ln K_{kit} + \pi \ln INT_{it} + \Sigma\delta_n Z_{nit} + e_{it}$$

where

Y = measure of performance

L= labour input

K = other inputs

INT = intangibles

Z = control variables

Measuring intangible investments

- All three countries use a similar method for own account OC based on 20% of payments to personnel responsible for organisational development and change.
- OC in all three countries include clinical managers as well as general managers
- Based on review of health literature that sees hospitals as professional bureaucracies characterized by distributed leadership between
  - doctors (differentiated by clinical levels)
  - qualified nurses and
  - administrative staff

Measuring intangible investments: Germany

- In German hospitals management tasks are divided between doctors, qualified nurses and management professionals.
- ***Investments in OC*** involved three steps:
  - Identifying the occupational groups relevant for creating organisational capital
  - Use of a survey to quantify the time these occupations spend on management tasks
  - These times vary by profession
  - Use the average wage for these occupational groups in each hospital times numbers in each group times 0.2 to calculate intangible investments

Measuring intangible investments: Hungary

- The data for Hungary (and the UK) allow a distinction between a broad and a narrow measure of OC
- In Hungary the workforce is classified according to if they are in a Leading position or not and if they are employed in the main activity, auxiliary activity or ancillary activity
  - **Title-based approach (**narrow criteria) it is assumed that only employees being in executive/managerial positions produce organisational capital.
  - **Task-based approach (**Broad criteria) – A wider group of workers perform tasks in course of which organisational capital is also created
- Used German survey results to assign time use.

Measuring intangible investments:UK

- For the UK, the NHS workforce census allows a distinction between professional and general managers.
- Clinical managers, are clinically qualified personnel who “have overall responsibility for budgets, manpower or assets or who are held accountable for a significant area of work”
  - 100% time on management: Nurse managers, Scientific, therapeutic and technical (STT) managers and Ambulance managers.
  - Also include 20% time of Nurse consultants, Modern matrons, STT Consultant therapists and consultant scientists
  - And assume 20% of hospital consultants have managerial responsibilities
- Include General plus clinical in OC but also examine the impact of the two separately

Variables

Performance

All three use cost weighted activities as a measure of overall performance of hospitals

For Germany this is adjusted for mortality rates

We also explored other measures such as mortality rates or activity rates for major conditions such as heart disease, musculoskeletal conditions and cancer, waiting times and mortality rates

Variables

Other inputs

All three countries include a measure of labour input

Both FTE and weighted by wage shares

Germany and Hungary also include intermediate inputs

Only the UK had data on investment in some tangible capital assets

Variables

Control variables

All countries include the size of hospitals, patient demographics (female, elderly) and local area control measures such as unemployment

Others vary by country, e.g. hospital type, prevalence of diseases in the local population

Samples and years covered

In all three only general hospital are included

Germany: 925 hospitals, 2006-2012

Hungary: 58 hospitals, 2010-2013

UK: 139 hospitals, 2010-2013

Results: Germany: cross sectional 2012

	Investment	Capital Stock
InvOrgCapital (log)	0,265***	0,157***
labour (log)	0,264***	0,353***
material costs (log)	0,340***	0,354***
sizecat	0,046***	0,049***
charitable	0.012	0.014
private	0,062***	0,059***
university hospital	-0,204**	-0,223***
share females	-0.055	-0,50
share 75+	0.038	0.049
op rate	0,082***	0,085***
mean length of stay	-0,024***	-0,025***
share qualified nurses	-0.043	0.034
GDP/capita	-0,002**	-0,002***
_const	-1,573***	-1,086***
number of observations	925	925
R^2	0.969	0.969

Results Germany: Panel, FE with time dummies

	Investment	Capital Stock
InvOrgCapital (log)	0,227***	0,190***
labour (log)	0,272***	0,346***
material costs (log)	0,201***	0,214***
sizecat	0,056***	0,060***
charitable	0.008	0.005
private	0,028*	0,026*
share females	-0,175**	-0,165**
share 75+	-0443***	-0,467***
op rate	-0,009	-0,008
mean length of stay	-0,010***	-0,009***
share qualified nurses	-0,042	0,058**
GDP/capita	-0,000	-0,000
_const	1,203*	0,784**
number of observations	6475	6475
R^2	0.961	0.961

Results: Germany: wage weighted labour input, FE &TD

	Investment	Capital Stock
InvOrgCapital (log)	0,256***	0,217***
wage weighted labor (log)	0,224***	0,293***
material costs (log)	0,197***	0,211***
sizecat	0,055***	0,062***
charitable	0.003	-0,001
private	0.022	0.018
share females	-0,247***	-0,231***
share 75+	-0,470***	-0,501***
op rate	0.001	0.003
mean length of stay	-0,007**	-0,006*
share qualified nurses	-0,104**	0,000
GDP/capita	-0,000	-0,000
_const	1.225	0,779**
number of observations	6216	6216
R^2	0.962	0.961

Results Hungary. Cross sections

	2010	2011	2012	2013
(Constant)	3.027	3.298	1.808	3.026
Labour	0.373**	0.194	0.234*	0.462***
Material costs	0.081	0.077	0.152**	0.113***
OC (Title based)	**0.021**	**0.025**	**0.109***	**-0.068**
Active beds	0*	0.000	0.000***	0.000**
Average stay in hospital	-0.076*	-0.104	-0.068**	-0.109**
% female	0	0.003	0.008	0.006
% aged 70+	0	-0.003	-0.001	-0.001
Unemployment rate	0.002	-0.008	-0.006	0.001
GDP/capita	0	0.000	0.000	0.000**

Results Hungary. Cross sections

	2010	2011	2012	2013
(Constant)	3.224	3.563	2.439	2.741
Labour	0.342**	0.139	0.164	0.345***
Material	0.073	0.065	0.136**	0.129***
OC (Task based)	**0.067**	**0.135**	**0.254****	**0.017**
Active beds	0**	0.000**	0.000**	0.000**
Average stay in hospital	-0.08**	-0.108**	-0.085***	-0.105**
% female	0.001	0.006	0.015	0.005
% aged 70+	-0.001	-0.004	-0.001	-0.001
Unemployment rate	0.002	-0.009	-0.007	-0.002
GDP/capita	0	0.000	0.000	0.000**

Results Hungary: Pooled

2010-2013	Title based		Task Based	
	B	Std. Error	B	Std. Error
(Constant)	,556	,222**	3,128***	,354
Labour	,011	,039	,216***	,061
Materials	,109	,015***	,102***	,025
OC	**,007**	**,029**	**,115****	**,046**
Beds in active care	,000	,000***	,000***	,000
AVG days of stay in hospital	-,012	,007	-,097***	,012
% female	-,018	,003***	,004	,004
% aged 70+	,001	,002	-,002	,002
Unemployment rate	-,001	,002	-,003	,003
GDP/capita	,000	,000	,000*	,000
year2010	-,001	,017	,027	,028
year2011	,006	,016	,026	,026
year2012	,013	,014	,051*	,022

Results UK: Inpatient CWI

	2010-11	2011-12	2012-13	2013-14
Investment in OC: all managers	**0.749*** **	**0.711*** **	**0.727*** **	**0.725*** **
	(0.045)	(0.047)	(0.049)	(0.048)
N	139	139	139	139
r2	0.669	0.623	0.618	0.624
Investment in OC: general managers	**0.116** **	**0.046**	**0.011**	**-0.038**
	(0.051)	(0.053)	(0.058)	(0.057)
Investment in OC: clinical managers	**0.634*** **	**0.674*** **	**0.719*** **	**0.760*** **
	(0.050)	(0.055)	(0.059)	(0.056)
N	139	139	139	139
r2	0.733	0.708	0.705	0.732

Results UK: Inpatient CWI , including controls

	2010-11	2011-12	2012-13	2013-14	Pooled
Investment in OC: general managers	**0.012**	**-0.006**	**-0.029**	**-0.042**	**-0.008**
Investment in OC: clinical managers	**-0.098***	**0.036**	**0.122***	**0.170****	**0.077**
Total staff	1.004***	0.745***	0.572***	0.536***	0.669***
% nurses	1.726***	1.326**	0.597	1.025*	0.878*
Beds: Less than 400	-0.078	-0.315***	-0.379***	-0.359***	-0.306***
Beds: 400-599	-0.066*	-0.069*	-0.162***	-0.150***	-0.122***
% female	0.291	0.293	-1.424**	-0.406	-0.400
% aged 75 plus	1.308***	1.462***	0.684	0.918**	1.060***
% emergency admissions	-0.293	-0.091	-0.359	-0.418	-0.247
Mean length of stay	-0.082***	-0.076***	-0.149***	-0.141***	-0.116***
GDP per capita	-0.000***	-0.000*	-0.000*	-0.000	-0.000**
Teaching hospital	-0.054	0.014	0.046	0.096*	0.036
Foundation Trust	0.030	0.027	-0.002	-0.026	0.003
Capital investment	-0.016*	0.003	-0.002	-0.002	-0.004

Additional Results

We tried a number of other specification including looking separately at mortality rates and constraining the dependent variable to just cover major diseases

UK results: Mortality rates

	2010-11	2011-12	2012-13	2013-14	Pooled
Investment in OC: general managers	**-0.007**	**0.001**	**-0.009**	**-0.022**	**-0.009**
Investment in OC: clinical managers	**-0.064***	**-0.098*****	**-0.066****	**-0.029**	**-0.067*****
Total staff	0.049	0.041	0.046	0.010	0.036
% nurses	-0.035	0.377	0.079	0.119	0.133
Beds: Less than 400	-0.049	-0.084***	-0.088***	-0.098***	-0.082**
Beds: 400-599	-0.050**	-0.038*	-0.034	-0.040*	-0.041***
% female	-0.263	-0.488	-0.626*	-0.682**	-0.501*
% aged 75 plus	-0.088	-0.175	-0.031	0.131	-0.026
% emergency admissions	0.104	0.160	0.146	0.089	0.128
Mean length of stay	0.011	0.025*	0.013	0.023*	0.019**
GDP per capita	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
Teaching hospital	-0.055*	-0.041	-0.048*	-0.025	-0.042**
Foundation Trust	-0.004	0.010	0.020	0.019	0.012
Capital investment	-0.007	-0.003	-0.014*	-0.019**	-0.008*

Results UK: Waiting times, excl top and bottom percentile

	2010-11	2011-12	2012-13	2013-14	Pooled
Investment in OC: general managers	**0.502**	**0.176**	**1.246**	**2.317***	**0.892**
Investment in OC: clinical managers	**3.485**	**2.908**	**0.894**	**0.133**	**2.174**
Total staff	-1.939	-7.450***	-5.068**	-0.419	-3.829**
% nurses	44.185**	23.185	31.898**	29.393*	34.303**
Beds: Less than 400	2.287	-3.595*	-4.237**	-0.776	-1.408
Beds: 400-599	4.145***	0.112	0.351	0.436	1.323
% female	-42.330*	-26.813	-13.271	-1.305	-20.629
% aged 75 plus	21.657	2.434	6.405	28.684**	14.687
% emergency admissions	-7.440	-13.964*	-22.062***	-13.528	-14.653**
Mean length of stay	-1.919*	-2.265***	-1.874**	-1.720**	-1.795***
GDP per capita	-0.005	-0.011**	-0.013***	0.002	-0.007
Teaching hospital	-1.804	1.105	1.230	-0.687	-0.231
Foundation Trust	-1.317	-2.720***	-2.108**	-1.606*	-1.862**
Capital investment	0.629	0.478	0.068	-0.408	0.251

Additional Results

In contrast, for Germany OC does not appear to affect mortality rates

Restricting to major conditions does not yield better results for the UK whereas the results are unaffected in Germany

Conclusions

- The general finding that emerges from these studies is that organisational capital is associated with enhanced hospital performance when broad measures are employed that include both general managers and clinical practitioners with some managerial responsibilities.
- The results for Hungary and especially the UK suggest that links between organisational capital and hospital performance is not statistically observable when just employing a narrow measure.
- Therefore personnel with clinical responsibilities appear to be important in generating the types of long term improvements that are associated with organisational capital.