

Measuring regional variation in the productivity of care home in England:

Using Adult Social Care Outcomes Toolkit (ASCOT) to adjust for quality of care

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Why do we care about regional productivity of care home? (1)

In England, the Department of Health (DH) holds overall responsibility for adult social care (ASC).

The aim of ASC is to **provide services to adults who for reasons of age, disability, illness or other dependency, need help to live as normal life as possible, within a residential care setting or in their own home.**

Residential and nursing care for old people account for a significant proportion of total ASC in England. We need to know whether this care is provided efficiently.

Why do we care about regional productivity of care home? (2)

- Demographic change
 - More than 1 in 10 of the population will be aged 75 or over by 2030 (Audit Commission, 2011);
 - A rise in the conditions associated with old age that require both health and social care services. For instance, the number of people living with dementia in the UK is expected to reach 1.4 million by 2040 (Audit Commission, 2011);
- Rising costs of care and support services (Fernandez and Forder, 2012)



Councils with care responsibilities have to make their own decisions about how to spend their money wisely. This means they have to

- Maintain or reduce the costs of services;
- Preserving quality of care and service outcomes.

We need to measure the regional productivity of care homes in order to understand whether public spending on care homes has achieved 'value for money' in different regions.

How to measure productivity in ASC? (1)

A cost weighted output index is constructed by a Laspeyres form. Output index growth in LA is written as,

$$I_{it+1} = \frac{\sum_{j=1}^J x_{jit+1} c_{jit} \left(\frac{q_{it+1}}{q_{it}} \right)}{\sum_{j=1}^J x_{jit} c_{jit}}$$

Where x_{jt} is the volume of ASC type j with $j = 1 \dots J$ in period t , and c_{jt} is the unit cost of output j at time t (Castelli et al., 2007, Bojke et al., 2013, Eurostat, 2001).

Total input of social care can be measured by the money spent on adult social care by the social services department in LAs in England (equivalent to direct input),

$$Z^{ind} = \frac{\sum_{n=1}^N \gamma_n E_{nt+1}}{\sum_{n=1}^N E_{nt}}$$

Where E_n is expenditure on input type n ; γ_n is the deflator applied to input n to wash out the effect of price rises in expenditure growth, and t is time ([Bojke et al., 2012](#)).

How to measure productivity in ASC? (2): Productivity growth

- Productivity is to compare total amount of the output to total input for ASC ([Castelli et al., 2007](#), [Dawson et al., 2005](#)):

$$\text{Productivity growth index} = \left(\frac{I}{Z}\right) \times 100$$

Where I is the index of output growth, Z is the index of input growth.

Challenges we face in measuring productivity in social care

Office of National Statistics (ONS) provided two reports on productivity in ASC services in 2006 and 2007 (Office of National Statistics, 2006, Office of National Statistics, 2007).

Limitations

- No quality adjustment of output because of data availability;
- Do not take into account attribution problems, such as general health needs of the population.

Can we learn from productivity analysis in health care?

- The productivity measures used in healthcare have a number of advantages:
 - Capture a range of health services delivered to NHS patients;
 - Make use of routine collection of health outcome data as quality adjustment of output;
 - Can be disaggregated both to different settings and to sub-national levels.
- **Limitations**
 - The quality adjustment indicators (survival rates, waiting times, etc) are not applicable for ASC;
 - Cannot solve attribution problems. For example, changing levels of average need in the region.

Measuring productivity in social care (1): Quality adjustment

- Quality indicators:
 - Structure:
 - ‘Relatively stable characteristics of the providers of care, of the tools and resources they have’(Donabedian, 1980);
 - Insensitive to changes over time, lack the core focus of the carer-service user relationship(Malley and Fernández, 2010)
 - Process and outcomes: Can be captured by using **Adult Social Care Outcomes Toolkit(ASCOT)**

ASCOT is developed to measure social care outcome and process in eight conceptually distinct attributes:

1) personal cleanliness and comfort, 2) food and drink, 3) control over daily life, 4) personal safety, 5) accommodation cleanliness and comfort, 6) social participation and involvement, 7) occupation, 8) dignity (Netten et al. 2012b).

Measuring productivity in social care (2): Quality adjustment

- Two main attribution problems may influence quality of care:
 - Clients' needs;
 - Other attribution problems:
 - Population level needs;
 - Demographic characteristics;
 - Socioeconomic characteristics.

Measuring productivity in social care (3): Quality adjustment

We are interested in knowing the gain in Quality of Life (QoL) that our ASC services create for service users (i.e. gain in ASCOT).

$$\Delta y = y^c(\text{quality, needs, otherattri}) - y^e(\text{needs, otherattri})$$

A linear model using ASCOT as the dependent variable can be denoted as follows,

$$y_{it} = \alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit} + \varepsilon_{it}$$

Where i is LA, t is the years, x are the health needs variables, i.e., health needs; z_k are LA characteristic variables, i.e., population needs, demographic characteristics and economic development variables; and α , β , and γ are the parameter vectors, ε is the residual.

Measuring productivity in social care (4): Quality adjustment

Predicted value for quality of care can be obtained after controlling for needs from service users and LA level characteristics.

The residual of Equation above, in a panel data regression, comprises two parts: v_i - unobserved quality factors that are constant across years; μ_{it} - the idiosyncratic quality changes. In other models, the residual can be obtained directly from the difference between the actual ASCOT and the predicted ASCOT. We obtain the predicted value for quality of care,

$$q_{it} = y_{it} - (\alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit} \gamma_k) = \varepsilon_{it}$$

Normalising quality of care, $q_{it}^{SCRQoL} = \varepsilon_{it} + \bar{y}$

The year to year quality of care change can then be obtained by

$$\Delta Quality = \frac{q_{it+1}}{q_{it}} = \frac{\varepsilon_{it+1} + \bar{y}}{\varepsilon_{it} + \bar{y}}$$

Measuring productivity in social care (5): Output growth index with quality adjustment

- Output Growth Index with quality adjustment

$$I_{it+1} = \frac{\sum_{j=1}^J x_{jit+1} c_{jit} \left(\frac{q_{it+1}}{q_{it}} \right)}{\sum_{j=1}^J x_{jit} c_{jit}} = \frac{\sum_{j=1}^J x_{jit+1} \left(\frac{\varepsilon_{jit+1} + \bar{y}}{\varepsilon_{jit} + \bar{y}} \right) c_{jit}}{\sum_{j=1}^J x_{jit} c_{jit}}$$

Outline of the rest of the presentation

- Data sources
 - Adult Social Care Survey 2010, 2011 and 2012;
 - Personal Social Services Expenditure and Unit Costs (PSSEX1) and Adult Social Care Survey (ASCS) of 2010 to 2012;
 - Various council data sets.
- Main findings
- Discussion and limitation

Data sources

Data sources

- Adult Social Care Survey (ASCS) 2010, 2011 and 2012
 - An annual survey
 - Service users were sent questionnaires to seek their opinions over a range of outcome areas to gain an understanding of service users' views and experience.
 - **Use ASCS to obtain aggregated ASCOT scores, client needs at LA level.**
- Personal Social Services Expenditure and Unit Costs (PSSEX1) 2010, 2011 and 2012
 - **Use PSSEX1 to obtain output and input data at LA level.**
- Various datasets from LA and census

Sample selection (N = 142): Drop LAs who did not provide full information on output, input and ASCOT

Variable specifications (1): Quality adjustment

Dependent variables		Variable specification	Data source
ASCOT (for service user above 65 residential and nursing care)		An average ASCOT score for each LA is used.	ASCS 2010, 2011 and 2012. Aggregated to LA level.
Independent variables		Variable specification	Data source
Service user health needs variables	Health needs	<ul style="list-style-type: none"> • Percentage of male service users • EQ5D: <ul style="list-style-type: none"> ○ Pain and discomfort; ○ Anxiety and depression; ○ Being able to get around indoors; • IADL (Instrumental ADL) <ul style="list-style-type: none"> ○ Being able to deal with finances/paperwork; • ADL <ul style="list-style-type: none"> ○ Being able to get in/out bed/chair by yourself; ○ Being able to feed yourself; ○ Being able to deal with finances/paperwork; ○ Being able to wash all over by yourself using bath or shower; ○ Being able to get dressed/undressed by yourself; ○ Being able to use WC/toilet by yourself; ○ Being able to wash face and hands by yourself. 	ASCS 2010, 2011 and 2012. Aggregated to LA level.
	Demographic characteristics	<ul style="list-style-type: none"> • Percentage of population above 65 • Percentage of population above 85 	
LA level characteristics	Pop needs	<ul style="list-style-type: none"> • Mortality rate, Limiting long standing illness etc. 	Various sources from Office of National Statistics
	Socioeconomic characteristics	<ul style="list-style-type: none"> • Average housing price • Average weekly wage • Living arrangement 	

Variable specifications (2): Output and input measure

- **Output**

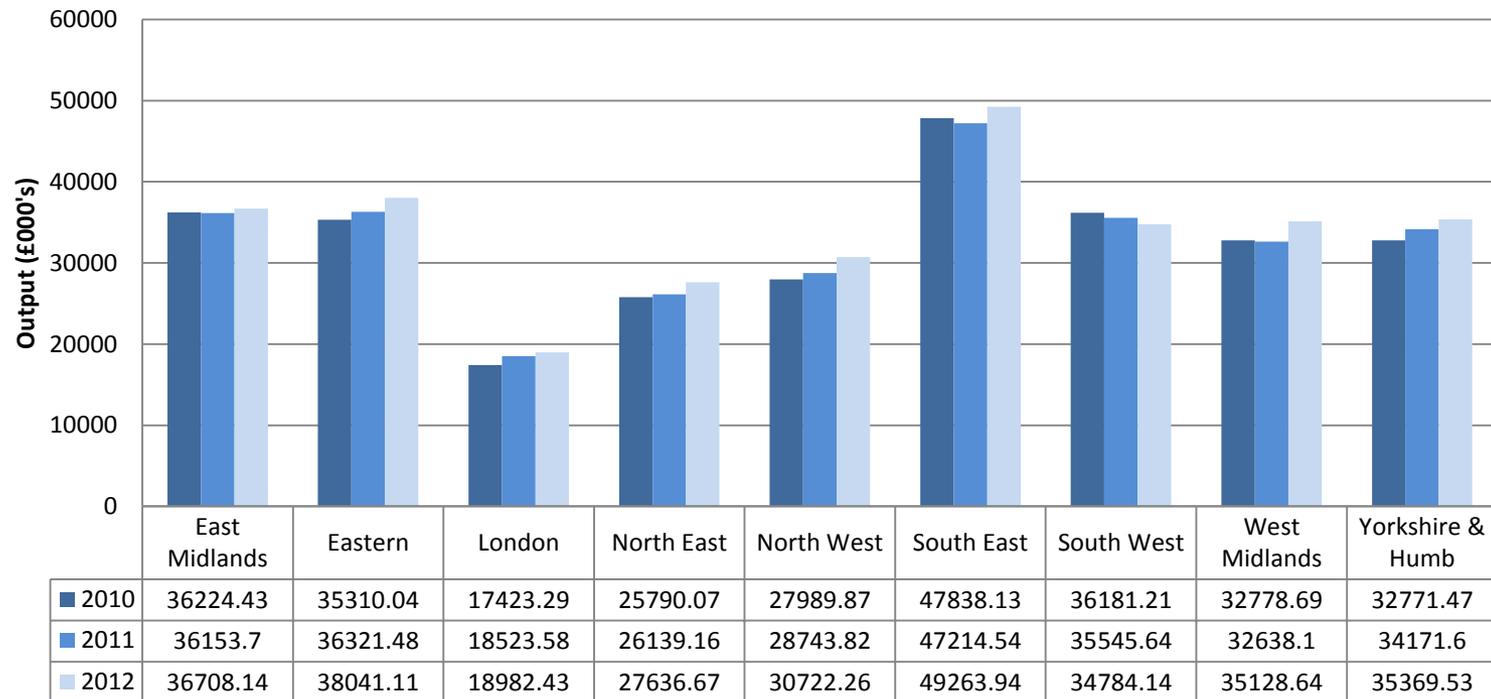
- Services measured in terms of time (e.g. number of weeks of residential care);
- Weighted by unit cost;
- Aggregated at LA level.

- **Input**

- Net current expenditure excludes capital charges less total income;
- Gross current expenditure excludes capital charges less income from joint arrangements, the NHS, and other income;
- Net total expenditure includes capital charges less total income;
- Deflated by Personal Social Services (PSS) Pay and Prices Index (Personal Social Services Research Unit, 2013)

Main findings

Regional output 2010 to 2012 (unadjusted) (£000's)



Outputs (without quality adjustment) are increasing for most regions from 2010 to 2012, except for SW.

Quality adjustment using ASCOT score

Client needs

Attribution factors

	OLS1	OLS2	FE1	FE2	RE1	RE2
gender	-1.331*	-1.502*	-1.551	-1.351	-1.257*	-1.305
ADL	-0.227***	-0.309***	-0.173***	-0.239***	-0.208***	-0.284***
IADL	0.209	0.617*	0.224	0.603	0.141	0.535*
EQ5D	-1.563***		-1.361***		-1.530***	
Avg. weekly wage(lg)	-0.058	-0.025	-1.178	-0.682	-0.222	-0.179
Avg. weekly HH income	0.049	0.103	-0.293	-0.94	0.13	0.18
Standardised mortality rate	0.006	0.008	0.006	-0.003	0.007	0.009
%Attendance allowance	-2.222	-3.85	-6.18	-0.118	-3.246*	-4.637*
%pop65plus	0.42	-2.255	24.399	33.184	0.313	-1.912
%pop85p	5.116	17.636	-96.454	-137.516	1.715	12.438
%limiting long standing illness	0.003	0.005	-0.028	-0.025	0.004	0.005
%Living alone	1.340*	1.754*	0.21	0.313	1	1.298
constant	26.129***	20.243***	40.514*	39.627*	26.114***	20.234***
r2	0.35	0.23	0.246	0.132		
r2_a	0.332	0.211	0.225	0.109		
rho			0.7	0.669	0.197	0.238
sigma_u			0.791	0.789	0.257	0.31
sigma_e			0.518	0.555	0.518	0.555

Using adjusted ASCOT from the regression:

$$q_{it} = y_{it} - (\alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit} \gamma_k) = \varepsilon_{it}$$

Normalising the residual:

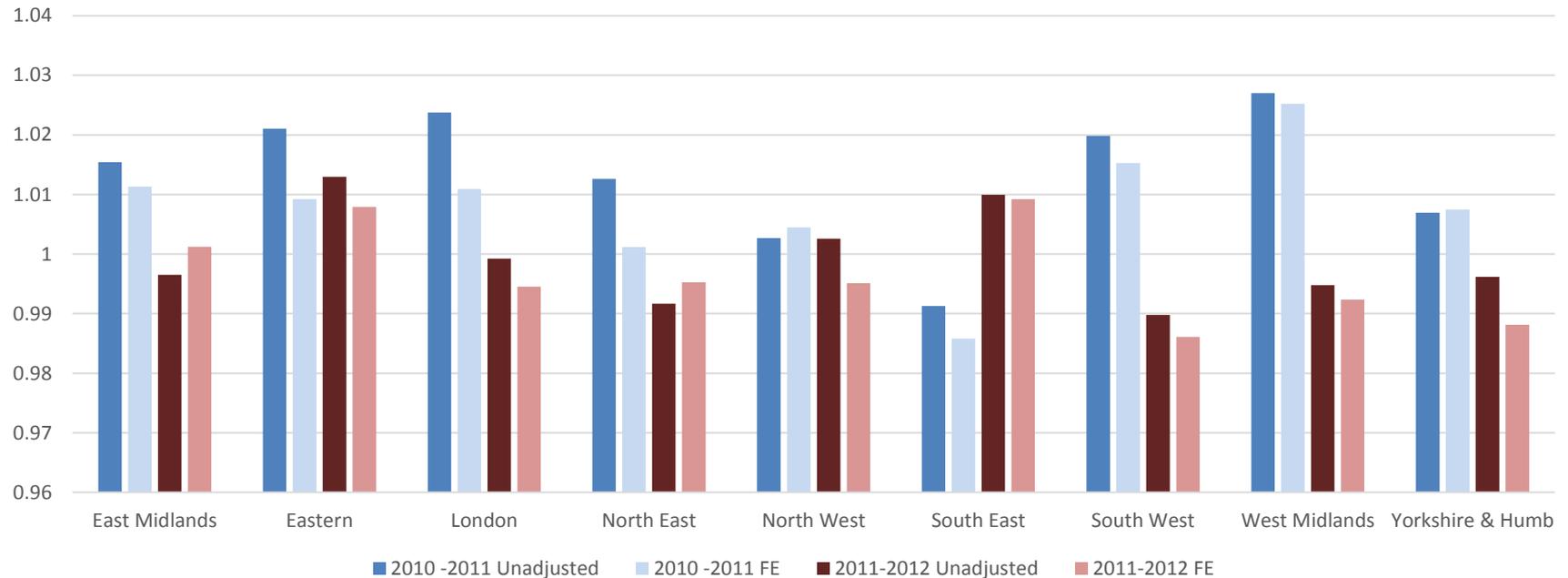
$$q_{it}^{SCRQoL} = \varepsilon_{it} + \bar{y}$$

Quality growth:

$$\Delta Quality = \frac{q_{it+1}}{q_{it}} = \frac{\varepsilon_{it+1} + \bar{y}}{\varepsilon_{it} + \bar{y}}$$

Quality of care is associated with client needs and some of the regional characteristics.

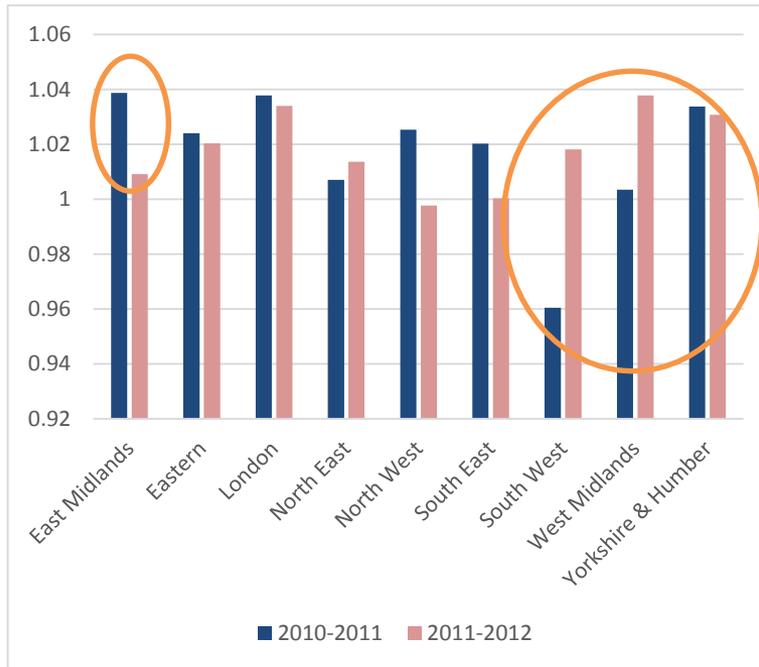
ASCOT (Unadjusted and Fixed Effect Adjusted) 2010 - 2012



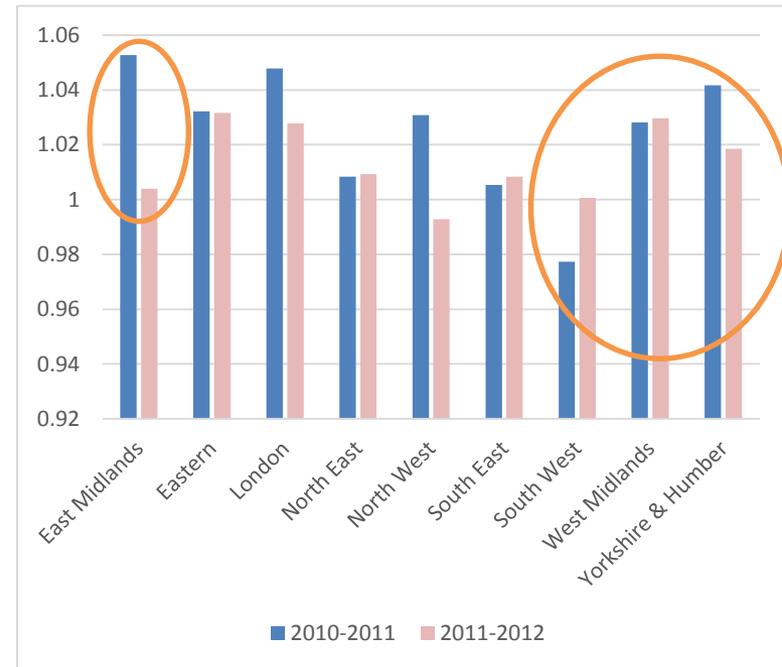
Some difference are observed between unadjusted ASCOT and adjusted ASCOT using fixed effects model.

Regional output growth indices (quality adjusted)

Cost Weighted Regional Output Growth Indices (Unadjusted)



Cost Weighted Regional Output Growth Indices (Quality adjusted using fixed effects regression)

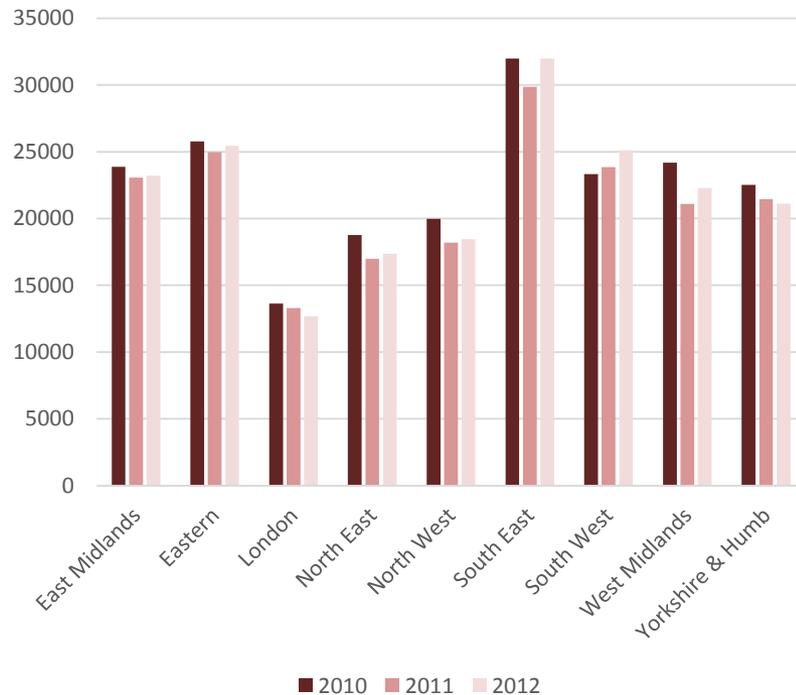


Quality adjustment made some differences on the overall output growth indices (see the marked bars).

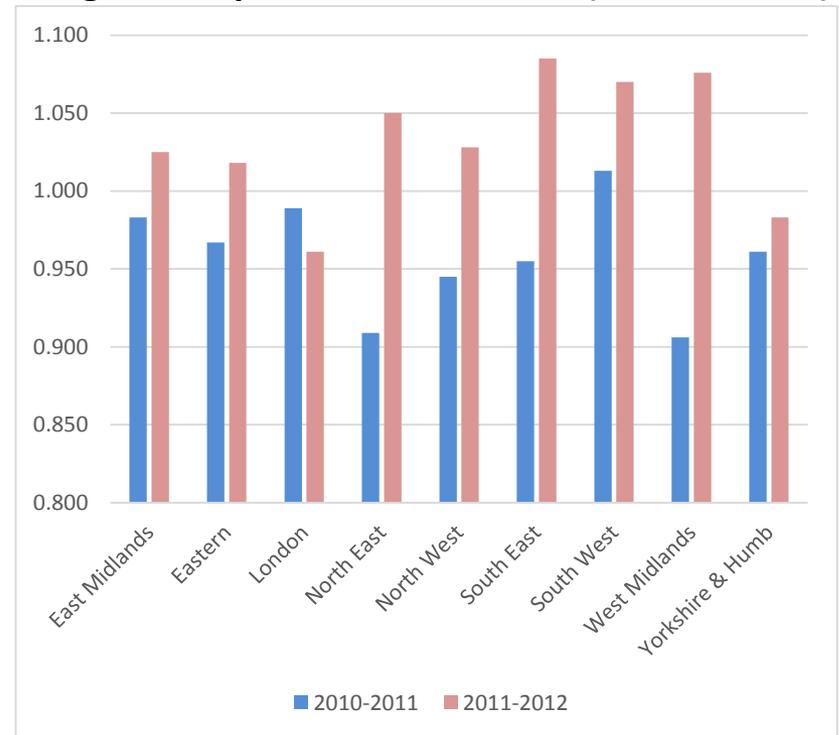
Regional input growth indices (PSS deflated)

Input growth indices were negative for most regions from 2010 to 2011, and were positive most regions from 2011 to 2012.

Regional input (PSS deflated) (£000's)

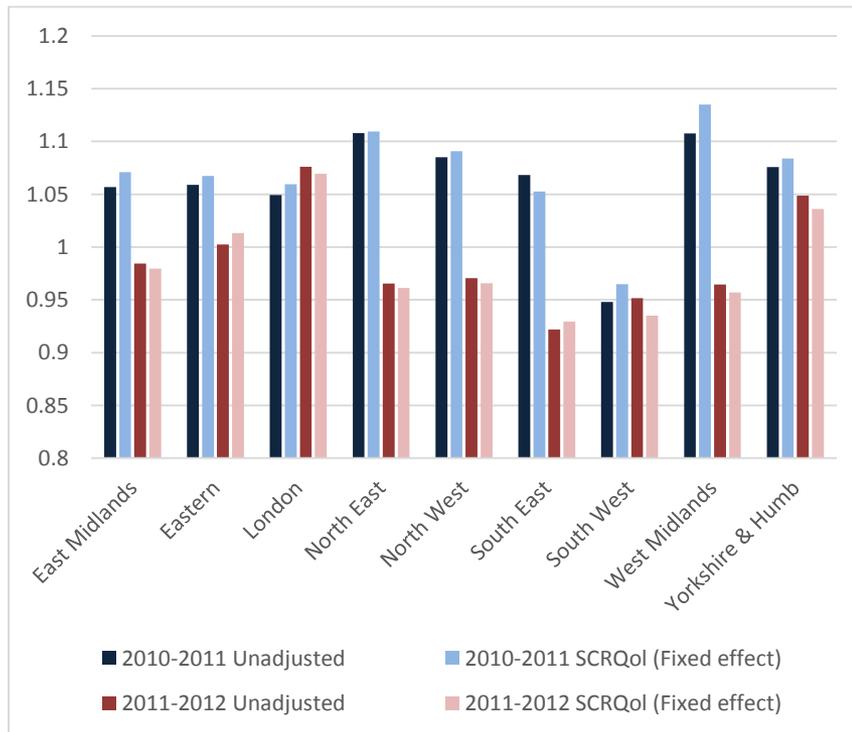


Regional Input Growth Indices (PSS deflated)

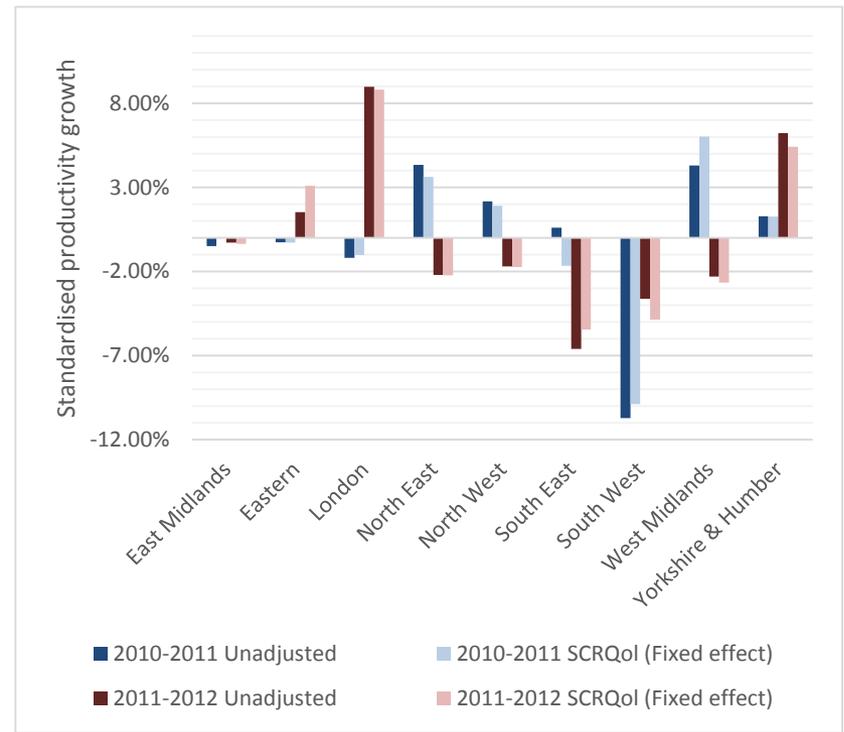


Regional productivity growth indices 2010 to 2012

Productivity Growth Indices (Unadjusted and Fixed Effect Adjusted)



Productivity Growth Standardised by National Average (Unadjusted and Fixed Effect Adjusted)



Discussion and conclusion

Some conclusions

- **Quality adjustment**
 - The quality adjustments made some differences on output growth indices (slide 20, 21 and 22);
 - Our results suggest that the quality of care for older adults increased from 2010 to 2011, and slightly decreased from 2011 to 2012.
- **Productivity growth**
 - This study found that output in most regions continue to increase, meaning that the amount of residential and nursing care provided to older people from 2010 to 2012 increased;
 - Input growth indices were negative for most regions from 2010 to 2011, and were positive most regions from 2011 to 2012;
 - Most regions showed some increases in productivity from 2010 to 2011. Productivity remained the same or showed some slight decreases for most regions from 2011 to 2012.
- **Policy implications**
 - By adopting productivity growth in a cross-sectional context, we are able to identify underperforming regions, and demonstrate areas where potential savings can made.
 - The next step would be to identify reasons why some regions are more productive than others, and to extend this method to other areas of ASC to monitor the performance of different regions.

Limitations

- Data source
 - ASCS: Unable to capture those service users who are not able to complete the questionnaires by themselves;
 - PSSEX1: Cannot separate expenditures from different input sources, i.e., labour, intermediate and capital input.
- Methods
 - Cannot adjust for all the attribution problems using the residual methods.
 - We are effectively estimating attribution problems as $\alpha + \sum_j \beta_j x_{jit} + \sum_k \gamma_k z_{kit}$ but this is likely to be mis-specified due to omitted variable (endogeneity bias).
- Changing policy context
 - Creates 'noise' in the analysis and makes interpreting changes more difficult. For example, the allocation of additional budget from NHS to ASC in 2011 .

References

- ATKINSON, A. B. 2005. *Atkinson review : interim report : measurement of Government output and productivity for the national accounts*, London, TSO.
- AUDIT COMMISSION 2011. *Improving value for money in adult social care*. London: Audit Commission.
- BOJKE, C., CASTELLI, A., GOUDIE, R., STREET, A. & WARD, P. 2012. Productivity of the English National Health Service 2003-4 to 2009-10.
- BOJKE, C., CASTELLI, A., STREET, A., WARD, P. & LAUDICELLA, M. 2013. Regional variation in the productivity of the English National Health Service. *Health Economics*, 22, 194-211.
- BRAVEMAN, P. 2006. Health disparities and health equity: Concepts and measurement. *Annual Review of Public Health*.
- CASTELLI, A., DAWSON, D., GRAVELLE, H., JACOBS, R., KIND, P., LOVERIDGE, P., MARTIN, S., O'MAHONY, M., STEVEN, P., STOKES, L., STEVEN, P. & WEALE, M. 2007. A new approach to measuring health system output and productivity. *National Institute Economic Review*. York, UK: Sage Publication.
- CHARLESWORTH, A. & THORLBY, R. 2012. *Reforming social care: option for funding*. London: Nuffield Trust.
- CULYER, A. J. & WAGSTAFF, A. 1992. *Need, equity and equality in health and health care*, University of York, Centre for Health Economics.
- DAWSON, D., GRAVELLE, H., O'MAHONY, M., STREET, A., WEALE, M., CASTELLI, A., JACOBS, R., KIND, P., LOVERIDGE, P., MARTIN, S., STEVEN, P. & STOKES, L. 2005. *Developing new approaches to measuring NHS outputs and activity*
- DEPARTMENT FOR COMMUNITIES AND LOCAL GOVERNMENT 2007. *The New Performance Framework for Local Authorities and Local Authority Partnerships: Single Set of National Indicators*. London: Department for Communities and Local Government.
- DEPARTMENT OF HEALTH UK 2012. *Equality Objectives Action Plan London*: Department of Health UK,.
- DONABEDIAN, A. 1980. *Explorations in quality assessment and monitoring*, Ann Arbor, Health Administration Press.
- EUROSTAT 2001. *Handbook on price and volume measures in National Accounts*. Luxembourg.
- FERNANDEZ, J.-L. & FORDER, J. 2012. Equity, efficiency, and financial risk of alternative arrangements for funding long-term care systems in an ageing society. *World Review of Economic Policy*, 28, 193-193.
- FERNANDEZ, J.-L., SNELL, T. & WISTOW, G. 2013. Changes in the patterns of spcial care provision in England: 2005/6 to 2012/13. *PSSRU discussion paper 2867* [Online].
- MALLEY, J. & FERNÁNDEZ, J.-L. 2010. Measuring quality in social care services: theory and practice. *Annals of Public and Cooperative Economics*, 81, 559-582.
- MALLEY, J. N., TOWERS, A.-M., NETTEN, A. P., BRAZIER, J. E., FORDER, J. E. & FLYNN, T. 2012. An assessment of the construct validity of the ASCOT measure of social care-related quality of life with older people. *Health and Quality of Life Outcomes*, 10.
- NETTEN, A. 2011. *Overview of outcome measurement for adults using social care services and support*. London: The School for Social Care Research.
- NETTEN, A., BURGE, P., MALLEY, J., POTOGLU, D., TOWERS, A. M., BRAZIER, J., FLYNN, T., FORDER, J. & WALL, B. 2012a. Outcomes of social care for adults: developing a preference-weighted measure. *Health Technology Assessment*, 16, 1-+.
- NETTEN, A., BURGE, P., MALLY, J., POTOGLU, D., TOWERS, A.-M., BRAZIER, J., FLYNN, T., FORDER, J. & WALL, B. 2012b. Outcomes of social care for adults: developing a preference-weighted measure. *Health Technology Assessment*, NIHR.
- OFFICE OF NATIONAL STATISTICS 2006. *Public service productivity: Adult social care. Economic trends (discontinued)*, 632.
- OFFICE OF NATIONAL STATISTICS 2007. *Public service productivity: Adult social care*. London: Office of National Statistics.
- PERSONAL SOCIAL SERVICES RESEARCH UNIT 2013. *Unit Costs of Health and Social Care 2013*. Canterbury: Personal Social Services Research Unit, The University of Kent.
- STREET, A. & WARD, P. 2009. *NHS Input and Productivity Growth 2003/4–2007/8*. CHE Research Paper 47. Available: http://www.york.ac.uk/media/che/documents/papers/researchpapers/rp47_NHS_input_and_productivity_growth_2003_4.pdf.

Thank you! 😊

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