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Recruitment and retention incentives in health labour markets: an analysis of participation in NHS Scotland following Dental Vocational Training

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Recruitment and retention incentives in health labour markets: an analysis of participation in NHS Scotland following Dental Vocational Training[1]

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Abstract

This paper uses a unique individual level administrative data set to analyse the participation of health professionals in the NHS after training. The data set contains information on over 1,000 dentists who received Dental Vocational Training in Scotland between 1995 and 2006. Using a dynamic nonlinear panel data model, we estimate the determinants of post-training participation. We find there is significant persistence in these data and are able to show that the persistence arises from state dependence and individual heterogeneity. This finding has implications for the structure of policies designed to increase participation rates. We apply this empirical framework to assess the accuracy of predictions for workforce forecasting, and to provide a preliminary estimate of the impact of one of the recruitment and retention policies available to dentists in Scotland.

Keywords administrative data, labour markets, participation.

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Tables 7

Figures 3

Conflicts of interest None

Ethical approval None required

1 Introduction

Within a publicly funded health care system such as the Scottish National Health Service (NHS), the public sector takes an active role in ensuring the education and training of clinicians and other health care professionals. Across the different NHS jurisdictions of the UK this activity is referred to as *workforce planning*. Workforce planning has to take into account projections of demand for different health professionals and to facilitate both university education and post-university training for a sufficient number of health professionals to fulfil that anticipated demand. As with any labour market, there are important dynamics that must be accounted for in terms of new inflows, for example, of migrant health professionals and outflows, for example, into other health services or into non-participation. The overall costs of education and training for health professionals are large and thus workforce planning assumes considerable importance; overprovision of education and training, or excessive inflow of outside trained professionals would constitute a waste of resources whilst underprovision of education and training, or excessive outflow of trained health professionals, would result in staff shortages and possible rationing of health care.

The focus of this paper is on post-university training of dentists in the Scottish NHS and upon the application of econometric methods to administrative data, with a view to understanding the retention (avoidance of outflow) of trained dentists. The data we analyse make up an unbalanced panel recording the participation in the NHS in Scotland of all dentists who received Vocational Training (henceforth, VT) in Scotland between 1995 and 2006: over 1,000 dentists giving rise to approximately 6000 observations. Aggregate information derived from these data have previously been used to inform workforce planning for dentistry in Scotland (NES (2004) and NES (2006)). We focus on the individual level observations and estimate dynamic non-linear panel data models in order to derive the nature of the participation process and its determinants. After controlling for age, sex, country of qualifications and cohort effects we find significant persistence in participation and are able to show that this arises from state dependence rather than individual heterogeneity. This finding has potentially important implications for policies designed to increase participation because it suggests that encouraging participation per se, rather than trying to identify specific individuals or groups is more likely to be a successful instrument in increasing participation.

A number of policies have been implemented in order to increase the retention of trained dentists in the Scottish NHS and our approach permits these to be evaluated. For the purpose of this paper we focus on one policy which offered financial inducements to dentists who stayed within the Scottish NHS – the Dental Undergraduate Bursary Scheme (DUBS).

The plan of the paper is as follows: in Section 2 we discuss the structure and cost of dental training in Scotland and set out the current policy framework. Section 3 describes the data and reports descriptive statistics on the variation of participation both within and between VT cohorts. Section 4 estimates the determinants of participation in NHS Scotland following VT using a dynamic nonlinear regression model which accounts for the persistence in participation. Section 4 also provides an indication of the value of the model for workforce planning by reporting the accuracy of the model in terms of its in-sample predictions (section 4.2) and uses the predictions from the regression model to estimate the costs and benefits of the Dental Undergraduate Bursary Scheme (section 4.3). Section 5 concludes.

2 Background

2.1 The structure and cost of dental training in Scotland

The public sector, Higher Education Institutions and students make relatively large, and specific, investments in dental training.

The man funding agency for Scottish universities, the Scottish Funding Council (SFC), pays each dental school a fixed price for each funded dental student. The number of dental students is controlled by central government. Thus, despite persistent excess demand from suitably qualified applicants, dental schools are constrained to offer a fixed number of undergraduate places. In 2007-2008 the price per student was £8,000 for the first non-clinical year and £15,840 for the final 4 clinical years of training. In comparison, the price for social science students in 2008 was £4,070.

In addition, central government compensates the NHS for the clinical costs of dental training through ring-fenced additional funds.[1] In 2007-2008 these funds amounted to £13,022,910 or £26,256 per clinical undergraduate student.

After graduating, dentists are able to register with the appropriate professional body, the General Dental Council, which enables them to practise dentistry in the UK. However, in order to be eligible to work in the NHS, new or recent graduates from UK dental schools must complete a programme of VT. Typically, VT comprises 12 months of supervised clinical experience in an approved training practice supplemented by an educational programme. VT is subsidised by the public sector in a number of different ways. In Scotland, trainees in the 2005-06 cohort received a salary of £27,372 and a *Vocational Training Allowance* of £3,000 (£6,000 in a designated area[2]).[3] A number of allowances and grants are specifically available to trainers: a *Vocational Training Practice Allowance* of £1,500 per trainee per year; new and existing training practices can apply for a *Vocational Training Practice Improvement Grant* of up to £10,000;[4] a *Trainers' Allowance* of £985 per month per trainee; and trainers receive the gross earnings of their trainees.

2.2 Policy framework

In response to concerns about access to NHS dental services, the *Dental Action Plan* (Scottish Executive (2005)) set out a number of supply side policies.

[1] There is a similar funding system in England.

[2] Designated areas include, Orkney, Shetland, Western Isles, Highland, Borders, Dumfries & Galloway, Grampian and, within Argyll & Clyde, Campbeltown, Dunoon, Lochgilphead, Lochgoilhead, Oban, Rothesay, Tarbert and the Isles of Mull, Iona, Colonsay, Tiree, Islay and Jura, and the Isle of Arran.

[3] Trainee salaries are paid by their trainer who is reimbursed for the full amount by the NHS.

[4] Depending upon the proportion of total earnings accounted for by NHS earnings and provided the practice continues to offer training for 3 years after the award of the grant.

The output target from Scottish dental schools has increased from 120 to 135 students since 2004. Adjusting for a 5 year attrition rate of about 10%, this output target requires an intake of approximately 150 students. Figure 1 shows the actual and expected output from Scottish dental schools and includes the output from a new dental school which is due to start training 15 graduate students on a four year course in 2008 and 20 students each year thereafter.

Figure 1: Actual and expected graduates from Scottish Dental Schools

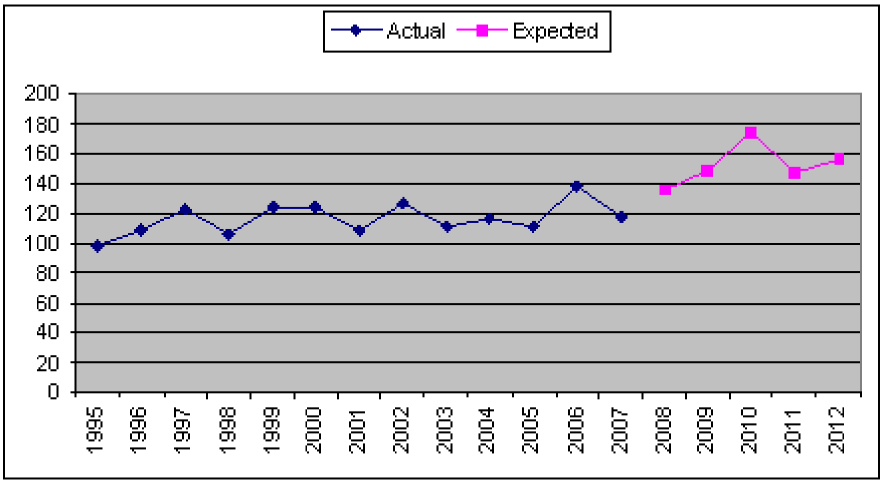


Table 1 shows that VTs are a relatively important, and increasing, source of the inflow into the stock of NHS dentists in Scotland. Government has committed to fund enough VT places in Scotland to match the output from Scottish dental schools.[5]

Table 1: The stock and flow of dentists in NHS Scotland

	Inflow			Outflow	Stock
	Returners	Other Joiners	from VT		
1996	0	175	54	159	2323
1997	21	167	71	158	2358
1998	31	173	70	157	2411
1999	37	160	80	153	2462
2000	34	162	61	194	2465
2001	46	166	87	194	2488
2002	52	164	87	164	2550
2003	51	168	92	192	2583
2004	47	184	93	206	2617
2005	58	193	84	203	2669
2006	70	314	106	219	2842
2007	62	260	97	259	2919

A number of other recruitment and retention incentives have been made available through the Dental Action Plan including payments which range from £5,000 to £20,000 for dentists who begin or resume work for the NHS following training or a career break and,

[5] The inflow from VT may comprise some dentists who have previously worked in the NHS (Returners) and, the majority, who had not previously worked in the NHS (Other Joiners). Thus there is double counting in Table 1.

of particular interest for this study, the Dental Undergraduate Bursary Scheme (DUBS) which offers eligible dental students £4,000 for each of their 4 clinical years while at dental school, in return for a commitment to work for the NHS.

3 Empirical framework

3.1 Data

Using the dentist's registration number, it is possible determine whether a dentist worked in NHS Scotland in any year, henceforth *participated*, following VT. The data in this paper report information on the participation of dentists who undertook VT between 1995 and 2006.

Figure 2 shows the participation rates by VT cohort for each year after VT. It can be seen that participation rates are falling over time within each cohort but there is some variation across cohorts at each year post VT.

Figure 2: Participation rates by cohort

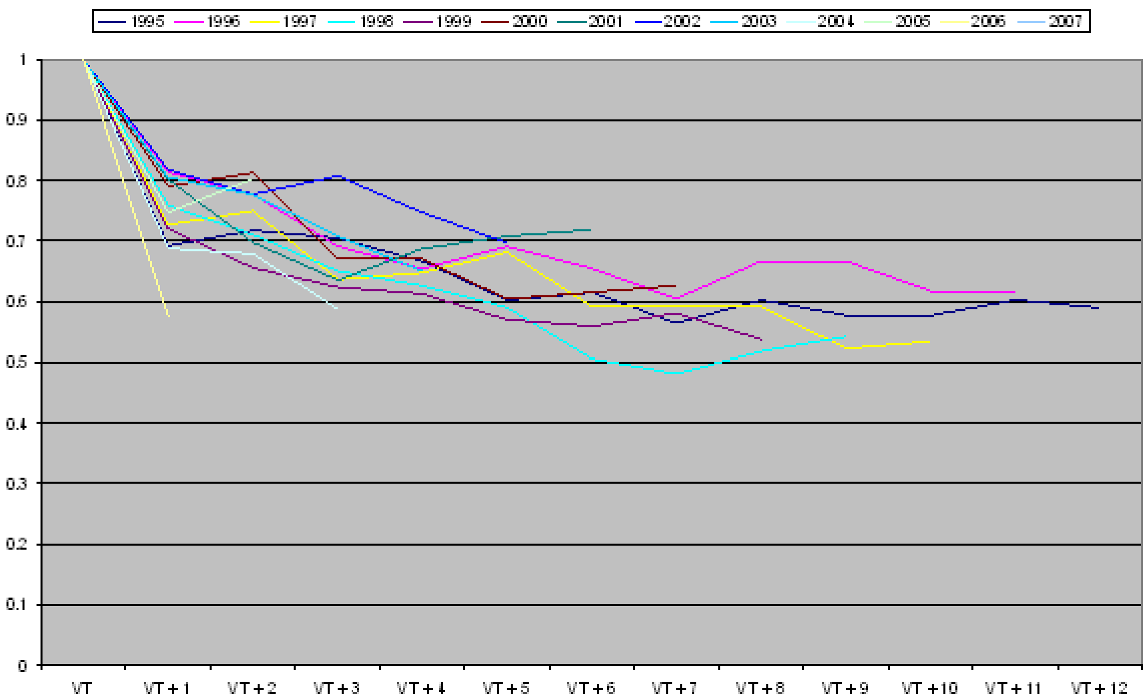


Figure 2 also shows a reduction in participation rates within each cohort but no clear pattern of participation between cohorts. The following sections consider the variation in participation rates within (section 3.1.1) and between (section 3.1.2) VT cohorts in more detail. Section 4 analyses the variation in participation rates both within and between cohorts within a regression framework.

3.1.1 Variation within cohorts

Table 2 reports a 1 in the year column if a dentist from the 2000 cohort was active in that year and shows the pattern of participation for the 2000 cohort.

Table 2: Patterns of participation: 2000 cohort

VTs	%	VT	VT + 1	VT + 2	VT + 3	VT + 4	VT + 5	VT + 6	VT + 7
36	39.56	1	1	1	1	1	1	1	1
10	10.99	1	0	0	0	0	0	0	0
6	6.59	1	1	1	0	0	0	0	0
5	5.49	1	0	1	1	1	1	1	1
4	4.4	1	1	0	0	0	0	0	0
4	4.4	1	1	1	1	1	0	0	0
3	3.3	1	1	1	0	1	1	1	1
2	2.2	1	0	1	0	0	0	0	0
2	2.2	1	1	1	1	0	0	0	0
2	2.2	1	1	1	1	0	1	1	1
2	2.2	1	1	1	1	1	0	0	1
2	2.2	1	1	1	1	1	1	0	1
2	2.2	1	1	1	1	1	1	1	0
1	1.1	1	0	0	0	1	0	1	1
1	1.1	1	0	1	0	0	0	1	1
1	1.1	1	1	0	0	1	1	1	1
1	1.1	1	1	0	1	1	1	1	1
1	1.1	1	1	1	0	0	0	1	1
1	1.1	1	1	1	0	1	1	0	0
1	1.1	1	1	1	1	0	0	1	0
1	1.1	1	1	1	1	0	1	0	1
1	1.1	1	1	1	1	1	0	1	0
1	1.1	1	1	1	1	1	0	1	1
1	1.1	1	1	1	1	1	1	0	0
91		24	19	19	14	14	11	13	13

Of the 91 VTs in the 2000 cohort, 39.56% were active in every year after VT. However, the next most frequent pattern of participation was for 10.99% of the VTs to never work in NHS Scotland following VT.

Table 3 uses the information in Table 2 to report the frequency of participation over the 6 years after VT for this cohort: 11% never participate, 6.6% participate only once in the seven year period, 6.6% participate only twice in the 7 years after VT, and so on.

Table 3: Frequency of participation: 2000 cohort

Years of participation	%
0	10.99
1	6.60
2	6.59
3	4.40
4	7.70
5	6.60
6	17.59
7	39.56
Total	100.00

3.1.2 Variation between cohorts

Figure 2 suggests that is no clear pattern in the participation rates of trainees between cohorts: they are neither uniformly increasing nor uniformly decreasing between 1995 and 2006. However, variations in the country of qualification and the sex composition of the cohorts over time are likely to account for some of the variation in these participation rates. Table 4 presents some initial evidence of this by reporting summary statistics for the sample. This shows, for example, that there is some variation in the proportion of Scottish graduates undertaking VT in Scotland. This ranges from 0.7638 in 2005 to 0.9355 in 1999.

Table 4: Descriptive statistics of the sample by cohort

		Country of qualification							
cohort	VTs	not known	England	Ireland	N. Ireland	Overseas	Scotland	Wales	Sex
1995	78	0.0513	0.1026	0.0128	0.0000	0.0000	0.8333	0.0000	0.4359
1996	81	0.0494	0.0370	0.0123	0.0000	0.0000	0.9012	0.0000	0.5185
1997	88	0.0568	0.0227	0.0227	0.0000	0.0000	0.8977	0.0000	0.4318
1998	83	0.0482	0.0602	0.0120	0.0602	0.0120	0.8072	0.0000	0.5060
1999	93	0.0000	0.0323	0.0215	0.0108	0.0000	0.9355	0.0000	0.3871
2000	91	0.0110	0.0659	0.0000	0.0330	0.0110	0.8681	0.0110	0.4176
2001	96	0.0208	0.0521	0.0000	0.0625	0.0000	0.8646	0.0000	0.3750
2002	99	0.0101	0.0404	0.0000	0.0505	0.0000	0.8990	0.0000	0.3939
2003	103	0.0097	0.0194	0.0097	0.0291	0.0000	0.9223	0.0097	0.4660
2004	109	0.0000	0.0917	0.0550	0.0459	0.0092	0.7890	0.0092	0.4771
2005	127	0.0000	0.0394	0.0709	0.0630	0.0472	0.7638	0.0157	0.4803
2006	132	0.0000	0.0833	0.0379	0.0455	0.0000	0.8258	0.0076	0.4470

3.2 Regression methods

Denoting participation by individual i in period t by y_{it} the intertemporal participation relationship can be written

$$y_{it} = 1_{\mathbb{R}^+}\left[x_{it}\beta + \gamma_1 t + \gamma_2 t^2 + \delta_1 y_{it-1} + \delta_2 \sum_{s=1}^{t-1}\prod_{r=1}^{s} y_{t-r} + u_{it}\right] \quad (1)$$
$$(i = 1,..,N; t = 1,..,T_i)$$

where $1_{\mathbb{R}^+}[\cdot]$ is the indicator function taking the value 1 if the expression in square brackets is positive and 0 otherwise; and x_{it} is a vector of the characteristics of individual i in period t. Individuals are observed from the first time period following VT, $t = 1$, to period T_i.

Repeated observations on the same dentist over time permit the unobserved error, u_{it}, term to be decomposed as

$$u_{it} = \alpha_i + \varepsilon_{it}, \quad (2)$$

where α_i is an individual-specific component which captures unobserved, time invariant characteristics of the individual not observed in these data such as their preferences for remaining in Scotland after VT; and ε_{it} is an idiosyncratic error term which captures factors such as transitory labour market changes.

Equations 1 and 2 allow for two different sources of persistence: *unobserved heterogeneity*, α_i; and *state dependence* measured by y_{it-1} and/or $\sum_{s=1}^{t-1}\prod_{r=1}^{s} y_{t-r}$ (Hsiao (2003)). Identifying which of these sources drives the persistence in the series is important in evaluating the effectiveness of policies, like the bursary policy, which are designed to increase recruitment and retention. For example, if there is persistence in the participation series and it is driven by unobserved individual heterogeneity, then the bursary policy is likely to have little impact on participation rates, but will be a source of rent for those who would have participated even in the absence of the bursary. In contrast, if the persistence is driven by state dependence then any policy that increases participation *temporarily* will have *permanent* effects on participation.

Analyses of dynamic panel data have to contend with the *initial conditions* problem: if the series is not observed from the beginning or if the error term is serially dependent, the initial condition of the sample is likely to be correlated with the error term and the estimated coefficients in Equation 1 will be inconsistent. These data are observed from the beginning of the series but we are assuming individual specific random effects, α_i, so the error term is serially dependent and therefore the initial condition of the series, y_{i0}, can't be treated as exogenous (Hsiao (2003)). In order to address the initial conditions problem we adopt the approach set out in Wooldridge (2005) and also used in Contoyannis et al. (2004). This conditional maximum likelihood (CML) approach paramaterises the random effects in terms of the initial condition and the mean values of the exogenous variables

$$\alpha_i = \alpha_0 + \alpha_1 y_{i0} + \alpha_2 \bar{z}_i + a_i \tag{3}$$

where $a_i \sim N\left(0, \sigma_a^2\right)$ and $\bar{z}_i$ denotes the mean values of the exogenous variables.

Equation 1 is estimated using a probit without random effects, a probit with random effects and a probit with random effects and controls for the initial condition.

4 Results

4.1 Regression results

Table 5 reports the results of estimating Equation 1 using a number of specifications. Model 1 assumes no individual specific random effects. Model 2 includes random effects but does not control for the likely correlation between the initial condition and those random effects. Model 3 is the CML model.

Ignoring the initial condition, the proportion of the variance accounted for by VT specific effects, ρ, is 0.065 which is not significant at the 5% level but is significant at the 10% level. This would suggest the restriction that $\rho = 0$ should be imposed and the results of the standard probit reported. However, the CML shows that when the initial condition is controlled for, the proportion of the variance accounted for by the VT specific effects increases and is significantly different from zero. The only additional parameter in the CML model is the initial condition of the series, y_{i0}.[6]

Given these results we restrict discussion to the marginal effects from the CML model.

[6] The only time varying variable in the model is the number of years post VT. The mean of this variable is perfectly correlated with the cohort variable.

Table 5: Regression results

	m1	m2	m3
	b/se	b/se	b/se
Sex (Male = 1)	0.1048*	0.1219*	0.1845*
	[0.0469]	[0.0539]	[0.0714]
Cohort = 1995	0.18	0.1836	0.2414
	[0.1311]	[0.1442]	[0.1842]
Cohort = 1996	0.1706	0.1794	0.1527
	[0.1323]	[0.1434]	[0.1826]
Cohort = 1997	0.0909	0.0926	0.1141
	[0.1305]	[0.1421]	[0.1802]
Cohort = 1998	0.0601	0.0637	0.0215
	[0.1309]	[0.1447]	[0.1841]
Cohort = 1999	0.0313	0.0233	0.0065
	[0.1295]	[0.1422]	[0.1802]
Cohort = 2000	0.1437	0.1485	0.1267
	[0.1363]	[0.1438]	[0.1807]
Cohort = 2001	0.2325+	0.2407+	0.2173
	[0.1401]	[0.1458]	[0.1825]
Cohort = 2002	0.2426+	0.2617+	0.2964
	[0.1425]	[0.1524]	[0.1888]
Cohort = 2003	0.0615	0.0679	0.0499
	[0.1444]	[0.1531]	[0.1889]
Cohort = 2005	0.7279*	0.7384*	0.8851*
	[0.1963]	[0.2095]	[0.2513]
Duration post VT (years)	-0.1448*	-0.1452*	-0.1748*
	[0.0451]	[0.0473]	[0.0510]
Duration post VT squared (years)	0.0068+	0.0070+	0.0091*
	[0.0035]	[0.0038]	[0.0040]
Country of qualification: England	-0.4180*	-0.4744*	-0.5902*
	[0.0932]	[0.1251]	[0.1631]
Country of qualification: Ireland	-0.6234*	-0.6935*	-0.8953*
	[0.1811]	[0.2335]	[0.3058]
Country of qualification: Northern Ireland	-0.5746*	-0.6604*	-0.7520*
	[0.1569]	[0.1863]	[0.2338]
Country of qualification: Overseas	-0.6463*	-0.6917	-0.7074
	[0.2015]	[0.4667]	[0.6028]
Country of qualification: Wales	0.0956	0.0598	0.1874
	[0.3069]	[0.5211]	[0.6664]
Country of qualification: Not known	-0.8286*	-0.9398*	-1.0009*
	[0.1693]	[0.2132]	[0.2729]
l1	1.9954*	1.9769*	1.6461*
	[0.0772]	[0.0811]	[0.0938]

Table 5: Regression results

	m1	m2	m3
	b/se	b/se	b/se
state	0.1371*	0.1274*	0.0898*
	[0.0174]	[0.0203]	[0.0216]
y_{i0}			0.8514*
			[0.1126]
Constant	-0.7470*	-0.7070*	-0.9329*
	[0.1545]	[0.1689]	[0.1990]
rho		0.06487	0.29343
Sample size	5851	5851	5851
Number of VTs		1048	1048

standard errors in brackets

* (+) denotes significant at the 0.05 (0.1) level

Only the participation rate in the 2005 cohort was significantly different from the participation rate in the 2004 cohort (the omitted category with the lowest participation rate). The 2005 cohort had a participation rate 21% higher than the 2004 cohort. There does not seem to be a clear trend towards increasing participation in recent years. However, the recruitment and retention incentives from the Dental Action Plan were only introduced in 2005.

Within each cohort, the participation rate falls but at a decreasing rate: an additional year post VT reduces the probability of participation by 6%.

The participation rate for males is about 6% higher than for females.

Graduates who qualified in England, Ireland and Northern Ireland have significantly lower participation rates than graduates from Scotland. The proportion of graduates from England, Ireland and Northern Ireland are reported in Table 4. These countries have participation rates 22%, 34%, 29% lower than Scottish graduates.

There is strong evidence of state dependence in these data. The coefficient on the lagged dependent variable, y_{it-1}, shows that participation in the previous period increases participation in the current period by 57%. The coefficient on the state variable, $\sum_{s=1}^{t-1} \prod_{r=1}^{s} y_{t-r}$, shows that the longer the duration of participation in the recent past, the greater the probability of participation in the current period. For example, a dentist working in NHS Scotland for the past 5 years is more likely to participate in the next year than a dentist who has been working in NHS Scotland for the past 4 years.

The initial condition of the series is significant and suggests that participation in NHS Scotland in the first year post VT increases the probability of participation in NHS Scotland for every year thereafter by 31%.

There is also evidence of individual heterogeneity in these data after controlling for the initial condition. The estimate of ρ suggests that 29% of the variance is accounted for by individual specific effects.

These results illustrate the importance of accounting for different forms of persistence. Both individual heterogeneity and state dependence appear to be a significant determinants of participation. Consequently, these results provide empirical support for incentives targeted at increasing the participation rate of dentists and the length of time spent in NHS Scotland such as those set out in the Dental Action Plan (Scottish Executive (2005)).

4.2 In sample predictions

One use of this empirical framework is to predict the participation patterns of future cohorts of trainees in order to inform workforce planning. Tables 6 and 7 report some measures of the accuracy of the predictions from the regression model: the sensitivity (specificity) of the test is about 95% (81%) which suggests there are very few false positives (negatives). The percentage of observations correctly classified is over 90%. This information suggests that this approach is likely to be useful for forecasting the future participation of trainees.

Table 6: Classification of fitted values given a cut-off of 0.5

	Active (p)	Inactive ($1-p$)	Total
Predicted Active ($\hat{p}$)	3562	344	3906
Predicted Inactive ($1-\hat{p}$)	220	1725	1945
Total	3782	2069	5851

Table 7: Summary statistics from the model predictions

Classified $p=1$ if $\hat{p} \geq 0.5$		%
Sensitivity	$\Pr(\hat{p} \mid p)$	94.18
Specificity	$\Pr(1-\hat{p} \mid 1-p)$	83.37
Positive predictive value	$\Pr(p \mid \hat{p})$	91.19
Negative predictive value	$\Pr(1-p \mid 1-\hat{p})$	88.69
False + rate for non-participants	$\Pr(\hat{p} \mid 1-p)$	16.63
False - rate for participants	$\Pr(1-\hat{p} \mid p)$	5.82
False + rate for predicted participants	$\Pr(1-p \mid \hat{p})$	8.81
False - rate for predicted non-participants	$\Pr(p \mid 1-\hat{p})$	11.31
Correctly classified		90.36

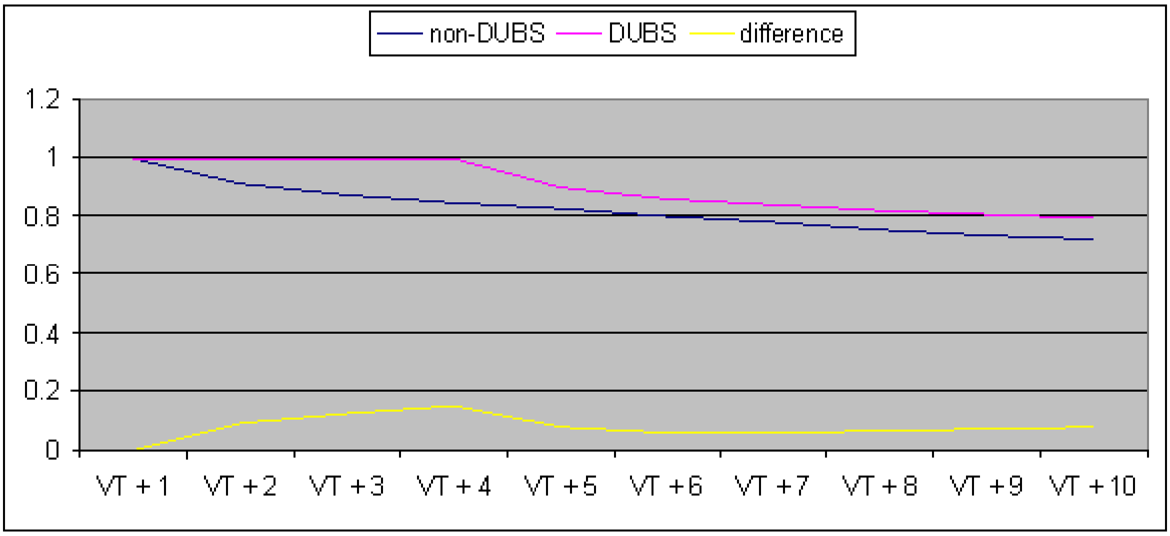
4.3 Evaluation of DUBS

A further application of this empirical framework is to evaluate the effectiveness of policies targeted at increasing recruitment and retention in NHS Scotland. Using Equation 1 and the regression results in Table 5 it is possible to estimate the impact on the probability of participation of DUBS by forecasting participation over the next 10 years.[7] Let q_t denote the probability of participation in period t in the absence of the bursary. We assume $q_t = 1$ in $VT + 1$. Estimates of q_t for $VT + t, t \in \{2, \ldots, 10\}$ can be calculated from Equation 1 and the regression results in Table 5. Let p_t denote the probability of participation in period t for those dentists who receive the bursary: $p_t = 1$ for $VT + 1$ to $VT + 4$ and p_t can be calculated using Equation 1 and the regression results in Table 5 for $VT + t, t \in \{5, \ldots, 10\}$.

[7] We choose 10 years as the planning horizon given the time span of our data.

For a representative individual[8] who trained in Scotland, Figure 3 illustrates the participation rates with and without the bursary, where the vertical difference between the two lines represents the difference in the participation rates ($p_t - q_t$) in each year. Figure 3 shows that the benefits to NHS Scotland increase during the contracted period and then fall.

Figure 3: The impact of the bursary on the probability of participation



Over a 10 year period, the expected participation of a DUBS dentist is 9.02 years. In contrast, the expected participation of a non-DUBS dentist is 8.24 years. Thus the additional benefits of a DUBS dentist is 0.78 years in NHS Scotland. According to SDPB (2007) there were about 2,000 dentists practising in Scotland in 2006-07 and about 700,000 children and 1,900,000 adults were registered. This suggests that an average dentist registers 350 children and 950 adults.

The cost of DUBS can easily be calculated. Using a 5% discount rate, the present value of the cost of the bursary for a DUBS dentist is £14,183 ($\sum_{i=0}^{3} \frac{4000}{(1+0.05)^i}$).

One way to measure the benefits of DUBS is to compare the cost of NHS treatment to the cost of private dental care. NHS patients don't pay registration fees but some, non-exempt, patients pay 80% of the total cost of treatment. Exempt patients pay nothing. In 2006, the median (mean) annual expenditure per patient on NHS dental services by adults was £16 (£34).

Private sector insurance against dental expenditure may be purchased through traditional insurance arrangements, including self insurance, or *healthcare cashplan schemes* which refund the cost of covered treatments up to a maximum limit. It is difficult to get a clear picture of the cost of these different types of insurance schemes but a search of the internet (moneysupermarket.com) for dental insurance revealed that the monthly cost of dental insurance for private treatment for a 44 year old ranged from £7 a month (4.5 times median expenditure on NHS dental services) to £20 a month (almost 15 times

[8] Base characteristics are: female, qualified from a Scottish dental school, and was in the 2004 cohort.

median expenditure on NHS dental services), depending upon the amount of cover.

Therefore, the amount of dental expenditure saved by switching from private to public sector care ranges from £50 (£84-£34) to £206 (£240-£34) per adult per year. The present value of these savings range from £22,300 per dentist (based on £50 per adult per year) to £151,855 per dentist (based on £206 per adult per year).[9] These figures exclude the savings for children who are exempt from paying NHS costs.

5 Conclusion

The individual level data and empirical framework used in this paper has estimated the determinants of participation in NHS Scotland following VT, assessed the empirical framework in terms of its ability to predict participation following VT, and provided a preliminary assessment of the Dental Undergraduate Bursary Scheme.

Subjecting almost 6,000 observations to analysis, we have found that the participation rate in NHS Scotland is systematically related to a set of observable trainee characteristics and previous participation. This distinction is important for policy purposes: while policy is unable to influence the gender or country of qualification of trainees, it is able to influence the participation rate through various recruitment and retention initiatives. Therefore, these results provide empirical support for incentives targeted at increasing the participation rate of dentists and the length of time spent in NHS Scotland such as those outlined in Scottish Executive (2005).

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[9] Based on saving £50 per patient per year and each dentist registering 950 adults per year, the present value of the output of a DUBS dentist compared to a non-DUBS dentists is $\sum_{t=0}^{14} \frac{950\times 50\times(p_t-q_t)}{(1.05)^t}$.