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Comparing the treatment provided by migrant and non-migrant health professionals: dentists in Scotland

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Abstract

Many OECD countries are increasingly relying on migrants to address shortages of trained health professionals. One key concern is whether migrant health professionals provide equivalent health care. We compare the treatment provided by migrant and non-migrant health professionals using administrative data from the Scottish dental system. A difference-in-differences model is estimated to examine whether migrant dentists respond differently to case mix and individual circumstances as compared with their non-migrant counterparts, and assess the extent to which any differences diminish over time. After controlling for both observed and unobserved differences between individual dentists and the cohort of patients that they treat, we find that migrant dentists have marginally different practice styles, and the variation diminishes over time within two years of practice.

JEL classification: C23, I11, I18, J61

Keywords: Migrant health professionals, Treatment difference, Assimilation, British NHS, Administrative data

Introduction

To address the shortages of trained health care professionals, OECD countries have adopted a mix of long-term policies of national self-sufficiency (e.g. increasing domestic training, improving retention, and adapting skill mix), and short or medium-term policies of international recruitment (OECD, 2008). Immigrant health professionals have proven to be a flexible and low-cost resource, and make a significant and escalating contribution to health care labour markets in industrialized countries. In 2000, there were approximately 400,000 migrant doctors and 710,000 migrant nurses working in the OECD area. The United Kingdom, in particular, has become one of largest recipient countries, with 33% (69,813) of the doctors and 10% (65,000) of the nurses working in 2006 qualified overseas (WHO, 2006).

There are important questions regarding the extent to which migrants are substitutes for domestically trained professionals, especially in the realm of health care, where in the presence of asymmetric information such professionals have considerable discretion over the type of care they deliver; this raises concerns regarding both the quality and safety of healthcare (OECD, 2008; Simoens and Hurst, 2006). Assessing the extent to which there are differences between internationally recruited and domestically trained health professionals is, therefore, clearly a concern for public policy. Until now, however, there has been little empirical work comparing the services delivered by migrant and indigenously trained health care professionals.

The labour economics literature has long focused on examining the economic assimilation of migrant workers (see the survey in Borjas, 1994). Upon arrival in a host country that is experiencing a shortage of country-specific human capital, migrants tend to exhibit a large earnings deficit relative to native workers of similar ability (Chiswick, 1980). However, this earnings gap usually diminishes as migrants learn the local language and institutions, accumulate local experience, and adjust their skills to suit local conditions (Eckstein and Yoram, 2003). In general, these studies use earnings as a proxy for skills, with more rapid assimilation rates, i.e. faster earnings convergence, being found among higher skilled migrants (Friedberg, 2000a, b). More recently, researchers have investigated not only earnings, but also employment in terms of labour force participation and self-employment (see, for example, the survey in Dustamn and Fabbri, 2005). It has been argued that labour market participation is more important than earnings for migration assimilation in northern and western European countries which have less flexible labour markets coupled with generous welfare systems (Zorlu and Hartog, 2008).

Whereas in conventional labour markets earnings and participation are natural measures of the extent to which migrant workers assimilate, for health care professionals a more relevant issue would seem to be the extent to which the care they supply converges on that being provided by indigenously trained counterparts. In particular the questions we address are whether there are any differences in the observed intensity of treatment provided by migrant and non-migrant dentists in the Scottish NHS and whether any such differences diminish over time, and if so, at what rate. The rate of convergence is relevant because Wang (2010) highlights a high turnover of migrant dentists in the Scottish General Dental Service (GDS). While we may expect that the high degree of transferability of medical education within Europe could reduce the assimilation time of health professionals, it is not clear to what extent the country-specific skills and practice styles developed in original countries could be adjusted to fit with the new health care system within the short stay of this particular group of migrant dentists.

To address these questions we use detailed administrative data from the Scottish National Health Service (NHS); these data enable us to measure the value of individual patient-level treatments carried out by individually identifiable but anonymous dentists and thus compare treatments carried out by migrant and non-migrant dentists over time. Our empirical method focuses on the extent to which any differences diminish over time.

The paper is organised as follows. The next section describes some relevant features of the dentist labour market and dental service provision in the NHS Scotland. The penultimate section describes our data, sets out our empirical methodology and presents the results. The final section discusses the results and concludes the paper.

Background

The majority of NHS primary care dental services in Scotland are provided by General Dental Practitioners (GDPs) in the GDS. An individual requiring treatment under the NHS visits and registers with a GDP, who is under an agreement with the GDS to provide NHS treatments; they then receive treatment from that dentist. The costs of treatment are met in part by purchasing authorities, called NHS boards, which receive government funds in order to meet the dental and medical health care needs of their constituent populations. Unlike other health services supplied by the NHS there is a substantial element of patient cost sharing in dentistry. Unless exempt from charges, which can occur for a number of reasons, the patient pays 80% of the NHS fees for their treatment up to a cash limit.

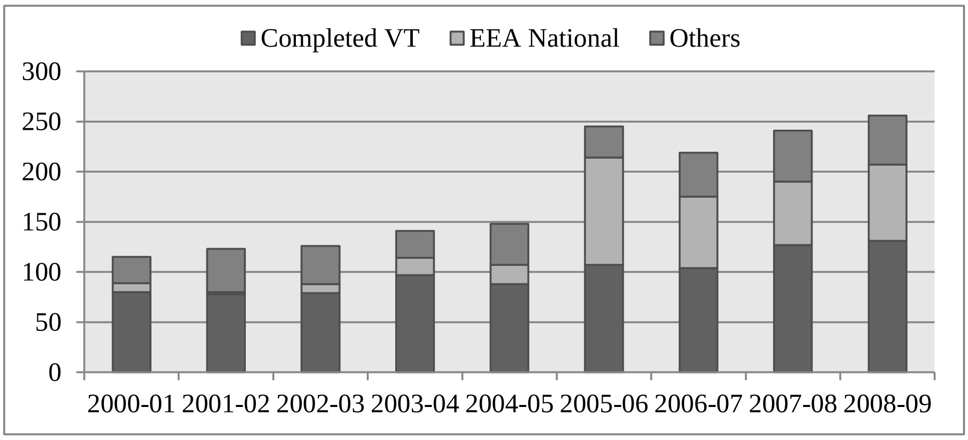
GDPs are predominantly self-employed and may work both privately and for the NHS. For NHS work a self-employed GDP's remuneration contract specifies both a fee for each treatment administered and a capitation payment for each patient registered. NHS Boards may choose to create salaried posts if access to the GDS is limited. A salaried GDP does not receive remuneration proportional to the number or types of treatments they carry out[1].

In order to practise dentistry in the GDS in Scotland, dentists need to obtain an NHS Board list number. To obtain a list number, dentists need to be issued with a Vocational Training (VT) number from NHS Education for Scotland to indicate that they have satisfactorily completed their Dental VT (DVT)[2] in the UK or are exempt from the requirement to complete DVT because:

- they are from an European Economic Area (EEA) Member State (other than the UK) and hold a recognised European Dental Diploma;
- they have had a Health Board/Performer number within the last five years;
- they have practised in primary dental care in the Community Dental Service or the Armed Forces for four years' full-time (or equivalent part-time), and for not less than four months during the past four years;
- they have completed a course of vocational training under the voluntary scheme; or
- their experience and or/training during the previous five years is equivalent to DVT.

VT numbers are therefore a lead indicator of the inflow of dentists into the NHS in Scotland. Figure 1 shows that VT numbers issued have more than doubled during the past 9 years. As can also be seen, this increase is mainly contributed by the EEA nationals. There has been a large and sustained increase in VT numbers issued to EEA applicants, particularly in 2005-06. To put these numbers into some context, the number of funded undergraduate dental students entering dental schools in Scotland in 2009-10 was 170. These EEA nationals comprise the migrant dentists in this paper.

Figure 1. VT numbers issued from October 2000 to September 2009



[1] Patients may also be treated in the NHS Community Dental Service (CDS) and the Hospital Dental Service (HDS). The role and remit of the CDS includes screening, health promotion and preventive programmes for children and adults with special needs and complements the GDS by identifying and managing the treatment of special needs groups. The HDS is a secondary care provider of dental services.

[2] Typically, DVT comprises 12 months of supervised clinical experience in an approved training practice supplemented by an educational programme.

The current policy framework for dental services in Scotland was set out in 2005 by the then Scottish Executive in the Dental Action Plan (Scottish Executive, 2005). This described a series of policy initiatives designed to "address our poor oral health record, provide better access for patients, and provide an attractive package for the professional staff who we wish to recruit to, and retain within, the NHS."

One of the policy initiatives launched by the Scottish Executive was to recruit about 35 dentists directly from Poland in 2006, to arrive in Scotland in three cohorts. These Polish dentists were employed on a three year contract with the salaried dental service after satisfactorily completing an intensive eight week English course and attending a two week residential course (NES, 2006). These recruited Polish dentists account for some but by no means all of the VT numbers issued to migrant dentists since 2005.

Empirical framework

Data

The anonymised treatment data analysed in this paper come from the Management Information & Dental Accounting System (MIDAS), which is a large-scale administrative database of linked patient-practitioner information that stores all GDS treatment in Scotland. Within each course of treatment (CoT), the patient usually receives a range of items of service, each with an associated fee; fees are regularly reviewed by a statutory 'arms-length' organisation, the Doctors' and Dentists' Review Body. The NHS payment system allocates a unique identifier for each patient, GDP, practice and CoT, making it possible to follow patients, GDPs and types of treatment over time.

The sample of data on migrant and non-migrant dentists was acquired by using the GDC number of dentists issued with a VT number to identify their GDS treatment. For migrant dentists, the sample was restricted to include only GDPs who began providing GDS treatment after January 2006. For non-migrant dentists, the sample was restricted to GDPs who completed DVT in July 2006.

The treatment data for both migrant and non-migrant dentists were restricted to information on the treatment of adults, because there is much more detailed information on the treatment of adults compared to children. The initial sample consisted of 199 migrant GDPs with 264,843 claims and 83 non-migrant GDPs with 217,755 claims which were all paid prior to September 2008. There is an obvious link between the treatment required and how long it has been since that patient consulted a dentist. We thus use visit duration as a control and therefore are required to drop each patient's first treatment (for which we do not have the treatment duration); this restricts the sample to 116,211 claims made by 192 migrant GDPs and 112,394 claims made by 83 non-migrant GDPs. Finally, we focus on treatment provided during the same experience period, i.e. the first 24 months after entry. This further reduces the sample size to 107,378 claims made by 192 migrant GDPs and 108,528 claims made by 83 non-migrant GDPs.

Table 1 reports descriptive statistics for migrant and non-migrant GDPs. Our dependent variable is the (log of) the value of a claim, which is measured in £UK at constant SDR[3]107 prices. This monetary value gives a natural measure of the extent, or intensity, of treatment that a dentist provides to their patient. From the unadjusted mean, migrant dentists provide nearly 3% more treatment per patient.

Table 1. Descriptive statistics

		Non-migrant			Migrant		
Variable	Description	N	Mean	SD	N	Mean	SD
feesdr107	Total value of the claim (constant SDR107 prices)	108528	36.52	57.54	107378	38.35	56.53
page	The age of the patient	108528	45.25	14.51	107378	45.44	14.43
psex	The sex of the patient (male=1)	108528	0.44	0.50	107378	0.45	0.50
exempt	Exemption status (exempt=1)	108528	0.27	0.44	107378	0.29	0.46
visitdur	Duration since last visit (months)	108528	5.53	3.56	107378	5.76	4.04
diag	Equals 1 if at least one treatment on the claim was a diagnosis item	108528	0.72	0.45	107378	0.70	0.46
prev	Equals 1 if at least one treatment on the claim was a preventive item	108528	0.0006	0.0243	107378	0.0004	0.0193
perio	Equals 1 if at least one treatment on the claim was a periodontal item	108528	0.49	0.50	107378	0.44	0.50
cons	Equals 1 if at least one treatment on the claim was a conservative item	108528	0.36	0.48	107378	0.40	0.49
surg	Equals 1 if at least one treatment on the claim was a surgical item	108528	0.07	0.25	107378	0.08	0.28
prosth	Equals 1 if at least one treatment on the claim was a prosthetic item	108528	0.06	0.23	107378	0.07	0.25
ortho	Equals 1 if at least one treatment on the claim was an orthodontic item	108528	0.0000	0.0053	107378	0.0001	0.0114
other	Equals 1 if at least one treatment on the claim was an 'other' item	108528	0.06	0.24	107378	0.07	0.26
occasional	Equals 1 if at least one treatment on the claim was an occasional item	108528	0.01	0.07	107378	0.01	0.11
incomplete	Equals 1 if at least one treatment on the claim was an 'incomplete' item	108528	0.005	0.068	107378	0.010	0.101
misc	Equals 1 if at least one treatment on the claim was a 'miscellaneous' item	108528	0.20	0.40	107378	0.22	0.42
trauma	Equals 1 if at the claim was characterized by trauma	108528	0.0012	0.0345	107378	0.0010	0.0314
enterage	The age of the dentist at the first treatment in the GDS	83	25.29	2.26	192	34.36	8.83
dsex	The sex of the dentist (male=1)	83	0.49	0.50	192	0.48	0.50
sal	Remuneration structure (salaried=1)	83	0.02	0.15	192	0.19	0.40
Exp_0-6	Equals 1 if less than 6 months elapsed since the first treatment	108528	0.09	0.29	107378	0.21	0.40
Exp_7-12	Equals 1 if 7-12 months elapsed since the first treatment	108528	0.28	0.45	107378	0.31	0.46
Exp_13-18	Equals 1 if 13-18 months elapsed since the first treatment	108528	0.32	0.47	107378	0.27	0.44
Exp_19-24	Equals 1 if 19-24 months elapsed since the first treatment	108528	0.31	0.46	107378	0.21	0.41

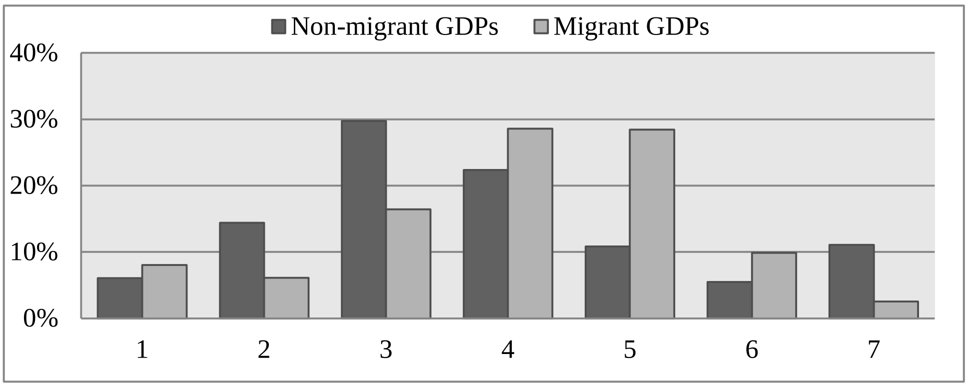
It can be seen that patients treated by the two groups of GDPs are very similar in terms of their age, gender, exemption status and duration since last visit.

The type of treatment provided to these patients is also very similar but there are some small differences in the proportion of CoTs in which diagnostic (examinations and x-rays), periodontal (scaling and polishing), and conservative (fillings) treatment were provided.

[3] The Statement of Dental Remuneration (SDR) is an annual publication which sets out the complete menu of capitation (continuing care) payments and item of service payments.

The average age at entry of the migrant GDPs was 34, nine years older than the non-migrants. Non-migrant GDPs were more likely to be non-salaried than migrant GDPs, perhaps as a result of the Scottish Executive's recruitment initiative. Figure 2 shows the distribution of CoTs by deprivation category of the practice (a seven point scale in which 1 indicates least deprived, and 7 indicates most deprived) and which we interpret as proxy for the average deprivation of that practice's patients, and indicates that migrant GDPs work in areas of greater deprivation than non-migrants.

Figure 2. Distribution of CoTs by deprivation category of the practice



Within the sample period migrant GDPs provide more treatment (by value) per CoT compared to non-migrants (£38.22 vs. £36.55). However, following Friedberg (2000), Figure 3 shows how the mean value of treatment per CoT changes during the sample period. It suggests that while there is some difference between migrant and non-migrant GDPs initially, there is convergence in the mean value per CoT from the fifth quarter after entry onwards.

Figure 3. Treatment value for migrant and non-migrant GDPs over time

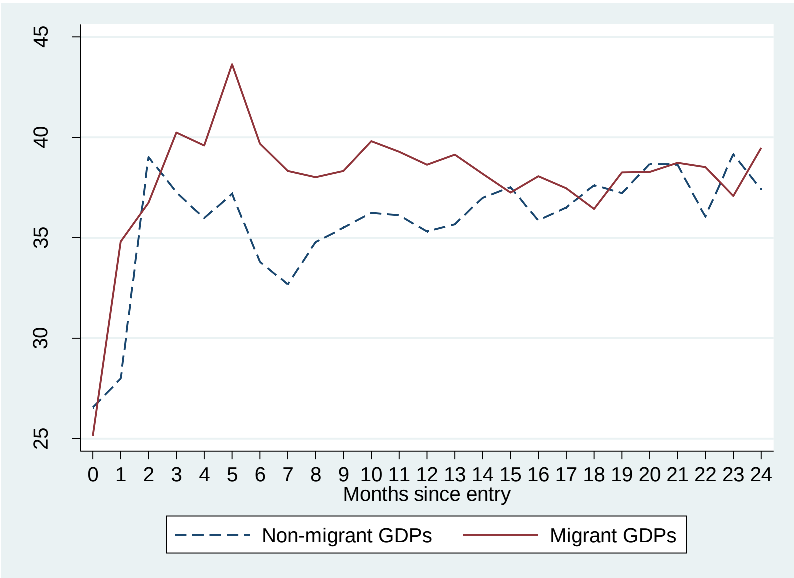


Figure 3 also indicates that both groups of GDPs exhibit an initial period during which mean of the value per CoT increases, a feature that is probably the result of the claims process: during the first few months only short and therefore relatively low value CoTs will be processed. Thus, we focus on the treatment provided after the second month after entry. This reduces the sample size to 103,412 claims made by 179 migrant GDPs and 107,668 claims made by 82 non-migrant GDPs.

Regression methods

The traditional Labour Economics literature has highlighted a speedy assimilation process by general migrant workers as they learn the local language and institutions, accumulate local experience, and adjust skills to suit local labour markets (Eckstein and Yoram, 2003). Figure 3 suggests that apart from some initial discrepancy there is convergence by migrant GDPs to their non-migrant counterparts in terms of treatment intensity. In order to more rigorously test for this pattern, whilst controlling for both observed and unobserved differences between individual dentists and the cohort of patients that they treat, we estimate the following individual-effects, difference-in-differences (DiD) model:

$$\ln(y_{ik}) = \alpha M_i + \theta Z_{ik} + \lambda Z_{ik} M_i + \sum \gamma_g Exp\_g_{ik} + \sum \delta_g Exp\_g_{ik} M_i + \mu_i + \varepsilon_{ik} \quad (1)$$

where y_{ik} is the value of the kth CoT provided by dentist i; M_i is a dummy variable indicating a migrant GDP; Z_{ik} denotes a set of controls such as patient characteristics and the broad treatment categories reported in Table 1 that vary across dentists and CoTs; Exp_g is a vector of binary variables indicating dentist experience by every six months elapsed since the first treatment ($g \in$ the reference category is the 2^nd^ month after entry); μ_i are dentist-specific effects capturing unobserved heterogeneity between dentists; and ε_{ik} is a pure random error orthogonal to all explanatory variables. The fixed effects estimation method is preferred to allow for arbitrary correlation between unobservable effects and observed explanatory variables. This, however, means that the coefficient on M cannot be estimated directly since a dentist's migrant status is fixed over time. Our analysis therefore focuses on the interactions between migrant status and other observable features of treatments (these interactions are set out in columns three and four in Table 2).

The coefficients on the interactions between the migrant dummy and treatment category indicators, *prev*m*, *perio*m*, ..., *misc*m*, capture differences in the practise styles of migrant and non-migrant GDPs. The coefficient on the interactions between the migrant dummy and experience category variable, *Exp_g*m*, captures the rate that migrant GDPs adjust treatment intensity over time, relative to the non-migrant GDPs, whilst allowing for their initial difference at the reference experience category. Henceforth, we use the term *assimilation rate* as the rate of reduction in treatment difference between migrant and non-migrant GDPs. We can calculate the assimilation rate during the period from t_0 to t_1 (month 3-6 $\leq t_0 \leq t_1 \leq$ month 19-24) as $E(\delta_g|t_1) - E(\delta_g|t_0)$. A quicker assimilation rate implies that treatments between migrant and non-migrants converge faster, and vice versa.

Regression results

Table 2 presents the results of estimating equation (1) in a dentist fixed effects model[4]. Dentist effects estimated in the fixed effects specification are significantly different from zero (F(260, 210745)=11.93, Prob>F=0.0000) and account for approximately 58% of the variation in treatment value (ρ=0.58). An F-test that all regressors are jointly equal to zero is rejected (F(74,210745)=4461.27, Prob>F=0.0000). Standard errors are corrected for both heteroskedasticity across dentists and within-dentist correlation using robust cluster variance estimation.

Table 2. Regression results

Assimilation estimates (ref. group: Exp_2)			
Exp_3-6	-0.0092	Exp_3-6*m	0.0389
	[0.0307]		[0.0350]
Exp_7-12	0.003	Exp_7-12*m	0.0484
	[0.0297]		[0.0339]
Exp_13-18	0.0115	Exp_13-18*m	0.0318
	[0.0298]		[0.0349]
Exp_19-24	0.0186	Exp_19-24*m	0.0052
	[0.0303]		[0.0360]
Treatment categories			
Prev	0.7394*	prev*m	0.0319
	[0.1318]		[0.2011]
Perio	0.6885*	perio*m	-0.0061
	[0.0130]		[0.0177]
Cons	1.1777*	cons *m	-0.0104
	[0.0191]		[0.0262]
Surg	0.6270*	surg*m	0.0344
	[0.0157]		[0.0215]
Prosth	1.4709*	prosth*m	0.1122*
	[0.0262]		[0.0372]
Ortho	1.1839	ortho*m	0.8166
	[0.8176]		[0.9958]
Other	0.0557+	other*m	-0.0261
	[0.0283]		[0.0373]
Occasional	0.6180*	occasional*m	-0.0792
	[0.0494]		[0.0643]

[4] A Hausman test rejected the random effects specification.

Table 2. Regression results (continued)

Incomplete	0.6061*	incomplete *m	-0.1448
	[0.0854]		[0.0970]
Misc	-0.0225	misc*m	0.0034
	[0.0196]		[0.0254]
Trauma	0.1122	trauma*m	0.0639
	[0.0680]		[0.0944]
Remuneration			
Sal	Yes	sal*m	Yes
Exempt	0.0896*	exempt*m	0.0206
	[0.0163]		[0.0211]
Patient characteristics			
Page	0.0031*	page*m	-0.0016
	[0.0011]		[0.0016]
page^2/100	-0.0048*	page^2/100*m	0.0021
	[0.0010]		[0.0016]
Psex	0.0137*	psex*m	0.0111*
	[0.0041]		[0.0055]
Visitdur	0.0395*	visitdur*m	-0.0015
	[0.0033]		[0.0039]
visitdur^2/100	-0.1459*	visitdur^2/100*m	0.0066
	[0.0171]		[0.0202]
Practice deprivation (ref. group: depcat4)			
Depcat	Yes	depcat*m	Yes
Health board (ref. group: caid5)			
Caid	Yes	caid*m	Yes
_cons	1.6189*		
	[0.1111]		
F	4461.27	N	211080
r2	0.61	N_g	261
r2_a	0.61	g_avg	808.74
r2_o	0.32	sigma_u	0.67
r2_w	0.61	sigma_e	0.56
r2_b	0.08	rho	0.58

For confidentiality reasons, we do not report coefficients on binary variables and responding interaction variables that are identified with small number of dentists, such as dentist contract (sal, sal*m), practice deprivation (depcat, depcat*m) and NHS Health Board (caid, caid*m).

Standard errors are in square brackets.

* significant at the 5% level.

+ significant at the 10% level.

An hypothesis test that the coefficients on the interactions between migrant status and the treatment category indicators are jointly equal to zero is not rejected at the 5% significance level (*P*=0.058). In terms of individual coefficients, the only significant difference between the treatment intensity of migrant and non-migrant dentists is for the prosthetic treatment: migrant GDPs provide significantly more treatment for patients who require for prosthetic treatment (11.22% *P*=0.003) compared with non-migrant GDPs.

Dummy variables for a dentist's contract (salaried or not) and each patient's exemption status capture how dentists respond to remuneration structure and demand-side cost-sharing, respectively. Coefficients on dentist contract and its interaction are based upon the 2 (or 0.8% of the sample) GDPs who switched contracts during the sample period and therefore, are not reported for confidentiality reasons. While non-migrant GDPs provide exempt patients with 8.96% more treatment than non-exempt patients (*P*<0.001), the interaction term shows that there is no significant difference between migrant and non-migrant dentists in the way they treat exempt and non-exempt patients.

As to the standard patient controls, only the interaction term on the patient's sex is significantly different from zero. This suggests that, relative to female patients, male patients receive significantly more treatment from migrant GDPs than from non-migrant GDPs (1.11%, *P*=0.044).

While the individual coefficients are not reported in Table 2, F-tests suggest that migrant GDPs provide significantly different treatment relative to non-migrants according to the deprivation category and (separately) NHS board in which they practise.

Migrant and non-migrant GDPs follow significantly different time patterns of treatment value. An F-test that the interaction terms are jointly equal to zero is rejected (P<0.001). Figure 4 plots treatment experience profiles for both migrant and non-migrant dentists using the coefficients on the experience variables. This shows that the treatment difference between migrant and comparable non-migrant GDPs, which is initially substantial, diminishes over time and is largely eliminated within two years of practice in the GDS. During the first two six months of practice, treatment value increases in both groups, which is likely to be a result of the claim process. It is therefore useful to begin a comparison at month nine. At this point migrant GDPs provide 4.84% more treatment by value than their non-migrant counterparts; this gap reduces to 3.18% over the following six months, and then approaches zero.

Table 3 presents predicted assimilation rates over time. It suggests that, after adjusting for observed heterogeneity across CoTs and dentist fixed effects, there is significant convergence of migrant GDPs to comparable non-migrants from the 7th to the 24th month since entry: the difference of treatment value reduces significantly by 4.32% (*P*=0.002, 95% confident interval is [-6.97%, -1.67%]).

Figure 4. Predicted treatment experience profiles for migrant and non-migrant GDPs

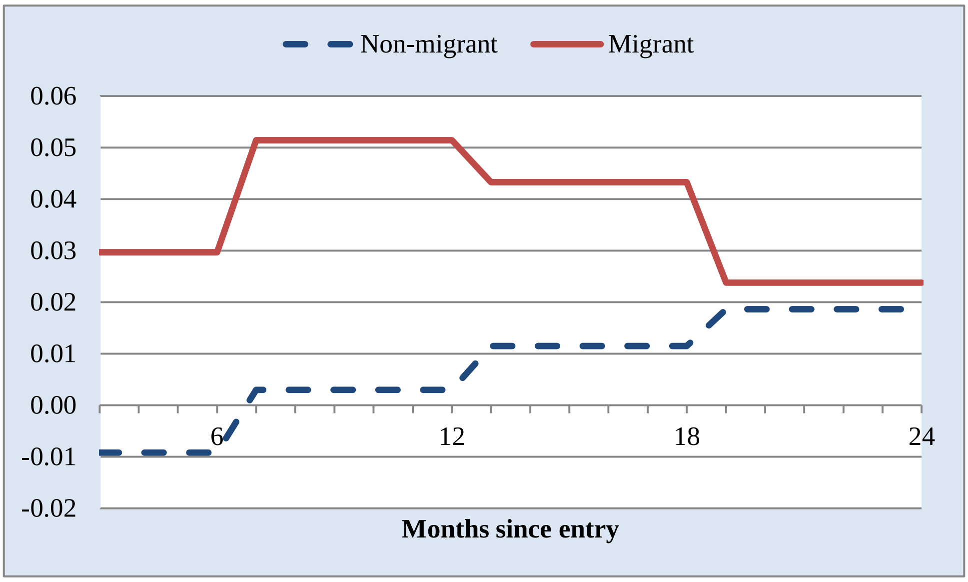


Table 3. Predicted assimilation rates

	Coef.	Std. Err.	P>t	[95% Conf. Interval]	
Exp_7-12 - Exp_3-6	0.0095	0.0154	0.540	[-0.0209,	0.0398]
Exp_13-18 - Exp_7-12	-0.0166	0.0114	0.145	[-0.0390,	0.0058]
Exp_19-24 - Exp_13-18	-0.0266	0.0082	0.001	[-0.0428,	-0.0104]
Exp_19-24 - Exp_7-12	-0.0432	0.0135	0.002	[-0.0697,	-0.0167]

As a robustness check, Table 4 presents assimilation estimates across different specifications. Specification 1 re-estimates our baseline model reported in Table 2, where we set the second 6 months after entry (*Exp*_7-12) as the reference group. The assimilation rate during the period from the 7th to the 24th month can therefore, be directly captured by δ_{19-24}. Specification 2 replicates specification 1 but focuses only on what might be termed *active* treatments, i.e. those which contain items of service over and above a routine examination, or a scale & polish, or both (Chalkley and Tilley, 2006). Active treatments constitute 65% of the sample. Specification 3 is the same as Specification 1, but excludes the variable, *visitdur*, so that information on patients' first treatments can also be used. Comparing the main coefficients of interest, *Exp*_19-24*m, across specifications 1-3 suggests that estimates of the assimilation process is very similar irrespective of the precise specification. During the period from the 7th to the 24th month after entry, the treatment difference between migrant and non-migrant GDPs reduces by an even larger magnitude for the total treatments

(5.56%) and subsequent active treatments (5.38%) as compared with subsequent treatments (4.33%). All these estimates are found to be statistically significant.

Table 4. Assimilation estimates across specifications

	1 Baseline	2 Excl. *inactive*	3 Excl. *visitdur*	4 Incl. *ln(l.feesdr107)*	5 Multi level
				(Ref. group: Exp_7-12)	
Exp_2-6*m	-0.0136	-0.0189	-0.0174+	0.0036	0.0028
	[0.0148]	[0.0184]	[0.0102]	[0.0156]	[0.0201]
Exp_13-18*m	-0.0168	-0.0198	-0.0272*	-0.0155	-0.0238+
	[0.0114]	[0.0160]	[0.0113]	[0.0117]	[0.0121]
Exp_19-24*m	-0.0433*	-0.0538*	-0.0556*	-0.0374*	-0.0413*
	[0.0135]	[0.0195]	[0.0152]	[0.0140]	[0.0136]

Robust standard errors clustered by dentists for Specification 1-4, and clustered by patients for Specification 5.

Standard errors are in square brackets.

* significant at the 5% level.

+ significant at the 10% level.

Specification 4 includes the natural logarithm of the value of the treatment patients received at their last visit, *ln(l.feesdr107)*, instead of *visitdur*, to account for the potential endogeneity, which occurs if unobserved factors that influence dentists' decisions on how often to treat patients may also influence their decisions on how much to treat. We find that there is little qualitative change in the assimilation estimates compared with the baseline specification. A possible explanation is that patients' visit duration for dental services is a patient-led or demand-side decision.

Finally, Specification 5 estimates a multilevel fixed effects model simultaneously controlling for patient- and dentist-specific effects. The three-way error-component model is estimated using the "FEiLSDVj" approach discussed by Andrews et al. (2006)[5]. Although the multilevel model may not be very well identified given the small proportion of patients switching between dentists during the two-year sample period, the assimilation estimates suggest a consistent assimilation process as compared with other specifications.

Discussion and conclusion

As a flexible and low-cost adjustment to temporary or regional imbalance, overseas qualified health professionals have made a significant and escalating contribution to

[5] The estimation is implemented using a memory saving Stata module "felsdvreg" written by Corneli ßen Corneli ßen T. 2006. Using Stata for a Memory Saving Fixed Effects Estimation for the Three-way Error Component Model. (Ed)^(Eds), FDZ Methodenreport Institute for Employment Research: Germany; 2006..

the health workforce in industrialized countries. This paper, for the first time to our knowledge, evaluates the impact of international recruitment on the healthcare provision in the host country by comparing the treatment provided by migrant and non-migrant health professionals, specifically dentists in the NHS in Scotland.

The treatment provided by all migrant dentists who started providing dental services in the GDS after 2006 are compared with the treatment provided by a group consisting of domestically trained dentists who recently finished DVT and subsequently worked in the GDS. We choose a particular cohort of GDPs for comparison rather than a representative sample of the overall GDPs because it is more policy relevant to compare the outputs of the migrant GDPs with the outputs of domestically trained dentists who entered the service at the same time.

We estimate a difference-in-differences model to examine whether the treatment provided by migrant and non-migrant dentists differ and converge during the sample period. Our results suggest that migrant GDPs have marginally different practice styles: compared with non-migrant dentists with comparable characteristics, migrant dentists provide significantly different amounts of treatment but only for patients who require prosthetic treatment and for male patients. We also find that the difference in the amount of treatment provided by migrant and non-migrant dentists diminishes with time spent in the GDS. Thus for this particular group of health professionals, migrant and non-migrants do not offer the precisely the same treatment, but differences diminish over time.

Dentists have considerable discretion over the type of service they deliver, and therefore, differences in treatment that are not the result of any observable characteristic of patients naturally give rise to concerns that dentists are exercising their discretion in a way that may be detrimental to patients, or that, in the case of migrant dentists, dentists are not familiar with the health needs of indigenous patients or preferred practice methods. Thus the evidence reported in this paper may give some comfort to patients and policy-makers alike.

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