DOCTORS' LABOUR SUPPLY AND INCENTIVES

A COLLECTION OF ESSAYS

BY

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DECLARATION OF AUTHORSHIP

I hereby declare that this thesis and the work presented in it is entirely my own and I have clearly documented all sources and materials used.

This work has not been submitted in any form for the award of a degree at this university or any other institution, nor has this work been published.

Alberto Núñez Elvira

August 2018

Not everything that can be counted counts,
and not everything that counts can be counted
(William Bruce Cameron)

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Chapter 2 was presented and discussed in the Health Economics Study Group (HESG, 2015), the Spanish Health Economics Association Conference in Granada (AES, 2015), the seminar hosted by OME on the Reward in the Public Sector (2015) and the 2nd EuHEA PhD student-supervisor and early career conference (2015). I greatly benefited from useful discussions at those conferences as well as the North West Doctoral Training Centre (NWDTC) Economics PhD Conferences. Chapter 4 has been submitted for discussion in an ONS event on subjective well-being which will take place in London in late November 2017.

Data used comes from the Office for National Statistics (ONS) and the UK Data Service either its website or the Secure Server, which is used in the Well-being analysis (Chapter 4 of this thesis).

All the views and interpretations expressed in this thesis are those of the author and do not necessarily reflect the views of other institutions.

ABSTRACT

This thesis examines UK doctors' labour supply from the intensive margin. Initially, it explores trends in average weekly hours of work using data from the Labour Force Survey (LFS). Next, it compares how average weekly hours of work vary over the lifecycle for doctors and compare to with other professionals' hours (lawyers and accountants). Finally, as doctors continuously report being stressed and unhappy, this thesis explores data from the Annual Population Survey (APS) to assess whether hours of work could alter self-reported well-being levels for doctors and other workers.

This thesis is made up of five chapters with three main essays on the topic of interest. Chapter 1 conveys an extensive background on what we know about doctors' labour supply in the UK and other countries.

Chapter 2 exploits the LFS to examine main trends in doctors' weekly hours of work (GPs and hospital doctors) over 21 years (1994-2014). It proposes a definition of total hours worked that encompasses total usual hours in main job (basic hours and overtime hours, paid or unpaid) plus total hours in second job. The chapter is mostly descriptive and focuses on changes in average weekly hours of work of the headcount of doctors over the period and on variation across different characteristics. It also portrays irregular working patterns, second job hours and desired hours of work (both more and fewer hours). The main finding conveys that despite training more doctors every year and the increasing female participation in the medical profession, hours of work have fallen over time and the sharpest fall occurs between 1994 and 2004. From 2004, this trend attenuates but continues falling though at a reduced rate.

Chapter 3 estimates labour supply models over the lifecycle for a representative agent using a pooled cross-section dataset from the LFS for 'partner' GPs (Self-employed), 'salaried' GPs, hospital doctors, lawyers and accountants. The main finding posits that the reduction in female doctors' average weekly hours

of work – especially 'salaried' GPs – has been larger than those of lawyers and accountants. This is attributed to lifecycle effects and, particularly, children.

Chapter 4 examines self-reported well-being outcomes (anxiety, happiness, life satisfaction and worthwhile levels) and variables relating health problems (depression, hypertension or whether having a health problem limits activity to work). We examine the relationship between hours of work and well-being levels. Although there is considerable literature on doctors' job satisfaction, especially GPs, and, also, there are numerous studies on the issue of burnout, this is not the case for well-being of physicians which is underexplored. The few existing studies come from small snapshots and unrepresentative samples. This chapter explores a large well-established dataset using conventional screens to examine the distribution of well-being and their proximate determinants. The information is available in the Annual Population Survey (APS) from 2011 quarter 2 to 2015 quarter 1, covering four fiscal years (2011/12 to 2014/15). Our main finding conveys that, contrary to popular belief, and the assertions of the professional bodies for physicians, doctors appear to be more satisfied, happier, feel that their life is more worthwhile, and they are less anxious than other professionals. The chapter also makes an economic contribution on labour supply: hours of work, at the margin, have virtually no significant effect on the measures of well-being. This means that individuals are on their labour supply curve but those reporting to work more hours may have lower values of the well-being measures. This is true for lawyers and accountants but not for doctors, which is viewed as evidence of intrinsic motivation driven by mission orientation among doctors. So, there is scope for expanding supply along the intensive margin, which may be both an inexpensive and quick solution to the alleged supply shortfall, relative to the current policy of expanding supply along the extensive margin.

Chapter 5 sums up the main findings and contributions.

LIST OF ABBREVIATIONS

AES	Health Economics Spanish Association
APS	Annual Population Survey
ASHE	Annual Survey on Hours and Earnings
BMA	British Medical Association
BMAQTS	British Medical Association Quarterly Tracker Survey
CfWI	Centre for Workforce Intelligence
CMA	Canadian Medical Association
DDRB	Doctors and Dentists' Review Bodies
DiD	Difference-in-differences
DoH	Department of Health
EEA	European Economic Area
ESR	Electronic Staff Records
EuHEA	European Health Economics Association
EUL	End User License
EWTD	European Working Time Directive
FRS	Family Resources Survey
FTE	Full-Time Equivalent
FY1	Foundation Year 1
FY2	Foundation Year 2

GP	General Practitioner
GMC	General Medical Council
GMP	General Medical Practitioners
GMS	General Medical Service contract
HEAL	Health Economics at Lancaster group
HEE	Health Education England
HESG	Health Economics Study Group
HMSO	Her Majesty Stationary Office
HoC	House of Commons
HSCIC	Health and Social Care Information Centre
ILO	International Labour Organization
IMG	International Medical Graduates
LFS	Labour Force Survey
LRMP	List of Registered Medical Practitioners
MABEL	Medicine in Australia: Balancing Employment and Life
MFF	Market Forces Factor
MPIG	Minimum Practice Income Guarantee
NAO	National Audit Office
NGPWS	National General Practitioners' Worklife Survey
NHS	National Health System
NPCRDC	National Primary Care Research and Development Centre

NWDTC	North West Doctoral Training Centre
OECD	Organization for Economic Cooperation and Development
OME	Office of Manpower Economics
ONS	Office for National Statistics
OOH	Out-of-hours
PAYE	Payer As You Earn
PMS	Personal Medical Services contract
PRUComm	Policy and Research Unit in Commissioning and the Health Care System
QLFS	Quarterly Labour Force Survey
QoF	Quality of Outcomes Framework
RCGP	Royal College of General Practice
RCP	Royal College of Physicians
SAS	Specialists and Associate Specialist
SIC	Standard Industry Classification
SOC	Standard Occupation Classification
SWB	Subjective Well-being
TSC	Technical Steering Committee
WHO	World Health Organization

Contents

LIST OF FIGURES

LIST OF TABLES

Chapter 1

INTRODUCTION

Labour inputs are used intensively in healthcare services, averaging 70% of total costs in the UK (HoC, 2007). This intense use of this input demands better understanding of the main labour force issues amongst different occupations. Those highly trained and skilled health workers will positively impact on the effectiveness and productivity in the health sector (WHO, 2000; Campbell et al, 2013) to deliver better services more effectively.

In England, Health Education England (HEE), which seeks to supply the NHS workforce with the required skills to provide high-quality services, has only estimated a labour supply model for non-clinical staff. Hence, labour supply models for clinical workers are still demanded (NAO, 2016). Nurses' labour supply has been analysed extensively (Antonazzo et al, 2013; Rice, 2003; Skåtun et al, 2005), but the evidence on doctors is more limited. Moreover, current forecasts on the headcount of doctors needed in the UK are based only on projections from existing trends. But they are unlikely to be accurate and do not delve into on the main issues underlying doctors' labour supply, at least from the intensive margin (NAO, 2016).

This thesis contributes to narrowing the existing gap in the literature in the UK doctors' labour force (Elliot, 2003; Fox, 2007; Nicholson and Proper, 2011) looking at the intensive margin of their labour supply. In fact, this thesis provides a comprehensive and detailed analysis on total average weekly hours of work over time using secondary data such that contained in the Labour Force Survey (LFS) expanding on this underexplored topic in the UK from the intensive margin.

Since 2000, there is a growing perception that there is a shortage of doctors in the UK but the expansion of the headcount of doctors has been notable since then. On the supply side, this has been accentuated by restrictions to the supply, trends in the nature of the supply due to changes in the gender composition of doctors, retirement decisions and growing intentions to take early retirement. On the demand side, factors that have been associated with this perception refer to changes in the nature of care requirements associated with the ageing population.

Legal changes such as the implementation of the European Working Time Directive (EWTD) might have adversely affected overall supply of hours of work curbing the average weekly hours of work to protect patients and minimise potential medical mistakes. Others such the share growth of immigrants and the increase in the training capacity of Medical Schools might have had a positive impact. The effect of austerity is unclear but the freeze on public sector pay might have had some supply side consequences even if overall health spending has been ring-fenced. Finally, Brexit is unlikely to increase supply and may have an adverse effect (few UK trained doctors work in the EU-28, while many EU-28 trained doctors work in the UK).

1.1. THE SUPPLY OF DOCTORS IN THE UK

1.1.1. GENERAL OVERVIEW

In the UK, there are few data sources that mostly provide information from the extensive margin (headcount and full-time equivalent figures). These are the List of Registered Medical Practitioners (LRMP), which is released by the General Medical Council (GMC), and the Doctors and Dentists Review Body (DDRB) reports from the Office of Manpower Economics (OME). There are other sources for each country within the UK such as the Statistics Offices or Departments of Health for the devolved governments for Scotland, Wales and Northern Ireland. In England, there is the Health and Social Care Information Centre (HSCIC), now called NHS Digital. This thesis is concerned with UK

doctors' labour supply and expands on the awareness of other reliable sources to explore this from the intensive margin, covering the whole country rather than looking at single national data.

Data from the LRMP comes from registrations made by doctors themselves while data from DDRB reports come from different sources available in each country, such as those from the NHS Employers, Departments of Health or Statistics Offices. For the specific case of the LRMP, records come from individuals and colleges. A medical student enrols in the medical register[1] provisionally after completion of the Foundation Year 1 (FY1), the first year of postgraduate training after graduated from a medical degree. The full registration comes after FY1. This may end on fully licensed doctors after a few more year of training and only licensed doctors can treat patients, at least in the NHS. Figure 1.1 shows trends of registered doctors in the GMC medical register (data refers to 31st of December 2016) and Figures 1.2 and 1.3 the number of doctors in the GP and the Specialist register respectively.

In 2014, the medical register in the UK included 267,168[2] doctors of whom 236,908 were licensed doctors (GMC, 2015). The difference between figures in the medical register and those licensed is attributed to the exclusion of doctors in training who are not fully licensed or doctors who stop practising, gave up their license for retiring or emigration reasons. Of the 236,908 licensed doctors, 188,248 were from England (79.46%), 20,108 from Scotland (8.49%), 9,812 from Wales (4.14%), 6,293 from Northern Ireland (2.66%) and 12,447 from other areas (5.25%). Licensed doctors included in the "Other" region refer to those licensed doctors who are located overseas and those who were impossible to locate from the date they registered.

[1] See Appendix 1 for careers path. Definitions of different categories are available in DDRB reports.
[2] Figures in the GMC 2015 report The State of Medical and Practice in the UK report a total number of registered doctors 267,168. However, Figure 1.1 showed 267,177 doctors in the same year. There may be some corrections done after the publication of the report.

Figure 1.1 Registered Doctors on the LRMP

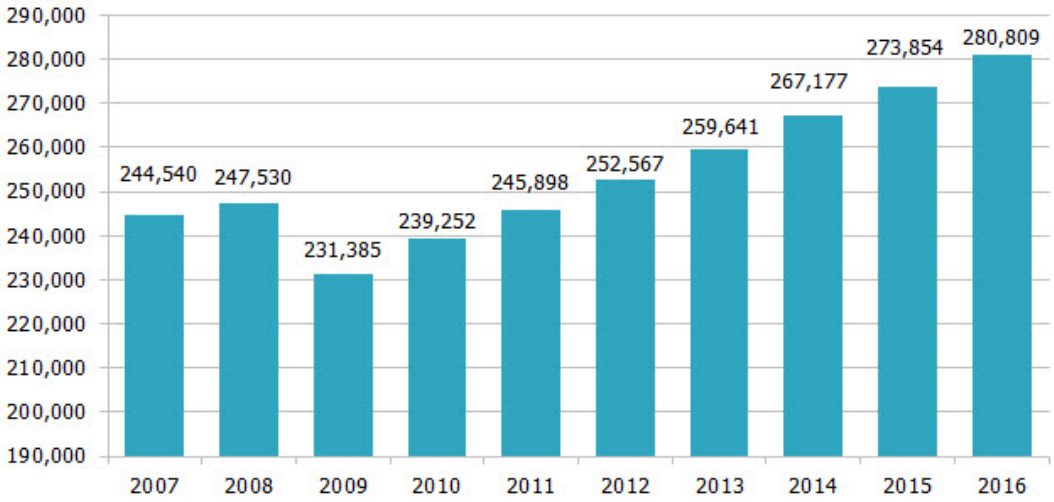


Figure 1.2 Registered Doctors on the GMC GP Register

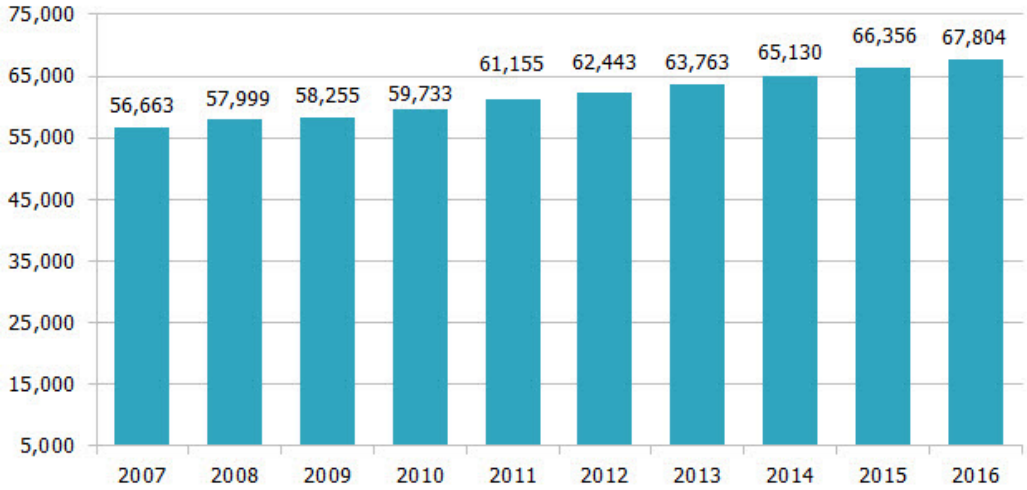
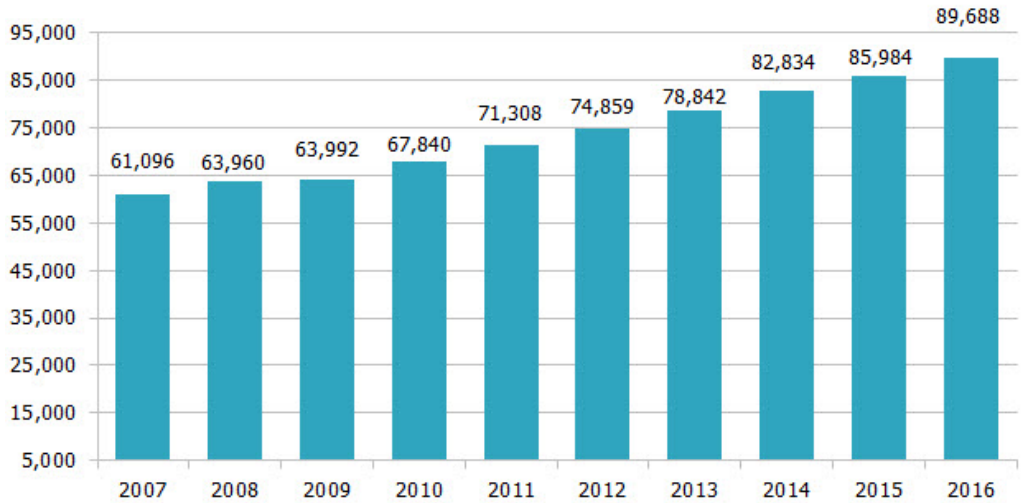


Figure 1.3 Registered Doctors on the GMC Specialist Register

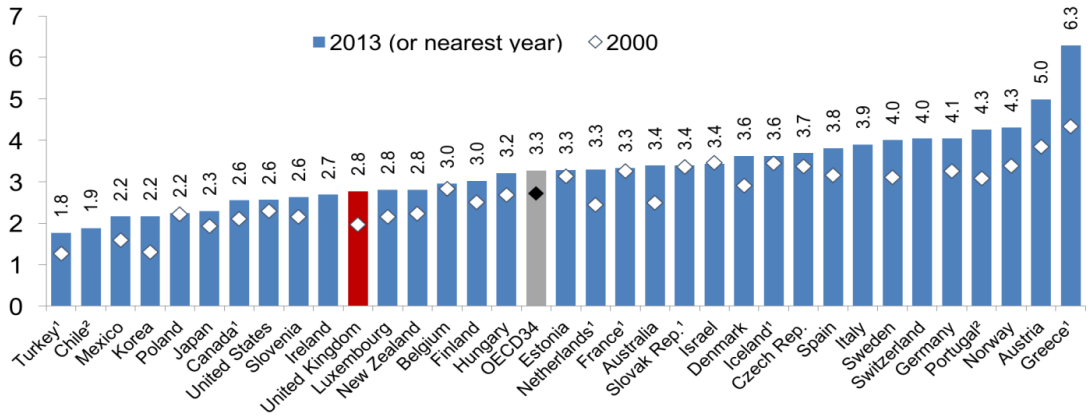


Source: http://www.gmc-uk.org/doctors/register/search_stats.asp

There is not strong consensus on absolute figures. Data from the GMC medical register in 2014 (GMC, 2015) shows that, amongst licensed doctors (236,908) 65.64% were UK trained (155,508), 10.12% (23,967) from the European Economic Area (EEA) and 24.24% (57,433) were International Medical Graduates (IMG), and the majority is from Asia. The same source conveys that on the GP register (60,279 licensed GPs), 5.86% (3,531) were EEA trained doctors, 16.6% (10,008) IMG, and 77.54% (46,740) UK-trained. The same figures from the Specialist register (73,342 licensed Specialists in 2014) show 60.46% (44,368) UK-trained doctors, 15.43% (11,321) EEA and 24.11% (17,693) IMG trained. However, the number of EEA-trained doctors has fallen over time (NAO, 2016)

In relative terms to population, the OECD reports 2.6 doctors per 1,000 population (OECD, 2010) in the UK rising to 2.8 in 2013 (OECD, 2015) and 2014 (OECD, 2016). Figure 1.4 depicts the number of physicians among OECD countries in 2013 and compares with figures in 2000.

Figure 1.4 Number of Licensed Physicians per 1,000 Population



Source: OECD Health Statistics 2015, http://dx.doi.org/10.1787/888933280876

The UK underperforms compared to the average number of physicians in the OECD. Knowing that the population in the UK in 2013 was 64,105,654 people[3]

[3] http://webarchive.nationalarchives.gov.uk/20160107172707/http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/2013/sty-population-estimates.html

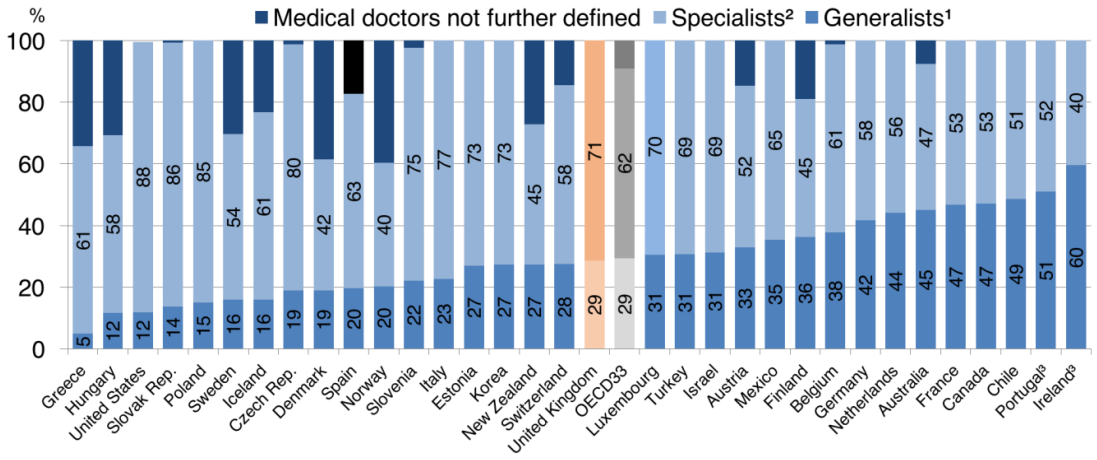
and there were 2.8 licensed physicians per 1,000 population then we can work out that there were 179,495 licensed doctors in the country, which is very close to data reported in DDRB reports (the 44th DDRB report recorded 177,388 licensed doctors in the NHS in 2014 and 183,522 in the 45th DDRB report in 2014).

COMPOSITION OF DOCTORS

In the UK, doctors usually split into specialists (hospitals), and generalists (primary care) where the former usually account for a larger proportion than the latter. Hospital doctors encompass consultants and specialists (associate specialists, SAS and other specialists) and doctors in primary care include General Medical Practitioners (GMP), both salaried and contractors, under the national General Medical Services contract (GMS) or the more local Personal Medical Services contract (PMS), which focuses on the special characteristics of populations in certain areas. During recent years, there have been new policies to tackle the unbalanced headcount between specialists and generalists. For example, under the Health Education England (HEE) mandate the goal is to achieve a 50:50 ratio between generalists and hospital doctors.

Figure 1.5 shows the composition of doctors for OECD countries in 2013 (OECD, 2015) and Figure 1.6 over time, by specialty, using data from DDRB reports. In 2013, 71% of UK doctors worked in hospital premises whilst 29% did in primary care premises. In Figure 1.6 the time trend composition conveys that the number of hospital specialists has grown over time whilst proportions in primary care doctors lessened. Figure 1.7 adds the ratio of hospital doctors for each generalist doctor in 2004, 2009 and 2014 and confirms that the number of physicians slightly grew over the number of generalists in the UK but is stable over time as it is in countries like Spain, Sweden or Norway.

Figure 1.5 Composition of Doctors (OECD Countries)

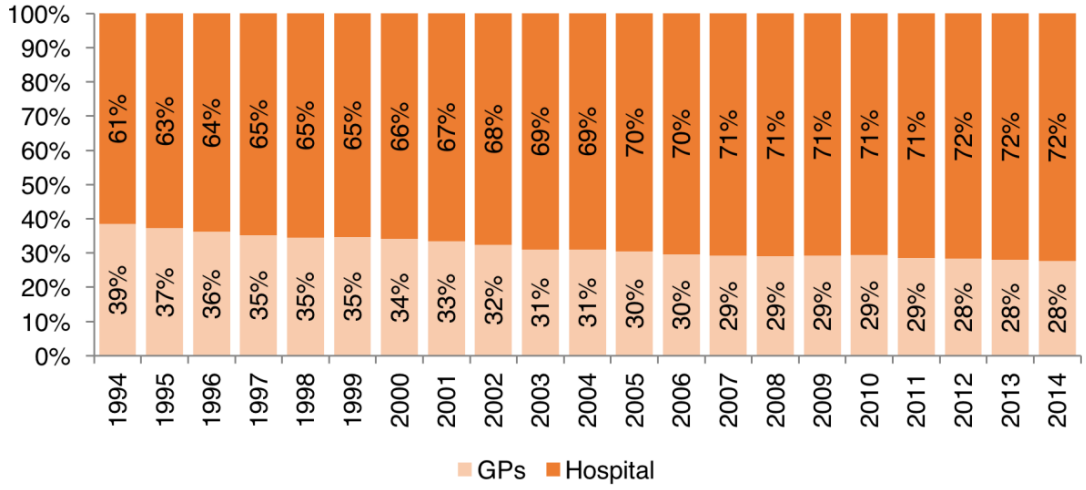


Source: OECD, Health Statistics 2015, http://dx.doi.org/10.1787/888933280883

Notes:

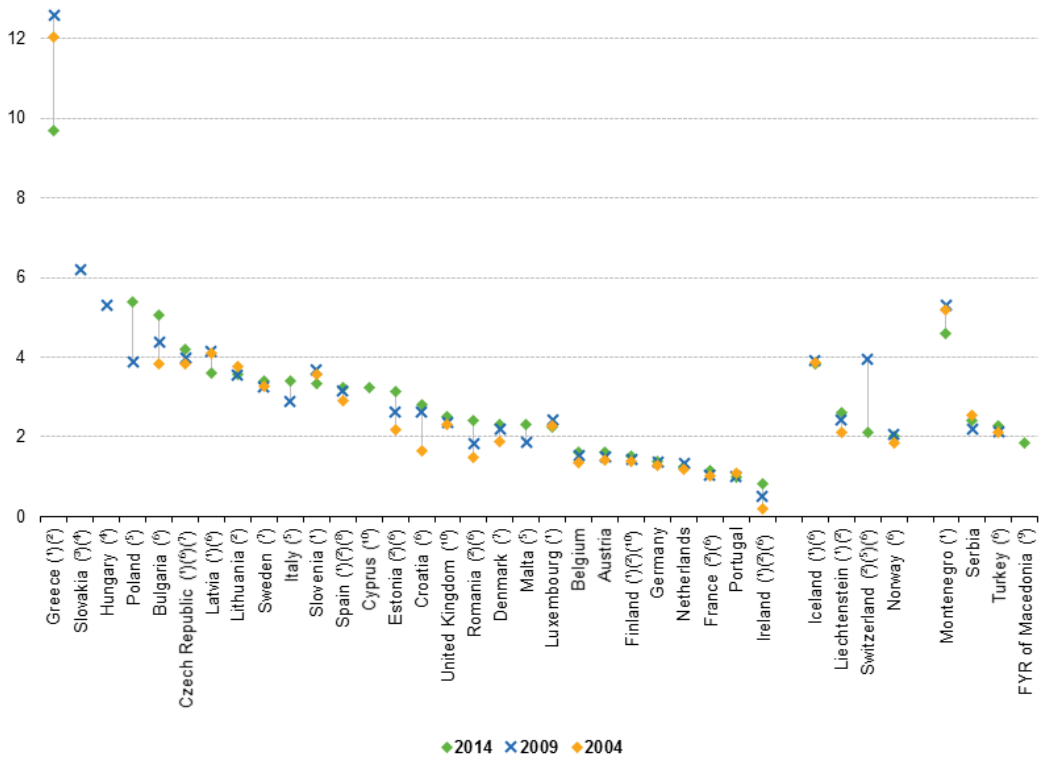
1. Generalists include general practitioners/family doctors and other generalist (non-specialist) medical practitioners.
2. Specialists include paediatricians, obstetricians/gynaecologists, psychiatrists, medical, surgical and other specialists.
3. In Ireland and Portugal, most generalists are not GPs ("family doctors"), but rather non-specialist doctors working in hospitals or other settings. In Portugal, there is some double-counting of doctors with more than one specialty.

Figure 1.6 Composition of Doctors by Specialty (DDRB data)



Source: Generated from DDRB reports

Figure 1.7 Ratio of Hospital Doctors to Generalists



(1) 2005 instead of 2004.
(2) 2009-14: break in series.
(3) 2007 instead of 2009.
(4) 2004 and 2014: not available.
(5) 2004: not available.
(6) 2004-09: break in series.
(7) 2013 instead of 2014.
(8) Specialists: definition differs.
(9) 2004 and 2009: not avavilable.
(10) 2014: estimates.

Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_personnel_statistics_-_physicians

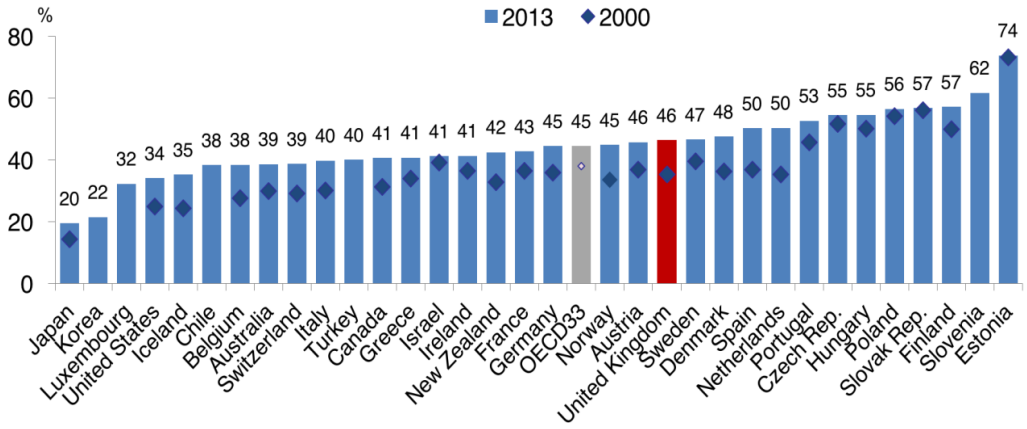
GENDER BREAKDOWN

The GMC medical register reported 148,572 males (55.61%) and 118,596 females (44.39%) of 267,168 registered doctors in 2014. Among the 236,908 licensed doctors, 54.74% were males (129,668) and 45.26% females (107,220). Breaking down gender figures on the GP and Specialist registers and, next, doctors in training proportions were 49.61% (29,903), 67.16% (49,293) and 42.87% (25,269) males respectively.

Overall, males are more numerous than females for two main reasons. Firstly, the number of specialists is larger than generalists and the proportion of males

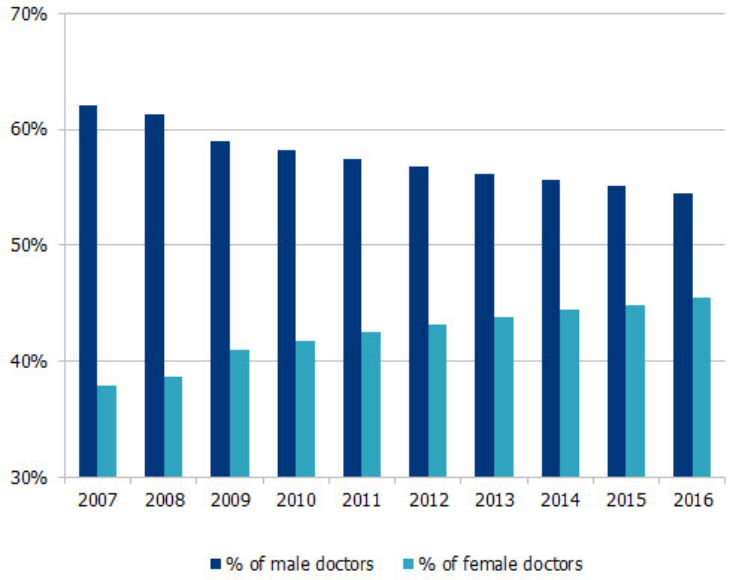
working as hospital specialists is greater than females. Secondly, before the expansion of UK universities in the 1990s, male medical students were more numerous than females. Since the 1990s this changed the gender composition and female participation rose. For example, the proportion of female consultants rose from 21% in 1999 to 31% in 2010 (CfWI, 2012). Data from the GMC in 2016 conveys that there were 59,564 males (66%) and 30,746 females (34%) of 90,310 specialists in the Specialists register, which has been stable compared to 2011 (see BMA, 2012). The GP register from the GMC reported 32,350 males (47.8%) and 35,307 females (52.2%) of 67,657 generalists. Figures 1.8 and Figures 1.9 show the change in the gender composition of doctors and Figure 1.10 the increasing female participation in Medical schools.

Figure 1.8 Share of Female Doctors



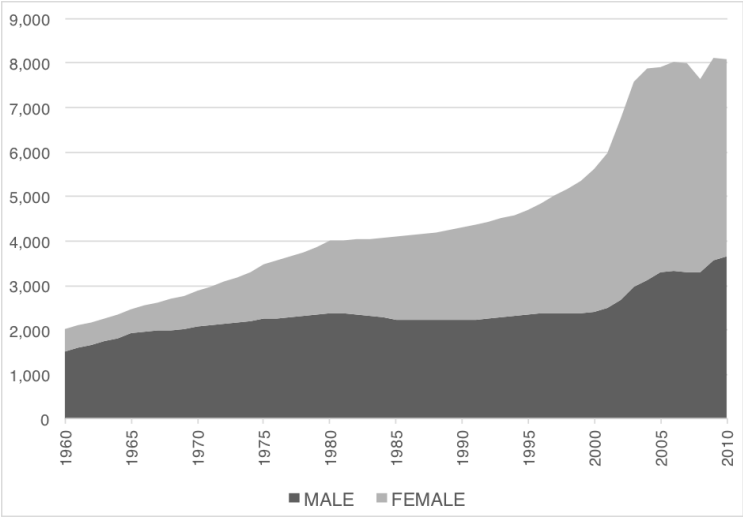
Source: OECD Health Statistics 2015 http://dx.doi.org/10.1787/888933280883

Figure 1.9 Registered Doctors by Gender Breakdown (2007-2016)



Source: http://www.gmc-uk.org/doctors/register/search_stats.asp

Figure 1.10 Medical School Intakes (England)



Source: CfWI (2012)

1.1.2. MORE FEMALES WANT TO BECOME DOCTORS

The number of female doctors has grown substantially over the last years. This has been a common trend in many countries (Riska, 2012; Boulis and Jacobs, 2008; More, 2009; Kilminster et al, 2007). Table 1.1. summarises the change in the proportion of females over time.

Table 1.1 Proportion of female doctors

REGION	PROPORTION FEMALE DOCTORS (%)							
	2000	2002	2004	2006	2008	2010	2012	2014
Post-soviet countries								
Czech Republic	51.55	51.84	52.15	52.44	53.02	53.73	54.39	-
Hungary	50.1	51.41	51.05	51.2	52.31	54.23	54.41	54.54
Poland	54.18	54.02	53.79	55.38	55.73	56.65	55.69	56.5
Lithuania (non-OECD)	-	69.68	69.54	69.27	69.84	70.07	69.53	69.69
Scandinavian countries								
Denmark	36.26	38.23	39.97	42.16	43.95	45.51	47.32	48.96
Finland	49.94	51.16	52.51	53.93	55.48	55.5	56.88	58.28
Norway	-	33.45	34.84	38.37	40.46	42.28	43.94	45.95
Sweden	39.58	40.57	41.54	43.13	44.54	45.59	46.67	47.58
Central Europe								
Austria	36.77	38.27	39.95	41.13	42.85	44.47	45.49	46.18
Belgium	27.65	29.44	30.97	32.4	34.03	35.63	37.32	39.5
France	36.5	37.21	38.08	38.81	39.73	40.82	42.07	43.59
Germany	36.01	36.92	37.75	39.11	40.76	42.46	43.87	45.21
Greece	33.93	35.16	35.94	37.32	38.51	39.37	40.24	41.2
Ireland	36.53	37.03	36.59	35.63	37.01	38.86	40.07	42.57
Italy	30.19	31.63	33.09	34.7	36.08	37.24	39.37	40.29
Netherlands	35.3	37.23	39.13	40.84	43.9	46.05	49.45	51.66
Portugal	45.58	46.45	47.41	48.2	49.54	50.69	52.07	53.4
Spain	36.82	41.67	44.78	45.28	48.17	50.18	50.29	51.55
Switzerland	29.12	30.65	32.2	33.58	34.72	35.96	37.74	39.72
United Kingdom	35.37	36.48	37.64	39.44	41.82	43.99	45.67	47.19
Non-European Countries								
Australia	29.96	31.52	32.35	33.81	35.14	-	37.68	39.34
Canada	31.32	32.78	34.14	35.77	37.29	38.83	39.91	41.24
Israel	39.19	39.89	40.32	40.61	40.82	41.06	41.24	41.4
Japan	14.33	15.54	16.36	17.12	18.02	18.84	19.55	20.3
New Zealand	32.86	34.66	36.31	37.71	39.55	40.84	41.93	43.21
United States	25	26.35	28.11	29.54	30.78	31.76	33.42	34.56

Source: OECD Stat (http://stats.oecd.org/Index.aspx)

The expansion in the number of female physicians has increased the proportion of females to about 50% of total doctors in some countries and around 35% in others (US) based on data from the OECD. Overall, in post-soviet countries female doctors were a majority showing proportions above 50% in all years

while in Scandinavian and European Countries there has been a rising participation of females in the medical profession since 2000, reaching proportions close or above 50% in Scandinavian countries and less or near to 50% in European countries. This proportion is lower in other non-European countries which sets between 35-40%.

This growth in the proportion of female doctors differs amongst countries. The increase in US female physicians is a result of the 1970s reform on US universities which expanded medical schools, a drop in the number of male doctors during the 1980s, and an increasing interest in medical careers for males and females during the 1990s as doctors was seen as a prestigious career in the US (Boulis and Jacobs, 2008). In other countries, such as post-soviet countries the introduction of social insurance mechanisms and private healthcare practices lessened participation in a formerly prestigious job during the soviet era, reducing doctors' income more than other professionals after the introduction of relevant structural reforms to gain competitiveness in a post-soviet era (Riska, 2012). In Scandinavian countries, the expansion of the public sector, the welfare state, and the expansion of gendered equality policies, attracted more females for medical careers. This was complemented with an education policy that expanded medical schools in the country and improved access to primary care publicly funded systems (Riska, 2001).

The interest in understanding the feminisation in doctors' careers has expanded during the last decade (McKinstry et al, 2006; Hedden et al, 2014; Jefferson et al, 2015). Similar patterns have been observed in most countries. However, there are some determinants that may explain whether there is gender segregation that leads female doctors to concentrate on a few specialties. For example, Riska (2012) compared doctors' specialties amongst the US, the UK, Finland, Lithuania and Sweden between 2007 and 2009 and confirm there is gender segregation and females usually prefer working in a few specialties such as general practice, paediatrics, psychiatry, obstetrics and gynaecology. In England, Jefferson also confirms that the proportion of females working in primary care grew hugely compared with the number of females working in

specialist care. Amongst the main reasons that may help explain this gender segregation are individual preferences on careers choices, working patterns such as the females' preference for part-time work or regular working hours (Riska, 2012). Other authors posit preferences, institutional or social changes (Boulis and Jacobs, 2008).

In a systematic review, Hedden et al summarise the gender differences amongst primary care physicians: females work fewer hours, are more likely to work part-time – especially if they have children aged under 18, do less intense work encountering fewer patients or reducing the number of visits, they prescribe and refer more to specialists do less out-of-hours, retire or leave earlier than males and are less likely to work in solo or rural practices. Heiligers and Hingstman got similar determinants for Dutch doctors but they did not get a clear part-time work preference for females (Heiligers and Hingstman, 2000). The scope of work matters for females and female primary care doctors prefer specialties where they can see younger patients and fewer elder patients, reducing the chronicity and complexity of treatments. In Australia, females primary care physicians prescribed 4% more than males, requested nearly 20% more clinical treatments, 18% more referrals or 10% more pathology tests (Harrison et al, 2011). In Netherlands, female primary care doctors prescribed less and recorded fewer technical interventions but referrals to specialists remains similar between males and females (Bensing et al, 1993). Others are out-of-office hours, years of practice or specific practice characteristics. Hedden et al find literature in Canada that confirms that fewer female primary care doctors tend to work out-of-hours (7% vs 9.6% of males) and doing home visits (1.5% vs 3.7% of males). Moreover, female GPs tend to take early retirement in greater proportion than males (in Australia, Brett et al confirm those proportions are 75% females wanting to retire earlier than the retirement age of 65 versus 59% of males). Other studies confirm that childbearing is one source for leaving the profession or reducing hours (Leese et al, 2002).

In England, the most relevant study estimates that female GPs work on average almost 12 hours less than male GPs (Gravelle and Hole, 2007). About 5.4 hours

of this gap (40%) is explained by the reduction in female hours of work. McKinstry et al are concerned about the impact of the feminisation in the Scottish primary care service, demanding more research on the effect of hours of work of female GPs. However, although most acknowledge gender differences in preferences to work, career preferences or hours of work over the life cycle there are no studies considering this analysis and the main policy implications. For example, Jones and Fisher tracked 544 medical graduates for over a decade to better understand what determined their career choices and to examine whether medical students were consistent with their decisions taken at the medical school (Jones and Fisher, 2006). They found that females are more likely to switch to primary care after a few years of experience since graduation seeking for a better work-life balance. Nonetheless, there are some questions that remain unanswered: Does the UK really need more GPs? What are the implications of having more GP doctors working part-time? Why is being a GP still unattractive to medical students relative to a hospital doctor?

1.2. WHY DOES LABOUR SUPPLY MATTER?

There has been a growing interest in the literature to understand the main issues on labour supply in general. Specifically, most articles since the 1970s have explored the differences in individuals' participation and hours of work (Blundell and MaCurdy, 1999). Between 1960s and 1980s, also, empirical literature tested how individuals made their choices to maximise their utility of work - for example labour supply decisions of lone parents (Bingley and Walker, 1997), both theoretical and empirical theories, at the extensive margin (labour force participation or work arrangement) or the intensive margin (hours of work). Other works have distinguished between static, dynamic and structural functions, producing a considerable number of analyses on intertemporal substitution between consumption and leisure (Card, 1991) or the analysis of the labour supply using life-cycle models that help explain the choices at different ages or the effect of business cycles on the supply of hours. Furthermore, the labour supply topic has encouraged researchers to find solution to selection bias, measurement error or other endogeneity problems

(Heckman, 1993). Other studies measured the elasticities at both margins (Reichling and Whalen, 2012; Chetty et al, 2011) of wages or unearned income on the decision to supply more or fewer hours. Besides, there have been some analyses at the extensive margin to understand why hours of work vary amongst countries (Prescott, 2004; Bozio, 2011; Blundell et al, 2011) or gender determinants of labour supply (Pencavel, 1986; Killingsworth and Heckman, 1986). This all shows that fostering awareness on what underlies labour supply choices helps to address specific problems arising in different markets and formulate the right incentives to increase individuals' work effort, productivity, efficiency and effectiveness on different policies, from fiscal policy to welfare or public policies to tackle potential inequalities.

The labour supply of doctors is important in many ways: better understanding of doctors' career preferences may help to improve workforce planning in specialties; how workers decide to supply more or fewer hours; whether there are gender differences in allocating work time or balancing work-family decisions; it helps identify specialties where workers are more likely to work part-time or full-time.

Training is costs and time is important as doctors' training is mostly borne by taxpayers, either financing universities or providing student loans, and it takes a long time to get a licensed doctor (on average 10 years for a GP and 12-14 for a hospital doctor). It is expensive, and much of the cost is born by the taxpayer[4]. It is important to better understand the main determinants of the labour supply of doctors over their lifecycle. This topic is underexplored in the literature, especially in the UK, and is very important in all health systems for many reasons. Although there is some literature on hospital consultants or general practitioners, better understanding of doctors' labour supply is important because it will help policymakers to better understand what motivates doctors to change their supplied hours of work; secondly, they would be able to

[4] Recently it was announced that it cost £230,000 to train a doctor over fees paid by medical students. This means the total cost after tuition fees. On average, the investment for the Medical degree would mean £245,000 of which tuition fees meant £44,458 for 2016/17. A GP would cost £400,000 and Consultants above £500,000 according to the Unit Costs and Social Care 2016 report. Data from the National Audit Office suggest those figures go to £485,000 for a GP and £720,000 for a hospital consultant (NAO, 2016).

design better policies and incentives to increase their performance or reduce dropouts from the labour force; finally, they could focus on increasing motivation, satisfaction, or better manage their geographical distribution.

The composition of doctors by sector (primary or secondary care) and by gender is not static. Expanding the number of analyses on doctors' labour supply will help to understand the main determinants, what main changes in the composition imply for the supply of healthcare services to the population and increase efficiency in delivering better health services. For example, the enhancement of community-based services improves the efficiency in the delivery of health services (RCGP, 2013) and increasing the proportion of female doctors is a gender equality policy. However, is we fail to understand what consequences those changes have or why females work different hours than males, then the effect on the health system will be limited. As seen in previous figures, the proportion of doctors who are female has been rising strongly. But males and females have different work patterns over their lifecycle (Blundell et al, 2011; Pencavel, 1986; Killingsworth and Heckman, 1986) which, as we will see, has important implications for the overall supply of care. There is more evidence on doctors' earnings in the UK (Morris et al, 2008; Morris et al, 2011; Gravelle et al, 2011) but very few studies on hours of work and this is reflected in our focus here on labour supply. The little evidence that does exist relies on data from specific questionnaires which make comparability problematic and forbids entirely any comparisons with trends in other workers. This is reflected here in our choice of LFS data.

1.3. STRUCTURE AND CONTEXT

This thesis is built upon three main empirical chapters and finishes with a final chapter where I draw my conclusions from the analysis.

1.3.1. OVERVIEW CHAPTER 2

The main contribution made in Chapter 2 is twofold. Firstly, it is the first analysis that extensively exploits data from the Labour Force Survey (LFS) for the analyses of the main issues on doctors' labour supply (GPs and hospital doctors). The research study spans over 21 years (1994-2014) and is mostly

descriptive, but nonetheless comprehensive and very informative. We explore average weekly hours of work using a new single variable of the self-reported hours of work, that encompasses hours in main – basic and overtime – and second job. The chapter offers information on hours of work for GPs and hospital doctors by gender breakdown and other demographics such as ethnicity (white versus non-white), country of birth (UK natives versus immigrants) or regional distribution (residence region). It also presents information on more or fewer hours wanted to work in main job. The analysis conveys that hours of work have fallen over time and that the sharp fall happens between 1994 and 2004. Since 2004, average hours of work continue falling but at a reduced rate. The second contribution of this chapter explores the trends in both the extensive and the intensive margin. Since 2000 the headcount of doctors has expanded almost every year and the number of female workers has grown very rapidly too, changing the gender composition of certain types of doctors, especially in primary care. However, as stated in the main contribution, total average weekly hours of work have fallen.

This detailed analysis can increase awareness of incorporating both margins when addressing workforce planning policies. Also, it will help policymakers to unravel whether there is a real shortage of doctors in the UK or they can tackle this perceived shortage from the intensive margin, incentivising doctors better.

1.3.2. OVERVIEW CHAPTER 3

Chapter 3 extends the previous analysis estimating labour supply models over the lifecycle for doctors (‘partner’ GPs, ‘salaried’ GPs and hospital doctors) and compares with other professionals (lawyers and accountants). The analysis confirms differences by gender and a gender gap in hours in all occupations, but the gap is wider amongst doctors, especially in primary care. This behaviour is mostly explained by motherhood in the literature on the labour supply and it is also the case for GPs. Moreover, since the new contract (2004) the policy has consisted on expanding the headcount of GPs increasing the recruitment of salaried GPs. Also, female GPs seem to participate more in this work arrangement, where they outnumber males. While the labour supply shows the

usual U-inverted shape for males that is not the case for females where it shows a more U-form curve between 26 and 46 years old. Beyond that age, the hours of work start to fall as one should expect. The chapter makes use of counterfactuals to explain the gap in hours by gender and occupation.

1.3.3. OVERVIEW CHAPTER 4

The last chapter covers the analysis of the well-being of doctors and the implications on the labour supply. Although there is considerable literature on job satisfaction, especially for GPs, and on the issue of burnout amongst physicians, that is not the case on well-being of doctors where the very little existing research relies on small snapshots and unrepresentative samples. The main contribution of this chapter lies in exploring the self-reported well-being measures (anxiety, happiness, life satisfaction and worthwhile) as well as other metrics (such as depression, hypertension and whether having health problems limit work activity) using the Annual Population Survey (APS). Contrary to popular belief, and the assertions of the professional bodies for physicians, doctors appear to be more satisfied, happier, feel that their life is more worthwhile and are less anxious than other professionals (like lawyers and accountants).

The chapter includes economic content relating to labour supply including hours of work in main and second job and desired hours (more or fewer than currently worked). It finds that hours of work, at the margin, has virtually no significant effect on the various measures of well-being included in the analysis. The could mean that these individuals are, on average, on their labour supply curve. Among the small proportion of respondents who state wishing to work more hours, we find that, controlling for the wage rate, those individuals have lower values of the well-being measures used. This is true for lawyers and accountants, but not for doctors. So, this can be viewed as evidence of intrinsic motivation. The main policy implication of this finding is that, hence, expanding supply along the intensive margin is likely to be both an inexpensive and quick solution to the alleged supply shortfall of doctors, relative to the current policy of expanding supply along the extensive margin.

Chapter 2

DOCTORS' HOURS OF WORK IN THE UK: LABOUR SUPPLY INSIGHTS USING THE LFS

2.1. INTRODUCTION

The unprecedented expansion of the headcount of doctors in the UK since 2001 has been justified by the increasing demand for medical services from a rapidly ageing population; growing expectations of better quality health services; and the overall rise in the UK population. On the supply side, despite the rising female participation in labour markets since the 1980s (Goldacre, 1998) and a rise in the number of immigrant doctors, there still is a belief that there is a shortage of doctors. The existing doctors have been reporting growing levels of stress and heavy workloads which have reflected growing intentions to leave the profession early[5]. Nevertheless, recent reports predict an increase of 60% in trained hospital doctors by 2020 (CfWI, 2012, RCP, 2013), potentially leading to an oversupply of 2,800 consultants, and 5,000 extra GPs for understaffed Primary Care services (NHS, 2016; RCGP, 2013).

These trends have supported a long-standing perception that the UK needs to recruit more doctors, especially in primary care services and professional bodies are suggesting significant shortfalls in supply. The Centre for Workforce Intelligence (CfWI) reported that England needs 3,250 more GPs (CfWI, 2012); the General Practice Forward Review foresees 5,000 extra GPs (NHS, 2016);

[5] See BMA, 2014q1; BMA, 2014q2; BMA, 2014q3; BMA, 2014q4; BMA 2015q1; BMA, 2015q2; BMA, 2015q3; BMA, 2015q4.

and other sources have suggested[6] to recruit 8,000 new full-time GPs by 2020[7] (RCGP, 2013; NHS, 2014; NHS, 2016). All of the existing work has focussed exclusively on the extensive margin and the policy suggestions have largely, but not entirely, been confined to expanding the number of doctors[8]. In our work, we focus on average hours of work (intensive margin) to investigate whether there might be some possibility of expansion along this margin, rather than only through increasing the headcount (extensive margin).

It is in primary care where there is very little information on hours since most such physicians (General Practitioners, GPs[9]) work as either self-employed ('partner' GPs) or employed ('salaried' GPs) at these independent partnerships (few are employed directly by the NHS). Thus, for GPs, there is limited data available on their supply of hours of work. Moreover, even the little we know about the FTE headcount of hospital doctors (DDRB, 1992-2017) is limited to their contractual arrangements and does not take account of overtime or activity in any second job.

THE 2004 CONTRACT

The 2004 contract introduced new incentives, mostly financial, for GPs and hospital doctors. Besides, it regulated the number of hours for full-time doctors: hospital doctors would make up to 40 hours per week, the equivalent to 10 Programme Activities where each Programme activity averages 4 hours; and GPs up to 37.5 hours per week, in 9 sessions of 4 hours and 10 minutes. Alternatively, the European Working Time Directive (EWTD) capped the

[6] https://www.bma.org.uk/connecting-doctors/the_practice/b/weblog/posts/general-practice-needs-support-now . http://healthwatchtrafford.co.uk/news/new-league-table-reveals-gp-shortages-across-england-as-patients-set-to-wait-week-or-more-to-see-family-doctor-on-67m-occasions/ .

[7] https://www.england.nhs.uk/commissioning/wp-content/uploads/sites/12/2016/05/targeted-invstmnt-recruit-return.pdf .

[8] For example, Bloor et al (2006) have suggested that the gap could be filled with highly qualified trained nurses.

[9] In the UK, most GPs are independent contractors (self-employed, partner GPs) and are bound to either a national contract (General Medical Services, GMS) or a local contract (Personal Medical Services, PMS).

maximum number of weekly average hours of work to 48 in a 17-week period to minimise medical errors.

For GPs, it covered primary care physicians contracted under the General Medical Services (GMS), both partner GPs and salaried GPs, and replaced the former 1998-2003 contract for GPs but those under the Personal Medical Services (PMS) were excluded. The PMS was introduced in 1997 under the 1990 GP contract and allowed GPs under this contract to work as 'salaried' GPs, getting paid by session and temporary work as locums. The contract aims to provide more flexibility for contractors, providing better order and clear structure to Primary Care Organizations.

Doctors benefited from the new financial incentives the 2004 contract offered. GPs get a 'global sum' which is a weighted income of all practices GPs covered, where each weight is allocated on the basis of each practice list size which is adjusted by patients' characteristics such as age or sex. Patients' weights are based on the workload they generate. So, locations where most patients are children, women and the elderly, will get higher weights and, thus, higher global sum. There is also an additional weight based on the location of the practice (rural versus urban practices where rural are more expensive, for example), the cost of hiring and employing staff (the so-called Market Forces Factor, MFF), the rate of changing or cancelling appointments in the patient list (known as the rate of "churn") and morbidity in the area based on the measure provided by the Health Survey for England. This 'global sum' formula may have change GPs' income and the income loss for some GPs (for example, in rural areas) and through their representative organisations the GPs were able to extract a concession. GPs receive a "Minimum Practice Income Guarantee, MPIG", which temporarily protected the previous income levels of those otherwise have lost out – that guarantee being withdrawn over time by a combination of inflation and the clawback of pay rises.

Payments are calculated using Carr-Hill formula (attributed to Professor Roy from The University of York). The calculation includes practice characteristics, individual patients' age, gender and health conditions and calculates a

"weighted" count of patients according to need. Hence, what matters is patients' characteristics and health conditions and not the burden of patients list. So, should two practices have the same number of patients, they could have different weighted patient numbers due to heterogenous patient characteristics and health conditions. This would result in higher levels of funding for the practice with worst patients' characteristics.

Additionally, the Government introduced a voluntary scheme to foster quality of the service delivered in primary care. This is called the Quality of Outcomes Framework (QoF). This mechanism incentivises GPs to increase their activity incorporating more services in their practices than the basic services. The requirement to benefit from this mechanism was to take more services and fulfil certain conditions based upon 146 indicators. The result is that GPs get points and, hence, more money. The money coming from QoF is taken out the global sum that rewards GPs' activity. So, essentially, this extra money is distributed income rather than representing extra money. However, GPs can opt out the QoF. The fact that the QoF payments are considered extra money for GPs' activity relies on this decision to opt in or out. However, most GPs opted in. The results derived from QoF has led to substantial improvements in the screening for risk factors in the community by primary care, particularly for older patients with cardiovascular disease.

With regards to hours of work the new contract does not establish a minimum number of hours per week, apart of setting the maximum for a full-time worker. However, almost all GPs were forced to opt out of weekend and night out-of-hours (OOH) services. The reason was financial as the cost of providing a good quality service was twofold the funding allocated to it by the patient. Also, the government set standards that were difficult to meet by workers (all calls to be answered within 60 seconds etc.).

Additionally, apart the 2004 contract reduced the basic pay GPs got but doctors still could get higher earnings thanks to the QoF bonus scheme. The old contract paid General Practitioners (GPs) on the basis of fees and allowances. In contrast, the new contract allocated resources to GPs through three main

funding streams: the global sum; the Quality and Outcomes Framework (QoF); and enhanced services payments. Separate funding streams were available for practices to modernise their premises and improve their IT infrastructure.

This chapter looks at doctors' labour supply from the intensive margin exploring average weekly hours of work in great detail over a twenty-one-year period (1994-2014) using information from the Labour Force Survey (LFS). We analyse doctors' self-reported hours of work over time, and while our main focus is on GPs, we also consider hospital doctors. Our ultimate objective is to examine the extent to which the supply of doctors' hours has changed - to complement what we already think we know about the headcount (extensive margin). We find evidence that hours of work have fallen over the last two decades, most of the drop occurring before the time the new 2004 contract was passed in February 2004 and implemented two months later. Although the GP headcount rose by 44.5% between 1994 and 2014, their average hours of work fell by 30% and their overall supply of hours remained almost exactly as it was in 1994 (only a 1% change between 1994 and 2014). In contrast, the increase in the supply of hospital doctors of approximately 136% is only translated into an overall increase in the supply of hours of 91% because of the 19% reduction in their average hours of work per week.

2.2. LITERATURE

Over the last years, there have been important changes in labour supply both at the extensive and intensive margin. By education level, participation (extensive margin) has risen markedly, especially for those with more years of education (16+). By gender, females have benefited from higher participation in the US and the UK, but males slightly have dropped theirs since 1970s (Blundell and MaCurdy, 1999). In other countries, like Germany, participation has been more stable over time though females' participation slightly rose and fell for low-educated workers. By cohorts, older cohorts of males have experienced lower declines in participation than young cohorts in the US, the UK and Germany but for females there has been the opposite.

Average annual/weekly hours of work (intensive margin) have shown different patterns by country and education level. In the US, for example, average weekly hours grew between 1983 and 1994 and highly educated workers increased their hours more than other workers (Blundell and MaCurdy, 1999). By gender, the more educated male workers, then, continue working more hours in the US than the low educated. Nevertheless, hours of work remained around 42 hours per week on average between 1970s and 1990s. In Europe, for example in the UK and Germany, average weekly hours fell in Germany between 1984 and 1994 and the highly educated workers experienced the sharpest fall. Meanwhile, in the UK, average weekly hours of work grew over the same period and the highest surge was for high educated workers whose average weekly hours grew by 5% between 1984 and 1994. On the other hand, female workers' average weekly hours increased for all workers in the US and the growth was greater for females having more than 16 years of education. In the UK, the change in average weekly hours was steadier for most female workers and grew for the more educated 14% (from nearly 30 hours per week in 1982 to slightly above 34 hours per week in 1994). Meanwhile, average weekly hours fell in Germany and the sharpest fall was for the more educated female workers.

The determinants of work behaviour of males and females is well documented. More years of schooling, increasing proportion of males taking early retirement, a fall in weekly hours worked, increase in holiday entitlement or exerting lower effort have been signalled as main causes to explain why males do work less over time (Pencavel, 1986). On the other hand, females' average weekly hours of work have shown a secular decline too but their participation in the labour market has grown dramatically. Killingsworth and Heckman posit that what matters when looking at females' labour supply is number of weeks worked per year rather than average weekly hours of work (Killingsworth and Heckman, 1986).

Most analysis from a family perspective or on married female workers usually control for unearned income. Ilmakunnas and Pudney estimated a discrete

choice model of labour supply for Finnish females to identify if Finnish females were constrained to work their desire hours using data from the Labour Force Survey and Census in Finland (Ilmakunnas and Pudney, 1990). There is an arbitrary assumption on participation (positive hours) and the definitions of part-time (19h) and full-time (39h). They control for unearned income and conclude that females are constrained because there are few chances to get part-time work as wages increase, setting the elasticity of Finnish females around 0.7. Other authors also included this control. Unearned income is important to evaluate labour supply as it plays an exogenous role on decisions on hours. Empirical evidence has tested that unearned income reduces labour supply and, thus, labour earnings while it increases the consumption of leisure about 11% (Imbens et al, 2001). This is more evident on workers aged above 50.

Specifically, for doctors, there is a long-lasting perception that there is a shortage of physicians which has been attributed to changes in modern societies such as ageing populations, growing needs of health services and rising female participation in labour markets since the 1980s have contributed to the expansion of the headcount of doctors (Goldacre, 1998). The literature looking at the feminisation of the medical profession is thin but has expanded quickly (McKinstry et al, 2006; Hedden et al, 2014; Jefferson et al, 2015). Although there are gender differences in the labour supply, this topic only has produced more studies recently and many are required. Most analyses usually are static and stress the positive role of females as a factor that is increasing the supply of doctor services to the market.

The growing female participation held the expansion of the headcount (extensive margin) of doctors in the UK since the late 1990s. Empirical studies focussed on understanding medical students' career preferences to ascertain potential shortages. Jones and Fisher tracked medical graduates from 1995 to 2004[10] (Jones and Fisher, 2006) and found that female GPs outnumbered males in 2004 (107/159 versus 52/159) and that they are more likely to work

[10] Sample size is 544 in 1995 and 484 responded to the questionnaire in 2004 (89%).

less than full-time (76% of females versus 21% of males). Moreover, they identified career changes to primary care[11] after a few years of experience being the proportion females switching to primary care greater than males. Among the main reasons that respondents gave for this switch were hours of work and working conditions (81%) followed by domestic circumstances or career prospects among others.

In the UK, the perceived shortage of doctors has been on the research agenda for some time (Elliot, 2003) but more studies are needed. Rather than training more doctors, Bloor et al discussed whether highly qualified nurses with advanced knowledge at doctors' level could be a more cost-efficient alternative (Bloor et al, 2006). However, this could exacerbate the shortage of nurses, which also has been widely explored in the literature (Antonazzo et al, 2013; Rice, 2005). Also, their study does not estimate the number of nurses in the NHS with that level of training, whether they will be willing to undertake further training, and how much time and cost it would take to train to become doctor equivalents.

In England, Gravelle and Hole estimate the total hours worked by English GPs using linear regression models (Gravelle and Hole, 2007) running probit models to ascertain the probability that GPs work part-time or full-time using data from a GP database from the Department of Health, through the National Primary Care Research and Development Centre. Including a part-time/full-time variable may lead to problematic interpretations because hours of work then appear on both sides of the equation. Overall, part-time GPs worked, on average, 13.5 hours less than full-time doctors; hours of work increased with experience (maximum level at 17 years of experience) and they report a 6.5 hours gender difference in full-time workers (49.55 for males and 43.16 females) and 5 hours for part-time workers (34.09 for males and 29.17 for females). Therefore, the overall effect they get is that female GPs work 11.3 hours less than males. This is explained by the big effect dependent children

[11] Only 18% (96/544) of those who graduated in 1995 chose to follow medical careers in general practice but in 2004 that proportion rose to 33% (160/483).

under 18 have on the supply of hours of work and that males are less influenced than females when there are dependent children at home.

The interest in the analysis of hours of work of doctors has also been studied in other countries and most confirm a fall over time in the average hours of work of physicians. For example, Staiger et al analysed the trends in the hours of work of doctors in the US using the Current Population Survey (CPS) data between 1976 and 2008 and acknowledge a fall of almost 4 hours per week in 10 years (54.9 hours per week in 1996-1998 and 51.0 hours in 2006-2008) whereas hours of other professionals remain steadier (Staiger et al, 2010). They also report that financial incentives have a strong effect on hours and concluded that the fall in hours occurred during the period where physician fees dropped, positing a close link between physician fees and hours of work.

In Norway, Baltagi et al find that hospital doctors work 9.4 hours less per month in 1996 than in 1994 which is attributed to the specialty they work in, family specifications (child dependent under 3 years), hospital location and size (Baltagi et al, 2005). Johannessen and Hagen report a 4-hour gender gap compared to the 10-hour gap found in the UK or Germany (Johannessen and Hagen, 2012) which is mainly attributed to having children aged under three.

In Canada, main data sources rely on data from the Canadian Medical Association (CMA), which access is not public. The fact that most GPs in Canada are self-employed and are paid on a common fee schedule permits them to allocate their hours of work at their discretion, like in the UK. This is important as GPs hours of work have fallen over time. Amongst the main explanations provided, spending too much time doing administrative work and less clinical work (NHS, 2014; NHS, 2016), a continuous drop in direct patient care (Crossley et al, 2009), resulting in a fall in the average hours of work of female GPs[12], or having dependent children under 5 are the most widely reported (Sarma et al, 2011). Marital status (being married) has not been sufficient to explain the reduction in hours of work if children are excluded

[12] Between 1982 and 2003 GP average hours of work plumped down from 45.4 hours to 38.3 hours, showing a fall of 5.6 hours for males, from 47 hours, and around 34 hours for females.

(Wang et al, 2013). So, children potentially could be a determinant of the female doctors' labour supply, at least Primary Care doctors.

In Australia, there is a growing interest on the analysis of hours of work, especially GP hours. Most studies use data from the dataset Medicine in Australia: Balancing Employment and Life (MABEL). Joyce et al examined the hours of work in main job for GPs, excluding potential hours of work devoted in a second job either in the private or the public sector. They find a 4.9 decrease of hours over a fifteen-year period (Joyce et al, 2015). Using wave 1 MABEL (year 2008) Kalb et al also confirm that GPs work fewer hours compared to hospital doctors, regardless of their gender, and that male doctors are older than females, which could be explained by retirement patterns and regulation (Kalb et al, 2017).

2.2.1. UK HEADCOUNT OF DOCTORS: MAIN DATA SOURCES

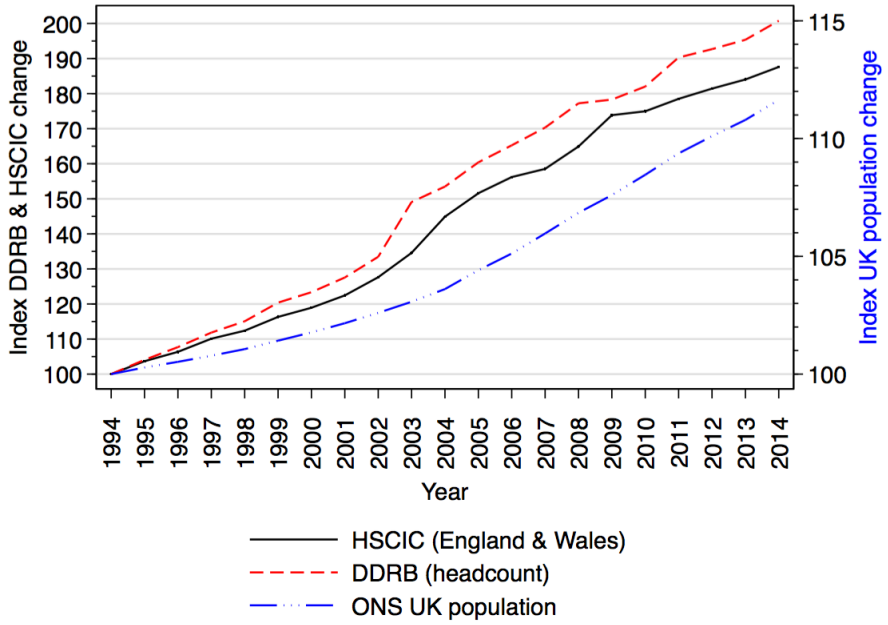
In the UK, there are a few sources that provide information of the headcount of doctors, but most do not include hours of work. The General Medical Council (GMC) contains information on the number of doctors in the UK, both registered and licensed doctors in its medical register. Also, it compiles information about the number of doctors by specialty through the GP and the Specialist register.

The Doctors and Dentists´ Review Body (DDRB) released yearly by the Office of Manpower Economics (OME) since 1991 has been collecting staff figures on headcount and full-time equivalent[13] (FTE) for the whole UK. However, unlike the GMC, they only provide overall figures with no gender breakdown and, from our understanding, they do not include information of hours of work either. In England, the Health and Social Care Information Centre (HSCIC), now call NHS Digital, is the main source for doctors' headcount, in primary care and at

[13] Full-time equivalents (FTE) is an arbitrary definition in the NHS. The relationship between full-time/part-time and FTE is as follows: a person working full-time equalises 1.0 FTE while for those working part-time there will be a pro-rata equivalence with 1 decimal. For example, 1 doctors working full-time will account for 1.0FTE. For GPs, full-time workers are those who work 37.5 hours per week (this is around 9 sessions considering that each GP session length is 4 hours and 10 minutes. Full-time hospital doctors work 40 hours per week (this requires making 10 Programme Activities (PAs) per week where each activity is estimated to require 4 hours). Part-time GPs, for example, working 20 hours each make 0.6FTE (20 hours/37.5) and part-time hospital doctors working the same number of hours make 0.5FTE. Hence, getting 1.0FTE will demand fewer hours for GPs than for hospital doctors.

hospital level, and includes the main demographics. The headcount of GPs grew by 19.9% (40,236 in 2013 including all GPs) and by 43% for hospital doctors, Consultants (41,220 in 2014), over the period 2003-2013 (HSCIC, 2014). Figure 2.1 conveys that the expansion of the headcount of doctors (DDRB, HSCIC) has grown faster than the growth in UK population (ONS).

Figure 2.1 DDRB, HSCIC and Population Change (Index)



The other sources that refer to hours of work are the British Medical Association (BMA) surveys, the UK Workload Surveys and the National GP Worklife Survey (NGPWS). The GP UK Workload Surveys are about GP practices. Two surveys have been carried out: the 1992/93 GP Workload Survey and the 2006/07 UK Workload Survey. It was not possible to access to the 1992/93 survey. The 2006/07 survey, which is accessible online[14], contains information under the 2004 contract and includes all workers in GP practices, not just GPs (HSCIC, 2007). Data for the 2006/07 survey comes from the Technical Steering Committee (TSC). This database includes 10,310 GP practices in the UK (data is from the four countries) and was the most comprehensive data by that time, including information about headcount, list size, contract types and GP

[14] http://content.digital.nhs.uk/pubs/gpworkload

practices in rural areas. In 2006/07, sample size was 6,387 including GPs (1,213), other clinical staff (1,306), non-clinical staff (3,267), attached workers to practise (497) and GP locums (104). From an initial random sample of 4,000 practices, 834 practices accepted to participate and received a questionnaire. Response rate is below 40% (329 practices of 834). Data included in the survey refers to the proportion of GPs by contract arrangement, average number of GPs by practice size, practice composition, hours of work by practice type, staff group (salaried, partner, non-clinical, other clinical staff, GP locums or GP registrar) or geographical location. It also includes average number of sessions worked by type of GP and the distribution of hours of work, for example.

There were 1,213 GPs who participated in the 2006/07 Survey of whom 67% were partner GPs, 19% salaried GPs, 7% GP Registrars and 8% GP locums. Overall, 70.8% of partner GPs, salaried GPs and GP Registrars are self-employed (amongst partner GPS 94.6% are contractors but this is only 2.8% for salaried GPs[15]). Full-time workers are defined as those working 8 or more sessions[16], which corresponded to 35 hours per week or more. Partner GPs working full-time are more numerous (62%) than salaried GPs (22%). On average, a full-time (FT) partner GPs[17] worked 44.4 hours per week (standard error 0.5) in this period, while all partner (full and part-time) GPs averaged 38.2 hours per week. Full-time salaried GPs worked 39.6 hours per week on average (standard error 1.2) and 23.8 hours per week overall (including full and part-time workers).

The series of the National GP Worklife Survey (NGPWS) have been running biennially since 1998 by the National Primary Care Research and Development Centre at the University of Manchester. To date, eight surveys (Sibbald et al, 2000, 2003; Whalley et al, 2005, 2006; Hann et al, 2009, 2011, 2013; Gibson et al, 2015) have been carried out with their resulting reports (see Appendix 2 for more detail). Between 1998 and the latest report released in 2015 hours of

[15] See Table 8, pp. X, Annex A in the 2006/07 Survey.
[16] For a GP, a session lasts 4 hours and 10 minutes (GPC, 2014).
[17] A GP working full-time is that one working 8 or more sessions per week, where a session is defined as half day (approximately 4 hours and 10 minutes). GPs not in the retainer scheme.

work of GPs decreased by 5 hours overall (from 46.4 average weekly hours in 1998 to 41.4). These series not only focus on hours of work but also provides information on job satisfaction, overall life satisfaction and intentions to quit.

2.3. DATA

2.3.1. JUSTIFICATION

This chapter draws from the comprehensive and detailed data contained in the Labour Force Survey (LFS), the main source for tracking changes in the UK labour market (Werner, 2006). We exploit this survey in great detail to conclude that potentially it can be used for prospective studies on doctors' labour supply.

The LFS is large, representing 0.16% of the population in Great Britain with more than 41,000 households, over 100,000 observations and approximately 600 variables each quarter with a homogeneous structure and few changes from period to period. A sample of 0.23% population of Northern Ireland is also included, adding approximately 1,600 additional households.

The LFS was launched in the 1970s, so it spans a reasonable number of years[18] and contains extensive information on demographics, at individual and household level, education, employment status (employed, inactive or unemployed), employment arrangement (full-time or part-time, employee or self-employed), industry and occupation, number of days worked, hours and earnings (Ma et al, 2006).

Since 1993, the data is collected in five consecutive waves, which is equivalent to quarters, in the Quarterly Labour Force Survey (QLFS) series[19]. In every wave, 20% of the sample is replaced and variables are asked for all respondents, except the income questions, which are asked only in wave 1 and 5. The total QLFS response rate has fallen from nearly 80% in 1993 to 50% in

[18] The LFS was launched in 1973, moved to a yearly basis in 1984-1991 and the Quarterly LFS (QLFS) was introduced in Spring 1992.
[19] Each wave corresponds to 13 weeks, to align with winter, spring, summer and autumn seasons.

2013[20]. This decrease has also been remarkable across waves[21] (ONS, 2015) where wave 1 has the highest response rate (80% in 1993 and around 60% in 2013). For the same period, refusals have increased 18 percentage points (approximately from 14% in 1993 to 32% in 2013) and non-responses have increased by 7 percentage points (approximately from 3% to 10%).

There are other surveys containing information about occupation, hours and earnings such as the Annual Survey of Hours and Earnings (ASHE) and the Family Resources Survey (FRS). ASHE is a sample of National Insurance Numbers (NINs). It is larger than the LFS and is based on a 1% sample of employee jobs taken from the tax office (Her Majesty Revenue and Customs, HMRC) Pay As You Earn (PAYE) records (Ma et al, 2006). Unlike the LFS, ASHE provides only individual responses rather than household number. Information on hours and earnings is supplied by the employer and is not self-reported as it is in the LFS which may reduce the biases in responses. ASHE, however, excludes data from self-employed workers but they are included in the LFS. This is a potential limitation for using ASHE as it only contains information of employees. For GPs, this would mean missing 70-80% of the GP headcount in the UK. Alternatively, the FRS is a continuous cross-section survey launched in 1992 by the Department for Work and Pensions (DWP) to track poverty and evaluate the role of the welfare system. The sample is large and random, covering 25,000 households yearly, but it is lower than LFS. FRS has considerable detail on income, earnings and hours of work and it is possible to identify doctors and dentists. Also, FRS contains data on income for self-employed, something the LFS fails to do. However, in the FRS respondents are not asked the Standard Occupation Classification (SOC) questions so we cannot identify medical practitioners using the 4-digit SOC groups, which we need for this group. Also, it neither asks questions about size of place of work

[20] Although it is unclear whether non-response is random so that when a household does not provide a response in a specific wave, information is obtained on a roll-forward basis with data from the previous wave.

[21] Over the past 20 years, response rate has dropped from 79% in April-June in 1993 to 49% in January-March in 2013. Usually, wave 1 reports the highest response rates and wave 5 the lowest, suggesting there is attrition bias in the survey.

nor provide information using the Standard Industry Classifications (SIC), which is required to split medical practitioners into GPs and hospital doctors.

Bearing in mind all the above, the LFS is the most complete available survey, conducted by ONS, and provides the best compromise for the analysis of the main issues on the labour supply of doctors. It is not as large as ASHE but contains detailed information about self-employed workers, allowing us to look at the hours of GP 'partners'. While the FRS contains income data for the self-employed and employee groups, it does not permit the identification of doctors using Standard Occupation Classifications nor break down doctors in hospital doctors and GPs combining occupation and industry classification groups with the detail this analysis requires.

2.3.2. SAMPLE DESCRIPTION

This chapter gets the information from a pooled cross-section dataset built from the QLFS data available from 1994 to 2014. We used all 5 waves from the person data set (End User License, EUL) to examine hours of work (intensive margin). Earnings variables are only reported in waves 1 and 5 for employees but this information is missed for self-employed workers. The sample includes respondents trained as medical practitioners who are reported as workers who gained a university degree in medicine. It includes only doctors that have completed their postgraduate training. Undergraduate medical students are excluded. Hence, the sample is formed by doctors in training (junior) and licensed doctors.

The initial identification encompasses 26,283 observations reported working as medical practitioners. It is possible to break into GPs and Hospital doctors and other roles using the Standard Industry Classification (SIC). We only consider GPs and Hospital Doctors and rule out other observations (mainly working in Academia, the pharmaceutical Industry and other professions, amounting to 3,499 respondents). Therefore, our final sample size is 22,784 doctors in the UK, of whom 36.57% are GPs (8,333) and 63.43% hospital doctors (14,451).

Unfortunately, the data does not permit break down of hospital specialties in more detail, which would have been very useful at least into Consultants or Specialists (SAS) but we do not need for the purposes of this thesis. Data from HSCIC for the UK reports the following proportions: 31.36% GPs (excluding Retainers and Registrars) from 1994-2014 and 68.64% hospital doctors (Consultants, Registrars and Other doctors in training). Therefore, and considering all types of GPs, the proportions given in the QLFS are very stable, 33.34% GPs (including all) and 66.66% hospital doctors. Hence, the LFS approximates well to official figures. Table 2.1 shows the main descriptive statistics for GPs and hospital doctors in absolute and percentage terms.

Table 2.1 Descriptive Statistics

	GENERAL PRACTITIONERS *(N = 8,333)*		**HOSPITAL DOCTORS** *(N=14,451)*	
Variables	**Mean**	**N**	**Mean**	**N**
Age	45.72	8,333	39.58	14,451
Males	0.59	4,928	0.61	8,877
Females	0.41	3,405	0.39	5,574
Full-time	0.71	5,942	0.90	12,972
Part-time	0.29	2,391	0.10	1,476
Public	0.62	5,142	0.97	14,069
Private	0.38	3,187	0.03	376
Native	0.80	6,691	0.66	9,497
Immigrant	0.20	1,642	0.34	4,954
White	0.83	6,877	0.67	9,753
Non-white	0.17	1,456	0.33	4,698
Employed	0.22	1,818	0.98	14,104
Self-employed	0.78	6,514	0.02	329

Note: For partner GPs, the average age is 47.33 where 64.69% are males and 35.31% females. By contract arrangement, 73.89% work full-time and 26.11% part-time. For salaried GPs, average age is 39.91 with 39.22% males and 60.78% females and 62.05% in full-time and 37.95% in part-time jobs.

By gender, the QLFS sample used in this chapter breaks down into 60.59% male doctors (13,805/22,784) and 39.41% females (8,979/22,784) and by type of occupation the breakdown shows a dominance of male workers, 59.14% male GPs (4,928/8,333) and 40.86% females (3,405/8,333) whilst for hospital doctors 61.43% males (8,877/14,451) and 38.57% females (5,574/14,451). For

England, data from HSCIC comprises 61.49% male GPs and 38.51% females; 64.97% male GP partners (62.84% in LFS data in England) and 35.03% females (37.16% LFS data).

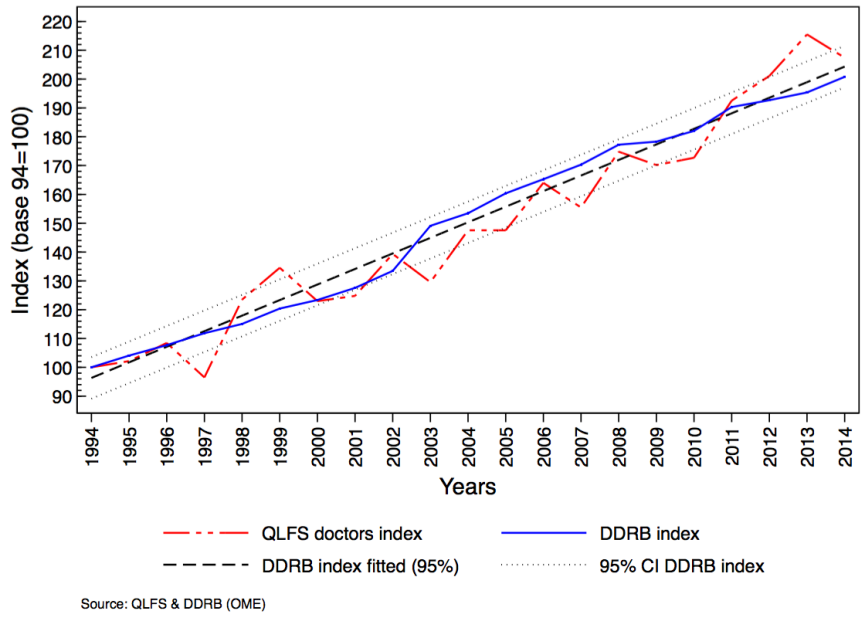
2.3.3. COMPARING THE QLFS WITH OTHER SOURCES

Our database is built upon 84 QLFS individual EUL datasets pooled over 21 years, from 1994 to 2014. Medical practitioners are reported as workers who gained a university degree from a recognised medical school by the General Medical Council (GMC). The LFS includes questions about qualifications gained outside the UK (variable FORTYP) but they are only available from 2011 onwards.

Initially, our identification strategy shows only workers who hold a degree in Medicine, either as a first degree or second degree. Subsequently, it refines the sample only keeping those who reported working as medical practitioners[22] in their main job using the most recent standard occupation code classification (SOC2010) and, next, it filters by industry code[23] using the Standard Industrial Classification (SIC92 and SIC07) to break down doctors in General Practice or Hospitals activities. Among GPs, partner GPs are self-employed GPs and salaried GPs are employees. The LFS does not enable us to go further to identify specialty, as it does not incorporate such detailed data. Figure 2.2 compares LFS and DDRB headcount growth (1994=100), which includes data for the whole UK[24], but the LFS tracks the growth in the DDRB index quite well, at least up to 2010, showing a rise in staff numbers.

[22] According to the GMC, medical practitioners are workers who are able "*to diagnose mental and physical injuries, disorders and diseases, prescribe and give treatment, recommend preventive action, and conduct medical education and research activities. They may specialize in particular areas of modern medicine or work in general practice and, where necessary, refer the patient to the specialist*". The entry requirements for this occupation are holding a university degree from a medical school recognised by the General Medical Council (GMC), followed by a year of pre-registration training as a house officer.
[23] Occupation codes are reported using the Standard Occupation Classifications (SOC1990, SOC2000, SOC2010). Industry codes are built upon Standard Industrial Classifications (SIC1992, SIC2007).
[24] Base year for headcount is 1994 and we compute the growth in figures.

Figure 2.2 LFS and DDRB Indices of Doctors Headcount



Source: QLFS & DDRB (OME)

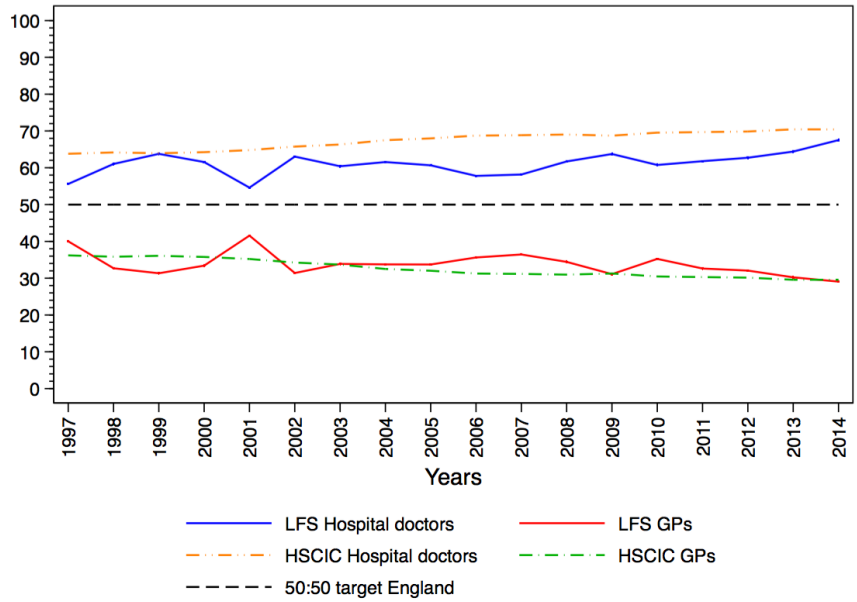
Note: the bumps and dips in 1997 and 1999 are explained by a fall in the number of male doctors by 20% (653 in 1997 and 823 in 1996) whilst females kept steady. In 1999, female doctors rose more rapidly than males (1.12 %) and quarter 1 is missed in 2001 due to Census 2001 work carried out by ONS at the expense of LFS work. We offset this by rolling-forward doctors' figures from previous quarter

With the Health Education England (HEE) Mandate (2015), the Department of Health (DoH) intends to increase the number of medical students becoming GPs, setting 50% target (known as 50:50 ratio). However, the assessment carried out in 2015 proved it was far from the 3,500-initial target. Figure 2.3 tests how well LFS tracks headcount from HSCIC plotting proportions by doctors' breakdown for England using the QLFS and compares data against the HSCIC numbers. We observe that the QLFS can also replicates quite well trends from HSCIC. The failure in achieving the 50:50 ratio (NHS, 2014) could reflect potential shortages of GPs, suggesting that the flows of trainees into General Practice are not enough to overcome this problem.

While the QLFS tracks the DDRB headcount reasonably well, only the NGPWS[25] is an alternative to compare whether average weekly hours of work in both surveys are alike.

[25] The series of the National GP Worklife Survey is a Commissioned survey started in 1998 at The University of York in alliance with PRUComm (Policy and Research Unit in Commissioning and the Health Care System). It covers GPs in England and Wales. Since the 3rd National GP Worklife Survey, the findings are reported from The University of Manchester. The PRUComm is funded by the Department of

Figure 2.3 Proportions of GPs and Hospital Doctors



Note: These figures record the headcount of GPs and hospital doctors. GP figures include Registrars and Retainers. Hospital doctors' figures include Consultants, Registrars and doctors in training.

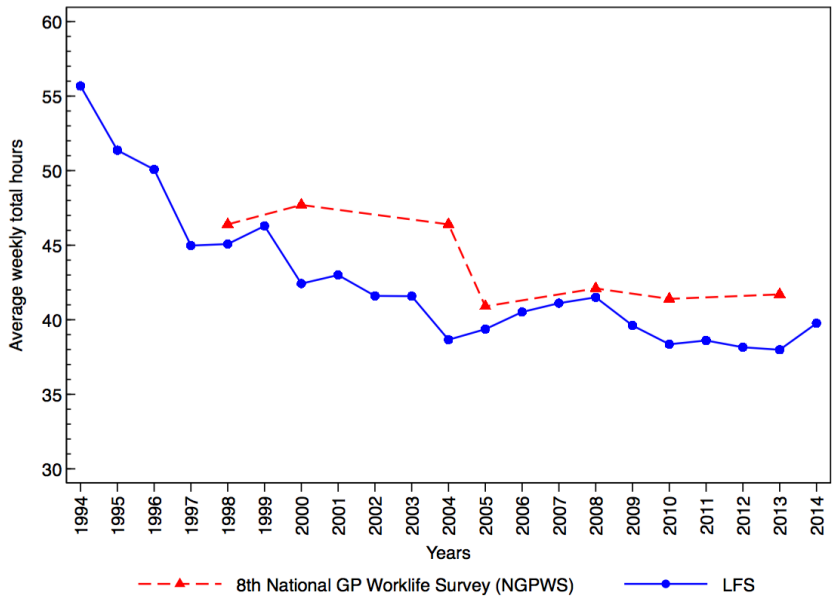
NGPWS data only refers to GPs in England and Wales, but the QLFS can approximate and compute that data as it covers the whole UK. Also, whereas NGPWS requires granted access, the LFS data is publicly available and data can be downloaded from the UK Data Service website. The anonymised version of the QLFS (End User License, EUL) is a better alternative to explore trends in hours of work and main issues of the labour supply of doctors in the UK (average hours worked). Figure 2.4 compares hours of work reported in the cross-sectional data of the National GP Worklife Surveys, which includes the

Health as a main reference centre for leading commissioning research. Data is collected between September and November 2012. This is a random sample of GPs which contact details are obtained from the GMS Statistics database from HSCIC and NHS Prescription Services. The random sample is based on 3,000 GPs in England (approx. 1/12 of population of GPs) excluding GP Registrars for the cross-sectional part. The longitudinal part was launched in 2010 (6th National GP Worklife Survey) and sample is 3,280 for the 7th National GP Worklife Survey (2,350 GPs in 2010, 855 GPs in 2008 but were not in 2010 plus 75 more from previous surveys). Response rate is 40% in cross-sectional part and 62% in the longitudinal in the 7th National GP Worklife Survey (for example in the 3rd Survey in 2004, response rate was 53% in the cross-sectional part (1,035/1,950) and 54% in the longitudinal survey (1,226/2,258). In the 7th National GP Worklife Survey they introduced a new question format to ask for hours of work which increased hours by 2 more (for example, in the 2008 report).

new question, and the total hours of work (main and second job) in the LFS for GPs working positive hours in England.

Hours of work in the NGPWS refer to average hours of work spent every week doing NHS GP-related work. Although they include all clinical and non-clinical NHS work, they do exclude out-of-hours work. Before 2008, the 5th NGPWS, the question about hours was more general: "*How many hours per week do you typically work as a GP? (Please exclude any hours on call)*". From 2008 they asked respondents: "*How many hours do you spend, on average, per week, doing NHS GP-related work? (Please include ALL clinical and non-clinical NHS work but EXCLUDE OUT-OF-HOURS WORK)*". This methodological change increased average hours by 2 compared to results from the original question. So, all average hours obtained in former surveys were updated to this change.

Figure 2.4 National GP Worklife Survey vs QLFS (England)



Note: LFS shows total hours in main and 2nd job. In 2008, the NGPWS introduced a new hours of work question and increased previous results on by 2 more hours.

2.3.4. VARIABLE DESCRIPTION

This chapter focusses on the analysis of the total hours of work of doctors over time using a new variable that encompasses total hours worked per week which includes total hours in main job (basic and overtime usual hours) and actual hours in second job. The fact that two different indicators for hours are included

in the definition (usual versus actual) is because usual hours in second job are not available in the LFS. Usual hours of work measure the number of hours that respondents usually work every week and are not affected by holidays, bank holidays, illnesses or any other absence. Therefore, they provide a better measure of usual working patterns rather than actual. Actual hours measure the number of hours that respondents work during the week and are seasonally adjusted to reflect absences from work (Walling et al, 2007; Clegg, 2012). Usual hours, then, provides a better indicator on hours worked on a regular basis and convey a better measure of the average weekly hours worked. Also, it depicts a broad and accurate insight on the usual available labour supply, in terms of total average hours worked by doctors. All the variables used to construct the variable total hours in main and second job are continuous (basic usual hours in main job, overtime usual hours in main job and actual hours in second job).

GPs are broken down into 'partner' and 'salaried' GPs using the ILO definition variable included in the LFS. This ILO definition classifies workers in terms of their employment type which classifies workers into active (employed, self-employed), unemployed or inactive (students, retired, looking for family, and other statuses). The GP breakdown by type of GP, thus, makes use of this classification where salaried GP is obtained by combining GP variable and employed working arrangement. These are dummy variables.

The analysis also includes covariates such as age, sex, married/cohabiting, single, widowed, divorced, separated, native, immigrant, white, non-white, want more hours, number of more hours wanted, want to work fewer hours, number of fewer hours wanted, public and private. All these variables are dichotomous except age.

Finally, we smooth trends of average weekly hours of work using a local polynomial (Cameron and Trivedi, 2009; Fan and Gijbels, 1996) of degree 3 and bandwidth 3. This smooths the trends in the graphs with non-parametric density functions and relies on a kernel-weighted local polynomial regression. Compared to other smoothing techniques, it is preferred to moving-averages

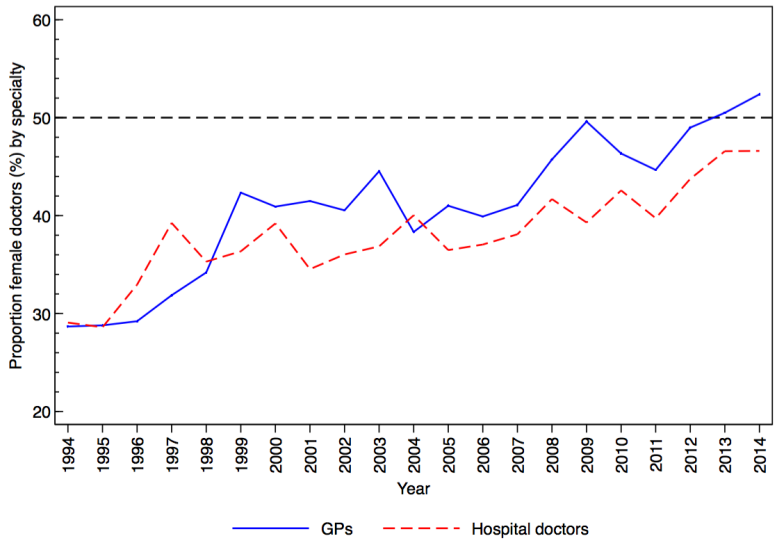
methods in pooled cross-section datasets because the Epanechnikov polynomial is the most efficient function to minimize the mean integrated squared error. This differs from Staiger et al (2010) who use moving averages.

2.4. RESULTS

2.4.1. DOCTORS BY GENDER BREAKDOWN

Figure 2.5 portrays sample size trends of female doctors over time to track the 50:50 ratio and conveys that female GPs now outnumber the proportion of male GPs and the increased participation of female GPs in relative terms has transformed this occupation into a female-dominated occupation (males' absolute figures fell from 415 in 1994 to 357 in 2014 in the LFS sample).

Figure 2.5 Feminisation of the Medical Profession



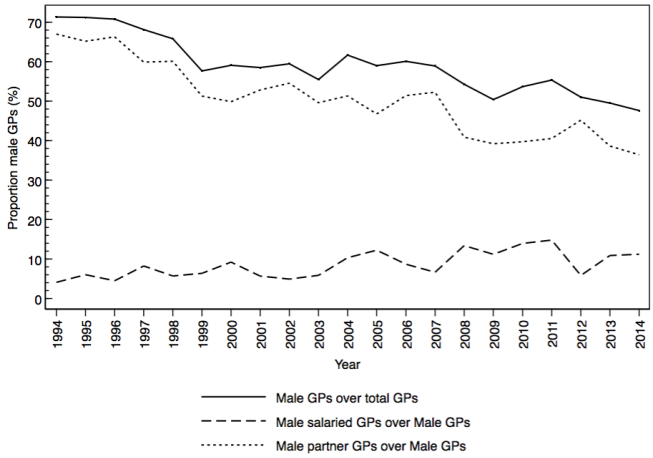
Note: QLFS data. From 1994 to 2014, women have increased their participation in the health sector. Female GPs almost doubled, from 28.67 % in 1994 to 52.38 % in 2014. However, the QLFS figures do not show that growth in absolute figures (119 in 1994 and 187 in 2014). Hospital doctors followed a similar trend (29.05% in 1994 and 46.60% in 2014) but absolute figures confirm a growing participation, from 157 female hospital doctors in 1994 to 384 in the 2014 sample.

The composition of GP numbers has changed over time. In the past, the medical profession was a male dominated occupation, but the growing female numbers has changed this composition. Figure 2.6 shows the composition of doctors by gender and GP role (partner or salaried GPs). The proportion of male GPs has fallen to 50% of GPs. This can be attributed to the decrease proportion of male GP partners. Female GPs have increased their proportion

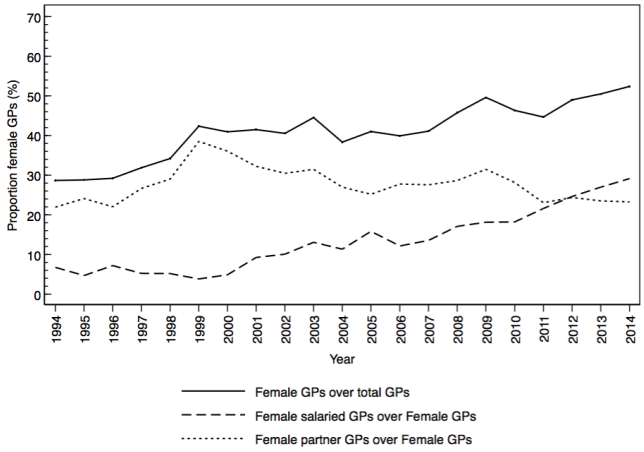
among all GPs, which is mostly attributed to the larger growth in female salaried GPs since 2006.

Figure 2.6 Composition of GPs by Gender Breakdown (partner vs salaried)

MALES



FEMALES



Hence, the growth in female GPs is explained by the increasing participation in salaried GPs. However, as partner GPs still mean almost 80% of all GPs, despite the rising numbers of female salaried GPs, primary care physicians continue to be a male dominated profession but less than it was in the past. The fast growth of female salaried GPs has not been enough to outnumber male GPs overall yet. Compared to HSCIC data, trends are similar, although the growth in female salaried GPs has been faster in England.

2.4.2. DESCRIPTIVE ANALYSIS

2.4.2.1. TOTAL HOURS OF WORK

Table 2.2 conveys the average weekly hours of work of hospital doctors, partner and salaried GPs by gender. The table includes a detailed decomposition of hours in basic usual hours in main job, overtime and total usual hours in main job. Then, it adds actual hours in second job. Missing data was recoded to zero-hours category for the sake of simplicity though the literature suggests that this is incorrect and lead to selection bias. We could have dealt with this potential endogeneity with a selection model but that is not the purpose of this chapter and we did not find a good instrumental variable to pull out this endogeneity.

Table 2.2 Decomposition Hours of Work: Gender and Specialist Breakdown

	MALES				FEMALES			
	Hospital doctors	GPs (overall)	Partner GPs	Salaried GPs	Hospital doctors	GPs (overall)	Partner GPs	Salaried GPs
Basic hours	44.71	44.46	45.37	39.08	40.00	32.44	33.13	31.02
Overtime hours	5.93	2.29	2.16	3.08	4.69	2.02	2.05	1.96
Hours main job	50.62	46.74	47.52	42.16	44.68	34.47	35.18	32.98
Hours 2nd job	1.27	1.45	1.48	1.29	0.48	1.03	1.04	1.00
Total hours (main & 2nd)	51.89	48.19	49.00	43.44	45.16	35.50	36.22	33.98
N	8,877	4,928	4,214	713	5,574	3,405	2,300	1,105

Figures 2.7-2.9 depict the non-parametric Kernel densities of total weekly hours in five-year intervals (time-effect) by gender breakdown and plot the estimate of the probability density function (pdf). In Figure 2.7, the changes in the kernel densities convey that doctors' average hours of work have fallen as well as the variance for both GPs and hospital doctors. The distribution has very few extreme observations as the right flat tails indicate. All portray a shift to the left in the distribution of hours, with higher decreased in standard deviation and flatted distribution for female GPs but more leptokurtic for hospital doctors. These features have been more obvious under the new contract (since February 2004). This has entailed fewer average weekly hours, a reduction in the standard deviation, increasing negative skewness and more leptokurtic

distributions overall and for males, while more flattened for females, especially GPs. In Figures 2.8 and 2.9, female workers behaved differently: female hospital doctors working 48 hours or more have increased since 2009, but their GP counterparts have reduced their workload with maximum probability set around 28-30 hours[26].

Figure 2.7 Kernel Densities of Total Hours (GPs and Hospital Doctors)

(A) General Practitioners (B) Hospital doctors

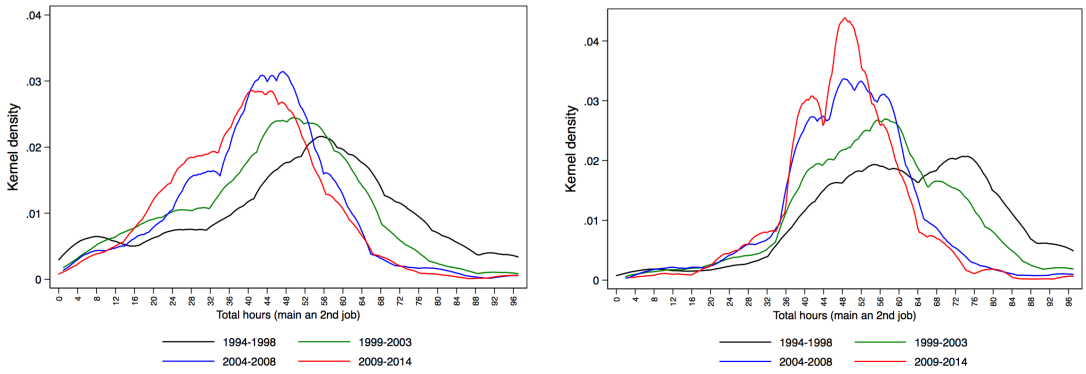
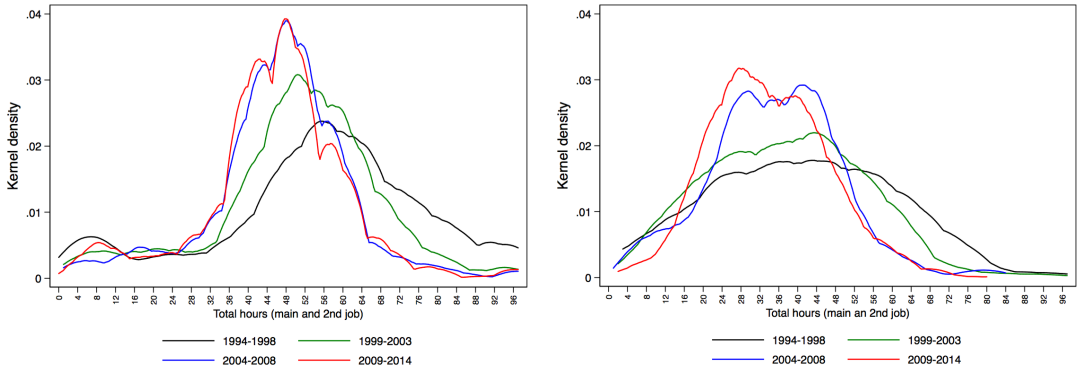


Figure 2.8 Kernel Densities of GPs Total Hours by Gender Breakdown

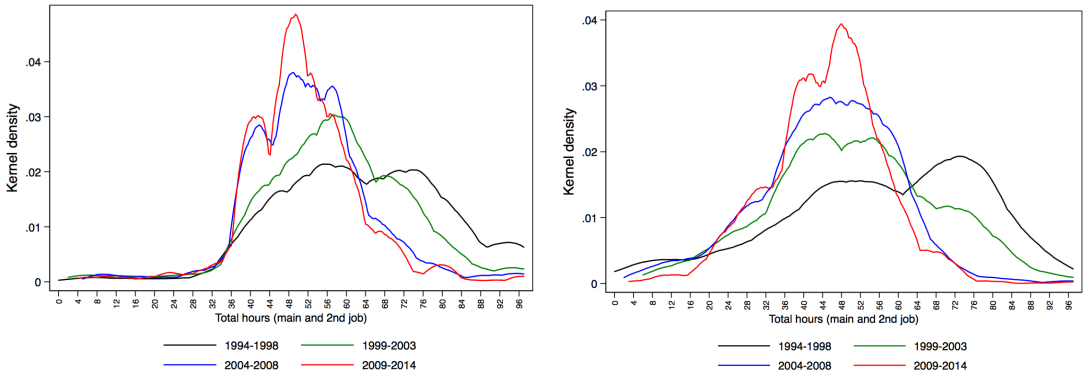
(A) Males (B) Females



[26] Appendix 3

Figure 2.9 Kernel Densities of Hospital Doctors' Total Hours by Gender

(A) Males (B) Females



Appendix 3.1. complements Figures 2.7, 2.8 and 2.9 summarising the main descriptive statistics (1st, 2nd, 3rd and 4th moments) in a table which confirms that standard deviation has fallen but still remains high (15 hours standard deviation). Appendix 3.2. shows the analysis by quartiles (Piketty and Saez, 2003) and Appendix 3.3. the cohort perspective. The analysis by quartiles conveys that the share of quartile 1 and 2 converge over time for GPs and account for 20% each in 2014, while quartile 3 sets higher than quartile 4 (around 35%). Overall, the distribution for GPs is volatile which could reflect the entries and exit in the labour market and, thus, the higher female participation over time. For hospital doctors, the shares show a similar pattern where quartile 1 barely changed (17% in 1994), quartile 2 increased from 20% to 25%, quartile 3 decreased from 30% to 26-27% in 2014 and quartile 4 slightly reduced to 30% in 2014. The right-hand side graphs plot average weekly hours for each quartile and year and includes the yearly average as a benchmark. Either GPs or hospital doctors' average hours are close to quartile 2 which may be pointing out a strong concentration of workers in those quartiles and fewer workers in the upper quartiles.

The cohort analysis in Appendix 3.3 is built upon cohorts born in 1941-1950, 1951-1960, 1961-1970, 1971-1980 and 1981-1990. We mostly concentrate on post-war cohorts because they account for 91% of observations. The kernel distributions show that younger cohorts work more intensively because they are

in their early careers. The standard deviation widened for GPs aged 45 or older (Cohort 5) but shrank for younger cohorts. The same happens for hospital doctors. For female GPs, cohorts 7 and 8 report the lowest number of hours, averaging 34 hours per week. The 2nd quartile averaged 24-33 hours and male GP cohorts are more leptokurtic than females. Also, the table included after the kernel densities in in Appendix 3.3. on page 177 shows that there has been a shift in sample size by cohort. Male sample was larger in early cohorts than females but female sample outnumbered males' in 1961-1970, 1971-1980 and 1981-1990 cohorts.

2.4.2.2. OVERTIME AND SECOND JOB HOURS

Figure 2.10 shows the overall average total weekly usual hours in main and second job of hospital doctors, salaried and partner GPs by year. Approximately 32.47% of GPs work overtime (2,706/8,333) compared to 61.21% of hospital doctors (8,845/14,451). Also, 16.12% of GPs reported having a second job (1,343/8,329) and 14.08% of hospital doctors (2,034/14,451) did so with the inclusion of the European Working Time Directive (EWTD) in the English Working Time Regulation.

The EWTD was passed in 1993 by the European Commission and enacted in the UK in 1998. Junior doctors, doctors in training (and transport workers) were included in the directive from August 2000 but GPs were not until the full compliance in August 2009. The main aim the EWTD was to limit the total number of working weekly hours for health and safety reasons. It sets an upper bound of weekly average hours of work in a 17-week period (48 hours). It also clearly details other requirements such as the length and frequency of breaks workers are entitled to take (20-minutes every 6 hours of work), rest after work (11 hours continuous rest in 24 hours and 25 hours continuous rest in 7 days or 48 hours in 14 days), holiday entitlements (4 weeks of annual leave and 5.6 weeks for doctors) and average hours of work in night shifts (8 hours in 24). These all requirements intended to prevent employees to work large number of hours for health and safety reasons.

Dolton et al state the main effects the EWTD had on medical practitioners: firstly, doctors anticipated the reduction in hours of work between 1994 and 1998; secondly, workforce management changed in hospitals; and, thirdly, this change in hospital managements influenced on doctors' individual behaviour. The main results led to an expansion of headcount in hospitals between 1997 and 2004 where consultants increased 43% and senior hospital doctors 38%. Furthermore, immigrant doctors grew too.

For GPs, the EWTD applies to salaried GPs and Registrars as they are employees. But they may not apply for partner GPs. The directive regulates out-of-hours mainly under the requirements explained above. For example, should overnight out-of-hours be between 00.00am and 8.00am, the worker would need to rest 11 hours and should not start working again until 19.00 hours.

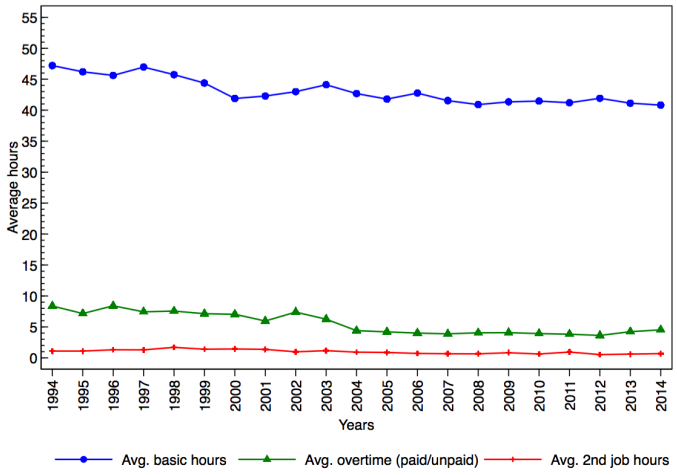
The QLFS also contains information about whether overtime hours are paid or unpaid and who reports having a second job[27] (Table 2.3). The LFS question for overtime is: "*Do you ever do any work which you could regards as paid or unpaid overtime?"* The second job asks: "*In the week ending Sunday the [Ref Date] did you do any other paid work or have any other paid job or business in addition to the one you have just told me about?"* (QLFS volume 2, 2013).

Figures 2.11, 2.12 and 2.13 depict similar trends over time than in Figure 2.10 but by gender breakdown. Overall, female GPs work fewer hours than males, even basic usual hours are far away from those worked by males, for example between 2004 and 2014 (Figures 2.11 and 2.12). On average, females GPs, salaried or partner, work fewer hours than male peers. Hospital doctors work longer hours than GPs. The reduction in hours for hospital doctors may be explained by the EWTD.

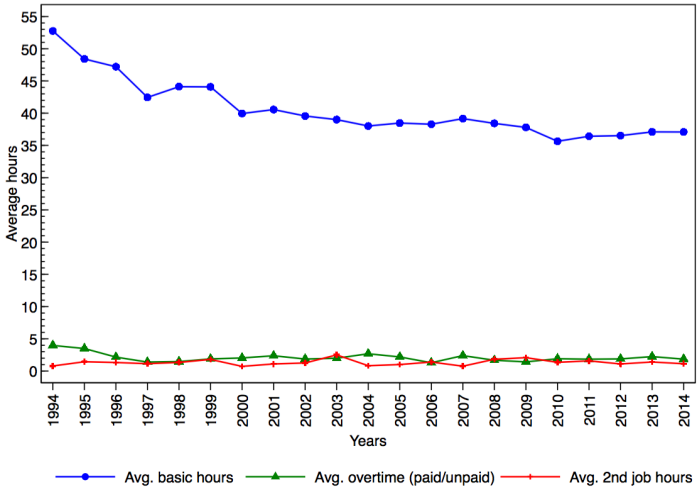
[27] We only consider workers who reported having a second job and discarded those transitioning from one job to another in reference week.

Figure 2.10 Decomposition Total Hours (Basic, Overtime and Second job)

(A) HOSPITAL DOCTORS



(B) PARTNER GPs



(C) SALARIED GPs

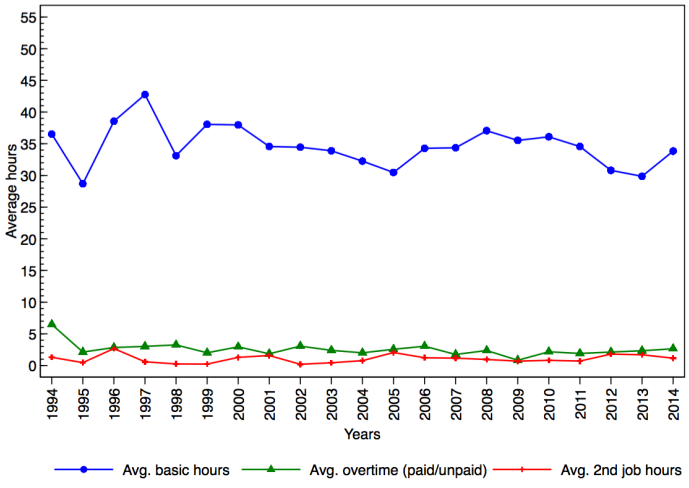
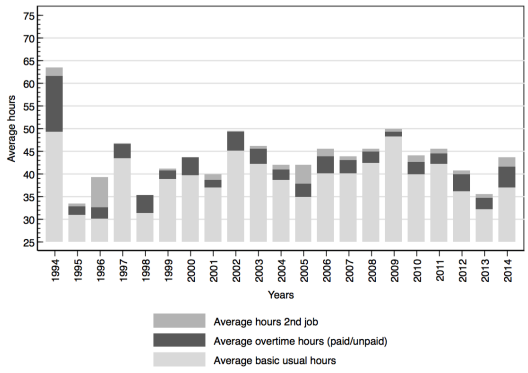


Figure 2.11 Decomposition of Hours of Work Salaried GPs

Males



Females

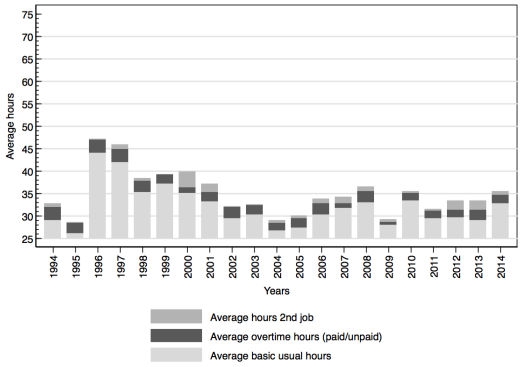
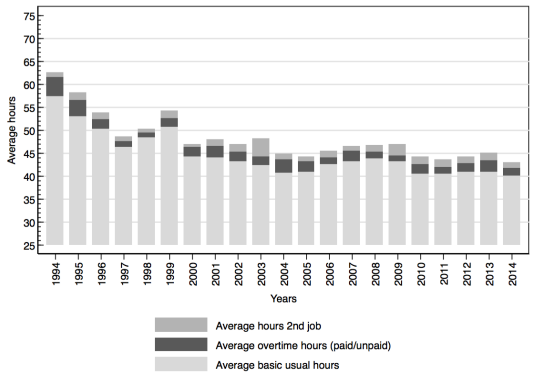


Figure 2.12 Decomposition of Hours of Work Partner GPs

Males



Females

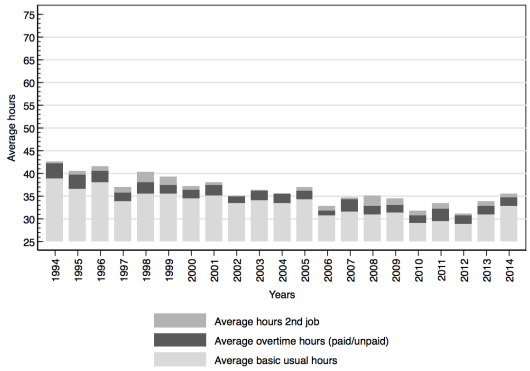
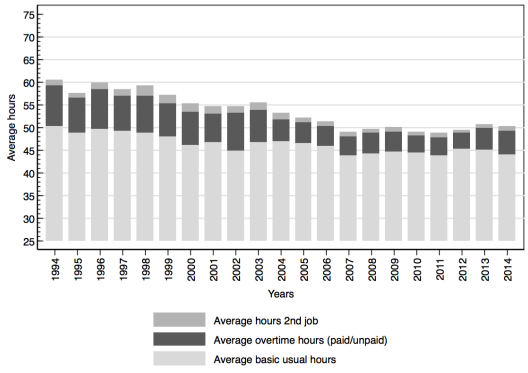
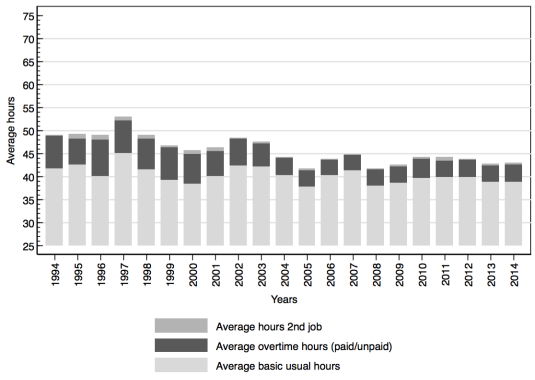


Figure 2.13 Decomposition of Hours of Work Hospital Doctors

Males



Females



Next, we explore whether the second job[28] is carried out in the public or private sector and provide the proportion of those workers over total sample size. Our data reflects that almost all hospital doctors do their second job in the public sector as well as GPs, although the proportion doing private practice is greater.

Table 2.3 shows that both hospital doctors and GPs tend to work more in the public sector in their second job, although the proportion of GPs is lower. It is difficult to track Partner GPs in their second job as they are self-employed but the QLFS considers employees those reporting a second job. Doctors working overtime were 61.21% of hospital doctors (8,845/14,451) and 32.47% of GPs (2,706/8,333). Those having a second job were 14.05% for hospital doctors (2,031/14,451) and 16.08% for GPs (1,340/8,333). By sector, 13.75% (1,987/14,451) of hospital doctors were in the public sector (92% for those reporting working in a second job, 1,984/2,031) and 0.33% in the private sector (2.31% for those with a second job, 47/2,031) while 9.72% of GPs reported in the public sector (807/8,333) and 6.40% in the private sector (533/8,333).

It is possible to convey the relationship between the average overtime hours done in main job and the average hours worked in second job by basic usual hours for hospital doctors and general practitioners (Figure 2.14). Figure 2.14(A) shows that the amount of overtime goes up to around 8 hours when basic usual hours in main job are equivalent to 31-40 hours (a full-time hospital doctors works 40 basic hours per week). After this, it declines. Before the implementation of the new contract in 2004, consultants in the NHS working full-time could take on private activity in a second job but this was capped to a maximum billing of 10% of their earnings in the NHS. However, the new contract removed this restriction and allows hospital doctors to undertake as much private practice as they wish. Nevertheless, the NHS is given priority to allocate hours in a second job. The only condition that is included in the 2004

[28] With the new contract, which came into effect in February 2004, doctors can have a second job without the restrictions they had in the past. Before 2004, NHS full-time Consultants could undertake practice in a second job in the private sector up to 10% of their NHS income but there was no restriction for part-time doctors who could undertake unlimited private practice (this included Consultants up to ten-elevenths of the full-time salary). Even though the 2004 contract includes no restriction on private income, the NHS has priority should any hospital doctor want to work more hours.

contract is that they need to report to their NHS managers their desire to work more hours and the manager could explore whether the hospital would be able to fulfil that desire, suggesting the NHS has a priority in the allocation of those hours. If the NHS cannot satisfy this desire, then NHS Consultants can choose between public or private.

Table 2.3 Doctors Working Overtime and in a 2nd job

	Hospital doctors					
	Males	**%**	**Females**	**%**	**Total**	**%**
No overtime	3,592	40.46%	2,014	36.13%	5,606	38.79%
Ever work overtime	5,285	59.54%	3,560	63.87%	8,845	61.21%
Total	8,877	100%	5,574	100%	14,451	100%
No 2nd job (incl. those change in ref week)	7,241	81.57%	5,176	92.86%	12,417	85.92%
Have a 2nd job in ref week	1,636	18.43%	398	7.14%	2,034	14.08%
in public sector	1,601	18.04%	386	6.93%	1,987	13.75%
in private sector	35	0.39%	12	0.22%	47	0.33%

	General Practitioners					
	Males	**%**	**Females**	**%**	**Total**	**%**
No overtime	3,506	71.14%	2,121	62.29%	5,628	67.54%
Ever work overtime	1,422	28.86%	1,284	37.71%	2,706	32.48%
Total	4,928	100%	3,405	100%	8,333	100%
No 2nd job (incl. those change in ref week)	4,069	82.57%	2,921	85.79%	6,990	83.88%
Have a 2nd job in ref week	859	17.43%	484	14.21%	1,343	16.12%
in public sector	487	9.88%	323	9.49%	810	9.72%
in private sector	372	7.55%	161	4.73%	533	6.40%

Figure 2.14 Average Overtime and 2nd job hours (by basic usual hours in main job)

(A) Hospital Doctors (B) General Practitioners

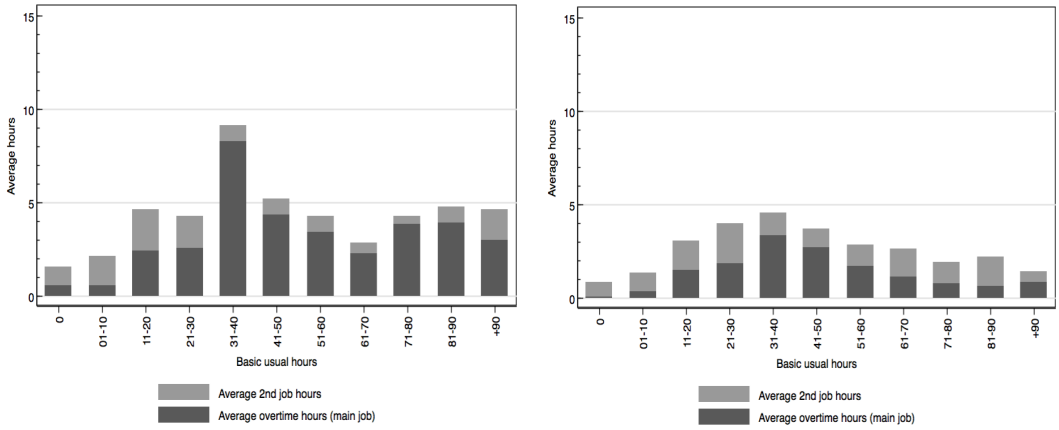
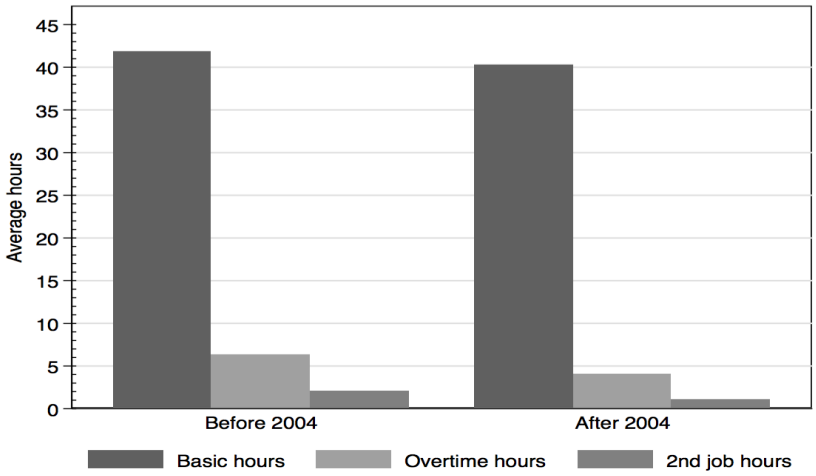


Figure 2.15 portrays overtime and second job hours of senior hospital doctors before and after 2004. The definition of senior and junior doctors is based on an age criterion. Bearing in mind that it takes 5-8 years to train a consultant after their postgraduate studies (Foundation Years 1 and 2), junior doctors become senior doctors at the age of 31-33 the earliest. In the data, we took a more conservative assumption and consider junior doctors aged under 35 and senior doctors aged 35 or older. Senior doctors have reduced their hours of work for every basic usual hour in main job. For example, full time doctors (those at 31-40 basic usual hours), overtime is around 11 hours and hours worked in a second job around 2 hours per week. With the new contract, senior doctors working 31-40 basic usual hours now work approximately 5 overtime hours in main job and second job hours are like those they worked before 2004. Hence, the new contract does not seem to incentivise senior doctors accordingly with the negotiated pay increase.

Figure 2.15 Hospital Senior Doctors' Hours (before and after 2004)



2.4.2.3. EXPLORING CONTRACTUAL CHANGES

We include a difference-in-difference (DiD) model to explore how contractual changes may have influence in the labour supply decisions of doctors (treatment group) compared to workers in other occupations (control group). Nevertheless, this chapter aims to be mostly descriptive, so we only include the DiD model to complement what we get from the LFS. We do not attribute any causal effect with the inclusion of this DiD. Our model is as follows:

$$H_{it} = \alpha + \beta X_i + \gamma T_i + \theta D_i + \delta D_i x T_i + \epsilon_{it} \qquad (1)$$

Where X_i is the usual vector of demographic controls which includes age, gender, marital status, native, white race, tenure (whether they have 6 or more years of experience) and contract arrangement (whether the individual works as an employee of self-employed); D_{it} is a dummy variable to ascertain whether the individual works as a doctor or not; T_i takes value 1 if year is 2004 or later and 0 otherwise; $D_i x T_i$ takes value 1 for doctors since 2004 and 0 otherwise. We expand on this model including the interaction with all controls.

$$H_{it} = \alpha + \beta X_i + \gamma T_i + \theta D_i + \delta D_i x T_i + \varphi D_i x T_i x X_i + \epsilon_{it} \qquad (2)$$

Table 2.4 reports estimates from the simplified version of the DiD model for the treated group (GPs and hospital doctors) with the control group (workers in other occupations). The table depicts that females work 6.5 fewer hours per week than males and the average weekly hours of work has fallen 1.5 hours per week. Doctors reduce their labour supply over the life cycle more dramatically than other workers and GPs' reduction is larger than hospital doctors. The difference-in-difference estimator portrays how much time doctors have dropped their hours of work since the implementation of the new contract in April 2004. This DiD estimate conveys that on average, GPs have reduced their labour supply by 2.571 hours per week and hospital doctors work 4.022 hours less.

Table 2.5 includes an additional interaction of the DiD estimator with females and working as an employee. Including more interactions within the controls reports that females in our sample work even fewer hours (14 hours less than males) but GPs and hospital doctors work even fewer hours than control groups. Now, the contractual changes in 2004 reduce hours of work of doctors by 3.5 hours. The DiD estimator now reflects that GPs work 2 hours less per week on average under the new contract and result is significant at all levels. However, that is not the case for hospital doctors where we do not get significant results.

Expanding the analysis with the interaction between treatment group and policy implementation with gender and employee variable reports that female salaried GPs, under the new contract, work 4.5 hours less and this result is significant at 5 and 10% level of significance. The analysis for hospital doctors is not significant at any level.

In summary, we get that, under the new contract, doctors have reduced their hours of work from 2.5 to 4 hours if we do not expand on the analysis disaggregating by gender and working as employees. When we include those additional interactions, the same we get that female salaried GPs have reduced their labour supply by 4.5 hours, but results are not significant for hospital doctors.

Table 2.4 Difference-in-difference (model 1)

Total hours (main & 2nd)	**GPs**	**Hospital doctors**
Treatment group	39.029***	14.360***
	(1.258)	(1.556)
Age	-0.180***	-0.180***
	(0.002)	(0.002)
Female	-6.566***	-6.566***
	(0.032)	(0.032)
Native	-0.684***	-0.684***
	(0.055)	(0.055)
White	1.917***	1.917***
	(0.063)	(0.063)
Tenure (years of experience)	3.821***	3.821***
	(0.040)	(0.040)
Employee	3.684***	3.684***
	(0.065)	(0.065)
Contract change (April 2004)	-1.572***	-1.572***
	(0.033)	(0.033)
Treated x Age	-0.603***	-0.264***
	(0.024)	(0.020)
Treated x female	-6.881***	-1.282***
	(0.419)	(0.302)
Treated x native	-1.022	1.067**
	(0.697)	(0.418)
Treated x white	-6.144***	-1.728***
	(0.826)	(0.428)
Treated x Tenure	9.396***	-0.233
	(0.561)	(0.427)
Treated x employee	-6.432***	8.663***
	(0.556)	(1.216)
DiD (Treated x Contract change since April 2004)	-2.571***	-4.022***
	(0.423)	(0.304)
Constant	44.941***	44.941***
	(0.114)	(0.114)
Observations	705,642	710,346
R-squared	0.092	0.097

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.5 Difference-in-difference model (model 2)

Total hours (main & 2nd)	**GPs**	**Hospital doctors**
Treatment group	36.404***	8.017**
	(1.265)	(3.291)
Age	-0.182***	-0.182***
	(0.002)	(0.002)
Female	-13.894***	-13.894***
	(0.206)	(0.206)
Native	-0.737***	-0.737***
	(0.054)	(0.054)
White	1.982***	1.982***
	(0.062)	(0.062)
Tenure (years of experience)	3.783***	3.783***
	(0.040)	(0.040)
Employee	0.286**	0.286**
	(0.118)	(0.118)
Contract change (April 2004)	-3.568***	-3.568***
	(0.153)	(0.153)
Female x employed	7.866***	7.866***
	(0.212)	(0.212)
Treated x Age	-0.594***	-0.260***
	(0.025)	(0.020)
Treated x female	-1.482*	7.849
	(0.786)	(6.170)
Treated x native	-0.962	1.174***
	(0.698)	(0.419)
Treated x white	-6.133***	-1.820***
	(0.830)	(0.428)
Treated x Tenure	9.360***	-0.223
	(0.562)	(0.427)
Treated x employee	-7.439***	15.507***
	(1.256)	(3.116)
DiD (Treated x Contract change since April 2004)	-2.011***	0.785
	(0.608)	(3.352)

...continues

Treated x Female x Employee	-1.484	-10.360*
	(1.835)	(6.192)
Contract change x female	2.974***	2.974***
	(0.263)	(0.263)
Contract change x employee	1.997***	1.997***
	(0.158)	(0.158)
Contract change x female x employee	-2.620***	-2.620***
	(0.270)	(0.270)
Treated x female x contract change	-0.045	1.936
	(0.992)	(6.779)
Treated x employee x contract change	3.543**	-5.292
	(1.545)	(3.375)
Treated x contract change x female x employee	-4.661**	-1.218
	(2.167)	(6.809)
Constant	48.025***	48.025***
	(0.146)	(0.146)
Observations	705,642	710,346
R-squared	0.098	0.103

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

2.4.2.4. DESIRED HOURS OF WORK

Finally, this chapter reports the available information on preferences to more or fewer hours which makes the LFS unique for our purposes. The LFS contains questions reporting the desire to work fewer hours[29] in current job or more hours at current basic pay and how many hours (few or more) they want. The information is only available from 2001, at least for the variable reporting the desired fewer hours. The LFS also includes questions for those wanting to work more hours[30]. We plot data from 2001 quarter 2 to be consistent with previous graphs on desired hours, despite data being available from 1996. The distribution of the desired hours is as follows and it is plotted in Figure 2.16.

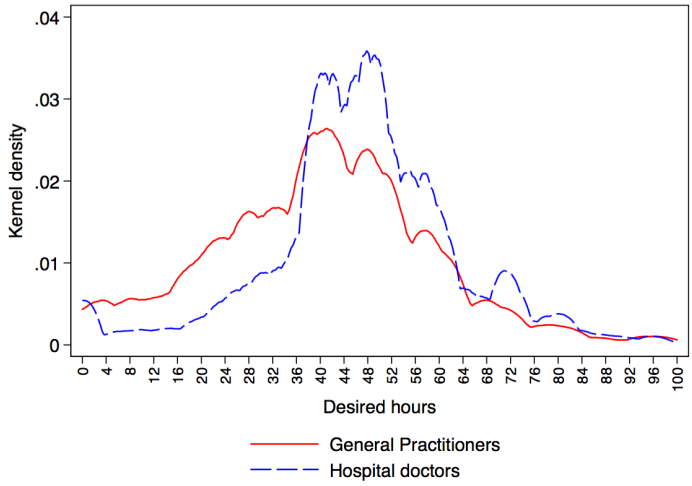
[29] Questions include "Whether prefer to work shorter hours than at present in current job" or "Whether would work shorter hours for less pay" and "How many fewer hours would like to work".
[30] "Whether would like to work longer hours, at current basic rate of pay, given the opportunity" and "Number of extra hours would like to work", which area available from 1996.

$$H_d = H_t^M + \max(H_d^m, 0) - \max(0, H_d^f) \quad (3)$$

Where, $\mathrm{H_d}$ stands for the distribution of desired hours, $\mathrm{H_t^M}$ is the total usual hours worked in main job (includes basic usual hours and overtime hours in main job), $\max(\mathrm{H_d^m}, 0)$ compiles the more hours wanted and $\max(0, \mathrm{H_d^f})$ the fewer hours wanted for less pay.

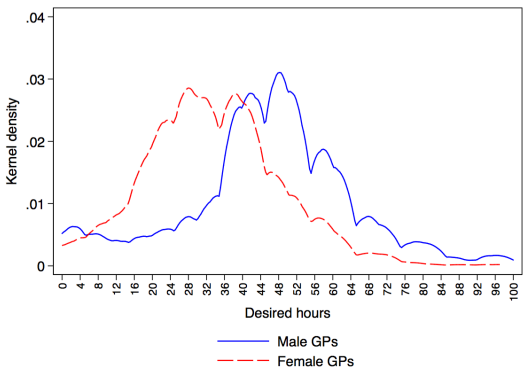
Figure 2.16 Distribution Desired Hours

(A) By Specialty



(B) By Gender

GPs



Hospital doctors

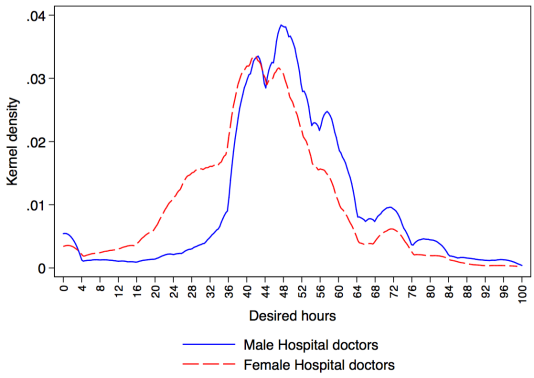


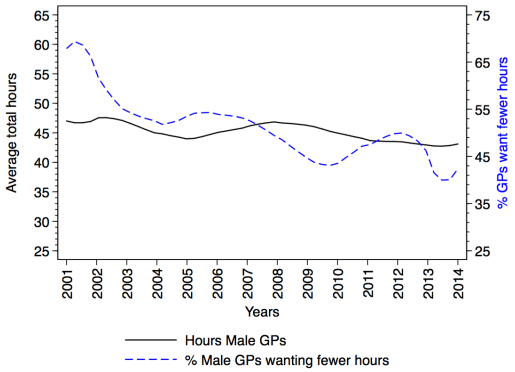
Figure 2.17 shows the average weekly hours worked by occupation for GPs and hospital doctors by gender. We plot data from 2001 (left axis) and the

percentage of doctors wanting to work fewer hours than at present in current job (right axis). Variable computing hours of work includes total usual hours in main job (basic and overtime) and hours in second job. The average is computed including zero-hours observations, near 2% for all doctors.

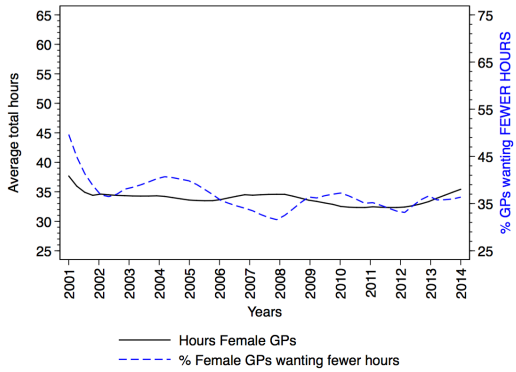
Figures 2.17(A) and (B) show that male GPs work on average near 45 hours per week while female GPs are working almost 10 fewer hours (34-35 hours per week). The proportion of male GPs wanting to work fewer hours drops overtime (from nearly 70% in 2001 to 42% in 2014) much faster than females (from 50% in 2001 to 36% in 2014). However, around 40% of GPs in the sample still want to work fewer hours.

Figure 2.17 Average Hours Work (left axis) and Desired Fewer Hours (right axis) than at Present in Current Job

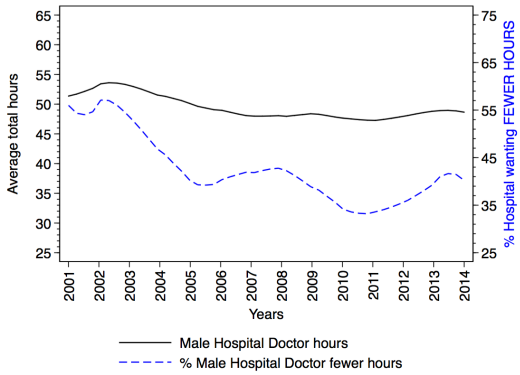
(A) Male GPs



(B) Female GPs



(C) Male Hospital



(D) Female Hospital

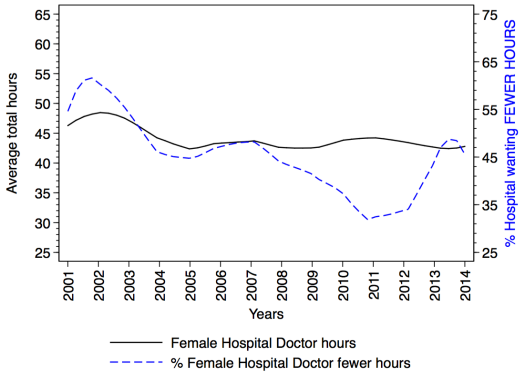


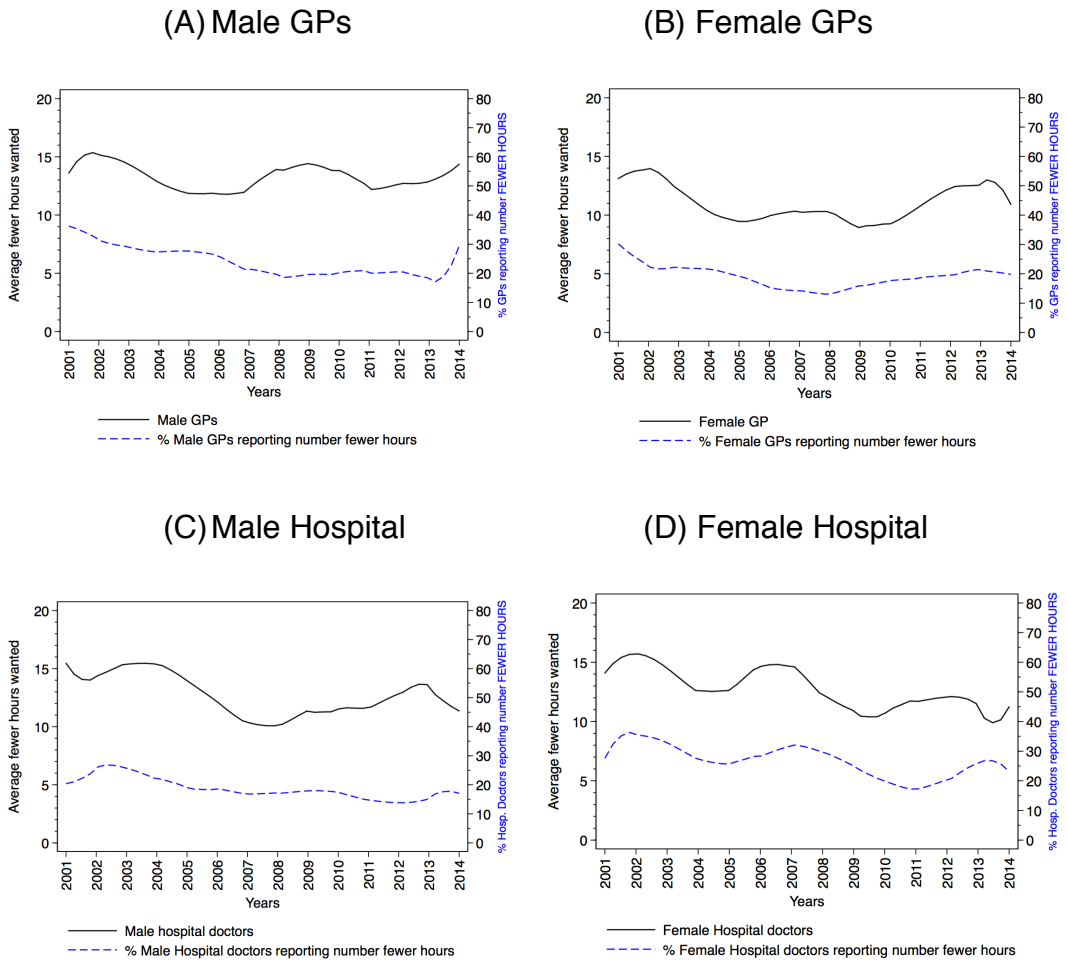
Figure 2.17(C) and (D) plots the same analysis for hospital doctors. The difference in hours of work is shorter than for GPs. Male hospital doctors worked on average nearly 50 hours over the period and female hospital doctors did close to 44 hours. The proportion of doctors wanting to work fewer hours follows a similar trend to that for GPs. The main finding is that the proportion of hospital doctors wanting to work fewer hours has been increasing since 2011 to the current share (43-45%), while that from GPs has been decreasing since 2012 (males) or steady (females).

To provide the most comprehensive analysis, we include information reported for those wanting to work fewer hours for less pay (right axis) and compare with the average weekly fewer hours desired than at current (left axis). This information is conveyed in Figure 2.18. The proportion of those wanting to work fewer hours falls over time. For GPs, is 51.41% (1,272/2,474) where 62.19% were males (791/1,272) and 37.8% females (481/1,272). For hospital doctors those figures are 50.50% (2,180/4,317) and 52.16% were males (1,137/2,180) and 47.84% females (1,043/2,180).

Since 2009, among those wanting fewer hours, female GPs are more likely to work less than males (53.33% female GPs, 481/902, and 58.86% female hospital doctors, 1,043/1,780). Male GPs (50.32% on average, 791/1,572) would work fewer hours in higher proportions compared to male hospital doctors (44.82% on average, 1,137/2,537). Among GPs 95.44% (1,214/1,272) reported wanting to work fewer hours (49.07% amongst those who only wanted working fewer hours at current pay, 1,214/2,474), and 94.56% of males (748/791 or 47.58% 748/1,572) and 96.88% females (466/481 or 51.66% among females wanting to work less 466/902) with an overall average number of desired fewer hours of 6.14 which is 6.35 for males and 5.78 for females. For hospital doctors, 42.45% of males reported the number of hours they would like to work (1,077/2,537) of whom 56.40% of females (1,004/1,780) and 48.20 % overall figure (2,081/4,317). Besides, 95.46% of hospital doctors reported the number of fewer hours they wished to work (2,081/2,180 or 48.2% of those wanting to work less reported the number of hours they would like to work,

2,081/4,317) and 94.72% of males (1,077/1,137 or 42.45% 1,077/2,537) and 96.26% females (1,004/1,043 or 56.40%, 1,004/1,780). The fewer average hours they claimed for less pay were, on average 6.14 hours overall, and 5.43 for males and 7.16 hours for females.

Figure 2.18 Average Fewer Hours Wanted for Less Pay



We also explore information from those reporting wanting more hours (Figures 2.19 and 2.20). Figure 2.19 conveys a falling interest in working more hours for female GPs and increasing for male GPs while hospital doctors show slightly higher proportions. In general, 2,70% of GPs (202/7,470 from 1996 to 2014) with 2.06% of males (89/4,313) and 3.58% females (3,157). Among all those who reported wishing to work more hours, 55.94% were females and 44.06% male GPs over time. For hospital doctors, 3.15% wanted longer hours from 1996 to 2014 (421/13,348), 3.79% males (307/8,092) and 2.17% females

(114/5,256). Among all those who reported wanting more hours, 72.92% were males (307/421) and 27.08% females (114/421). Figure 2.19 shows more volatility for GPs than for hospital doctors. On average, GPs wished to work 8.19 more hours (8.72 male GPs and 7.70 females) and hospital doctors reported 10.53, 11.22 and 9.83 respectively.

Figure 2.19 Average Hours Work (left axis) and Desired More Hours Wanted (right axis) at Current Basic Pay

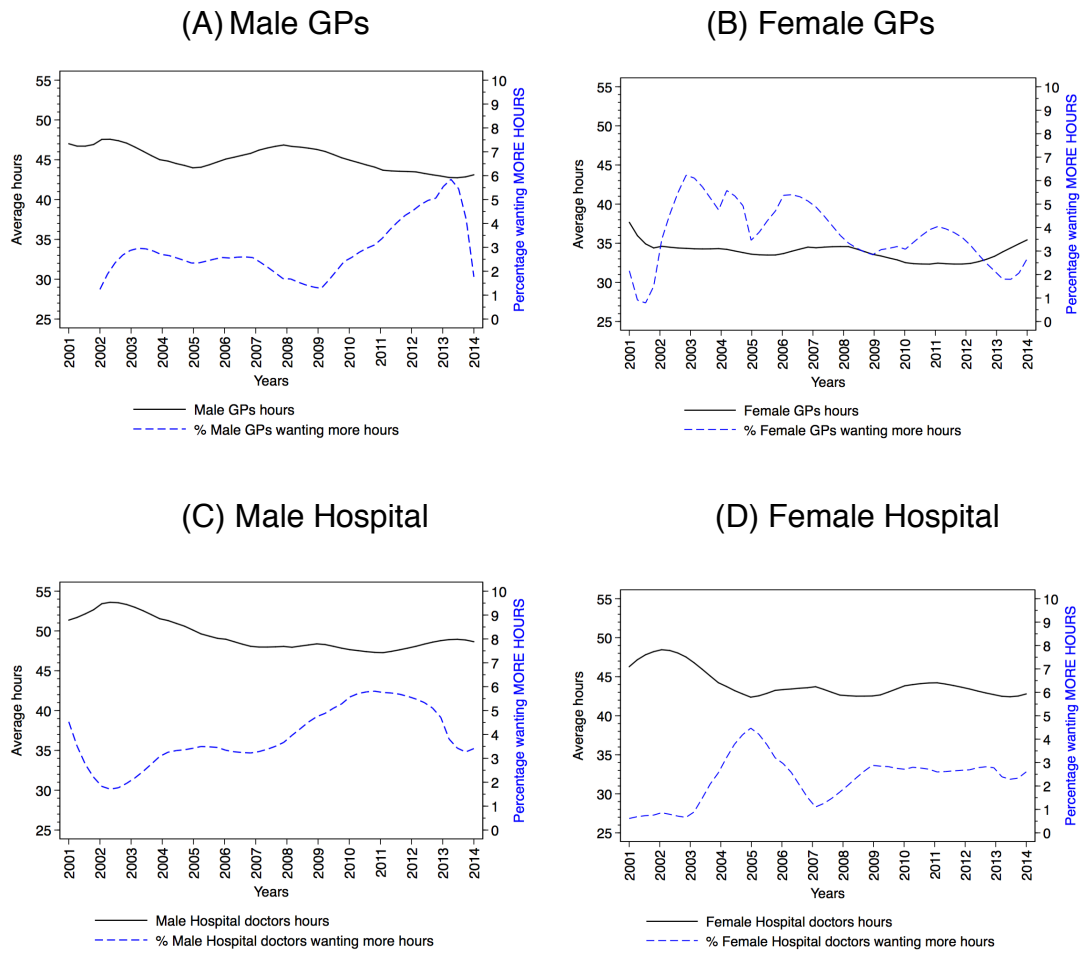
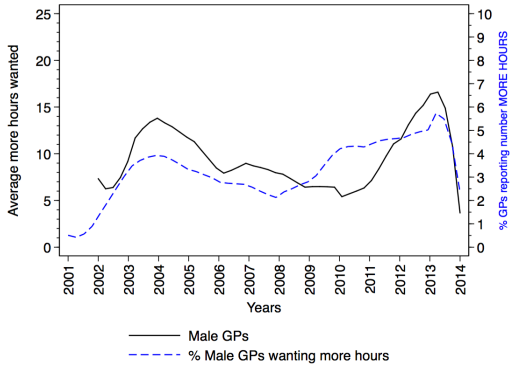
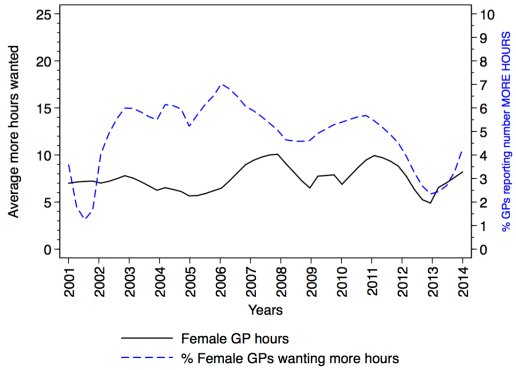


Figure 2.20 Average More Hours Wanted at Current Basic Pay

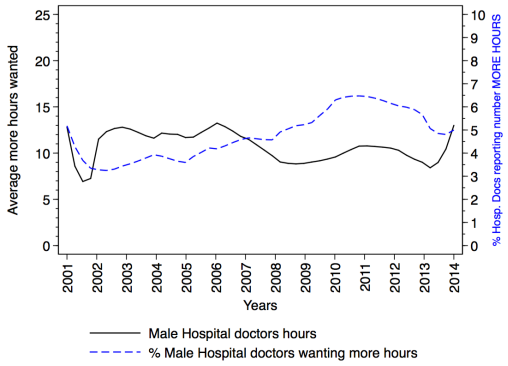
(A) Male GPs



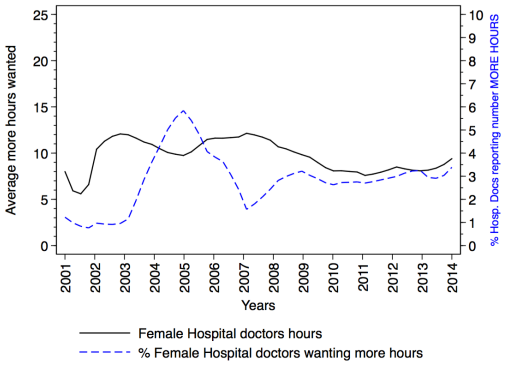
(B) Female GPs



(C) Male Hospital



(D) Female Hospital



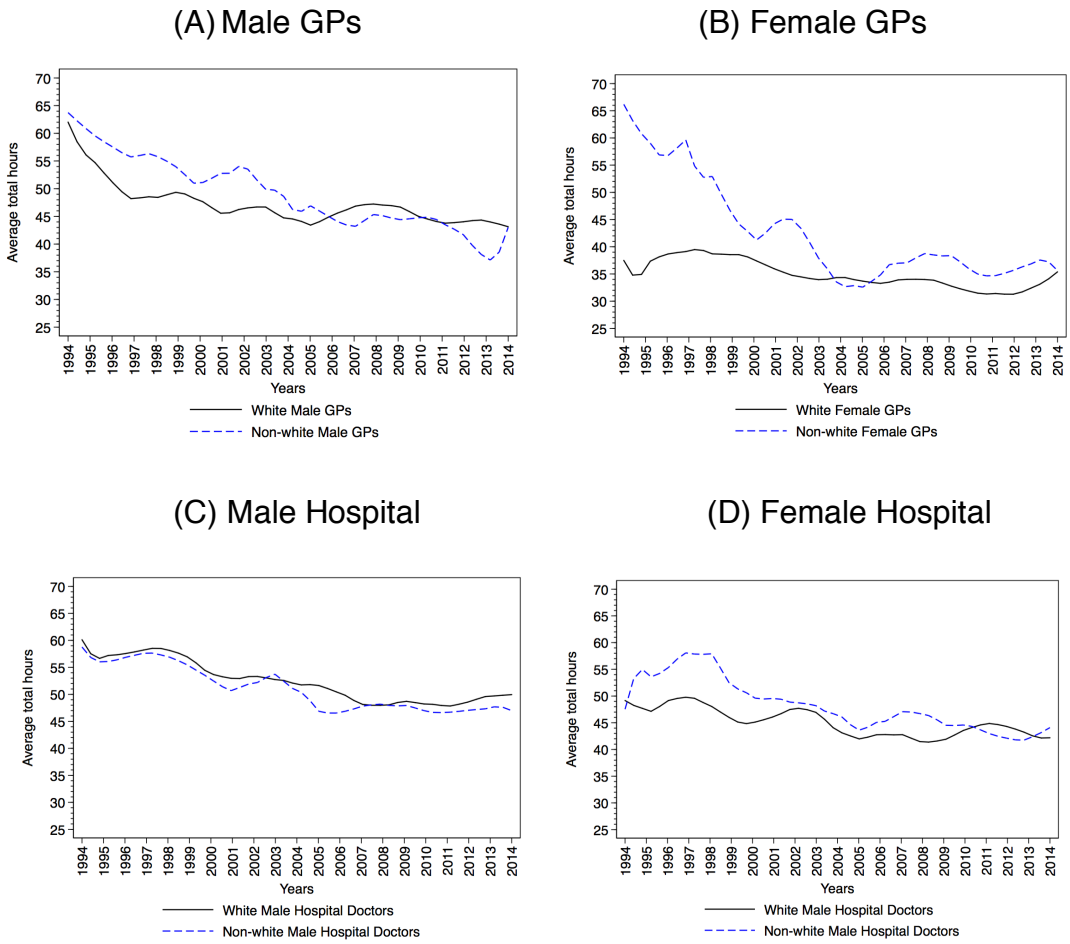
2.4.2.5. IMMIGRANTS, ETHNICITY AND HOURS OF WORK

We explored average weekly hours of work of doctors by country of birth and ethnicity by year and gender (Figures 2.21 and 2.22). Table 2.6 summarises overall figures by country of birth and ethnicity for GPs and hospital doctors over the whole period of analysis. Average hours of work per week are 42.99 for GPs and 49.29 hours per week for hospital doctors over the whole period. Native GPs work 42.59 hours per week on average and foreign GPs 44.66 hours per week. Native hospital doctors work, on average, 49.62 hours per week and immigrant hospital doctors 48.65 hours over the period of analysis. By gender breakdown, average hours of work per week report male GPs work 48.18 hours while females 35.49 hours per week. Among males, native GPs

work 48.16 hours and immigrants 48.25 whilst among female GPs, native reported 35.04 hours per week and immigrant 37.78 hours. For hospital doctors, males work 51.89 hours and females 45.16. Among males, native hospital doctors work 53.18 hours per week and immigrants 49.97 hours whilst native females 45.13 hours and foreign females 45.24.

By ethnicity (Figure 2.21), white GPs work on average 42.55 hours per week and non-white 45.32 hours. White male GPs averaged 48.08 hours per week and non-whites 48.67. White female GPs worked on average 34.91 hours and non-whites 39.16. White hospital doctors averaged 49.36 hours and non-whites 49.13 hours. White male hospital doctors reported working 52.78 hours per week and non-whites 50.28 hours. Female white hospital doctors worked 44.81 hours and non-whites 46.32 hours per week.

Figure 2.21 Ethnicity (White versus Non-whites)



In Figure 2.22 we do not find relevant differences between the hours worked among respondents (native versus immigrants and white versus non-whites) and figures followed similar downward trends confirming fewer hours for females, which is wider among GPs. Therefore, although doctors coming to work to the UK used to work more hours in the past, their hours of work converge to those native doctors.

Figure 2.22 Country of Birth (Native versus Immigrants)

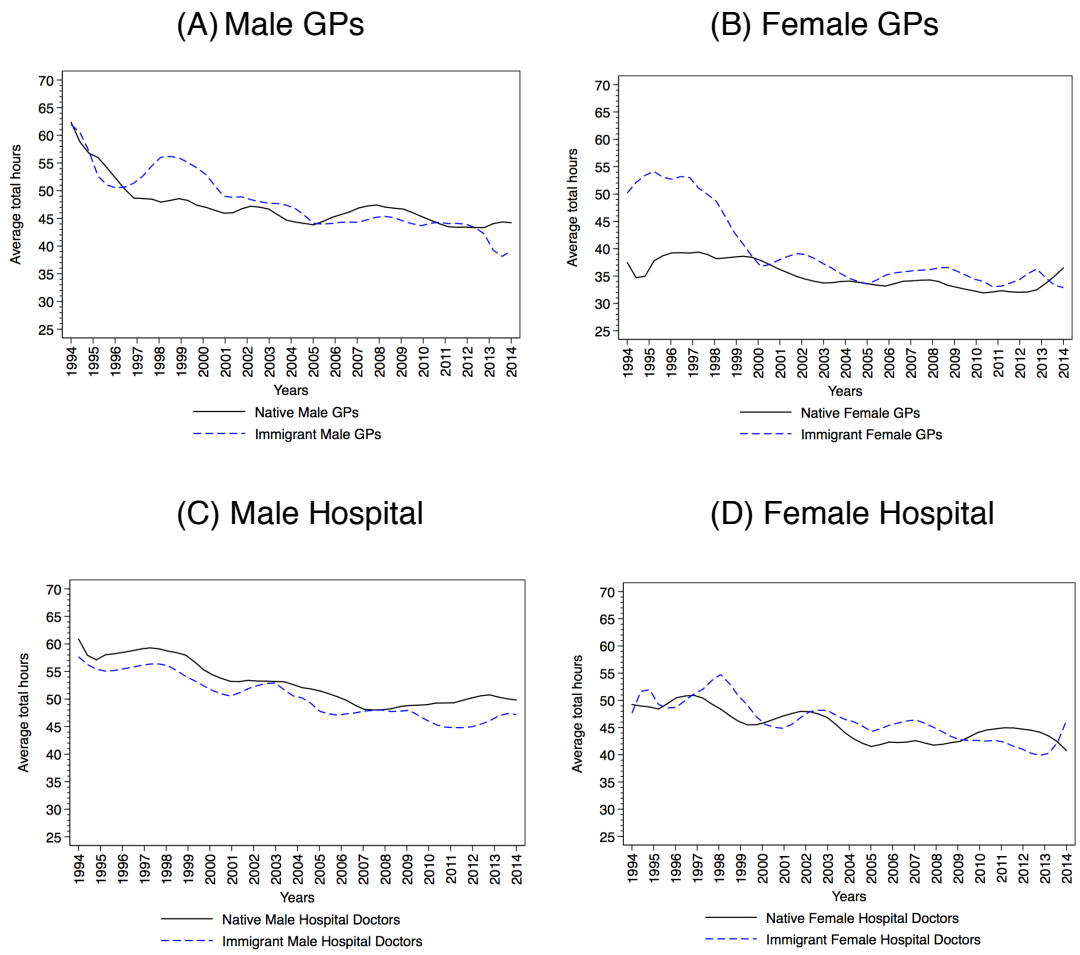


Table 2.6 Country of Birth and Ethnicity

General Practitioners						
Country of birth	**Males**	**%**	**Female**	**%**	**Total**	**%**
Native	3,849	78.10%	2,842	83.47%	6,691	80.30%
Immigrant	1,079	21.90%	563	16.53%	1,642	19.70%
Totals	4,928		3,405		8,333	

Ethnicity	**Males**	**%**	**Female**	**%**	**Total**	**%**
White	3,987	80.91%	2,890	84.88%	6,877	82.53%
Non-white	941	19.09%	515	15.12%	1,456	17.47%
Total	4,928		3,405		8,333	

Hospital doctors						
Country of birth	**Males**	**%**	**Female**	**%**	**Total**	**%**
Native	5,306	59.77%	4,191	75.19%	9,497	65.72%
Immigrant	3,571	40.23%	1,383	24.81%	4,954	34.28%
Totals	8,877		5,574		14,451	100%

Ethnicity	**Males**	**%**	**Female**	**%**	**Total**	**%**
White	5,595	63.03%	4,158	74.60%	9,753	67.49%
Non-white	3,282	36.97%	1,416	25.40%	4,698	32.51%
Total	8,877		5,574		14,451	

The QLFS also reports precise information for country of birth. Table 2.7 shows all observations and proportions and Figure 2.23 depicts the decomposition of country of birth into UK-born, EU-27 born and respondent born in other countries (mainly African and Asian countries).

Figure 2.23 conveys the decomposition of doctors by country of birth. The QLFS sample contains 290 GPs coming from the EU (3.48% of all GPs) and 628 EU trained hospital doctors (4.35%). These figures differ from the GMC figures where, in 2017, approximately 6% of all GPs are EU-trained and 17% of hospital doctors. Also, the GMC[31] reports 16% of GPs trained in other countries and 25% hospital doctors. The LFS tracks well the proportions for UK-trained doctors and other countries but not as accurate for EU-trained doctors.

[31] http://www.gmc-uk.org/doctors/register/search_stats.asp

Figure 2.23 Decomposition of immigrants by country of Primary medical education

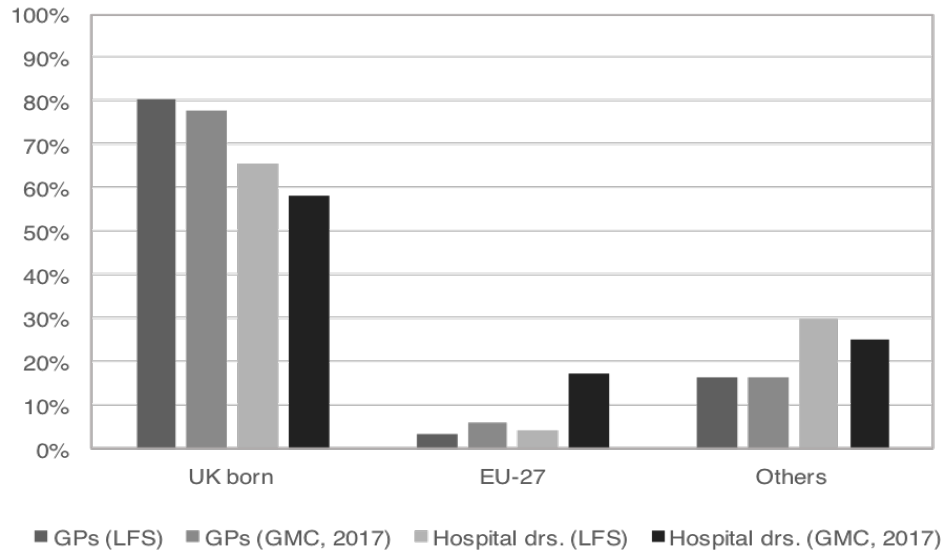


Table 2.7 Decomposition of immigrants by country of Primary medical education

		GPs			Hospital doctors			Overall
		Males	**Females**	**Total**	**Males**	**Females**	**Total**	**Totals**
N	**UK born**	3,849	2,842	6,691	5,306	4,191	9,497	16,188
	EU-27	165	125	290	364	264	628	918
	Others	914	438	1,352	3,207	1,119	4,326	5,678
	Totals	4,928	3,405	8,333	8,877	5,574	14,451	22,784
%	**UK born**	78.10%	83.47%	80.30%	59.77%	75.19%	65.72%	71.05%
	EU-27	3.35%	3.67%	3.48%	4.10%	4.74%	4.35%	4.03%
	Others	18.55%	12.86%	16.22%	36.13%	20.08%	29.94%	24.92%
	Totals	100%	100%	100%	100%	100%	100%	100%
Avg. Hours	**UK born**	48.16	35.04	42.59	53.18	45.13	49.63	46.72
	EU-27	44.80	33.19	39.80	48.46	45.45	47.19	44.86
	Others	48.88	39.09	45.70	50.14	45.19	48.86	48.11
	Total	48.18	35.50	43.00	51.89	45.16	49.29	46.99

2.4.2.6. REGIONAL DISTRIBUTION OF HOURS

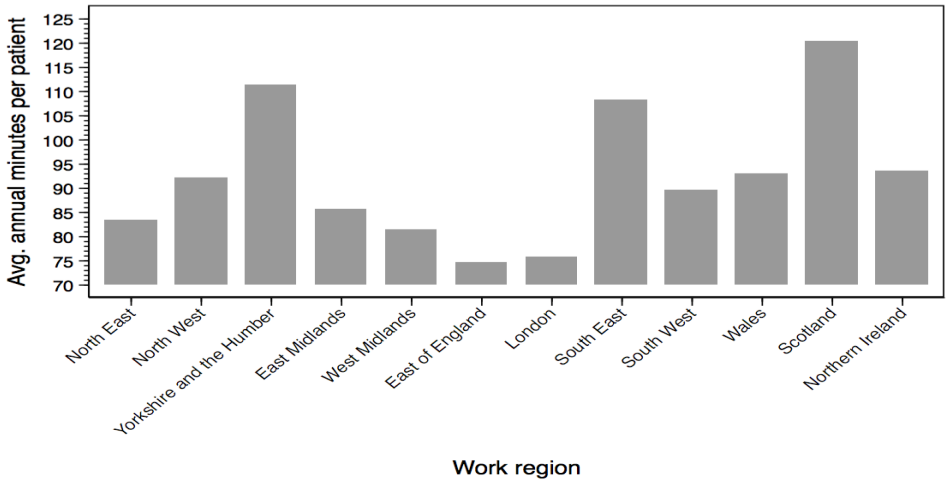
We show the regional distribution of doctors' hours to reflect whether there are inequalities in the distribution of doctors' hours. For this purpose, we first compute the regional distribution of LFS doctors working[32] in each region. Then we multiply the number of GPs in each region using DDRB headcount by the average proportion of LFS doctors in each region. Next, we work out the average weekly hours of work in each region and convert into annual hours multiplying by 52 weeks. Then, we get the total annual stock of hours for each region multiplying the average annual hours by the number of GPs in each region. Besides, we collected population data by region from ONS for each year and got the average population over the period for each region. Dividing total hours by the average population in each region, we get the total average hours for each person living in the region and, multiplying by 60 minutes per hour, we get the time per patient in minutes.

Figure 2.24 summarises the distribution of total annual time per patient by region for GPs and hospital doctors. Figure 2.24(A) shows that Eastern England and London are the regions with the lowest time per patient in primary care followed by the Midlands and the North East. The result for London may reflect a population effect, emphasising that more GPs would be required. The bottom figure, Figure 2.24(B), portrays the situation for hospital doctors. Again, East of England scores lower than other regions in the ranking followed by Southern region, East Midlands and Wales.

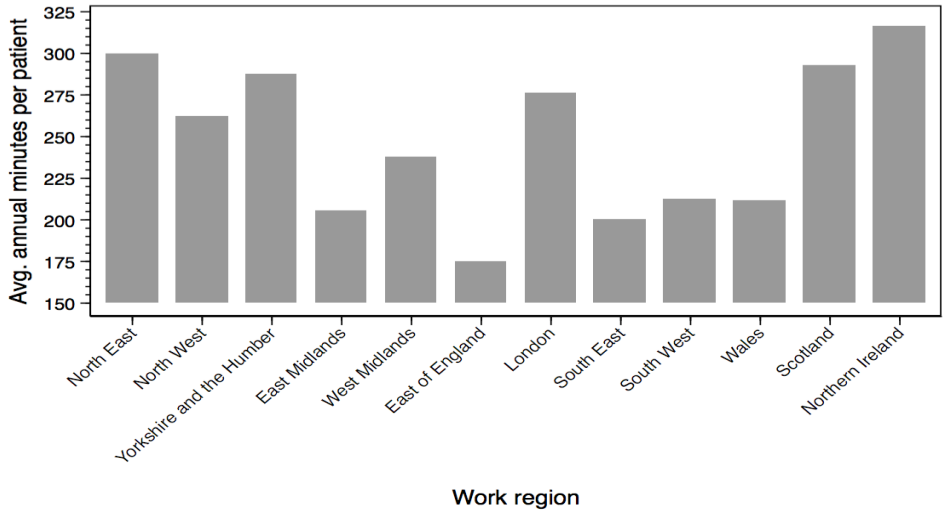
[32] Data combined with the living region, shows that doctors usually live in the region they work but our data shows that 23 % of GPs (5 % of hospital doctors) living in the North East work in the North West and 22 % of GPs (25 % hospital doctors) living in the South East work in East of England.

Figure 2.24 Regional Distribution of Hours (annual time per patient)

(A) General Practitioners



(B) Hospital doctors



2.4.3. OVERALL SUPPLY

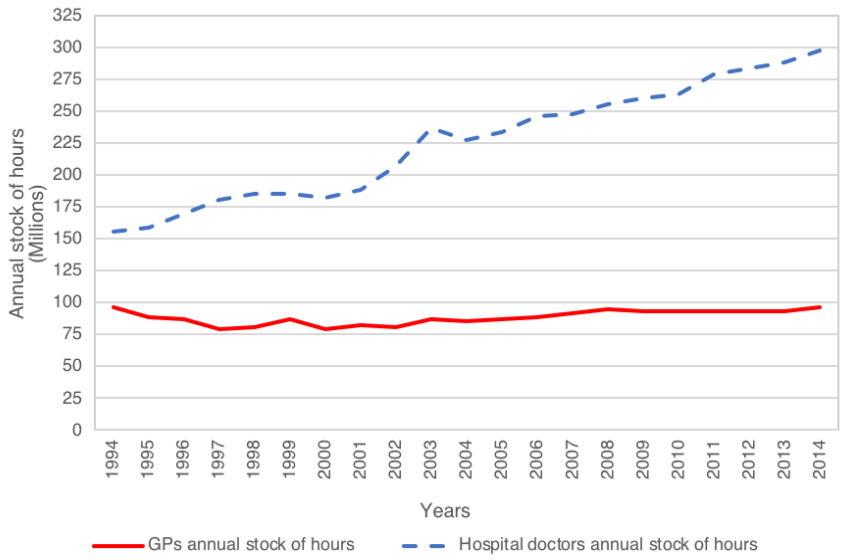
So far, we can conclude that the LFS has many benefits and can become a potential resource for the analysis of doctors' labour supply. In this section, we provide a snapshot on the trends of the extensive and the intensive margin that aims to be a baseline for prospective analyses. Thus, by way of conclusion, we construct a measure of overall supply by multiplying what we know about the headcount from other sources by what we now know about the supply of the average member of the headcount over time. For this purpose, we multiply the headcount figures from DDRB reports by the QLFS average hours every year.

This provides a stock supply measure of hours available every year, separately for GPs and for Hospital Doctors every year (Table 2.8[33]). Figure 2.26, below, shows that the total annual stock of hours for GPs has hardly changed in 2014 compared to 1994 (panel A) and averaged about 87m hours – that makes an annual average of 88 minutes per person over the period. In contrast, the supply of hospital doctor time has risen from 156m hours in 1994 to 298m, averaging 226m hours – giving the population an average 223 minutes over the period. The tiny panel at the bottom, convey the overall supply for GPs and hospital doctors.

The important takeaway is that the headcount gives a wildly optimistic view about supply.

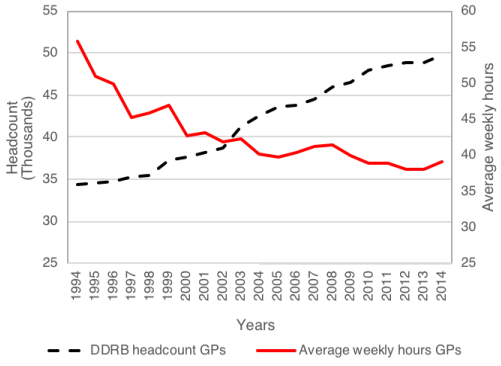
Figure 2.25. Overall supply of hours (headcount, average weekly hours and annual stock hours)

(A) Total annual stock of hours



[33] Two quarters are missed in the QLFS (2001q1 and 2004q1) and got no occupation figures with End User License data. However, we fixed this rolling forward figures from the immediate previous quarter. Also, total figures differ from previous because we added those inactive workers as they represent a potential labour force in the future.

(B) GPs



(C) Hospital doctors

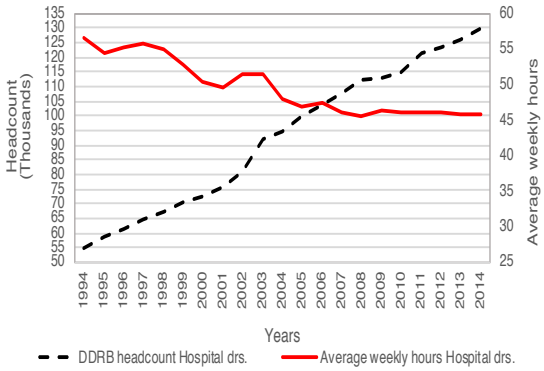


Table 2.8 Overall Supply Hours (GPs and Hospital doctors)

			GENERAL PRACTITIONERS			HOSPITAL DOCTORS		
Year	**UK Population**	**Total UK doctors**	**Average weekly hours GPs**	**DDRB headcount GPs**	**GPs annual stock of hours**	**Average weekly hours Hospital drs.**	**DDRB headcount Hospital drs.**	**Hospital doctors annual stock of hours**
1994	57,862,145	89,380	55.93	34,430	96,275,406	56.67	54,950	155,698,281
1995	58,024,799	93,020	50.92	34,600	88,085,190	54.42	58,420	158,954,803
1996	58,164,374	96,260	49.91	34,810	86,867,574	55.16	61,450	169,487,291
1997	58,314,249	99,960	45.16	35,220	79,531,163	55.69	64,740	180,267,624
1998	58,474,943	102,840	45.80	35,540	81,380,846	54.93	67,300	184,838,363
1999	58,684,427	107,600	47.00	37,230	87,497,624	52.89	70,370	186,079,947
2000	58,886,065	110,260	42.63	37,580	80,104,468	50.35	72,680	182,976,737
2001	59,113,016	114,010	43.13	38,170	82,320,441	49.60	75,840	188,101,678
2002	59,365,677	119,297	41.93	38,651	81,034,148	51.36	80,646	207,094,936
2003	59,636,662	133,270	42.21	41,330	87,235,231	51.52	91,940	236,838,442
2004	59,950,364	137,170	40.12	42,540	85,329,923	47.98	94,630	227,000,100
2005	60,413,276	143,350	39.79	43,620	86,777,126	46.86	99,730	233,679,492
2006	60,827,067	147,693	40.46	43,771	88,555,570	47.47	103,922	246,680,488
2007	61,319,075	152,218	41.24	44,450	91,649,355	46.08	107,768	248,322,981
2008	61,823,772	158,403	41.45	45,999	95,329,475	45.60	112,404	256,272,403
2009	62,260,486	159,355	40.04	46,520	93,139,243	46.25	112,835	260,927,643
2010	62,759,456	162,686	38.96	47,992	93,487,394	46.01	114,694	263,881,366
2011	63,285,145	170,091	38.86	48,504	94,244,332	45.96	121,587	279,421,322
2012	63,705,030	172,214	38.04	48,822	92,867,746	46.07	123,392	284,234,768
2013	64,105,654	174,614	38.14	48,823	93,114,161	45.93	125,791	288,882,528
2014	64,596,752	179,454	39.09	49,752	97,229,970	45.92	129,702	297,787,290
Change 1994-2014	**11.64%**	**100.78%**	**-30.11%**	**44.50%**	**0.99%**	**-18.97%**	**136.04%**	**91.26%**

2.5. CONCLUSION

In this chapter, we restrict ourselves to describing the results from the LFS and have not explored any possible causal effects that may arise from any model (for example, DiD). Nonetheless, we consider this analysis may be useful for policymakers for the following reasons. For the first time, we now have, a systematic picture of the intensive supply side from a large random sample, to augment what we already knew about the extensive margin. Secondly, it shows that the headcount measure gives an optimistic view of supply – especially for GP services. This vindicates the use of LFS data for investigating the intensive margin. Despite the large expansion in the headcount of doctors, both GPs and hospital doctors, the overall hours of GP work supplied to the UK population has fallen over the period, while the overall supply of hours of hospital doctors have grown dramatically. This may be quite the opposite to what is likely to be required to match the pattern of demand – where there has been an impressive growth in the number of patients who may require long term care outside of acute care environments.

The main results confirm a fall in the average hours worked by doctors between 1994 and 2014, both GPs and hospital doctors. One potential explanation may be that doctors have reported being overworked and stressed in recent years. However, these downward trends are greater between 1994 and 2004 than since 2004 and yet reports of stress continue to abound. In addition, female doctors have experienced the largest fall in hours, especially in primary care. The takeaway is that the expansion in the headcount of doctors has not succeed in providing the available GP hours for patients (although it may be true that GPs have made greater use of other inputs in an effort to compensate for this fall in the supply of their own time) but our work does not include any analysis on the impact of GP time on the quality of care provided. The information about desired hours is an interesting feature of the LFS and we report that there are fewer doctors who would prefer working lower hours for less pay but since 2012 we notice that this has been broadly static. This is

surprising – we might imagine that falling desired hours would be a symptom of being overwhelmed by the increasing workload over time.

There are some limitations in this work. The LFS sample of doctors do not reflect overall sample weights. We get too few doctors from LFS relative to what we would expect but we believe the sample is representative[34]. Moreover, using pooled cross section data does not allow us to follow up individuals over time. The 5-quarters panel formed by the longitudinal LFS is rather too short to analyse dynamic behaviour. Moreover, the overall sample is small and the fact that we have only 20-year worth of data implies that we cannot rely on LFS to form a pseudo panel dataset. A further issue is that previous occupation and education data is only collected for pre-70-year olds in LFS. Thus, we can get only an imperfect view of early retirement issues, which is a strong constrain because surveys collected by the BMA suggest that GPs report growing intentions to retire early. Only in recent years (from 2011) has LFS collected data on several aspects of well-being. This will become an important element of understanding why doctors wish to work less as this data builds. Finally, the LFS is self-reported data, which may suffer from measurement error. However, unless this measurement is systematically related to the variables that we are interested in, such as gender, immigration etc., this will not have any implications for the trends that we showed. Moreover, it seems likely that the LFS is still a better guide to the hours that doctors *usually* work than the administrative data that might be available. The only other dataset that could potentially be used to address this could be personnel records, where we could compare earnings with known points on the pay scale to infer wage rates and hours of work. However, we are pessimistic about doing this because there is much heterogeneity in pay arrangements around the scale. Indeed, most GPs are self-employed and so are residual claimants. Here the LFS is disappointing, relative to FRS, in not collecting self-employed incomes. Despite these limitations, we still believe that the LFS is the best survey for these purposes.

[34] Indeed, the proportion of doctors we get from the LFS is 0.96% of DDRB GP (including registers and retainers) and 0.78% of hospital doctors' headcount (including all hospital doctors and doctors in training) which are greater than the 0.16% of LFS sample.

Chapter 3

DO DOCTORS WORK HARDER THAN OTHER PROFESSIONALS? A COMPARATIVE ANALYSIS OF THE HOURS OF WORK

3.1. INTRODUCTION

This chapter expands on the existing literature on the labour supply of doctors in the UK comparing the hours of work of doctors with other professionals such as lawyers and accountants using a pooled cross-section dataset from the Quarterly Labour Force Survey (QLFS). There are several contributions of this work. Building on Gravelle and Hole (2007), we extend their analysis for General Practitioners (GPs who are the gatekeeper community-based physicians in the UK) and incorporate hospital doctors in the analysis. Then, we compare doctors with lawyers and accountants. The latter have been widely used as comparator groups by the Doctors and Dentists' Review Board (DDRB)[35] – one of the UK pay review bodies that makes recommendations on pay awards for public sector employees.

[35] Comparator occupation groups, from private and public sectors, for pay comparability in DDRB reports to help them deliberate their main comments, considerations and conclusions on retention and recruitment. Amongst these groups there are lawyers (solicitors) and accountants. These groups share similar criteria with doctors and dentists: similar entry requirements, qualifications and intellectual rigour. According to DDRB "these are careers which might reasonably be thought of as possible alternative careers by individuals joining the medical and dental professions and which have clearly defined career progressions" (DDRB, 2003, page 20).

The pay review recommendations are supposed to ensure that the UK NHS is able to recruit, retain and motivate sufficient doctors for its purposes. In fact, the current concern is the widespread perception that there is shortage of doctors in the country that may threaten the quality of the service delivered. Since 2008 there have been some reasons that may exacerbate this shortfall of doctors. Firstly, the austerity "cap" on pay rises that have been imposed on public employees (doctors included) may well have exacerbated the shortage. Secondly, the advent of Brexit and the electorate's desire to reduce immigration raises further supply side concerns because, for several decades now, EU-immigrants have made an important contribution to the overall supply of doctors to the NHS. Finally, there has been concern over the extent to which the profession is well placed to cope with the desire to provide more care in the community via GPs reflecting the needs of an ageing population. There has been a long-term commitment to encourage more entry doctors to choose General Practice. While the DDRB "headcount" data suggests a steady rise in the supply of doctors on the extensive margin, the division between hospital and General Practice has not shifted towards the latter. On the contrary, the proportion of trainees who choose to enter the profession as GPs has been falling over time. Moreover, little is known about the hours of work of doctors, i.e. the intensive margin. In chapter 2, we showed that there has been a reduction of average total weekly hours. Now, we break down that trend by type of specialty and try to give an explanation on the main reasons that potentially could explain this fall.

The motivation for this chapter is twofold. Firstly, it broadens the literature on the labour supply of doctors in the UK looking at the main determinants that could explain why hours of work have dropped. The traditional policy response to tackle any perceived shortage of doctors has been to expand the headcount of doctors and to implement strategies to attracting more medical students to the GP route. For example, in England, under the Health Education England (HEE) Mandate, passed in 2013, the Department of Health (DoH) tried to increase the number of GPs by setting a target of 50% of the flow of new medical students to become GPs by 2015 (NHS England, 2014; NHS England,

2016). However, this target was missed by a wide margin and its limited success may have helped in contributing to the belief that there is a shortage of GPs. Secondly, from 1994 to 2014, there has been a growing female participation in this job market, which is a result of the expansion of the British universities in the 1990s. Both have helped to expand the supply of doctors and have changed the composition of doctors, where females have now outnumbered males, especially in Primary Care.

The chapter is organised as follows. Section 3.2 discusses the most relevant literature on the labour supply. Section 3.3 describes and explains the data source. Section 3.4 presents the main models used. Section 3.5 shows results both from the econometric models and counterfactual analysis. Finally, the main conclusions of the analyses are drawn.

3.2. LITERATURE REVIEW

3.2.1. LABOUR SUPPLY LITERATURE

BY GENDER

Since the 1970s, the interest in understanding the main determinants of labour supply has increased motivated, for example, by the growing female participation (Mincer, 1962). Empirical studies reflect that males' participation has dropped since then while females' participation has grown. These changes in males' participation can be explained by the expansion on education (more years of schooling), a growing proportion of males taking early retirement, a fall in weekly hours worked, increase in holiday entitlement or exerting lower effort have been signalled as main causes to explain why males have reduced their hours supplied over time (Pencavel, 1986). In the meantime, females' average weekly hours of work have declined secularly too, but their participation in the labour market has grown substantially. Here, we focus on exploring the intensive margin rather than the extensive margin or the average number of weeks worked per year (Killingsworth and Heckman, 1986).

At the extensive margin, most research exploring females' labour supply showed that females are more likely to work part-time than males because they demand more flexibility in their jobs (Killingsworth and Heckman, 1986). At the intensive margin, researchers conveyed that females' elasticity was larger than males and ranged 0.5 to 2.2 in some studies, but not all. So that, female workers are more sensitive for changes in wages, for example, than males. In particular, women with children have larger elasticity than females without children; single workers are less responsive (smaller elasticity) than married or cohabiting workers. At the extensive margin, males' elasticity is larger than females ranging from 0.2 to 0.7 for males and from 0.1 to 0.4 respectively showing that there are some determinants that may harm female participation (Reichling and Whalen, 2013; Ilmakunnas and Pudney, 1990).

The literature on females' labour supply is big (Mincer, 1962; Heckman and MaCurdy, 1980; Killingsworth and Heckman, 1986; Mroz, 1987; Ilmakunnas and Pudney, 1990; Attanasio et al, 2008) and most studies have focused on understanding the main determinants at the intensive margin. While wage rates, taxes and unearned income may impact little on the labour supply of married females (Mroz, 1987), other determinants such as domestic work, qualifications and, especially, children can have a bigger impact. To foster female participation and, thus, hours of work, the cost of childcare must reduce (a 15% reduction will enhance participation of mothers around 25 years old 0.47 to 0.7) must increase as well as a reduction in the gender wage-gap (Antonazzo et al, 2008). Females are more likely to reduce their labour supply in their late 20s and 30s for childbearing in motherhood (Montgomery and Trussell, 1986; Antonazzo et al, 2008). The role of unearned income is explained as the effect of former saved assets or partners' income on family decisions such as childbearing. This unearned income is considered an exogenous variation on family income and fertility which may change depending on spouse's labour force participation. When the spouse is working, income effects will be large compared to the situation when they are not working. Hence, the larger the unearned income, the fewer hours supply and the greater the time devoted to home production, leisure and family decisions such as childbearing

(Montgomery and Trussell, 1986; Kniesner, 1976; Devereux, 2004; Blau and Kahn, 2007). This is due to the fact that females have more substitutes of work time than males (home production and leisure versus males' substitution decisions with leisure only). Other authors posit that the increase in female participation in the 1980s and the 1990s is explained by females married with males with high wages. However, they find that married females' wage elasticity converged to males' and observed a reduction in females' elasticity to husband's wage becoming less responsive at least at the extensive margin (Juhn and Murphy, 1997).

BY OCCUPATIONS

In the UK, there has been an uneven distribution of females in the labour force, possibly indicating that there may be segregation in some occupations. Indeed, in the 1980s the number of females overcame number of males in the UK (52% of population), but they only accounted for 45% in terms of labour participation (Roberts, 1992). Then, the proportion of paid employed females rose to 48% in 1990 and 57% in 2001 (Crompton and Lyonette, 2011). Moreover, part-time has widely spread amongst females where, approximately, 44% of females worked part-time in the UK compared to 8% of males. Finally, there was an hourly gender wage gap, which accounted for 74% in 1986 (measuring females' hourly wage over males' hourly wage). The concentration of females in some occupations has been widely discussed as evidence on horizontal segregation in the UK (Roberts and Coutts, 1992). The existence of this kind of segregation difference occupation by gender. Females usually concentrate in occupations in healthcare (81.3%), social care (84%) or even accountancy or law but due to the gender differences on preferences and determinants, the preference for part-time work may limit their career aspirations in some occupations.

Law firms have been recruiting females since the 1970s (Menkel-Meadow, 1989). But females might see their career promotions limited by own preferences on wanting more flexible jobs. In the UK, for example, the proportion of female lawyers rose from 39.5% in 2001 to 43% in 2006 and 48% in 2010 (Michelson, 2013). Workers in law firms usually work large number of

hours and promotions can come up as a result of a rat race selection where law firms signal inefficient long hours (Landers et al, 1996). And those working long hours are being promoted. Signalling long hours jobs may discourage workers wanting to work fewer hours in their firms and females worked fewer hours than males though still long hours. For example, lawyers' average hours of work are about 50 hours per week, but it ranges from 45 to 55 weekly hours depending on the quartile workers belong to (Kay and Hagan, 1995; Landers et al, 1996; Wallace, 1997). In Canada, female lawyers worked 45.94 hours per week on average while males did nearly 50 hours per week (Kay and Hagan, 1995); males worked 18 more hours than females and children reduced females labour supply by 10 hours on average (Landers et al, 1996).

The other comparator group we use here are accountants, which has been recently surveyed (Haynes, 2017). The reason why we pick these three groups for our analysis (doctors, lawyers and accountants) is because all require high investments in training and qualifications in early careers, both at undergraduate and graduate levels, in their careers. Specifically, for accountancy, women started to enter accounting in 1980s while in law firms this gender boost started in the 1970s. Between 1978 and 1987 the number of female accountants grew 12% versus the 2.8% increase of male accountants (Ciancanelli et al, 1990) according to the Institute of Chartered Accountants in England and Wales (ICAEW). In 1987, the inflow of female dropped the average age in the distribution of female accountants and 82% of female accountants aged under 36 while for males this proportion was 35%.

Between 1990 and 1995 the average age of women working in accounting based on figures from the Institute of Chartered Accountants of Scotland (ICAS) was 35.3 years (Gammie et al, 2013). Usual hours of work in accountancy are long, especially since available data usually comes for workers in the Big 4 and males work longer weekly hours than females. On average, accountants work 45 hours per week, but full-time workers usually do between 50 and 60 hours regularly while part-time females report working 40 hours per week (Gammie et al, 2013). Specifically, Gammie et al worked out that approximately 85% of

full-time workers worked between 31 and 50 hours where the majority reported working between 41 and 50 (55% of all full-time accountants). Only 13% of female employees reported working more than 50 hours per week and 19% of contracted females outside the accounting firm. Part-time workers reported doing between 21 and 30 hours per week and this accounted for 47.8% of females but proportions may change depending on the area (24% in audit and assurance, 70% in taxes, 75% corporate finance, 40.7% general practice and 83.35 in other functional areas). Crompton and Lyonette reported similar hours for accountants for male GPs (around 44 hours per week) but lower work time for female GPs who reported working 35 weekly hours on average. Females working in these areas complain about long-working hours (Crompton and Lyonette, 2011; White et al, 2003). The proportion of female workers doing part-time identified this as a big career limitation in their future promotions. Indeed, most part-time females (and males) reported that their even work more hours than contracted in part-time. This excess of hours is unpaid overtime. Long hours may be a determinant on career progression in lawyers and accountants, but this is not the case for doctors where progression rather depends on long hours but seniority and skills (competence tests).

The analysis of hours of work by occupation draws some conclusions. Firstly, we may expect some rat race phenomenon of working longer hours for lawyers and accountants, but not for doctors. The reason why we do not expect this is because doctors is a career based on competence tests rather than working harder. This is, for example, the situation for hospital doctors (consultants) where the number of available jobs is fixed and, secondly, promotion is competence based. Also, the introduction of a revalidation scheme may determine career promotion. Moreover, we could have combined these two control groups into one single comparator group. But the fact that doctors are different from both lawyers and accountants is more informative and persuasive than being different from the average of the two combined control groups. This motivates us to explore differences in the labour supply of these three main occupations.

DOCTORS' LABOUR SUPPLY

Flexibility at work and possibility to work part-time has been identified as strong valuable job characteristics. This may be interpreted as a reverse causality situation which may attract certain workers to specific occupations. Specifically, for doctors, there are two factors that may help in explaining the growing female participation in general practice. Firstly, the main contract agreed in the 2004 contract, which included an opt-out on-call and weekend working (Crompton and Lyonette, 2011). Secondly, the easiness to change from one hospital specialty to general practice after a few years of working experience.

Childbearing prospects also influence in doctors' decision to switch. Crompton and Lyonette reported that there is a growing proportion of females who changed to general practice in their late 20s. Moreover, with regards to hours of work per week, male GPs usually work on average 44 hours per week while females do 35 hours per week. In fact, females reported working long hours but have flexibility to manage their agenda as long as they work the contracted hours. This means that a GP can work 10-11 hours a day and only work 3.5 days per week, which accounts for nearly 40 hours.

For the UK, there has been an increasing number of studies on the labour supply of doctors in recent years. Notable studies for the UK include Fox (2007) and Gravelle and Hole (2007); Crossley et al (2009), Sarma et al (2011), or Wang and Sweetman (2013) in Canada; Baltagi et al (2005), and Johannessen and Hagen (2012) in Norway; Kalb et al (2017) in Australia; and, finally, Thornton (1998) or Staiger et al (2010) in the US. Some look at the labour supply of hospital doctors (Baltagi et al, 2005; Johannessen and Hagen, 2012) or the self-employed physicians (Thornton, 1998) but most focus on Primary Care (GPs) where the shortage has been more widely discussed (see, for example, Elliot, 2003).

The existing studies in England for GPs mainly have focused on the analysis of payment mechanisms (Morris et al, 2011) or the evaluation of the 2004 contract examining hours of work and on-call hours (Gravelle and Hole, 2007). Dolton et al (2015) look at senior doctors in the UK to assess the effect of the European

Working Time Directive (EWTD), which estimates the effect of the EWTD on the hours of work of senior and junior doctors.

In the UK, some authors explained how medical careers choices are made (Jones and Fisher, 2006) tracking medical students for 10 years after graduation (1994 to 2004) from a Medical school to explore their career preferences using an annual postal questionnaire. Their findings suggest that General Practice usually is not a first option for medical students when choosing medical careers. Only 17.6% (96/544) picked this career path after graduation in 1994. In 2004, the number of GPs rose to 159 doctors, which accounts for almost 30% of the cohort sample. This may confirm what the literature states: after a few years of experience, doctors may consider switching to primary care. Therefore, there may be some factors such as better work-life balance and working reduced hours that may facilitate that more doctors can become GPs Gravelle and Hole studied hours of work of English GPs (Gravelle and Hole, 2007). Based on a self-made questionnaire, Gravelle and Hole send it out to a random sample of GPs in England in February 2004 and compare their results with other sources like the LFS or the DDRB annual reports. Their main findings suggest that females work fewer hours than males and that GPs in England work, on average, 44.5 weekly hours. These are larger hours than those reported in the DDRB (38.8 in 1992-93 and 39 in 1998) but the authors´ estimates are close to those from the LFS for the same period. Also, they find that the size of the partnership influences the number of hours of work supplied, obtaining a positive correlation between partnership size and hours of work.

In England, other studies have used data from the Electronic Staff Records and the National Primary Care Research and Development Centre (NPCRDC), as Gravelle and Hole. These studies are the biennial series of the National GP Surveys for England (for example see Hann et al, 2013; Gibson et al, 2015). Gibson et al pointed out that average hours of work of English GPs were 41.4 hours per week in 2015. This confirms a downward trend over time where hours from previous surveys carried out in 1998, 2001, 2004, 2005, 2008, 2010 and 2012 reported average weekly hours of 46.4, 47.7, 46.4, 40.9, 42.1, 41.4 and

41.7 respectively. They also incorporate information on job satisfaction, stressors or intentions to quit the profession. The latter increases over time, which may be explained by the growing job dissatisfaction of GPs.

Finally, other analyses have preferred a cohort-focus using year of graduation from Medical School as the key variable to define cohorts (Crossley et al, 2009; Sarma et al, 2011; Wang et al, 2013; Jones and Fisher, 2006; Gravelle and Hole, 2007). Studies in Canada suggest that the decline in the hours of work of doctors is explained by a drop in the average hours of work of female GPs and the change in the proportion of time spent on direct patient care over time (Crossley et al, 2009). Crossley et al measure direct patient care work hours of GPs and emphasise the importance of doing analyses of the intensive margin rather than for the extensive margin (Crossley et al, 2009). Their findings suggest that growing bureaucracy help explain the fall in hours of work in direct patient care. They find a zero-income effect and advocate for technological changes or the expansion (or reduction) of the number of practices to explain this effect, as Johannessen and Hagen also do. Most studies also found predictable effects of other potential drivers of, especially for female GPs, such as children (Sarma et al, 2011 and Kalb et al, 2017) and marital status (Wang et al, 2013). Other variables that affect the number of working hours are geographical job location (doctors in rural areas work less) or being employees (self-employed GPs work fewer hours that hospital doctors who are invariably employees).

3.3. DATA

This chapter benefits from the QLFS pooled cross-section data generated in chapter 2 of this thesis. The data covers twenty-one years (1994-2014) and is accessible from the UK Data Service. The LFS has been used extensively for labour supply modelling in the UK economy. Here, the chapter only refers to labour supply for different groups of occupations: doctors (partner GPs, salaried GPs and hospital doctors), lawyers and accountants.

3.3.1. VARIABLE DEFINITIONS

The occupation variable in the main job is generated using the 4-digits Standard Occupation Codes (SOC) available in the survey (SOC1990, SOC2000 and SOC2010). The reference occupation variables are the 4-digits minor occupation group in main job, with codes 240, 241 or 242 for lawyers and 250, 251 or 252 for accountants and occupation codes 221 and 2211 for medical practitioners. Classifying doctors by type of premises (primary vs secondary care) requires combining information from the occupation codes with the available the Standard Industry Classification (SIC) codes which allows to distinguish doctors working in hospital premises from those in primary care. Furthermore, we break down primary care physicians in partner GPs (self-employed) and salaried GPs (employees) using the self-employed and employee variables available. A set of control variables are also included: country of birth, ethnicity, and marital status. Immigrants were defined as being born outside the UK; although, because of Brexit, a new variable breaks down immigrants into European immigrants and other immigrants. Ethnicity takes value 1 for whites and zero otherwise; and the variable married takes value 1 for those whose marital status is married or cohabiting, and zero otherwise; and ever married takes value 1 for those who ever were married (married, cohabiting, separated, divorced, widowed) and zero otherwise. Childbearing is also included with variables that show whether individuals had children aged 0-2, 2-4, 5-9,10-15, where comparator group is having no children. Several measures of hours of work are available in the data: usual hours of work reported in main job (basic, paid and unpaid overtime, and total hours). Actual hours in second job were recoded to zero when answers did not apply. The overall hours (in both main and second jobs) was defined as the sum of total usual hours in main job and in second job. Eventually, real earnings variables (hourly wage, gross weekly earnings and net weekly earnings) were computed based on 2014 price indices. Then, I included variables such as age at graduation from full-time studies or years of experience.

3.3.2. SAMPLE DESCRIPTION

Our pooled cross-section data results in a sample size of 85,583 observations of which 8,333 were currently working as GPs in main job[36], 14,451 hospital doctors, 21,647 lawyers and 41,152 accountants over the twenty-one-year period (1994-2014). By gender breakdown 62.98% were males (53,898) and 37.02% females (31,685). By occupation, the gender breakdown shows similar proportions with 59.14% (4,928), 61.43% (8,877), 58.13% (12,583) and 66.85% (27,510) being male GPs, hospital doctors, lawyers and accountants respectively and 40.86% (3,405), 38.57% (5,574), 41.87% (9,064) and 33.15% (13,685) female workers.

The proportion of natives and white workers is very similar across groups except for hospital doctors, which is lower (66% and 71% respectively). Also, doctors have a larger share of immigrant workers than lawyers and accountants, and this is higher for hospital doctors (34.28% overall, but as much as 40.23% for male hospital doctors). Approximately, 80% of GPs were married, 69% for hospital doctors and 63% of lawyers and accountants. However, the proportion of single hospital doctors, lawyers and accountants are very similar.

The average age of doctors is 45.72 for GPs, with partner GPs averaging 47.34 and salaried GPs 39.90. Tables 3.1(A) and 3.1(B) show the information by gender breakdown and Table 3.2. shows the differences in means. Female salaried GPs average 36.88 years, similar to other lawyers and accountants and slightly below hospital doctors (See Table 3.1(B)) but partner GPs aged 43.88 years on average, 7 years older than female salaried GPs. Doctors' earnings are larger than those for lawyers or accountants. Hospital doctors have the largest yearly earnings averaging £72,000 for males and £55,761 for females, followed by salaried GPs (£64,075 for males and £47,363 for females), lawyers (£58,979 for males and £45,606 for females) and accountants (£52,638 for males and £39,815 for females). Male partner GPs

[36] Amongst GPs, 78% are partner GP (6,514/8,333) and 22% salaried GPs (1,818/8,333).

have more years of experience than other workers (16 years on average) followed by lawyers, salaried GPs, hospital doctors and accountants. Female parent GPs also reported the largest number of years of experience (11.56) followed by hospital doctors, accountants, lawyers and, salaried GPs (5.34).

In Table 3.2(A), male partner GPs are 6 years older than lawyers and 7 than accountants. Salaried GPs show a similar average age and hospital doctors are the youngest. Males do not have many children at different ages. Salaried GPs work less than lawyers but similar to accountants. In Table 3.2(B) female doctors work significantly fewer hours than female lawyers and accountants. The difference is 5 less for female partner GPs compared to lawyers and 7.5 fewer hours for salaried GPs compared to lawyers. Hospital doctors work harder than lawyers and accountants.

Table 3.1 Descriptive Statistics
(A) MALES

	Partner GPs			Salaried GPs			Hospital doctors			Lawyers			Accountants		
Variables	N	Mean	sd	N	Mean	sd	N	Mean	sd	N	Mean	sd	N	Mean	sd
Age	4,214	49.23	10.73	713	44.59	13.27	8,877	41.00	10.75	12,583	43.29	11.53	27,510	41.90	11.83
Age2	4,214	2,538.17	1,107.50	713	2,164.41	1,327.61	8,877	1,796.52	945.89	12,583	2,006.95	1,059.96	27,510	1,895.40	1,061.20
Employees	4,214	0.00	0.00	713	1.00	0.00	8,877	0.97	0.17	12,583	0.49	0.50	27,510	0.74	0.44
Full-time work	4,214	0.86	0.35	713	0.81	0.39	8,877	0.96	0.19	12,583	0.94	0.23	27,510	0.92	0.27
Native	4,214	0.79	0.41	713	0.71	0.45	8,877	0.60	0.49	12,583	0.91	0.29	27,510	0.87	0.34
Immigrant	4,214	0.21	0.41	713	0.29	0.45	8,877	0.40	0.49	12,583	0.09	0.29	27,510	0.13	0.34
White	4,159	0.85	0.35	693	0.73	0.44	8,699	0.66	0.47	12,382	0.94	0.23	26,988	0.90	0.29
Married/Cohabiting	4,214	0.90	0.30	713	0.78	0.42	8,877	0.77	0.42	12,583	0.71	0.46	27,510	0.67	0.47
Ever married (incl. married, cohabiting, separated, divorced, widowed…)	4,214	0.96	0.21	713	0.83	0.38	8,877	0.81	0.40	12,583	0.77	0.42	27,510	0.74	0.44
Average number of children in family under 19	4,202	1.15	1.17	713	0.96	1.10	8,864	1.01	1.10	12,554	0.91	1.07	27,485	0.77	1.00
No child in family under 19	4,214	0.44	0.50	713	0.49	0.50	8,877	0.47	0.50	12,583	0.52	0.50	27,510	0.57	0.49
One child in family under 19	4,214	0.15	0.36	713	0.18	0.39	8,877	0.18	0.38	12,583	0.16	0.36	27,510	0.15	0.36
Two children in family under 19	4,214	0.23	0.42	713	0.20	0.40	8,877	0.22	0.42	12,583	0.22	0.42	27,510	0.21	0.41
Three or more children under 19	4,214	0.18	0.39	713	0.13	0.33	8,877	0.13	0.34	12,583	0.10	0.30	27,510	0.07	0.26
Age eldest child in family under 16	1,511	9.29	4.53	259	7.88	4.60	3,518	7.80	4.36	4,356	8.07	4.41	8,320	7.85	4.42
Age youngest child in family under 19	2,187	8.34	5.62	356	6.69	5.67	4,539	6.15	5.32	5,760	6.72	5.37	11,209	6.86	5.59
Age eldest child in family under 19	2,187	11.44	5.35	356	9.56	5.94	4,539	8.90	5.58	5,760	9.28	5.63	11,209	9.28	5.73
Have children in family under 16	4,202	0.98	1.12	713	0.84	1.05	8,864	0.92	1.07	12,554	0.82	1.03	27,485	0.68	0.96
Have children aged 0-2	4,214	0.10	0.32	713	0.13	0.34	8,877	0.14	0.37	12,583	0.12	0.33	27,510	0.10	0.32
Have children aged 2-4	4,214	0.16	0.43	713	0.18	0.42	8,877	0.21	0.47	12,583	0.17	0.42	27,510	0.14	0.38
Have children aged 5-9	4,214	0.29	0.64	713	0.28	0.61	8,877	0.30	0.61	12,583	0.26	0.59	27,510	0.22	0.53
Have children aged 10-15	4,214	0.46	0.78	713	0.28	0.59	8,877	0.29	0.63	12,583	0.29	0.63	27,510	0.23	0.56
Cohort 1901-1910	4,214	0.00	0.00	713	0.01	0.08	8,877	0.00	0.00	12,583	0.00	0.00	27,510	0.00	0.01
Cohort 1911-1920	4,214	0.00	0.06	713	0.01	0.11	8,877	0.00	0.02	12,583	0.00	0.04	27,510	0.00	0.04
Cohort 1921-1930	4,214	0.03	0.18	713	0.03	0.16	8,877	0.00	0.06	12,583	0.01	0.10	27,510	0.01	0.09
Cohort 1931-1940	4,214	0.10	0.30	713	0.04	0.21	8,877	0.03	0.18	12,583	0.04	0.21	27,510	0.04	0.19
Cohort 1941-1950	4,214	0.23	0.42	713	0.12	0.33	8,877	0.12	0.32	12,583	0.16	0.37	27,510	0.14	0.35
Cohort 1951-1960	4,214	0.35	0.48	713	0.22	0.41	8,877	0.22	0.42	12,583	0.27	0.45	27,510	0.23	0.42
Cohort 1961-1970	4,214	0.22	0.42	713	0.29	0.45	8,877	0.32	0.47	12,583	0.29	0.45	27,510	0.28	0.45
Cohort 1971-1980	4,214	0.06	0.24	713	0.22	0.41	8,877	0.24	0.43	12,583	0.18	0.38	27,510	0.23	0.42
Cohort 1981-1990	4,214	0.00	0.04	713	0.06	0.24	8,877	0.05	0.22	12,583	0.04	0.20	27,510	0.07	0.25
Cohort 1991+	4,214	0.00	0.00	713	0.00	0.00	8,877	0.00	0.02	12,583	0.00	0.01	27,510	0.00	0.04
Work in ref. week (n/y)	4,214	0.90	0.29	713	0.93	0.25	8,877	0.93	0.26	12,583	0.93	0.25	27,510	0.92	0.27
Basic usual hours (main job)	4,214	45.37	18.57	713	39.08	16.58	8,877	44.71	14.34	12,583	42.53	13.19	27,510	38.40	11.07
Ever work overtime (n/y)	4,214	0.27	0.44	713	0.42	0.49	8,877	0.60	0.49	12,583	0.40	0.49	27,510	0.49	0.50
Overtime usual hours (main job)	4,214	2.16	5.65	713	3.08	6.18	8,877	5.93	8.94	12,583	3.60	6.21	27,510	3.83	5.79
Total usual hours (main job)	4,214	47.52	19.44	713	42.16	18.11	8,877	50.62	16.33	12,583	46.13	13.50	27,510	42.23	12.29
Have a 2nd job (n/y)	4,214	0.18	0.39	713	0.13	0.34	8,877	0.18	0.39	12,583	0.04	0.19	27,510	0.04	0.19
Actual hours (2nd job)	4,214	1.48	5.11	713	1.29	4.79	8,877	1.27	4.15	12,583	0.29	2.47	27,510	0.30	2.29
Total hours (main & 2nd)	4,214	48.99	19.94	713	43.43	18.17	8,877	51.89	16.66	12,583	46.42	13.59	27,510	42.53	12.36
Real hourly wage	0	.	.	184	30.07	14.16	2,282	29.26	14.35	1,616	28.67	16.49	5,665	25.85	13.24
Real gross weekly earnings	0	.	.	185	1,232.21	591.05	2,333	1,384.91	596.98	1,630	1,134.22	703.22	5,699	1012.28	676.95
Real net weekly earnings	0	.	.	181	848.82	380.75	2,263	978.84	427.99	1,576	793.05	491.26	5,489	700.34	442.00
Experience years	4,195	16.36	9.98	704	8.75	10.51	8,862	8.53	8.78	12,536	11.11	10.42	27,408	7.84	8.23
Length time current employer	4,148	6.74	1.68	708	5.00	2.57	8,786	5.38	1.99	12,418	5.84	1.96	27,186	5.35	1.93
Age at graduation full-time studies	974	25.27	4.55	216	26.16	5.17	2,284	27.01	5.47	3,744	23.41	4.46	8,293	23.91	5.10

Note: Earnings in the LFS are self-reported from employees. This excludes self-employed workers, which accounts for 80% of GPs.

Table 3.1. (continues)

(B) FEMALES

Variables	Partner GPs			Salaried GPs			Hospital doctors			Lawyers			Accountants		
	N	Mean	sd	N	Mean	sd	N	Mean	sd	N	Mean	sd	N	Mean	sd
Age	2,300	43.88	9.56	1,105	36.88	9.11	5,574	37.31	10.14	9,064	36.86	9.36	13,642	36.91	9.31
Age2	2,300	2017.14	913.79	1,105	1,442.96	783.94	5,574	1,495.04	837.12	9,064	1,446.24	760.94	13,642	1,448.76	749.33
Employees	2,300	0.00	0.00	1,105	1.00	0.00	5,574	0.98	0.13	9,064	0.79	0.41	13,642	0.86	0.35
Full-time work	2,300	0.53	0.50	1,105	0.50	0.50	5,574	0.79	0.40	9,064	0.82	0.39	13,642	0.79	0.41
Native	2,300	0.85	0.35	1,105	0.80	0.40	5,574	0.75	0.43	9,064	0.89	0.32	13,642	0.85	0.36
Immigrant	2,300	0.15	0.35	1,105	0.20	0.40	5,574	0.25	0.43	9,064	0.11	0.32	13,642	0.15	0.36
White	2,272	0.91	0.28	1,064	0.81	0.39	5,442	0.79	0.41	8,866	0.89	0.31	13,338	0.89	0.31
Married/Cohabiting	2,300	0.79	0.41	1,105	0.73	0.45	5,574	0.58	0.49	9,064	0.52	0.50	13,642	0.53	0.50
Ever married (incl. married, cohabiting, separated, divorced, widowed...)	2,300	0.88	0.32	1,105	0.77	0.42	5,574	0.64	0.48	9,064	0.61	0.49	13,642	0.63	0.48
Average number of children in family under 19	2,295	1.24	1.12	1,105	1.06	1.10	5,567	0.76	1.02	9,053	0.67	0.94	13,628	0.65	0.91
No child in family under 19	2,300	0.38	0.48	1,105	0.44	0.50	5,574	0.59	0.49	9,064	0.60	0.49	13,642	0.61	0.49
One child in family under 19	2,300	0.16	0.37	1,105	0.18	0.38	5,574	0.14	0.35	9,064	0.18	0.39	13,642	0.17	0.37
Two children in family under 19	2,300	0.30	0.46	1,105	0.25	0.43	5,574	0.19	0.39	9,064	0.16	0.37	13,642	0.18	0.39
Three or more children under 19	2,300	0.16	0.37	1,105	0.13	0.33	5,574	0.08	0.27	9,064	0.06	0.23	13,642	0.04	0.20
Age eldest child in family under 16	991	8.67	4.52	483	6.25	4.06	1,800	7.45	4.36	2,719	6.92	4.42	4,103	7.07	4.36
Age youngest child in family under 19	1,354	7.48	5.46	598	4.63	4.87	2,255	5.75	5.10	3,500	5.73	5.19	5,219	5.85	5.24
Age eldest child in family under 19	1,354	10.30	5.59	598	7.17	5.43	2,255	8.22	5.51	3,500	7.66	5.69	5,219	7.84	5.63
Have children in family under 16	2,295	1.09	1.09	1,105	0.98	1.06	5,567	0.70	0.98	9,053	0.62	0.90	13,628	0.60	0.88
Have children aged 0-2	2,300	0.12	0.33	1,105	0.20	0.43	5,574	0.12	0.34	9,064	0.12	0.35	13,642	0.11	0.33
Have children aged 2-4	2,300	0.20	0.48	1,105	0.27	0.51	5,574	0.16	0.42	9,064	0.15	0.41	13,642	0.14	0.39
Have children aged 5-9	2,300	0.35	0.66	1,105	0.33	0.66	5,574	0.23	0.56	9,064	0.18	0.48	13,642	0.19	0.49
Have children aged 10-15	2,300	0.45	0.78	1,105	0.21	0.53	5,574	0.20	0.53	9,064	0.17	0.49	13,642	0.16	0.46
Cohort 1901-1910	2,300	0.00	0.00	1,105	0.00	0.00	5,574	0.00	0.00	9,064	0.00	0.00	13,642	0.00	0.00
Cohort 1911-1920	2,300	0.00	0.05	1,105	0.00	0.00	5,574	0.00	0.00	9,064	0.00	0.00	13,642	0.00	0.00
Cohort 1921-1930	2,300	0.01	0.09	1,105	0.01	0.09	5,574	0.00	0.04	9,064	0.00	0.03	13,642	0.00	0.01
Cohort 1931-1940	2,300	0.03	0.17	1,105	0.01	0.10	5,574	0.02	0.12	9,064	0.00	0.07	13,642	0.00	0.07
Cohort 1941-1950	2,300	0.10	0.31	1,105	0.04	0.18	5,574	0.06	0.25	9,064	0.04	0.21	13,642	0.03	0.18
Cohort 1951-1960	2,300	0.37	0.48	1,105	0.09	0.29	5,574	0.16	0.36	9,064	0.18	0.38	13,642	0.15	0.36
Cohort 1961-1970	2,300	0.37	0.48	1,105	0.30	0.46	5,574	0.30	0.46	9,064	0.34	0.47	13,642	0.35	0.48
Cohort 1971-1980	2,300	0.11	0.31	1,105	0.41	0.49	5,574	0.32	0.47	9,064	0.32	0.47	13,642	0.35	0.48
Cohort 1981-1990	2,300	0.01	0.10	1,105	0.15	0.35	5,574	0.14	0.34	9,064	0.11	0.31	13,642	0.11	0.32
Cohort 1991+	2,300	0.00	0.00	1,105	0.00	0.00	5,574	0.00	0.02	9,064	0.00	0.02	13,642	0.00	0.05
Work in ref. week (n/y)	2,300	0.88	0.33	1,105	0.86	0.35	5,574	0.88	0.33	9,064	0.89	0.31	13,642	0.88	0.32
Basic usual hours (main job)	2,300	33.13	14.78	1,105	31.02	14.14	5,574	40.00	14.09	9,064	36.31	11.13	13,642	34.18	9.40
Ever work overtime (n/y)	2,300	0.34	0.47	1,105	0.45	0.50	5,574	0.64	0.48	9,064	0.55	0.50	13,642	0.53	0.50
Overtime usual hours (main job)	2,300	2.05	4.69	1,105	1.96	3.65	5,574	4.69	6.97	9,064	4.14	5.72	13,642	3.42	5.11
Total usual hours (main job)	2,300	35.18	15.60	1,105	32.98	15.00	5,574	44.68	16.09	9,064	40.45	12.51	13,642	37.60	11.27
Have a 2nd job (n/y)	2,300	0.15	0.36	1,105	0.13	0.34	5,574	0.07	0.26	9,064	0.03	0.17	13,642	0.03	0.18
Actual hours (2nd job)	2,300	1.04	3.94	1,105	1.00	3.81	5,574	0.48	2.78	9,064	0.17	1.46	13,642	0.24	1.92
Total hours (main & 2nd)	2,300	36.22	15.92	1,105	33.98	15.26	5,574	45.16	16.02	9,064	40.62	12.51	13,642	37.84	11.24
Real hourly wage	0	.	.	308	32.03	12.85	1,554	26.30	13.47	1,971	24.78	13.45	3,364	22.51	10.92
Real gross weekly earnings	0	.	.	308	910.83	444.22	1,577	1,072.32	826.48	1,980	877.04	614.16	3,379	785.69	413.24
Real net weekly earnings	0	.	.	302	634.50	337.17	1,550	738.52	324.20	1,930	610.28	385.86	3,294	551.25	285.19
Experience years	2,296	11.56	8.83	1,100	5.34	6.64	5,561	7.06	7.89	9,027	6.03	6.31	13,608	6.10	6.04
Length time current employer	2,278	6.12	1.72	1,101	4.65	2.01	5,532	5.03	2.02	8,991	5.06	1.85	13,546	5.13	1.77
Age at graduation full-time studies	587	24.84	4.20	387	24.81	4.45	1,504	25.24	4.77	2,920	23.22	4.17	4,597	24.59	5.80

Note: Earnings in the LFS are self-reported from employees. This excludes self-employed workers, which accounts for 80% of GPs.

Table 3.2 Descriptive Statistics – Mean Differences by Gender[37]

(A) MALES

	Partner GPs vs Lawyers	Partner GPs vs Accountants	Salaried GPs vs Partner GPs	Salaried GPs vs Lawyers	Salaried GPs vs Accountants	Hospital doctors vs Partner GPs	Hospital doctors vs Salaried GPs	Hospital doctors vs Lawyers	Hospital doctors vs Accountants
Age	5.94	7.33	-4.63	1.30	2.69	-8.23	-3.59	-2.29	-0.90
Age2	531.22	642.78	-373.76	157.46	269.01	-741.66	-367.89	-210.43	-98.88
Employees	-0.49	-0.74	1.00	0.51	0.26	0.97	-0.03	0.48	0.23
Full-time work	-0.09	-0.06	-0.05	-0.13	-0.11	0.11	0.15	0.02	0.04
Native	-0.11	-0.07	-0.08	-0.19	-0.15	-0.20	-0.11	-0.31	-0.27
Immigrant	0.11	0.07	0.08	0.19	0.15	0.20	0.11	0.31	0.27
White	-0.09	-0.05	-0.12	-0.21	-0.17	-0.20	-0.08	-0.29	-0.25
Married/Cohabiting	0.19	0.22	-0.12	0.07	0.11	-0.13	-0.01	0.06	0.09
Ever married (incl. married, cohabiting, separated, divorced, widowed…)	0.18	0.22	-0.13	0.05	0.09	-0.15	-0.02	0.03	0.07
Average number of children in family under 19	0.25	0.38	-0.19	0.05	0.19	-0.14	0.05	0.11	0.24
No child in family under 19	-0.08	-0.14	0.06	-0.03	-0.08	0.03	-0.02	-0.05	-0.10
One child in family under 19	0.00	0.00	0.03	0.03	0.03	0.03	-0.01	0.02	0.03
Two children in family under 19	0.00	0.02	-0.03	-0.03	-0.01	0.00	0.03	0.00	0.02
Three or more children under 19	0.08	0.11	-0.06	0.03	0.06	-0.05	0.00	0.03	0.06
Age eldest child in family under 16	1.21	1.44	-1.40	-0.19	0.03	-1.49	-0.08	-0.27	-0.05
Age youngest child in family under 19	1.62	1.47	-1.65	-0.03	-0.18	-2.19	-0.54	-0.57	-0.71
Age eldest child in family under 19	2.16	2.16	-1.88	0.28	0.27	-2.54	-0.65	-0.38	-0.38
Have children in family under 16	0.16	0.30	-0.14	0.02	0.16	-0.06	0.08	0.11	0.24
Have children aged 0-2	-0.01	0.00	0.03	0.01	0.02	0.04	0.02	0.03	0.04
Have children aged 2-4	0.00	0.02	0.01	0.01	0.04	0.04	0.03	0.04	0.07
Have children aged 5-9	0.03	0.08	-0.02	0.01	0.06	0.01	0.02	0.04	0.08
Have children aged 10-15	0.17	0.22	-0.17	0.00	0.05	-0.16	0.01	0.01	0.06
Cohort 1901-1910	0.00	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.00
Cohort 1911-1920	0.00	0.00	0.01	0.01	0.01	0.00	-0.01	0.00	0.00
Cohort 1921-1930	0.02	0.02	-0.01	0.02	0.02	-0.03	-0.02	-0.01	0.00
Cohort 1931-1940	0.05	0.06	-0.05	0.00	0.01	-0.06	-0.01	-0.01	-0.01
Cohort 1941-1950	0.07	0.09	-0.11	-0.04	-0.02	-0.11	-0.01	-0.05	-0.03
Cohort 1951-1960	0.08	0.12	-0.13	-0.05	-0.01	-0.13	0.01	-0.05	0.00
Cohort 1961-1970	-0.07	-0.06	0.06	0.00	0.00	0.10	0.04	0.03	0.04
Cohort 1971-1980	-0.12	-0.17	0.16	0.04	-0.01	0.18	0.03	0.07	0.02
Cohort 1981-1990	-0.04	-0.06	0.06	0.02	-0.01	0.05	-0.01	0.01	-0.01
Cohort 1991+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Work in ref. week (n/y)	-0.03	-0.02	0.03	0.00	0.01	0.02	-0.01	-0.01	0.01
Basic usual hours (main job)	2.84	6.96	-6.29	-3.44	0.68	-0.65	5.63	2.19	6.31
Ever work overtime (n/y)	-0.13	-0.22	0.15	0.02	-0.07	0.33	0.18	0.20	0.11
Overtime usual hours (main job)	-1.44	-1.67	0.91	-0.53	-0.75	3.77	2.86	2.33	2.10
Total usual hours (main job)	1.39	5.28	-5.36	-3.97	-0.08	3.10	8.46	4.49	8.39
Have a 2nd job (n/y)	0.14	0.15	-0.05	0.10	0.10	0.00	0.05	0.15	0.15
Actual hours (2nd job)	1.19	1.18	-0.19	1.00	0.99	-0.20	-0.01	0.98	0.98
Total hours (main & 2nd)	2.57	6.46	-5.56	-2.99	0.90	2.90	8.46	5.47	9.36
Real hourly wage	-	-	-	1.41	4.22	-	-0.82	0.59	3.40
Real gross weekly earnings	-	-	-	97.99	219.93	-	152.70	250.69	372.63
Real net weekly earnings	-	-	-	55.78	148.48	-	130.02	185.79	278.50
Experience years	5.25	8.52	-7.62	-2.37	0.91	-7.83	-0.21	-2.58	0.69
Length time current employer	0.90	1.40	-1.75	-0.85	-0.35	-1.37	0.38	-0.47	0.03
Age at graduation full-time studies	1.86	1.36	0.89	2.75	2.25	1.74	0.85	3.60	3.10

Note: Earnings in the LFS are self-reported from employees. This excludes self-employed workers, which accounts for 80% of GPs.

[37] Differences are obtained subtracting the average of the second group (lawyers or accountants) from the first group (GPs or hospital doctors).

(B) FEMALES

	Partner GPs vs Lawyers	Partner GPs vs Accountants	Salaried GPs vs Partner GPs	Salaried GPs vs Lawyers	Salaried GPs vs Accountants	Hospital doctors vs Partner GPs	Hospital doctors vs Salaried GPs	Hospital doctors vs Lawyers	Hospital doctors vs Accountants
Age	7.02	6.98	-7.01	0.02	-0.03	-6.57	0.43	0.45	0.41
Age2	570.90	568.38	-574.18	-3.28	-5.80	-522.09	52.08	48.81	46.28
Employees	-0.79	-0.86	1.00	0.21	0.14	0.98	-0.02	0.19	0.12
Full-time work	-0.29	-0.26	-0.03	-0.32	-0.29	0.27	0.29	-0.02	0.01
Native	-0.03	0.01	-0.06	-0.09	-0.05	-0.10	-0.04	-0.13	-0.10
Immigrant	0.03	-0.01	0.06	0.09	0.05	0.10	0.04	0.13	0.10
White	0.02	0.02	-0.10	-0.08	-0.09	-0.13	-0.02	-0.10	-0.11
Married/Cohabiting	0.27	0.25	-0.06	0.21	0.19	-0.21	-0.15	0.06	0.04
Ever married (incl. married, cohabiting, separated, divorced, widowed…)	0.27	0.25	-0.11	0.17	0.14	-0.25	-0.14	0.03	0.01
Average number of children in family under 19	0.57	0.59	-0.18	0.39	0.41	-0.48	-0.30	0.09	0.11
No child in family under 19	-0.22	-0.23	0.07	-0.16	-0.16	0.21	0.14	-0.01	-0.02
One child in family under 19	-0.02	0.00	0.01	0.00	0.01	-0.02	-0.03	-0.04	-0.02
Two children in family under 19	0.14	0.12	-0.05	0.09	0.07	-0.11	-0.06	0.03	0.01
Three or more children under 19	0.10	0.12	-0.03	0.07	0.09	-0.08	-0.05	0.02	0.04
Age eldest child in family under 16	1.75	1.60	-2.42	-0.67	-0.82	-1.22	1.19	0.53	0.38
Age youngest child in family under 19	1.75	1.63	-2.85	-1.10	-1.22	-1.73	1.12	0.02	-0.10
Age eldest child in family under 19	2.64	2.46	-3.13	-0.49	-0.67	-2.08	1.05	0.56	0.38
Have children in family under 16	0.47	0.50	-0.11	0.36	0.39	-0.39	-0.28	0.08	0.10
Have children aged 0-2	0.00	0.01	0.08	0.08	0.09	0.00	-0.08	0.00	0.01
Have children aged 2-4	0.05	0.06	0.07	0.12	0.13	-0.05	-0.11	0.01	0.02
Have children aged 5-9	0.17	0.16	-0.02	0.15	0.14	-0.11	-0.10	0.05	0.04
Have children aged 10-15	0.28	0.29	-0.24	0.04	0.05	-0.25	-0.01	0.03	0.04
Cohort 1901-1910	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cohort 1911-1920	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cohort 1921-1930	0.01	0.01	0.00	0.01	0.01	-0.01	-0.01	0.00	0.00
Cohort 1931-1940	0.02	0.02	-0.02	0.01	0.01	-0.01	0.00	0.01	0.01
Cohort 1941-1950	0.06	0.07	-0.07	-0.01	0.00	-0.04	0.03	0.02	0.03
Cohort 1951-1960	0.19	0.22	-0.28	-0.09	-0.06	-0.21	0.07	-0.02	0.01
Cohort 1961-1970	0.03	0.02	-0.07	-0.04	-0.05	-0.06	0.01	-0.04	-0.04
Cohort 1971-1980	-0.21	-0.24	0.30	0.09	0.06	0.21	-0.09	0.00	-0.03
Cohort 1981-1990	-0.10	-0.10	0.14	0.03	0.03	0.13	-0.01	0.02	0.02
Cohort 1991+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Work in ref. week (n/y)	-0.01	-0.01	-0.02	-0.03	-0.03	0.00	0.02	-0.01	0.00
Basic usual hours (main job)	-3.18	-1.05	-2.11	-5.30	-3.17	6.87	8.98	3.68	5.81
Ever work overtime (n/y)	-0.21	-0.19	0.11	-0.10	-0.08	0.30	0.19	0.09	0.10
Overtime usual hours (main job)	-2.09	-1.37	-0.09	-2.17	-1.45	2.64	2.72	0.55	1.27
Total usual hours (main job)	-5.27	-2.42	-2.20	-7.47	-4.62	9.50	11.70	4.23	7.08
Have a 2nd job (n/y)	0.12	0.11	-0.02	0.10	0.10	-0.08	-0.06	0.04	0.04
Actual hours (2nd job)	0.87	0.80	-0.04	0.83	0.76	-0.56	-0.52	0.31	0.24
Total hours (main & 2nd)	-4.40	-1.62	-2.24	-6.64	-3.85	8.93	11.17	4.53	7.32
Real hourly wage	-	-	-	7.25	9.52	-	-5.73	1.52	3.80
Real gross weekly earnings	-	-	-	33.79	125.14	-	161.49	195.28	286.63
Real net weekly earnings	-	-	-	24.22	83.24	-	104.03	128.25	187.27
Experience years	5.53	5.46	-6.22	-0.69	-0.76	-4.50	1.72	1.03	0.96
Length time current employer	1.06	0.99	-1.47	-0.41	-0.48	-1.09	0.38	-0.03	-0.10
Age at graduation full-time studies	1.62	0.24	-0.03	1.59	0.22	0.41	0.43	2.03	0.65

3.3.3. CHANGE IN HEADCOUNT OVER TIME

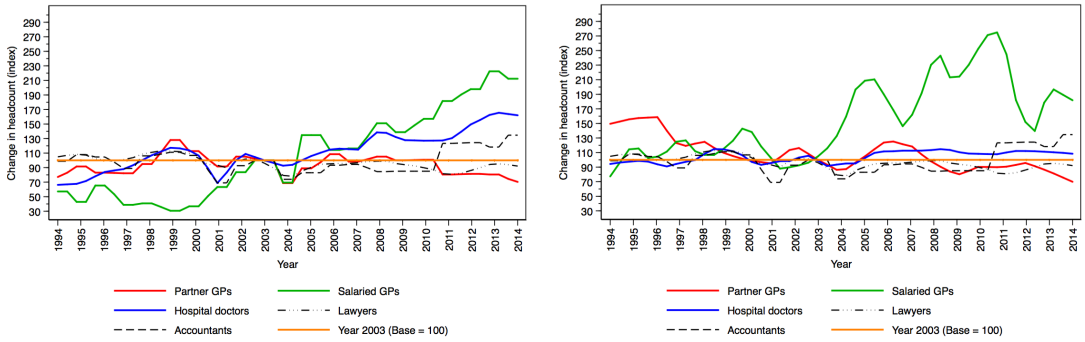
Figure 3.1 plots information from the extensive margin and then we compare with information from the intensive margin (hours of work). For this purpose, we create an index to show how headcount changed using year 2003 as the base year (2003=100)[38]. Sample sizes get small when we break down the data by type of doctor. There is an important but relatively smoothed growth in the headcount of female salaried GPs which increases by around a factor of three over these 21 years. There was a sharp spike in the number of salaried male GPs after the 2004 contract change. So, male GPs increased approximately by

[38] Quarter 1 is missed in years 2001 and 2004 for all occupations. The headcount figures are adjusted for this to reflect this missing data.

a factor of two on average. Male hospital doctors remained more and less constant but there was a smooth growth in female hospital doctors who approximately doubled in number. In contrast, the overall number of lawyers remained, fairly, static with just a modest trend towards feminisation. Also, there was a big increase in the accountant headcount around 2010, which was larger for females. Prior to this, there was a gradual change in the gender balance towards women.

Figure 3.1 Change in Headcount by Gender (2003=100)

FEMALES MALES

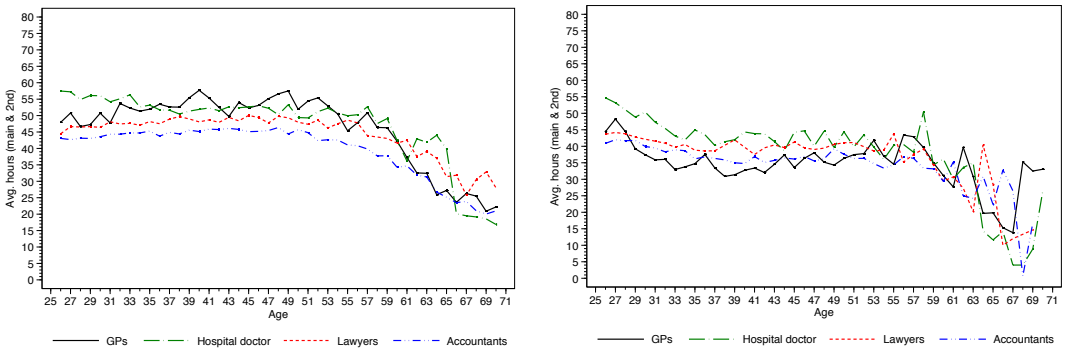


3.3.4. AGE PROFILES IN OBSERVED HOURS

Figure 3.2 shows the self-reported average hours of work by age conditional on working positive hours in main job by gender breakdown, using the definition of total hours in main and second job proposed in chapter 2. The age profile seems similar for men across occupations. There is a marked drop near the age of 60 which is more pronounced for GPs. Hospital doctors work markedly longer hours in their late 20's and early 30's which is the period of most intensive training for them (basically when they are junior doctors). The number of hours for female GPs drops during potential childbearing ages, which data reports being between 28 and 42 years old.

Figure 3.2 Observed Average Total Hours of Work (main & 2nd)

MALES FEMALES



3.4. MODELS

3.4.1. LABOUR SUPPLY OVER THE LIFECYCLE

In this chapter, we provide estimates of average weekly hours of work using simple labour supply models, conditioned on occupation in main job. Firstly, we estimate a pooled model for all 5 occupations (partner GPs, salaried GPs, hospital doctors, lawyers and accountants) where accountants are the comparator group.

We include an occupation-specific model, by gender breakdown, where we condition our estimates on occupation in main job positive total hours in main and second job and aged 26-70. The reason why we picked up that age range (26-70) is because doctors typically have a longer training period than lawyers and accountants. They usually spend 5 or 6 years, on average, in medical education, and a further 2 years in postgraduate work-based training (referred to as Foundation Years 1 & 2 which are based largely in hospitals). This means that they usually end their degrees aged 23-24 and their postgraduate studies at 25-26. Therefore, doctors start working at age 26 at the earliest though they need to undertake further training (as doctors in training) for 3 further years in primary care and 5 to 8 years in secondary care. The upper-bound age is a limitation imposed by the LFS which stops asking about retirement after 69.

Doctors' occupation can be interpreted more like a career than a typical job. In this context, much of the variation in wages is likely to be driven by a lifecycle path of wages over which agents can reasonably expect to experience is unlikely to reveal parameters that would be useful for policy analysis. This justifies ruling out wages in our model. In the face of fully anticipated wage variation, lifecycle optimisers will have hours of work variation that is highly correlated with expected wage variation in the absence of credit constraints. However, nothing is learnt about the effects of reforms to wage profiles by knowing about movements along them. Moreover, our data only reports information on earnings for employees and information for self-employed is missed. Nevertheless, we expand on our analysis on individual characteristics running a household analysis. For this purpose and for the sake of providing a more comprehensive analysis, our household level analysis includes earnings when available and partner's education/occupation as a proxy to partner's earnings when data on wages is missed.

The analysis restricts to reduced form modelling, where our person-specification labour supply model is as follows

$$H_{it}^{j} = \alpha^{j} + \beta' X_{it}^{j} + \gamma D_t + u_{it}^{j} \quad (1)$$

Where the superscript j stands for the occupation held in main job (GP, Partner GP, salaried GP, hospital doctors, lawyer or accountant), subscript i stands for the individual respondent (conditioned on gender, male or female) and t for survey year, respectively. Variable *H* measures the total hours of work in main and second job. Then, X is a vector of covariates that contains a set of demographics: gender, age, age^2, white vs non-white).

The extended version of the model incorporates more covariates: married/cohabiting vs single, native vs immigrant, working in London or South East of England vs other region and family characteristics (number of dependent children aged under 16 and dummy variables for those aged 0-2, 2-4, 5-9 and 10-15) and, finally, D_t is a set of time dummies (survey years).

Then, we complement this analysis with a year of birth cohort analysis and, finally, a household-specification analysis. Year of birth cohort is an excellent proxy of year of graduation because almost all medical students start their degrees at the age of 18 and almost all complete on time.

$$H_{gtc}^{j} = \alpha^{j} + \beta' X_{gtc}^{j} + \gamma D_t + \delta C_t + u_{gtc}^{j} \quad (2)$$

Where the superscript j stands for the occupation (GP, hospital doctors, lawyer or accountant) and subscripts g stands for gender (male or female), t for survey year and c for cohort. Variable *H* measures the total hours of work in main and second job, *X* is a vector that contains a set of demographics that include variables such as age, age^2, ethnicity (white vs non-white), marital status (married, which includes widowed, divorced or separated, vs single), country of birth (native, for those who were born in the UK, vs immigrant) and region of residence (living in London or South East of England vs other region) and family characteristics in terms of whether they have children aged under 19 and dummy variables to check whether there are dependent children aged under 5, between 5 and 9 and between 10 and 15. Finally, D_t is a set of time dummies and C_t is a set of cohort dummies. The year dummies capture seasonality every year and this nets out the average change in a variable resulting from any seasonal fluctuation.

The introduction of cohorts in the analyses requires collapsing values of the observed variables either dependent or independent variables, where the individual subscript is no longer required and is replaced by the cohort where individuals belong to. Hence, models 1 and 2 would be, under Deaton assumptions,

$$\bar{H}_{gtc}^{j} = \bar{\alpha}^{j} + \bar{\beta}' \bar{X}_{gtc}^{j} + \bar{\gamma} D_t + \bar{\delta} C_t + \bar{u}_{gtc}^{j} \quad (2.1)$$

There are some limitations using cohorts that would be worth to acknowledge. Despite cohort studies with pseudo-panels have advantages such as less attrition bias than panel data, there is still the possibility that individuals may leave their household or drop out the survey. Also, sample sizes may differ depending on the periods of time considered, being smaller in some years.

Finally, our household labour supply model specification is as follows

$$H_{ht}^{j} = \alpha^{j} + \beta' X_{ht}^{j} + \gamma D_t + \delta \log(w) + \theta\, partnerjob + \varphi D_{dt} + u_{ht}^{j} \quad (3)$$

Now, the superscript j still stands for the occupation in main job (GP, partner GP, salaried GP, hospital doctors, lawyer or accountant) and subscript h stands for each household (conditioned on gender, male or female) and t for survey year, respectively. Variable *H* still measures the total hours of work in main and second job. Hourly wage is included in variable w is expressed in real terms with base price index 2014. And variable '*partnerjob'* denotes partner's occupation/education level. The LFS only reports earnings for employees. Therefore, information for 80% of GPs (partner GPs – self-employed) is missed. We try to overcome this limitation using partner's occupation/education as proxy of partner's earnings. Finally, variable D_{dt} reflects a dummy variable that takes value 1 if household partner is also a doctor (includes GP and hospital doctors).

3.5. ECONOMETRIC RESULTS

3.5.1. ESTIMATES OF LABOUR SUPPLY MODELS

The OLS coefficients are obtained running the aforementioned models. All include a vector of demographics and a vector of survey year dummies to account for time fixed effects and are conditioned on gender and occupation, for those working positive hours and in the age range 26 to 70 years old both included. There are two main models: one that includes estimates from a parsimonious specification that includes a pooled model and conditioned models on occupation by gender breakdown (Table 3.3) and an extended version[39] (Tables 3.4). The predicted values are plotted for both models though the extended version is shown in Figure 3.3. These figures depict a fall in the hours of work for doctors with all coefficients significant and that salaried GPs are working the fewest number of hours in all models. Lawyers and accountants' average hours have been more regular and consistent over time.

[39] All coefficients of the extended version are included in Appendix 4.

For doctors, the big drop in hours occurs from 2000 for males and in 2004 for females. Eventually, we plot residuals from individual estimated models for pooled and conditioned models (Appendix 4.1.).

For males, most coefficients are significant in the pooled model. Conditioned models report most coefficients significant except controls for ethnicity (white race) and country of birth (native). Native male workers work fewer hours than non-native for both genders, except salaried GPs and hospital doctors. The coefficient for native male salaried GPs is not significant (2.5 hours more than immigrant workers) but for hospital doctors is significant at a 1% significance level (near 2 more hours). The average weekly hours difference for native partner GPs is -2.2 and -1.8 hours per week for male accountants. White GPs also seem to work fewer hours than non-whites, while hospital doctors, lawyers or accountants seem to work longer hours. For females, native salaried GPs work nearly 6 hours less than non-natives and the coefficient is statistically significant, while for lawyers or accountants these differences are close to 2 hours less. White doctors tend to work fewer hours (almost 8 hours less for GP partners) but lawyers and accountants work, on average, 0.5 to 1 hour more per week.

The predicted hours confirm that male doctors work more than lawyers and accountants. Nevertheless, there may be some unobservable variables (family characteristics) that will help to explain these differences why female salaried GPs supply fewer hours.

Table 3.3 Parsimonious OLS Estimates

Total hours (main & 2nd)	POOLED MODEL	CONDITIONED MODELS: MALES					CONDITIONED MODELS: FEMALES				
		Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants	Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
Occupation											
Partner GPs	5.151***										
	(0.229)										
Salaried GPs	-0.964**										
	(0.390)										
Hospital doctors	8.016***										
	(0.155)										
Lawyers	3.635***										
	(0.110)										
Accountants	-										
	-										
Female	-7.740***										
	(0.101)										
Age	1.340***	5.062***	2.955***	1.340***	2.016***	2.221***	1.594***	-3.883***	-0.958***	-0.400***	-0.802***
	(0.041)	(0.240)	(0.371)	(0.142)	(0.091)	(0.056)	(0.333)	(0.429)	(0.190)	(0.141)	(0.110)
Age2	-0.018***	-0.058***	-0.036***	-0.018***	-0.024***	-0.027***	-0.016***	0.042***	0.006**	0.003	0.007***
	(0.000)	(0.003)	(0.004)	(0.002)	(0.001)	(0.001)	(0.004)	(0.005)	(0.002)	(0.002)	(0.001)
Native	-0.975***	-2.177**	2.521	1.957***	-1.150***	-1.836***	1.303	-5.646***	-0.747	-1.996***	-1.806***
	(0.158)	(0.894)	(1.840)	(0.412)	(0.428)	(0.228)	(1.136)	(1.354)	(0.563)	(0.433)	(0.315)
White	0.970***	-3.433***	-1.042	0.280	2.494***	2.255***	-7.796***	-1.485	-1.971***	0.733*	0.958***
	(0.173)	(1.074)	(1.880)	(0.419)	(0.524)	(0.243)	(1.403)	(1.284)	(0.560)	(0.425)	(0.320)
Constant	24.204***	-35.944***	7.320	36.453***	6.249***	2.275*	12.389	128.239***	76.623***	51.463***	60.049***
	(0.885)	(5.544)	(9.459)	(3.084)	(1.949)	(1.196)	(7.606)	(9.783)	(4.012)	(2.849)	(2.169)
N	78,300	3,952	644	8,069	11,534	24,613	2,200	1,031	4,827	8,042	12,104
R2	0.16	0.30	0.24	0.13	0.09	0.13	0.07	0.206	0.126	0.025	0.039
Adj. R2	0.16	0.29	0.21	0.13	0.08	0.13	0.06	0.187	0.122	0.0221	0.0375
F-test	429.7	48.95	8.13	39.74	27.59	85.25	6.38	12.04	25.99	8.574	23.35
Prob>F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The extended model (Table 3.4) expands on the reduced form adding more controls such as region of residence, marital status and children (number of children and dummies for dependent children within certain age range). Dependent children are aged under 16 but children aged 16-18 are considered dependent should they are enrolled in full-time education. We simplify our models only controlling for the number of dependent children aged under 16.

Our extended pooled model in Table 3.4. convey that doctors and lawyers work larger hours than accountants although the coefficient for salaried GPs is not significant. Females work near 8 hours less on average than males; natives work 1 hours less than immigrants; and white workers 1 hour more than non-white workers. We also control for family characteristics such as number of children and age of youngest and eldest children. Our estimates are not significant in the pooled model when controlling for family characteristics. They are only significant when the eldest child is aged 3-4 when the labour supply drops 2.21 hours. When there are 2 children and the eldest ages 5-9, the fall in hours is only 1.651. Therefore, the supply of hours is reduced when there are dependent children in the family and the youngest children are aged 0-2 and 3-4, except when there are 2 children at home and the youngest is aged 5-9.

The conditioned models portray increasing hours of work for married males except hospital doctors. Females' hours decrease, and the effect is more negative for doctors than lawyers or accountants (around 3.3 hours less for partner GPs, 2.2 for salaried GPs and 3.6 for hospital doctors, 0.5 hour less for lawyers and 1.4 for accountants). The coefficient is significant for male lawyers and accountants but not for any male doctor type. It is significant for all female workers except salaried GPs who work mostly 1 hour less than peers in other regions, GP partners work nearly 2 more hours. But the coefficient for salaried GPs is not significant. Working in London and the South-East is associated with higher hours of work for both males and females, especially male partner GPs and lawyers, except for female salaried GPs and hospital doctors (approximately 2 hours less). Living in London and South East is associated with fewer hours for male partner GPs, lawyers and accountants and more hours for female hospital doctors

.

Table 3.4 Extended OLS Model

Total hours (main & 2nd)	POOLED MODEL	CONDITIONED MODELS					CONDITIONED MODELS				
		MALES					FEMALES				
		Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants	Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
Occupation											
Partner GPs	5.095***										
	(0.231)										
Salaried GPs	-0.352										
	(0.379)										
Hospital doctors	8.304***										
	(0.158)										
Lawyers	3.884***										
	(0.112)										
Accountants	-										
	-										
Female	-7.921***										
	(0.101)										
Age	1.805***	2.609***	3.150***	1.537***	1.851***	2.009***	2.743***	-2.204***	1.102***	1.464***	0.983***
	(0.047)	(0.277)	(0.501)	(0.174)	(0.108)	(0.066)	(0.228)	(0.470)	(0.194)	(0.153)	(0.111)
Age2	-0.024***	-0.032***	-0.039***	-0.020***	-0.022***	-0.025***	-0.031***	0.022***	-0.018***	-0.020***	-0.014***
	(0.001)	(0.003)	(0.006)	(0.002)	(0.001)	(0.001)	(0.002)	(0.006)	(0.002)	(0.002)	(0.001)
Native	-0.967***	-2.133**	2.318	1.762***	-0.815*	-1.684***	2.397**	-5.946***	-0.976*	-1.508***	-1.531***
	(0.159)	(0.913)	(2.037)	(0.420)	(0.448)	(0.234)	(1.079)	(1.277)	(0.538)	(0.428)	(0.297)
White	1.060***	-2.866***	-1.440	0.127	3.148***	2.699***	-8.439***	-0.830	-1.923***	1.511***	1.231***
	(0.173)	(1.091)	(2.080)	(0.423)	(0.534)	(0.246)	(1.340)	(1.220)	(0.540)	(0.403)	(0.304)
Married	0.124	3.674***	3.271*	-1.718***	1.826***	1.829***	-3.353***	-2.208**	-3.577***	-0.541**	-1.426***
	(0.119)	(0.941)	(1.827)	(0.462)	(0.300)	(0.180)	(0.830)	(1.001)	(0.478)	(0.265)	(0.203)
Number of children											
1	-2.753	5.385***	3.054	2.261	1.934***	-1.933	-3.942***	0.756	-12.268***	-8.551***	-4.964
	(2.200)	(0.953)	(2.333)	(3.097)	(0.504)	(2.559)	(1.025)	(2.183)	(0.877)	(0.759)	(7.445)
2	-4.226	1.900**	-3.530	3.614	-0.051	4.074	-5.329***	-0.780	-1.793**	-9.473***	-14.581***
	(6.777)	(0.893)	(2.733)	(3.231)	(0.573)	(4.534)	(1.164)	(1.637)	(0.901)	(1.340)	(0.361)
3+	15.864	2.712*	-4.160	1.974	1.034	18.112	-3.072	5.025***	2.484	-3.349	-19.214***
	(13.846)	(1.636)	(5.466)	(3.474)	(1.251)	(11.878)	(2.353)	(1.679)	(4.589)	(2.768)	(2.769)
Age youngest child											
0-2 years	-19.741	-1.294	-2.734	-4.548	-3.767**	-17.523	-3.103	-15.728***	-13.761***	-7.267**	4.283
	(13.855)	(2.062)	(5.348)	(3.643)	(1.537)	(11.900)	(3.071)	(3.370)	(5.005)	(3.646)	(3.176)
3-4 years	-20.134	-6.151***	-1.151	-4.252	-0.625	-18.049	-6.905**	-13.274***	-13.694***	-5.742	10.248***
	(13.856)	(2.261)	(5.739)	(3.708)	(1.582)	(11.892)	(3.178)	(2.184)	(5.058)	(3.764)	(3.194)
5-9 years	-18.239	-0.424	2.113	1.399	-0.176	-17.184	-6.475***	-10.917***	-10.504**	-7.115**	10.490***
	(13.850)	(1.778)	(5.415)	(3.614)	(1.335)	(11.887)	(2.505)	(3.397)	(4.760)	(2.990)	(2.906)
1 child & age youngest child 0-2	19.509	-3.699	-3.689	9.796***	-5.766	21.649*	-3.929**	-5.010***	-7.771***	-9.243***	-6.293***
	(14.127)	(4.962)	(7.377)	(2.095)	(8.038)	(12.400)	(1.716)	(1.485)	(0.747)	(0.471)	(0.365)
1 child & age youngest child 3-4	19.665	-1.645	-24.046***	-0.375	-4.783**	23.086*	-9.371***	-13.117***	-9.858***	-8.855***	-6.942***
	(14.055)	(4.548)	(7.307)	(2.892)	(2.222)	(12.243)	(2.329)	(2.392)	(1.635)	(1.083)	(0.574)
1 child & age youngest child 5-9	18.327	-3.446	-11.712	-8.344***	-4.514**	18.138	-12.682***	-8.024**	-2.845**	-7.634***	-5.406***
	(14.032)	(4.147)	(7.668)	(2.343)	(1.792)	(12.175)	(2.642)	(3.299)	(1.157)	(0.743)	(0.531)
2 children & age youngest child 0-2	20.805	-2.635	2.416	-0.806	3.880**	13.899	-1.156	-5.143	-8.334***	-6.332***	-7.783***
	(15.426)	(3.128)	(6.605)	(2.237)	(1.891)	(12.742)	(2.472)	(3.838)	(1.795)	(1.400)	(1.036)
2 children & age youngest child 3-4	21.119	1.434	0.196	1.276	-0.035	15.124	-6.776**	-7.263**	-9.990***	-5.653***	-10.592***
	(15.426)	(2.985)	(7.933)	(2.320)	(1.818)	(12.732)	(2.759)	(3.622)	(1.693)	(1.354)	(0.994)
2 children & age youngest child 5-9	19.105	-1.015	-4.304	-6.367***	0.976	13.277	-7.373***	-8.034***	-6.505***	-9.503***	-9.461***
	(15.418)	(2.085)	(6.120)	(2.000)	(1.506)	(12.721)	(1.689)	(2.585)	(1.126)	(0.841)	(0.626)
Age eldest child											
0-2 years	-1.147	-2.986	-3.507	-8.059***	6.574	-3.499	-37.653***	-11.732***	5.415**	9.155***	-2.889
	(1.816)	(4.712)	(4.503)	(1.650)	(7.982)	(2.583)	(4.209)	(4.079)	(2.312)	(3.159)	(4.481)
3-4 years	-2.210**	-1.357	11.973***	-0.574	2.103	-5.216***	-8.182***	-9.020**	-4.410*	1.712	6.406***
	(0.943)	(2.983)	(4.165)	(2.041)	(1.511)	(1.478)	(2.825)	(3.986)	(2.540)	(3.084)	(2.417)
5-9 years	-0.487	0.513	1.212	1.422	1.474*	0.425	-6.993***	-8.542***	1.609	-4.841**	-0.623
	(0.506)	(1.613)	(3.575)	(1.221)	(0.895)	(0.631)	(2.274)	(2.976)	(2.063)	(2.145)	(1.766)
2 children & age eldest child 0-2	-1.207	1.000	0.000	9.139***	-8.177	1.369	-7.694**	-11.732***	1.159	-4.239**	-1.986
	(1.900)	(5.385)	(0.000)	(2.369)	(8.071)	(2.678)	(3.781)	(4.079)	(2.508)	(1.790)	(1.300)
2 children & age eldest child 3-4	-1.067	1.388	-15.679***	-0.001	-4.702**	3.121*	-12.591***	-9.678**	-4.470**	-4.333***	-4.698***
	(1.055)	(3.781)	(5.505)	(2.386)	(1.845)	(1.609)	(2.615)	(3.965)	(1.968)	(1.542)	(1.127)
2 children & age eldest child 5-9	-1.651***	-2.907	-10.566**	-2.778*	-2.864***	-1.697**	-5.462***	-3.746	-2.128	-4.640***	-1.488*
	(0.605)	(2.155)	(4.758)	(1.543)	(1.096)	(0.769)	(2.070)	(3.131)	(1.434)	(1.154)	(0.781)
Constant	17.030***	17.714**	15.275	35.634***	8.329***	5.295***	1.937	110.617***	40.207***	17.884***	26.499***
	(1.099)	(7.112)	(15.305)	(3.938)	(2.457)	(1.472)	(6.669)	(10.988)	(4.652)	(3.264)	(2.387)
N	74,885	3,756	626	7,719	10,899	23,424	2,125	1,007	4,693	7,728	11,762
R2	0.18	0.32	0.27	0.14	0.10	0.14	0.21	0.39	0.24	0.17	0.20
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The empirical evidence suggests that having children lowers hours of work, especially for females both quantitatively (number of children) or qualitatively (age of dependent children). We observe this when we control for number of children or the age of the youngest (eldest) child.

Nevertheless, interacting these two variables reports interesting results. While the number of children does not refrain male workers to work longer hours, the negative effect is more evident for females. Male hospital doctors with one single child aged 0-2 increase their labour supply 9.796 hours but when the child's age is 5-9 we get a negative coefficient (-8.344 hours). Results for 'partner' GPs are not significant and for 'salaried' GPs we only get a significant result when there is one child aged 3-4. The reduction is so high that this is explained by an outlier in our sample. For male lawyers and accountants there is a fall in hours of work when children aged 3-4 and 5-9.

For female workers, overall, our results convey a general reduction in hours of work. Controlling for age of the youngest (eldest) child and number of children, we get that female workers reduce their labour supply largely when their children age 3-4 and 5-9. The interaction of these two controls reports the following findings. The coefficient for female partner GPs with 3 or more children and the eldest is aged 0-2 represents a single observation in 1994 aged 35 and working 8 hours per week. Despite this outlier, our results are consistent with the literature (Sarma et al, 2011; Crossley et al, 2009) and depict that females experience a larger reduction in their labour supply for childbearing, which is more noticeable when the number of children increases and are aged 0-4 and 5-9. Finally, the trend in hours over time is consistent with the literature.

Within the age range 30-50[40], male partner GPs work more than 50 hours per week while lawyers work between 4 and 7 fewer hours than partner GPs (8 to 12 less hours for accountants). Beyond the age of 50, all professions reduce their supply of hours. Hours of work of female partner and salaried GPs show the opposite behaviour: they work fewer hours than lawyers and accountants. Hospital doctors work the largest number of hours with no gender distinction.

Figure 3.3 displays the predicted hours using estimates from the extended model and conveys that female GPs work fewer hours than lawyers and

[40] Appendix 5.

accountants. The predictions rely on the OLS coefficients in Tables 3.4. Overall, male Partner GPs work harder than lawyers and accountants until aged 60 where the sharp fall may be interpreted as an increasing number of partner GPs retiring above that age. Male Salaried GPs behave similarly to the other groups, but the confidence interval widens after age 65 because fewer people are working beyond that age. Male hospital doctors work harder than the other groups. In summary, male doctors usually work harder than lawyers and accountants and seem to start leaving the profession at the age of 60.

The analysis for females is quite different. The labour supply curve does not show the usual inverted U-shape form. What is interesting is that figures clearly depict that females reduce their labour supply for childbearing. The raw data and the graph confirm that childbearing occurs between the late 20's and early 40's for all professions. Our data shows that the representative female reduces her hours of work in her thirties, which is consistent with the literature (Sarma et al, 2011; Crossley et al, 2009) and after that, females increase their hours of work gradually. The lifecycle labour supply curve is more striking for female salaried GPs because the current recruitment policy addresses to recruit salaried GPs rather than partner GPs to tackle the alleged shortage of GPs. It seems likely that the financial incentives of partner GPs to expand by adding a partner are lower than those if the increase in headcount relies on salaried GPs. Female salaried GPs reduce their labour supply during childbearing significantly (about 40-50% of average hours worked) but after that, they increase their hours of work gradually. The hours of work after 60 years old are noisy for retirement reasons. The NHS pension scheme is typically much more generous than the private sector schemes that accountants and lawyers will find themselves in. So, there is large variation in the results.

With average weekly hours worked, it is possible to work out total annual hours worked summing up the predicted average week total hours for each age (Table 3.5). Full-time NHS doctors benefit from a minimum of 6-week holiday pay yearly, except junior doctors under the 2016 contract who only have 27 days[41].

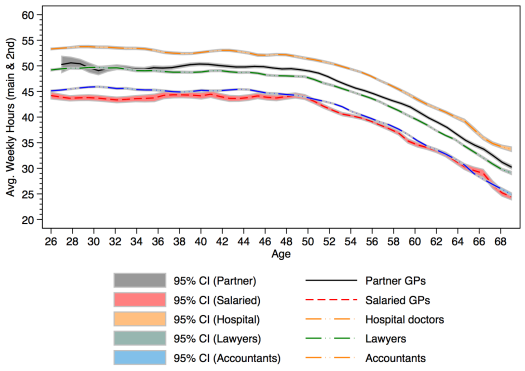
[41] https://www.bma.org.uk/advice/employment/leave/leave-overview

Full-time lawyers and accountants have 5.6 weeks. Hence, we will use a 6-week holiday entitlement as a rule of thumb.

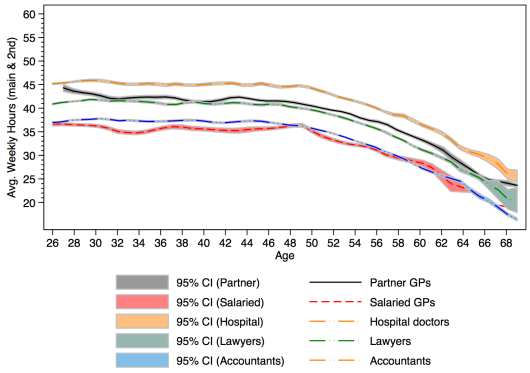
Figure 3.3 Predicted Average Hours of Work (extended model)

(A) Pooled model

MALES

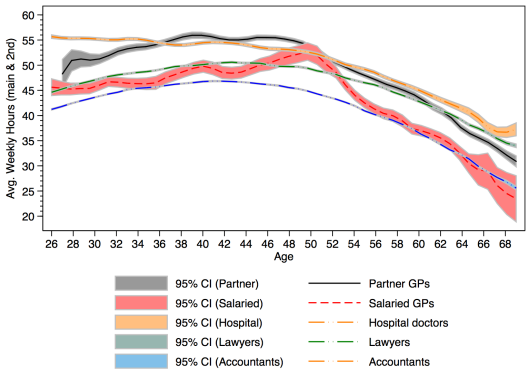


FEMALES



(B) Conditioned models

MALES



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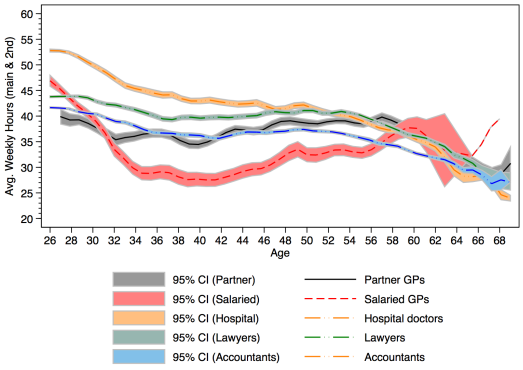


Table 3.5 shows the predicted average total hours of work per annum. So, summing up all average weekly hours worked over a substantial number of years across each lifecycle profile (in this analysis the lifecycle is 45 years, ranging ages 26 to 70 both included). However, legal retirement ages are, currently, 60 for females and 65 for males. Hence, our whole lifecycle working life spans 35 years for females and 40 years for males. Hence, assuming that holiday entitlement is 6 weeks per year, we multiply average weekly hours by 44 working weeks per year to get average annual hours. Then, we multiply by

35 working years for females and 40 for males to get all predicted hours worked over the whole lifecycle for the representative agent (Table 3.6).

Table 3.5 Predicted Average Annual Hours

	Model 1 (simple)		Model 2 (extended)	
	Males	**Females**	**Males**	**Females**
Partner GPs	2,101.39	1,603.75	2,117.86	1,585.85
Salaried GPs	1,885.43	1,370.43	1,882.37	1,326.47
Hospital doctors	2,200.75	1,815.68	2,188.62	1,764.74
Lawyers	2,004.69	1,671.30	2,008.02	1,635.01
Accountants	1,794.48	1,709.33	1,793.18	1,532.57

Table 3.6 Predicted Average Total Hours Worked over Whole Lifecycle

	Model 1 (simple)		Model 2 (extended)	
	Males	**Females**	**Males**	**Females**
Partner GPs	84,055.46	56,131.18	84,714.30	55,504.74
Salaried GPs	75,417.01	47,965.05	75,294.75	46,426.40
Hospital doctors	88,029.85	63,548.94	87,544.64	61,765.75
Lawyers	80,187.44	58,495.43	80,320.63	57,225.48
Accountants	71,779.03	59,826.65	71,727.27	53,639.82

COHORT MODEL RESULTS

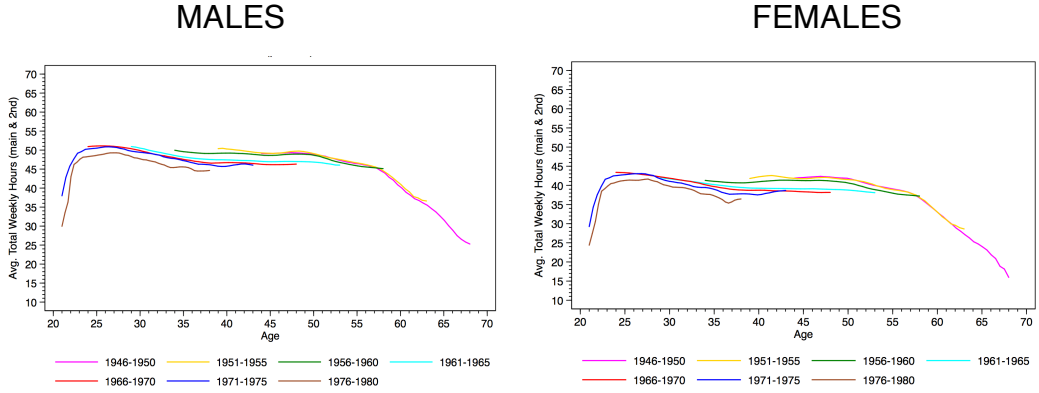
Our cohort models follow Deaton's methodology (Deaton, 1997) and complement our previous analysis. The LFS does not include a variable reporting the year of graduation from a medical school. But it does include two variables that could be possible to use: firstly, the age when completed full-time education and it is available from 2000 quarter 2 (previously it was only available in two quarters along the year). Secondly, year/age when obtained the highest qualification which is reported from 2001 onwards. These two variables could be used as a proxy for year of graduation from higher education. However, as they do not provide that information accurately, we opted for setting year of birth as the cohort variable.

In our case, we construct our cohort variable (year of birth) using the other two variables, subtracting age from year. However, this could lead to potential confounding problems. Hence, our models include dummies for ages and cohorts but exclude year dummies, which differs from Deaton who controls for age, year and cohort dummies. Figure 3.4 portrays the predicted values by cohorts (Appendix 6 reports the estimates).

Figure 3.4 (A) depicts the usual U-inverted shape of the labour supply over the lifecycle, both for men and women. Overall, females work fewer hours than males at all ages. The reduction of hours of work in cohort 1971-1975 (blue line9 in their thirties is larger for females (from 43 hours in their 30s to approximately 37 hours in their 30s) than males (50 hours to 46 hours). The conditioned models show that younger cohorts usually work fewer hours than older cohorts. Male salaried GPs' hours are very volatile which could be explained by sample bias (the number of salaried GPs is very low and irregular). On the other hand, females show the U-shape that individual OLS models report. Cohort coefficients are not significant for salaried GPs. They are for younger cohorts of male hospital doctors and partner GPs (both males and females).

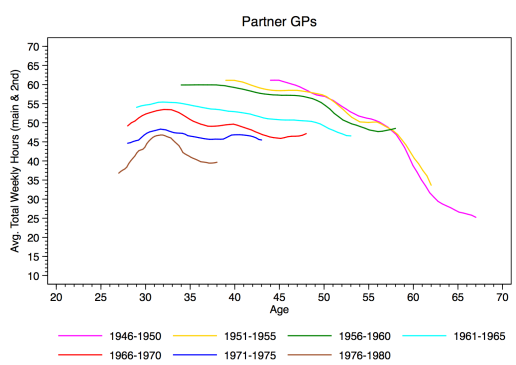
Figure 3.4 Predicted Average Hours of Work by cohorts (extended model)

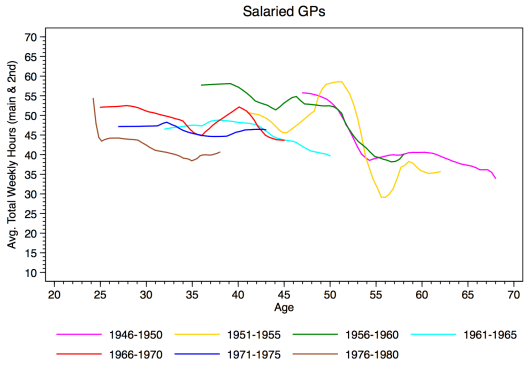
(A) Pooled model

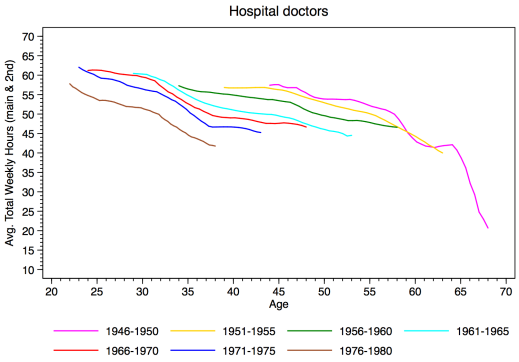


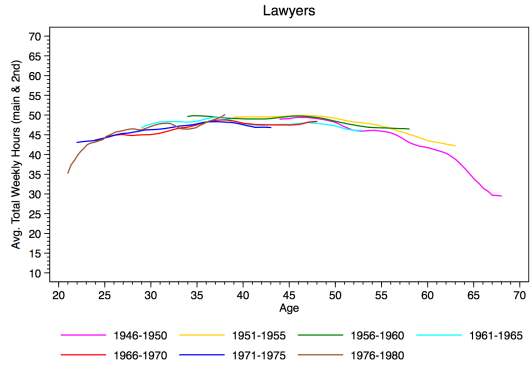
(B) Conditioned models

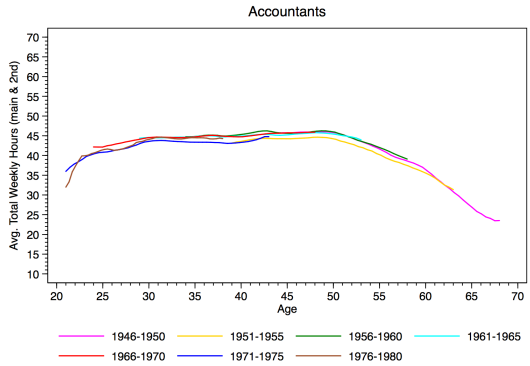
MALES



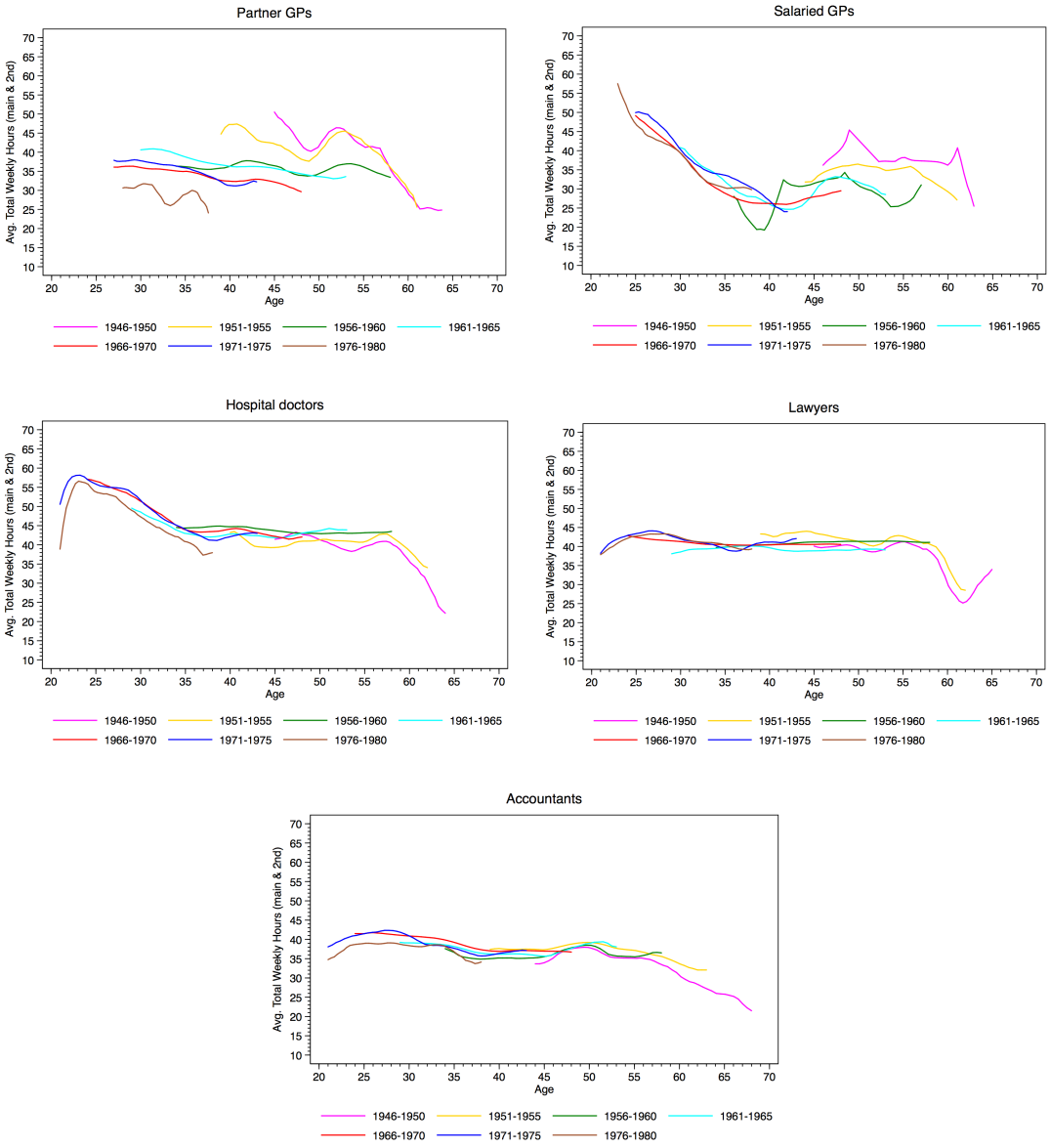








FEMALES



HOUSEHOLD MODELS

Next, we complement this analysis with regressions from household models. We include partner's occupation as a proxy of partner's income for all workers. As earnings information is not available for self-employed workers and 80% of GPs work as partner GPs, we preferred to include a proxy for partner's earnings to capture the effect of partner's occupation should partner work as a self-employed (either as partner GP or other occupation). Males are majority playing

a head of household role (Table 3.7) while females are more numerous classified as spouse/partner in interview date in the survey (Table 3.8).

Table 3.7 reports estimates for the extended household model conditioned on males. Males are play a head of the household role in most cases when the couple is married. For other marital statuses this can change. We estimate a pooled model and conditioned models for each occupation to ascertain whether earnings variables and partner's occupation may affect the weekly hours of work supplied.

Our earnings variable is hourly pay. This variable is only reported in 2 of the 5 waves (wave 1 and 5) in the LFS for employees, excluding this information for self-employed. We account for inflation changes in hourly pay setting the inflation base year in 2014 (100=2014). This allows us to control for real wages rather than nominal wages. Table 3.7 shows that real hourly wages are significant for hospital doctors and accountants at all levels and lawyers at 5%. A 1% increase in real wages reduces total weekly hours of work for hospital doctors while it increases lawyers and accountants' hours of work. The coefficient is not significant for salaried GPs. This coefficient enables us to get the elasticity of labour supply deriving equation 3. Hence, the elasticity for males could be computed as $\frac{\partial H_{ht}^{j}}{\partial w} = \frac{\delta}{realhourpay}$. The elasticity of head of household members' (males) labour supply is -0.16 for salaried GPs though it is not significant; -0.18 for hospital doctors, 0.13 for lawyers and 0.12 for accountants who are head of household (males).

The effect of partner's occupation in the decision of hours of work is uneven. In general, when the partner has a manager position or a wealthy occupation (for example doctors, business and finance), then that reduces labour supply. This is the case for partner GP when their partners are hospital doctors (-4 hours per week at 1% level of significance); chartered accountant, economist, or similar this drop is larger (-13 hours). However, other occupations may enhance the supply of hours like engineer or technician (+6 hours) or business associate (+15 hours). For salaried GPs, we only found positive effects on hours of work when partner is a scientist (+16 hours) or, for hospital doctors' when the partner

is a health associate (+3.5 hours per week. For lawyers and accountants, partner's occupation reduces labour supply when coefficients are significant.

Table 3.8 depicts information for spouse/partners in the household. This analysis reports that when real hourly wages increase by 1%, it reduces labour supply for salaried GPs and hospital doctors while it increases lawyers and accountants. The elasticity of spouse/partner's labour supply is, thus, -0.28 for salaried GPs and -0.19, 0.13 and 0.17 for hospital doctors, lawyers and accountants respectively. When occupation of the head of household, in this case, is in the health sector, the reduction of hours for partner/spouse is larger than in the previous analysis. Overall, spouse/partner reduces their labour supply regardless their partner's occupations except for accountants when their partner works as a partner GP. Then they increase their labour supply by 5 hours per week.

Number of children are more important for household spouses. When there are 2 children in household, spouses reduce their hours of work compared to households where there are no children. The largest reduction is for salaried GPs followed by hospital doctors. Lawyers and accountants' coefficients are similar and around 5 hours. Contrary to what we could expect, age of the youngest and eldest children is not as determinant as we could have expected. This interaction is only significant for spouse/partners with one child aged 5-9 or 2 children and the youngest is aged 0-2.

Table 3.7 Extended Household Model (males)

Total hours (main & 2nd)	Pooled model	Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
Occupation						
Partner GPs	5.567***					
	(0.452)					
Salaried GPs	1.439					
	(0.927)					
Hospital doctors	5.876***					
	(0.309)					
Lawyers	4.531***					
	(0.260)					
Accountants	-					
	-					
Female	-2.933***					
	(0.523)					
Age	2.775***	2.749***	-1.127	1.807***	-0.068	1.199***
	(0.039)	(0.492)	(0.988)	(0.465)	(0.464)	(0.234)
Age2	-0.036***	-0.031***	0.013	-0.021***	-0.001	-0.015***
	(0.000)	(0.005)	(0.010)	(0.005)	(0.006)	(0.003)
Married	1.005***	2.901	0.528	-2.329	2.723**	1.061**
	(0.112)	(2.375)	(6.164)	(1.574)	(1.228)	(0.509)
log real hourly wage	-	-	-3.353	-4.525***	3.125**	2.114***
	-	-	(2.591)	(1.202)	(1.240)	(0.561)
Partner's occupation						
Partner GPs	1.394***	-1.455	7.092	2.496	4.199	-3.504**
	(0.518)	(1.249)	(7.561)	(1.929)	(5.905)	(1.421)
Salaried GPs	-0.007	-0.944	3.728	1.413	-2.023	-3.120*
	(0.568)	(1.575)	(4.562)	(1.921)	(2.528)	(1.805)
Hospital doctor	-0.281	-3.856***	-2.690	1.417	-0.925	-0.258
	(0.353)	(1.477)	(6.090)	(0.997)	(2.873)	(2.487)
Other doctors (regulator, university,...)	1.111	2.418	3.114	0.933	-13.049***	-0.720
	(0.744)	(2.571)	(7.008)	(1.787)	(2.264)	(2.596)
General Managers	2.684***	-1.698	-1.247	3.189	2.784*	0.894
	(0.155)	(2.809)	(6.982)	(2.567)	(1.476)	(0.779)
Managers Finance or admin. Services	2.613***	3.862	-	-4.472*	-1.121	-0.167
	(0.293)	(3.473)	-	(2.497)	(1.878)	(1.076)
Managers Health & Social Care	0.094	2.656	12.646*	0.788	2.448	-6.288**
	(0.399)	(3.293)	(7.033)	(2.401)	(3.296)	(2.506)
Scientists & technicians	1.073***	6.944*	16.919**	0.795	-1.445	-0.853
	(0.246)	(4.051)	(7.387)	(3.191)	(1.929)	(1.698)
Engineers & technology	-0.274	6.104***	10.180	4.994	-6.167*	-0.758
	(0.254)	(2.344)	(10.373)	(5.155)	(3.242)	(1.584)
Other health professionals (dentists, pharmacists, opticians, vets,...)	1.138***	0.600	7.775	-1.385	-4.842**	-2.599***
	(0.248)	(1.759)	(6.654)	(1.285)	(2.053)	(0.828)
Teaching professionals (all education levels)	2.467***	-2.358*	8.359	1.660	1.119	0.265
	(0.111)	(1.413)	(5.908)	(1.516)	(1.346)	(0.513)
Legal professionals (judges, barristers, solicitors)	0.535**	0.413	-	-1.289	0.404	-0.411
	(0.272)	(1.820)	-	(2.525)	(1.045)	(1.104)
Business & Finance (chartered accountants, management accountants, actuaries, economists, business analysts,...)	0.621***	-13.408***	-	0.983	-1.270	-1.373**
	(0.223)	(3.224)	-	(3.004)	(1.780)	(0.631)
Health associates (nurses, midwives, radiographers, chiropodists,...)	0.546***	-1.139	0.730	3.510***	2.402	-1.547**
	(0.151)	(1.281)	(7.210)	(1.226)	(2.049)	(0.761)
Legal associates (legal service, estimators, valuers,...)	3.839***	-	-	0.840	-2.399	-8.269***
	(0.633)	-	-	(14.225)	(3.967)	(0.970)
Business associates (brokers, investment analysts, underwriters, taxation experts,...)	1.445***	15.201**	-	5.287**	4.054	-1.420
	(0.289)	(7.073)	-	(2.139)	(5.477)	(0.917)

...continues

Children

Number of children							
	1	-1.870	4.510***	9.287	-0.124	1.121	-0.602
		(3.271)	(1.607)	(7.720)	(1.666)	(2.675)	(0.986)
	2	4.856	0.681	12.971	1.598	0.905	-0.359
		(5.517)	(1.342)	(10.000)	(1.810)	(3.067)	(1.176)
	3+	21.476***	3.972*	16.638	0.341	-0.275	4.055*
		(0.220)	(2.298)	(11.805)	(1.670)	(3.620)	(2.074)
Age youngest child							
	0-2 years	-21.235***	-5.110*	-13.243	-1.825	1.391	-2.126
		(0.347)	(2.758)	(12.986)	(1.874)	(4.214)	(2.665)
	2-4 years	-22.342***	-7.749***	-11.613	2.218	2.934	-6.286**
		(0.421)	(2.986)	(9.840)	(2.906)	(6.104)	(2.514)
	5-9 years	-20.497***	-4.372*	-12.810	2.040	4.563	-2.023
		(0.351)	(2.471)	(9.853)	(2.089)	(4.212)	(2.598)
	10-15 years	-19.866***	-	-	-	-	-
		(0.646)	-	-	-	-	-
1 child & age youngest child 0-2		22.123***	-6.020	0.000	8.721***	0.104	-0.012
		(3.732)	(4.248)	(0.000)	(2.472)	(5.877)	(3.252)
1 child & age youngest child 2-4		22.651***	3.533	-3.321	0.778	-11.903	7.966**
		(3.373)	(4.352)	(16.211)	(5.101)	(7.828)	(3.863)
1 child & age youngest child 5-9		20.527***	-2.523	14.469	-8.626**	-9.724*	3.357
		(3.294)	(4.019)	(12.655)	(3.705)	(5.095)	(2.989)
2 children & age youngest child 0-2		15.289***	-1.008	6.514	-4.940*	-2.023	1.628
		(5.530)	(3.761)	(11.822)	(2.983)	(5.669)	(3.215)
2 children & age youngest child 2-4		17.126***	2.876	-6.688	-6.636*	-4.999	5.639*
		(5.534)	(3.535)	(7.703)	(3.646)	(6.948)	(2.918)
2 children & age youngest child 5-9		15.276***	3.000	0.000	-4.760*	-4.682	1.401
		(5.528)	(2.841)	(0.000)	(2.855)	(5.349)	(2.970)
Age eldest child							
	0-4 years	-0.495	1.658	3.873	-8.525***	-3.443	0.553
		(1.799)	(2.981)	(11.718)	(1.757)	(2.996)	(1.646)
	5-9 years	-1.299*	-2.106	-2.198	-0.763	5.917*	-3.072
		(0.693)	(2.866)	(7.286)	(2.829)	(3.487)	(2.744)
2 children & age eldest child 0-4		0.979	0.000	0.000	10.440**	0.000	0.000
		(1.829)	(0.000)	(0.000)	(4.049)	(0.000)	(0.000)
2 children & age eldest child 5-9		1.352*	7.218*	0.000	4.722	-7.838*	2.419
		(0.739)	(4.084)	(0.000)	(3.569)	(4.274)	(3.067)
Constant		-6.185***	-10.973	81.960***	36.035***	36.455***	13.877***
		(0.813)	(12.024)	(25.185)	(8.799)	(8.590)	(4.520)
N		139,563	1,240	78	874	537	1,784
R2		0.195	0.187	0.556	0.157	0.147	0.109
Year dummies		Yes	Yes	Yes	Yes	Yes	Yes
Number children x Age youngest children		Yes	Yes	Yes	Yes	Yes	Yes
Number children x Age eldest children		Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.8 Extended Household Models (females)

Total hours (main & 2nd)	Pooled model	Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
Occupation (spouse/partner)						
Partner GPs	1.836***					
	(0.480)					
Salaried GPs	-1.053**					
	(0.530)					
Hospital doctors	9.124***					
	(0.362)					
Lawyers	4.236***					
	(0.294)					
Accountants	-	-	-	-	-	-
	-	-	-	-	-	-
Female (spouse/partner)	0.197	-	-	-	-	-
	(0.529)	-	-	-	-	-
Age (spouse/partner)	2.605***	2.325***	1.437	2.157***	0.021	0.106
	(0.039)	(0.568)	(1.309)	(0.530)	(0.487)	(0.312)
Age2 (spouse/partner)	-0.035***	-0.027***	-0.021	-0.030***	-0.005	-0.005
	(0.000)	(0.006)	(0.015)	(0.006)	(0.006)	(0.004)
Married (spouse/partner)	-2.884***	-0.720	-1.757	-0.838	1.131	0.468
	(0.124)	(1.555)	(4.075)	(1.375)	(0.975)	(0.685)
log real hourly wage (spouse/partner)	-	-	-8.219***	-4.429***	2.622***	3.113***
	-	-	(2.633)	(1.365)	(0.920)	(0.834)
Partner's occupation						
Partner GPs	-2.848***	-5.643***	-7.676*	-6.145**	-7.202**	5.288***
	(0.478)	(1.582)	(4.148)	(2.721)	(3.265)	(1.849)
Salaried GPs	-3.850***	-6.964***	-7.486*	-7.070***	-	-
	(0.924)	(2.197)	(4.126)	(2.379)	-	-
Hospital doctor	-4.249***	-3.950**	-5.902*	-0.870	-4.165	-5.843***
	(0.319)	(1.589)	(3.531)	(1.405)	(4.153)	(1.906)
Other doctors (regulator, university,...)	-3.791***	-8.102**	-8.922**	3.097	-	-9.255***
	(0.809)	(3.722)	(3.653)	(4.034)	-	(1.497)
General Managers	-0.540***	-3.867**	-7.934**	-4.934**	-1.542	-1.777*
	(0.135)	(1.848)	(3.942)	(1.958)	(1.323)	(0.954)
Managers Finance or admin. Services	0.791***	-3.447	-9.536*	-8.998	-3.395	1.112
	(0.274)	(2.993)	(5.250)	(5.866)	(2.105)	(1.766)
Managers Health & Social Care	2.625***	-13.680**	-7.731	-8.868*	9.647**	-6.025*
	(0.519)	(5.996)	(6.125)	(4.593)	(4.574)	(3.267)
Scientists & technicians	0.563**	7.558**	-1.866	-0.526	-3.959**	-0.577
	(0.252)	(3.294)	(6.908)	(3.119)	(1.890)	(2.205)
Engineers & technology	-1.171***	-1.553	-10.479***	-2.010	-1.157	-1.425*
	(0.151)	(2.121)	(3.946)	(2.108)	(1.462)	(0.848)
Other health professionals (dentists, pharmacists, opticians, vets,...)	-0.480	-3.133	-5.634	-0.792	2.493	-0.169
	(0.318)	(2.483)	(4.336)	(2.343)	(5.736)	(1.599)
Teaching professionals (all education levels)	4.728***	-4.263**	-8.883**	-0.970	-0.186	-3.366***
	(0.155)	(2.076)	(4.117)	(2.486)	(1.846)	(1.252)
Legal professionals (judges, barristers, solicitors)	-3.682***	-3.083	10.473*	-9.262***	-2.490**	-4.440***
	(0.293)	(2.778)	(6.083)	(3.486)	(1.101)	(1.720)
Business & Finance (chartered accountants, management accountants, actuaries, economists, business analysts,...)	-0.685***	-9.883***	8.438	-1.713	-3.024*	-2.075**
	(0.209)	(2.304)	(7.421)	(3.033)	(1.583)	(0.921)
Health associates (nurses, midwives, radiographers, chiropodists,...)	2.772***	7.194**	-7.155	2.799	0.305	2.981
	(0.270)	(3.071)	(5.089)	(3.565)	(2.360)	(2.264)
Legal associates (legal service, estimators, valuers,...)	-1.026	-6.284***	-	5.634*	-10.938**	-7.699**
	(1.089)	(2.312)	-	(3.172)	(5.268)	(3.766)
Business associates (brokers, investment analysts, underwriters, taxation experts,...)	-1.450***	1.855	-10.997*	-1.602	-1.878	-2.856*
	(0.266)	(2.832)	(6.159)	(3.039)	(1.853)	(1.684)

...continues

Children

Number of children							
	1	-4.708*	-1.428	-3.912	-6.532**	-3.158	-3.186**
		(2.826)	(1.474)	(5.057)	(2.800)	(2.591)	(1.498)
	2	-13.410**	-4.696***	-15.596***	-7.449***	-5.390**	-5.664***
		(5.830)	(1.421)	(4.629)	(2.679)	(2.274)	(2.113)
	3+	46.518***	-0.261	-8.064	-17.056***	-6.060**	-1.899
		(0.851)	(2.422)	(7.488)	(6.501)	(2.990)	(6.644)
Age youngest child							
	0-2 years	-69.322***	-12.795***	-13.226*	1.159	-5.207	-12.969*
		(0.907)	(3.148)	(7.308)	(7.707)	(4.364)	(6.902)
	2-4 years	-66.904***	-6.586*	-5.705	6.717	-3.989	-10.970
		(0.949)	(3.424)	(7.148)	(7.548)	(6.201)	(9.051)
	5-9 years	-61.604***	-6.277**	-1.801	8.051	-3.741	1.994
		(0.910)	(2.823)	(4.240)	(6.891)	(4.190)	(7.393)
1 child & age youngest child 0-2		55.267***	11.588	12.894	-11.273	-10.764*	13.633*
		(3.603)	(11.835)	(10.743)	(7.492)	(5.714)	(7.534)
1 child & age youngest child 2-4		59.427***	9.604**	-2.129	-7.083	-6.612	7.130
		(3.078)	(4.703)	(10.828)	(9.622)	(7.298)	(9.923)
1 child & age youngest child 5-9		56.574***	-11.195**	5.389	-6.915	-1.750	-5.557
		(2.975)	(5.162)	(9.786)	(8.362)	(5.212)	(7.845)
2 children & age youngest child 0-2		66.093***	16.074***	13.038*	-1.383	0.429	11.345
		(5.905)	(3.757)	(7.605)	(8.428)	(5.970)	(7.349)
2 children & age youngest child 2-4		63.248***	3.981	6.337	-10.558	2.034	7.495
		(5.909)	(4.136)	(7.451)	(8.242)	(7.118)	(9.437)
2 children & age youngest child 5-9		62.622***	3.442	0.000	-5.642	-2.285	-3.776
		(5.901)	(3.316)	(0.000)	(7.605)	(5.040)	(7.760)
Age eldest child							
	0-4 years	7.346***	-4.186	-7.013	5.157	11.816**	-2.645
		(2.085)	(11.174)	(5.933)	(4.646)	(5.008)	(2.588)
	5-9 years	-0.018	-6.978**	-1.969	-3.750	4.873	-2.040
		(0.731)	(3.286)	(5.228)	(5.017)	(3.841)	(3.733)
2 children & age eldest child 0-4		-8.338***	0.000	0.000	-5.250	-12.550*	0.000
		(2.130)	(0.000)	(0.000)	(6.445)	(6.521)	(0.000)
2 children & age eldest child 5-9		-2.168***	-2.548	2.059	-1.829	-7.074	-1.990
		(0.803)	(3.803)	(6.986)	(5.950)	(5.263)	(4.209)
Constant		0.150	-4.660	37.247	28.019***	40.501***	36.882***
		(0.824)	(12.415)	(25.163)	(10.462)	(9.556)	(5.853)
N		139,563	972	172	653	683	1,056
R2		0.212	0.172	0.581	0.288	0.268	0.252
Year dummies		Yes	Yes	Yes	Yes	Yes	Yes
Number children x Age youngest children		Yes	Yes	Yes	Yes	Yes	Yes
Number children x Age eldest children		Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The sample characteristics are relatively homogeneous across occupations. Therefore, decomposing the gap in hours using the classical Blinder-Oaxaca (BO) decomposition would not add much to our understanding of the variation of hours across occupations conditional on gender. However, over time, it is likely that the gender composition changes over time in each occupation which may also change the proportion of full-time workers. For example, the proportion of full-time workers in one group might be different from other groups where there might be more people working part-time.

3.5.2. EXPLAINING THE GAPS IN HOURS

Previous results suggest a gap in hours by gender and amongst occupations. It is possible to explain this gap in hours using counterfactuals to acknowledge how the growth in headcount may have contributed to widen or narrow the gap in hours. To get the counterfactuals used in this chapter we, firstly, obtained the estimates from an OLS pooled model. Then, we worked out the average of every covariate for each year and occupation group (also conditioning on gender). Next, we multiplied both to get the predicted hours for each group. Two counterfactuals are calculated in this chapter: first, a weighted predicted hour variable using the weights for each group and year; finally, a second counterfactual that weights the predicted hours by the group someone is interested in studying. For example, it is possible explore the extent to which the increase in the proportion of has contributed to the weighted average hours of work. Figure 3.5 depicts the gap in hours by gender for each occupation and Figure 3.6 does the same for each occupation controlling for gender.

Figure 3.5 shows the difference in predicted hours for males and females and the gap between the weighted hours variables for each occupation. In essence, the closer the weighted variables are to either the predicted male or female hours, the higher proportion of those workers in the sample. As it is a time trend graph, it will reflect changes in the composition of males and females within occupations.

The gap between the weighted variables widens over time in Figure 3.5(A). It is the fall in the number of male partner GPs what explains the narrow gap.

Female proportions are from 25% in 1994 to 40% in 2014. This proportion can be tricky. Absolute figures do not change a lot for females. It is the drop of male number what increases the proportion of female partner GPs. Over time, this gap widens relative to the total hours weighted by gender proportions up to 6.5 hours in 2014.

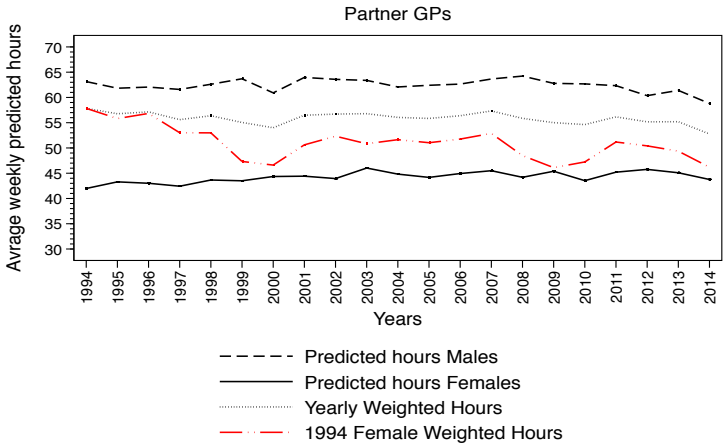
Figure 3.5(B) is more irregular, and this volatility is explained by the few observations in the sample. Also, salaried GPs have been traditionally dominated by females in all years, ranging from 58.5% in 1994 to 73.2% in 2014. The high variation until 200 is explained by big increases of male salaried GPs in the sample. Then that effect is smoothed by a higher number of observations for females.

Figure 3.5(C) shows a gap in hours of 8 hours in 2013 and 2014 and it is explained by the growing female hospital doctors. Figure 3.5(D) explains the six-hours difference with the same argument and it is the same for Figure 3.5(E) where the widest gap is about 7 hours.

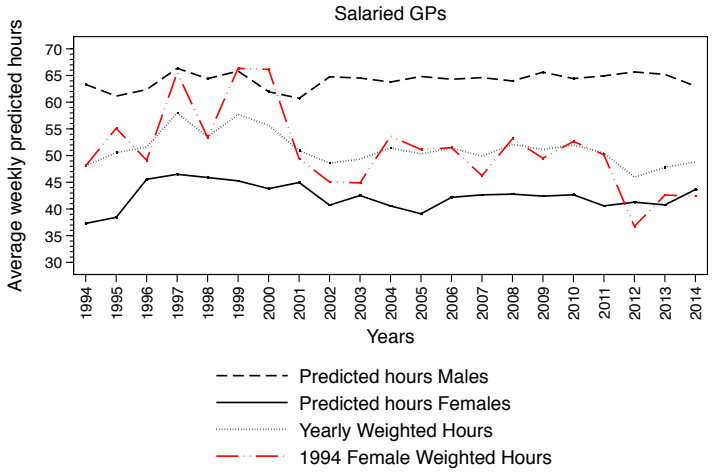
In a nutshell, the graphs included in Figure 3.5 convey that females work fewer hours than males if we take the counterfactual as the reference. So, it is the increase in the number of female workers what may explain this gap, which is especially wide when the proportion of females grew more dynamically than the change in male.

Figure 3.5 Hours Gap Gender for Each Occupation

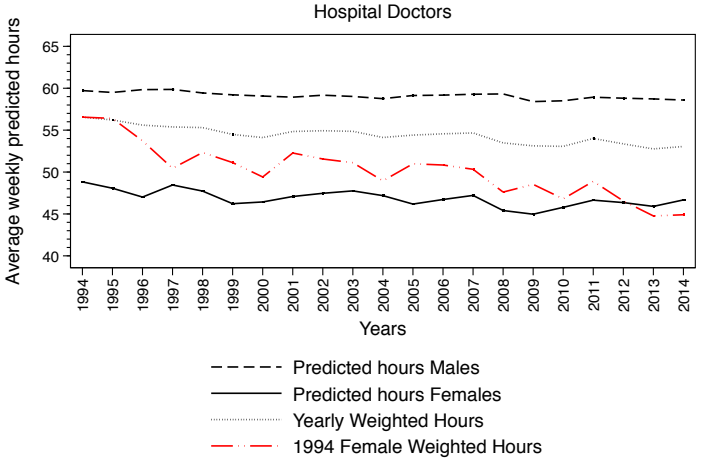
(A)



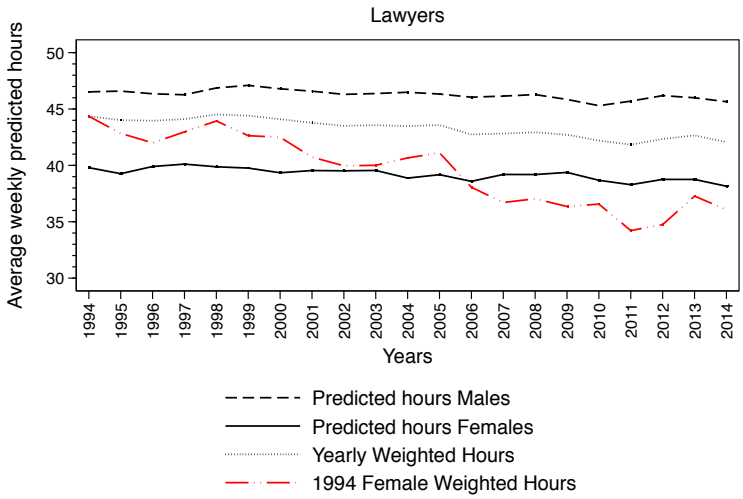
(B)



(C)



(D)


Lawyers
Average weekly predicted hours
50
45
40
35
30
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Years
Predicted hours Males
Predicted hours Females
Yearly Weighted Hours
1994 Female Weighted Hours

(E)

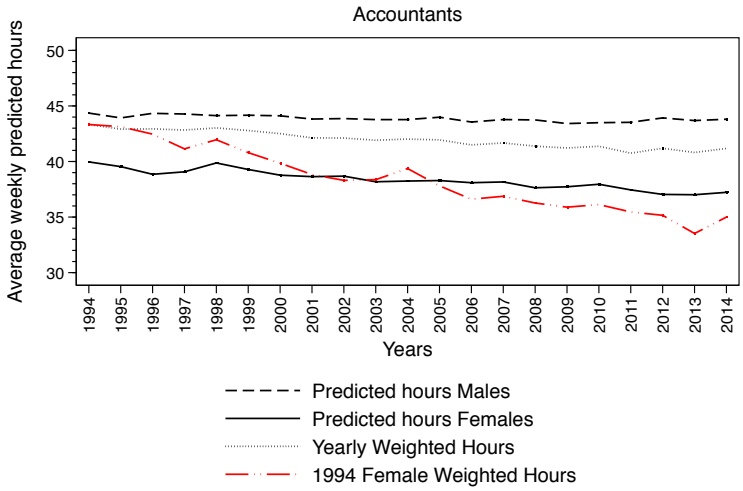

Accountants
Average weekly predicted hours
50
45
40
35
30
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Years
Predicted hours Males
Predicted hours Females
Yearly Weighted Hours
1994 Female Weighted Hours

Figure 3.6 and 3.7 show the gap in hours comparing different occupation groups for each gender. Males are depicted in Figure 3.6 and females in Figure 3.7. The counterfactual is built upon GP samples in 1994 unless comparing Partner GPs and Salaried GPs, which, in that case, it is Salaried GPs the counterfactual used for 1994.

Figure 3.6(A) shows that while the number of observations for male salaried GPs doubled and those of male Partner GPs halved, the gap in hours expanded and partner GPs worked larger hours than salaried GPs. The maximum difference is in 2010 and 2011 where the gap widens to 13 hours. Then it continues to fall since 2012 to levels close to 11 hours.

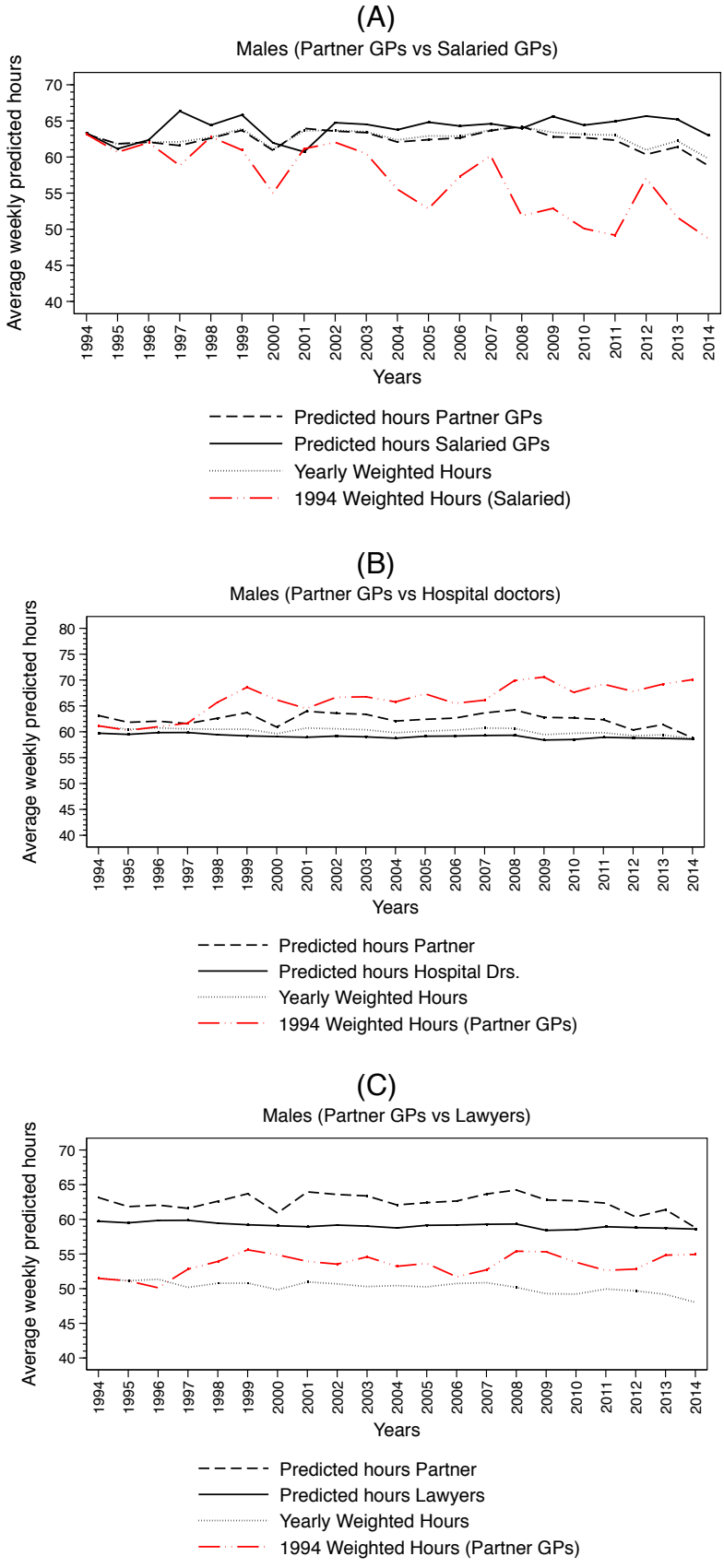
Figure 3.6(B) inverts that trend which is explained by the high proportion of male hospital doctors that grows 20% approximately. The following graphs are explained by similar reasons. When the gap in hours widens, this may be explained by the male partner GPs proportions dropping over time. When it narrows, the most reasonable explanation is that the proportion of lawyers or accountants change but their hours of work per week are steadier over time.

For salaried GPs (Figures 3.6(E) onwards) the change in the proportion of salaried males impacts little on the weighted hours variables.

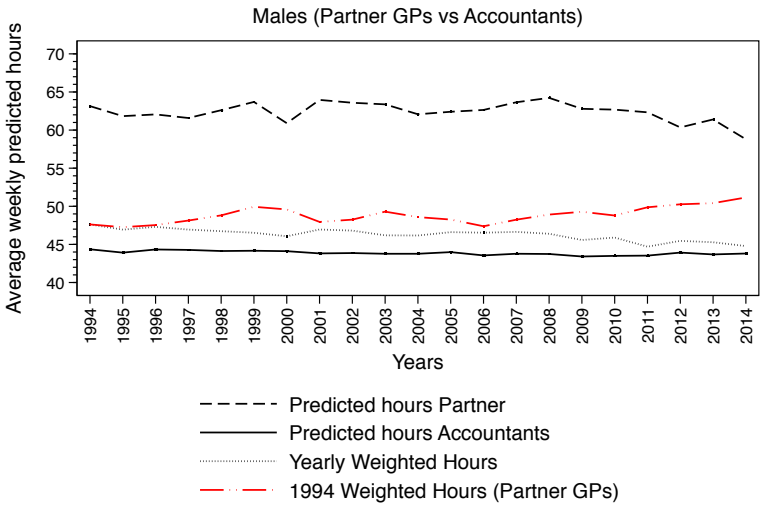
Figure 3.7 portraits the gap in hours across occupations for females. The argument that lies in most graphs is that when the proportion of female workers grew, the gap in hours widened as it is shown in Figure 3.7(A) or (E).

So, the main conclusion that we can get from the hours' gap graphs is that when the proportion of females grew significantly, it increased the gap in hours especially when the proportion was not too small. So, when females represented beyond 30 or 35% of all the proportion of workers, the hours of work dropped, explaining why those gaps widened. The increase in the sample for salaried GPs increased substantially in 2013 and 2014 making the gap bigger than earlier and near to 13 or 15 hours per week.

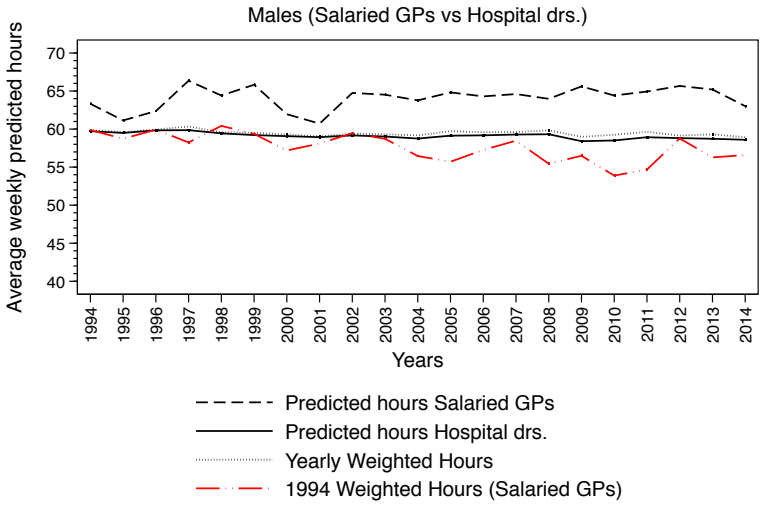
Figure 3.6 Hours Gap Among Occupations (MALES)



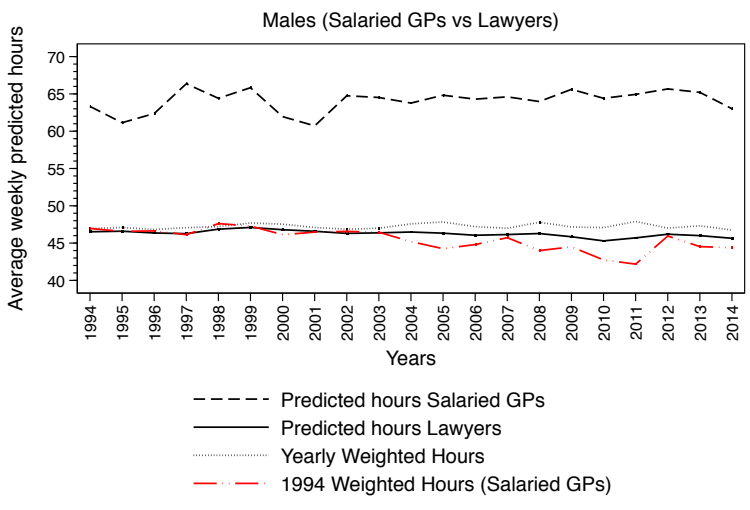
(D)


Males (Partner GPs vs Accountants)
Average weekly predicted hours
70
65
60
55
50
45
40
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Partner
Predicted hours Accountants
Yearly Weighted Hours
1994 Weighted Hours (Partner GPs)

(E)


Males (Salaried GPs vs Hospital drs.)
Average weekly predicted hours
70
65
60
55
50
45
40
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Salaried GPs
Predicted hours Hospital drs.
Yearly Weighted Hours
1994 Weighted Hours (Salaried GPs)

(F)


Males (Salaried GPs vs Lawyers)
Average weekly predicted hours
70
65
60
55
50
45
40
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Salaried GPs
Predicted hours Lawyers
Yearly Weighted Hours
1994 Weighted Hours (Salaried GPs)

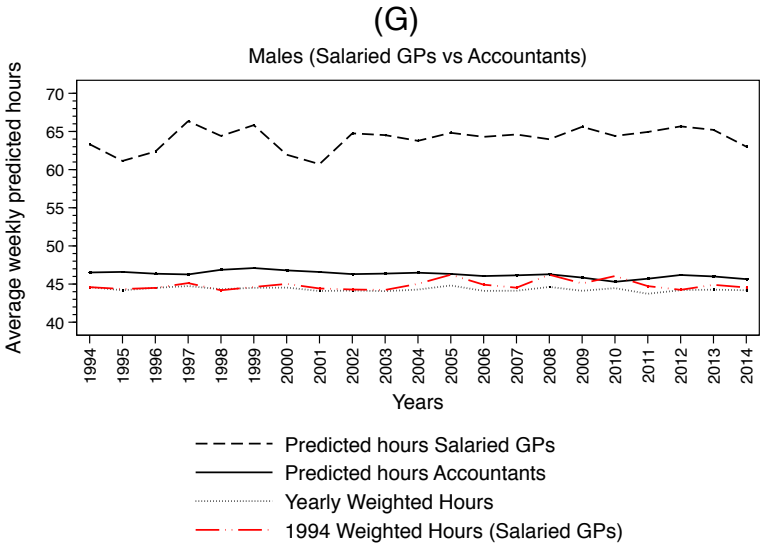
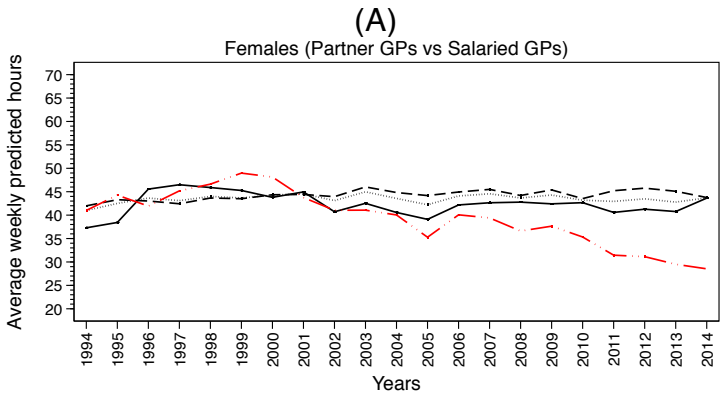
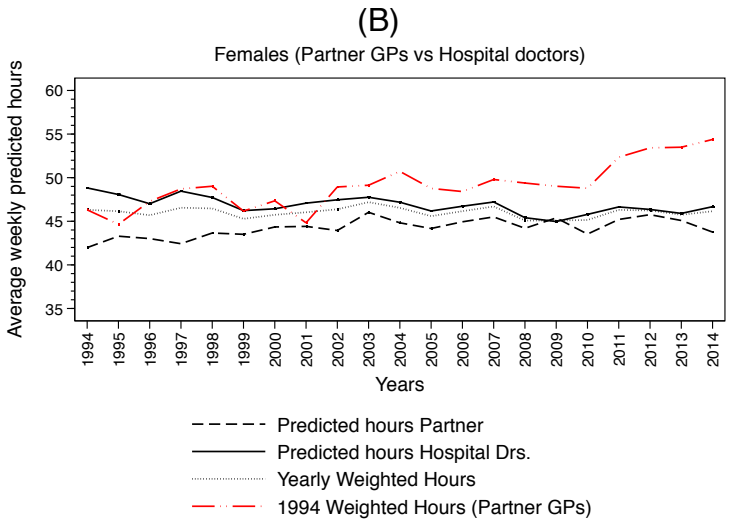
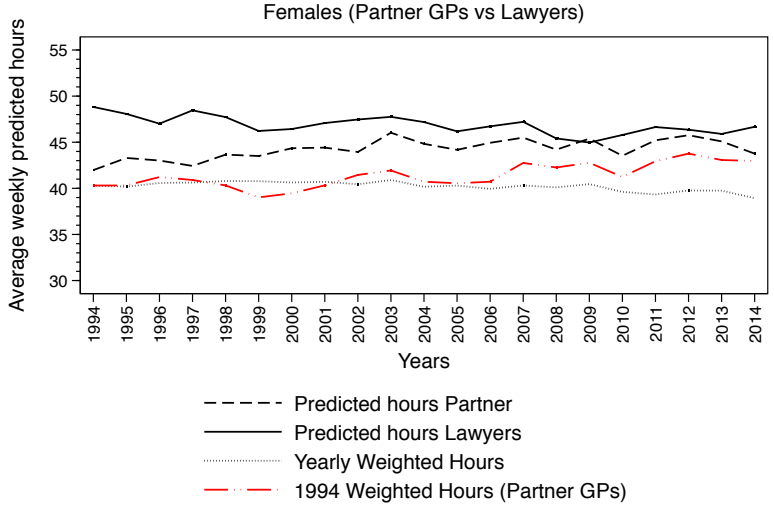


Figure 3.7 Hours Gap Among Occupations (FEMALES)

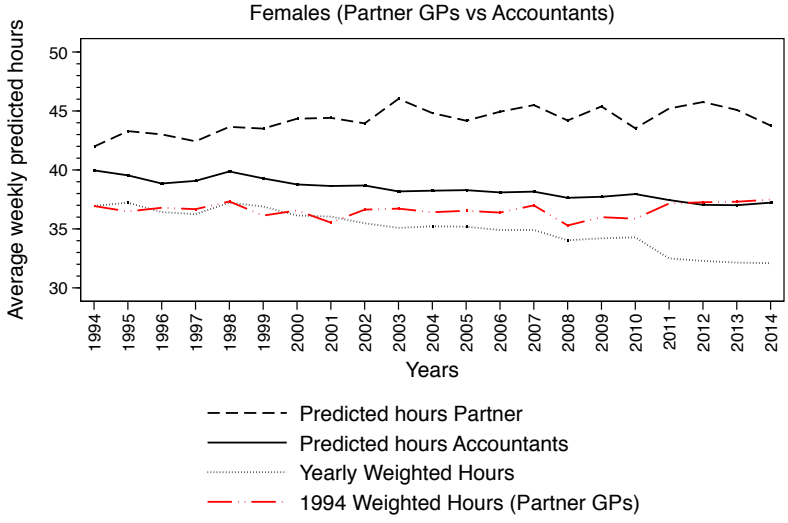




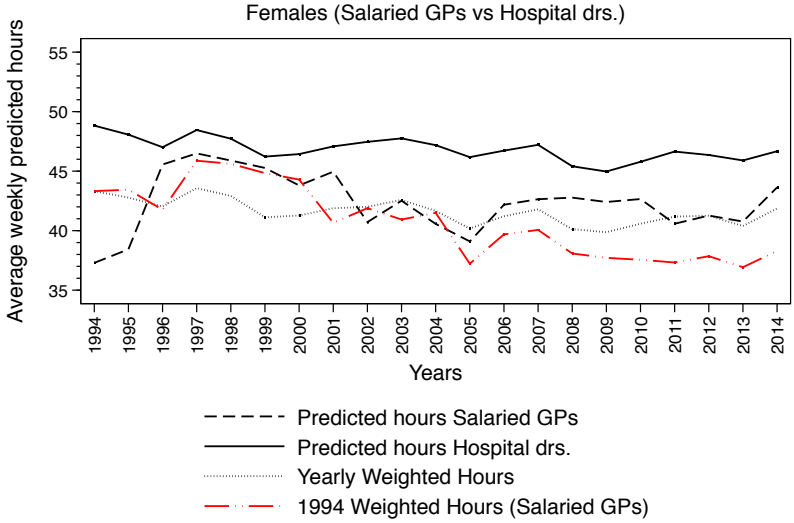
(C)


Females (Partner GPs vs Lawyers)
Average weekly predicted hours
55
50
45
40
35
30
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Partner
Predicted hours Lawyers
Yearly Weighted Hours
1994 Weighted Hours (Partner GPs)

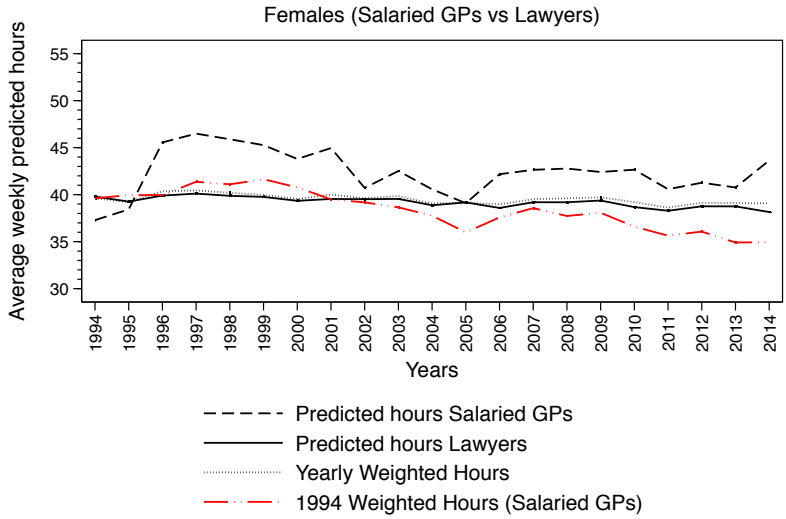
(D)


Females (Partner GPs vs Accountants)
Average weekly predicted hours
50
45
40
35
30
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Partner
Predicted hours Accountants
Yearly Weighted Hours
1994 Weighted Hours (Partner GPs)

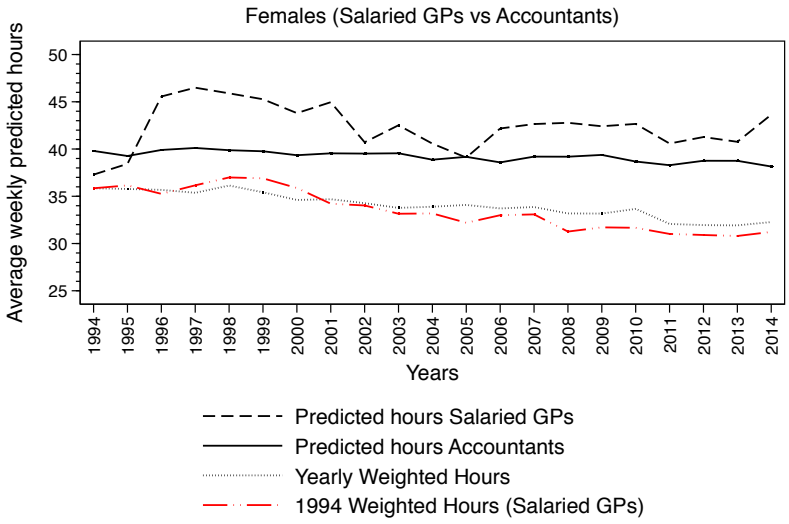
(E)


Females (Salaried GPs vs Hospital drs.)
Average weekly predicted hours
55
50
45
40
35
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Years
Predicted hours Salaried GPs
Predicted hours Hospital drs.
Yearly Weighted Hours
1994 Weighted Hours (Salaried GPs)

(F)



(G)



3.6 LIMITATIONS

Since there is virtually no UK literature on this topic it seemed sensible to start with basic descriptive statistics and reduced form econometric summaries of the data, rather than attempting to model labour supply in any structural way.

There are a few limitations to this work. First, OLS, cohorts and household regressions are conditioned on occupation, working positive hours and a specific age range which may lead to sample biases. However, we think that occupational choice is not a serious source of selection (on unobserved variables) bias – these choices are effectively made at age 16 where choice of

senior High School curriculum will determine entry into the medical and other professions. While we select on starting age, there are very few observations working in these professions below age 26 or above 69. So, this source of bias will be small. Conditional on working at all is a much more serious source of potential bias. However, this is likely to be less of a problem than for other workers because these are graduate professions that lead to what, even now, is effectively a lifetime career. These are expensive careers to enter and someone would expect the utilisation rates of these skills to be high across the lifecycle. Of course, there are career interruptions for women largely associated with children, but this is something that affects all professions and it is unclear that any bias would differ much across occupations.

A second reservation is that data is cross-section data rather than panel data. Using cross-sectional data, it is not possible to track individuals over time and their transitions in-and-out the labour market. However, sample size for the longitudinal version of the QLFS was very small whilst the pooled cross-section is richer in the variables available as well as being much larger.

Thirdly, years of education variables were not included but this is not likely to be an important issue. These are careers so age tracks experience very well, and the variation in years of education across individuals in these professions is likely to be relatively small since entry requires very specific trainings.

Finally, the definition for GPs and Hospital doctors is broad and it is not possible to make comparisons between GPs, Junior Hospital Doctors, Consultants (i.e. Senior Hospital Doctors), or within specialties. The data simply does not allow us to identify these distinctions and only administrative data is likely to allow such work to be done.

Further work, nonetheless, suggests itself. Regrettably they mostly require longitudinal data and existing panels datasets are far too small to generate sufficient sample sizes, and such work must, in the UK, await the availability of register administrative data (for example from NHS contracts and payroll, or from the NHS pension scheme). Firstly, retirement decisions would be worth

exploring. This has been a recurrent issue in Australia (Brett et al, 2009; Pit and Hansen, 2014) and the UK (Sibbald et al, 2003; Hann et al, 2010; BMA surveys 2014a-2015d). Australia has had the foresight to create a panel dataset (Medicine in Australia: Balancing Employment and Life, MABEL) specifically of medical workers and this has been used creatively for research purposes. Secondly, increasing early retirement intentions have been reported among GPs in England in the BMA surveys (BMA surveys 2014a-2015d). Among all doctors, it is GPs who have been consistently reporting the highest rate of uptake for early retirement (45% on average) which grew to 46.5% in last quarter in 2015 (BMA, 2014a-d; BMA, 2015a-d). Hann et al studied the relationship between job satisfaction and intentions to leave the profession, finding that 16.5% of GPs who reported moderate or higher intentions to leave their job, did eventually leave (Hann et al, 2010). However, this has been an underexplored area and the few existing studies, again, rely on self-reported questionnaires and the BMA surveys. An important issue with retirement is to look at whether doctors coordinate their retirements with their partners (Hurd, 1990; Gustman et al, 2004; Merkurieva, 2015; Warren, 2013). The analysis of career interruptions is a further topic that is important and would also demand panel data.

Finally, the chapter did not analyse earnings thoroughly. This is something that could have done with the LFS cross-sections. However, this will be part of our future research agenda. In the medical profession wages are determined by a pay scale, and although there is increasing ability for there to be departures from these scales several DDRB reports that this flexibility is hardly ever used. Thus, in the context of doctors, explaining wage rates is less important than would normally be the case.

3.7. CONCLUSION

This chapter has compared hours of work of partner GPs, salaried GPs, and hospital doctors with those of lawyers and accountants. It has been tested that the QLFS is a useful survey to track the hours of work of doctors. It is the main survey in the UK that monitors the performance of the labour market every

month and reports a good array of variables regarding hours and earnings for different types of workers (employees, self-employed). The sample size is large, and it offers a wide array of variables to be used.

This analysis documents that GPs work fewer hours than other occupations and much of this fall has been driven by the increased proportion of female entrants to the profession. The rate of feminisation has grown much faster for doctors than lawyers and accountants. But, female GPs work fewer hours than females in other occupations during most of their career. The baseline model reports lower hours for native and white workers with a larger difference for doctors than for lawyers and accountants.

The lifecycle hours for salaried GPs are interesting for females, who work fewer hours until middle age. After that, they start to work more hours and converge to a similar number of average hours than other occupations. However, the data conveys that the number of females salaried GPs grows up to the age of 40 and then declines, which may be considered as a cohort effect.

The extended version of the model includes some additional covariates such as marital status, regional dummies and family characteristics using number of children and dependent children as proxies. Children impact more in the decisions of females than males. Those estimates imply that female doctors, especially GPs, reporting having children worked less than mothers in other professions.

On average, over the lifecycle, female GPs show the biggest hours' gap (14 hours less than males). Meanwhile, the predicted total hours of work showed that female salaried GPs worked the fewest total hours over their lifecycle for a representative individual that worked between 26 and 70 years old. Children reduce the total hours of work supplied by females about 2,000 hours over their lifetime compared to the parsimonious model. However, although the analysis fitted to current retirement ages (60 for females and 65 for males) is consistent with the assertion that female salaried GPs rank bottom among these occupations, the difference between the two models is negligible.

Chapter 4

THE WELL-BEING OF DOCTORS AND THE IMPLICATIONS FOR LABOUR SUPPLY

4.1. INTRODUCTION

The conventional approach to explore the main issues of the intensive margin of doctors' labour supply is to estimate a model of the economic determinants of hours of work. There are two examples of such work that explicitly model the behaviour of physicians (Saether, 2005; Kalb et al, 2017). However, this is a difficult task in a context where almost all of the observational variation in the wage rate is associated with anticipated movements along a lifecycle career path. At best, such econometric work will provide estimates of Frisch labour supply elasticities of hours' response to expected changes in wage rates. However, those elasticities are not appropriate for simulating the effect of exogenous variation in wage profiles induced, for example, by some reform, as opposed to movements along them.

There is considerable literature on job satisfaction of doctors, especially general practitioners (Sibbald et al (2003); Hann et al (2009, 2010); Whalley et al (2005, 2006); French et al (2007)), and there is considerable research on the issue of burnout amongst physicians. However, there is very little research on the well-being levels of doctors, and what does exist is for small snapshots and unrepresentative samples.

This paper offers a novel approach to understand the main implications of wellbeing on physician's labour supply. For the first time, we are able to exploit a large well-established dataset such as the Annual Population Survey (APS).

In particular, we explore the self-reported subjective wellbeing variables available (anxiety, happiness, depression, feeling worthwhile, illness). We examine the distribution of physicians' wellbeing, other metrics such as health problems, and their proximate determinants. Then, we compare UK physicians' wellbeing levels (GPs and Hospital Doctors separately) with other professional groups (lawyers and accountants) and show how these metrics vary with hours of work.

The notable contribution of this paper is that we propose and implement an innovative idea to explore and test the extent to which individuals, across different professions, are "on/off" their respective labour supply equations. We are particularly interested in how the working hours of these professionals affect their self-reported wellbeing outcomes.

Sometimes a causal correlation is made between certain occupations triggered by the presence of intrinsic motivation provided by having a *mission orientation* (Belsey and Ghatak, 2005). A good example of this is the standard view of public servants, where having a public-sector ethos is viewed as a form of intrinsic motivation. So, the existence of intrinsic motivation implies that the effect of incentive schemes is low to enhance workers carry out their assigned tasks effectively (Heyes, 2005).

The classical view of the medical profession is similar. Physicians will treat patients in the best possible way without the need for monitoring or demand specific incentives. The idea that physicians perform according to the edicts of a Hippocratic Oath is a vivid illustration that non-pecuniary motivation might be even more important than financial incentives. Arguably, these ideas apply more forcefully to contexts where there are professionals whose occupations bring specific ethics and obligations to act in a responsible way.

We are particularly interested in the following issues about physicians' wellbeing. Firstly, how long working hours, and especially those dimensions of hours that are effectively elective (overtime and second job hours), affect their wellbeing outcomes. Secondly, we examine preferences in working more or fewer hours. We inspect how reporting working too few or to many hours than

desired hours affects outcomes may alter their wellbeing levels. Finally, since there is a widespread belief that physicians may be mission oriented, we also investigate how these effects might differ across occupations. So, we might expect this to be reflected in how their wellbeing is affected by the hours that they work.

Our headline findings are that, contrary to popular belief, physicians (GPs and hospital doctors) are less anxious, happier and more satisfied than other professionals. Hospital doctors are less depressed and less likely to self-report being sick, than either accountants or lawyers who reported similar levels to GPs. More predictably, doctors report that they feel that their life is worthwhile – somewhat more so than accountants and lawyers.

Finally, we explore whether there is potential for expansion of supply along the intensive margin since this is likely to be an inexpensive solution to the perceived shortage in the supply of, for example, GP time. When we explore the relationship with hours of work we find that, that a marginal extra hour has virtually no effect on physicians' wellbeing outcomes, but this does not happen for accountants and lawyers. This might signal that physicians are, on average, "on" their labour supply curve. However, a small proportion of individuals declare being underemployed and would like to work more hours compare to the self-reported hours they currently work. Controlling for the wage rate, we find that those individuals have lower values of the wellbeing measures. In particular, this is true for lawyers and accountants, but not for physicians. This could be viewed as evidence of doctors' intrinsic motivation exhibited by the mission orientation. Finally, the main policy implication for being "on" their labour supply curve implies that a small overtime premium rate would be required to incentivise them to expand their hours of work. This could be a policy to be implemented quickly to tackle the shortage of doctors, and alongside the current policy of expanding along the extensive margin[42].

[42] Unofficial estimates of the cost of training a doctor are upwards of £300,000 each. And the reported shortfall in the supply of doctors is upwards of 5,000. So, the overall cost of such an expansion of supply along the extensive margin is at least £1.5 billion. The working life of a doctor is unlikely to average over 40 years, even in the long term. So, we might expect sustaining this expansion in supply would add approximately £400m pa to the current costs. In contrast, the existing stock of GPs amount to approximately 60 thousand who work, on average, around 38 hours per week (in our APS data). An additional 3 hours per GP per week, on average, from the existing stock of GPs would provide approximately same additional supply as expanding the

4.2. BACKGROUND LITERATURE

GENERAL LITERATURE

There has been a bourgeoning interest in understanding well-being measures (Erdogan et al, 2012) and also in Economics. Here, the main focus has been on understanding how economic variables correlate with well-being. So far, most studies have focused on understanding how income at all levels correlate with happiness (Oswald, 1997; Kahneman and Krueger, 2006), but the understanding of how people can be happier has expanded to other areas such as labour markets (Alesina et al, 2005; Golden and Wiens-Tuers, 2006; Wooden et al, 2009). Perhaps, one of the key questions using these measures is how reliable they are to make consistent and unbiased conclusions (Krueger and Schkade, 2008).

Exploring these relationships with subjective well-being measures lies in the idea of understanding how people maximise their utility and, thus, what drive their decisions. Easterlin, for example, studied whether the growth in GPD in the US in the post-war period (1946-1957) led to a similar trend in happiness (Easterlin, 1974) and concluded that the growth in happiness was a small proportion of the growth in national income. Other authors tested whether certain variables may lead to greater levels of happiness being those controls married, high income, females, white ethnicity, high education or retired workers (Oswald, 1997).

The main variables that usually measure well-being are happiness and life satisfaction. Overall, income is correlated with well-being variables when these are dependent variables, but this correlation is weaker when the measure of well-being is experienced happiness than life satisfaction (Kahneman and Krueger, 2006). One of the problems that subjective well-being measures face is that should there be low correlation between well-being variables and controls, that could be partially due to attenuation biases or the presence of

headcount by 5,000. The hourly rate for salaried GPs is about £25. So, the cost of the additional time at the margin would up upwards of £250m pa. On the face of it, these crude calculations suggest there may be some headroom to provide overtime rates of 50% above the regular rate and still be cheaper than the alternative expansion along the extensive margin.

high measurement error in the sample. In fact, if the well-being variables are self-perceptions the biggest limitation is how to infer any utility measure from those analyses. Nevertheless, Kahneman and Krueger state that well-being data are not expected to provide utility measures but just correlations with other demographic controls. Thus, for that purpose, they would be good measures to predict future outcomes.

If we compare well-being measures with other reliable ratios found in other microeconomic variables, they underperform: 0.9 versus 0.5-0.7. But the scores resulted from well-being variables would be reliable enough to make conclusions (Krueger and Schkade, 2008). When those measures of well-being are more reliable is when analyses compare group means and have benefited from statistical aggregation and regression coefficients showed attenuation bias.

DOCTORS' LITERATURE

Healthcare workers, like teachers and other public-sector workers, are often seen to having a mission orientation relative to other professionals. This may lead to higher levels of satisfaction in their jobs and better performance. However, recent surveys have reported the opposite with higher levels of discontent for doctors in their jobs, mostly GPs. This may imply a degree of demotivation, lower job satisfaction and higher "burnout" (BMA, 2014a-2015d). The literature on burnout in the context of (mostly US) physicians suggests that burnout is associated with worse clinical outcomes for patients. We might expect this to be indicative of high turnover rates, and growing absenteeism through increasing number of reported sick days.

The literature on job satisfaction is large, especially for nurses (Lu et al, 2005, 2012) or GPs (Whalley et al, 2005, 2006; Hann et al, 2009, 2010; Sibbald et al, 2003). Variety in professional tasks, relationships, contact with colleagues and patients, and supervising medical students have typically been found to be positive sources of higher job satisfaction. Low income, long working hours, the size of the bureaucratic burden, work-life imbalance, and not having enough

recognition have been widely reported as sources of lower job satisfaction among GPs (Van Ham et al, 2009). Practising in large cities or depressed areas also correlate negatively with job satisfaction (Sibbald et al, 2003). Hence, decreasing job satisfaction may lead to increasing burnout and, thus, more likely intentions to quit.

Research in occupational psychology classifies stressors in five categories: intrinsic to the job (such as workload or work-life balance), the role in the institution, career promotion, relationships at work, and organisational structure and environment (Cooper and Marshall, 1976). Higher levels of stress mean poorer physical health, worse psychological well-being or lower job satisfaction. Johnson et al (2005) compare physical health, psychological well-being and job satisfaction among 26 occupations, which included accountants and medical workers. Accountants and medical workers reported similar levels of physical health (12.66 for accountants and 12.67 medical/dental workers), psychological well-being (17.47 and 17.82) but higher job satisfaction for doctors (25.66 versus 18.74 for accountants). The analysis of stress and these three variables report that both medical workers and accountants rank higher in physical health and psychological well-being compared to their means, but it is job satisfaction what makes the big difference. When doctors ranked 8th, accountants ranked 24th in this league table suggesting that stress appears to impact more negatively on accountants than doctors.

Higher levels of stress can lead to growing burnout and, thus, increasing intentions to leave the profession or, even, mental health illnesses (psychiatric morbidity). Doctors have been reporting higher levels of burnout for the last years (Lemaire and Wallace, 2017) and hours of work, job stress and workload have been reported as the main drivers of stress. Females are more likely to suffer from stress, but it is not clear the effect of age on stress as the literature offers mixed results: some studies show a negative correlation with burnout, for example for part-time GPs; and others address a positive correlation between being single and burnout (Imo, 2016).

Workload and well-being have been reported in two main surveys in the UK that assess doctors' job satisfaction, for example: the British Medical Association Quarterly Tracker Survey (BMAQTS) and the series of the National General Practice Worklife Survey (NGPWS). The BMAQTS reports high levels of stress among doctors (61 % of doctors reported being stressed in the 2017 quarter 2 survey). It also contains information on morale levels, work-life balance and current workload. GPs reported the highest proportion of medical practitioners working 'very often' outside regular hours compared to hospital consultants, junior doctors or specialists and associate specialists (SAS). Likewise, the NGPWS also includes job satisfaction, stressors, hours of work and intentions to quit variables. Importantly, for the purposes of this chapter, the survey includes a question about satisfaction with life '*Overall, how satisfied are you with life?'*

In the 8th Report of the National GP Worklife Surveys, Gibson et al report lower job satisfaction levels for GPs than previous years and stress that this is the lowest level since 2001 (Gibson et al, 2015). Hours work is found to be the main detractor of job satisfaction (mean 3.56 on a seven-point scale) where 48.5% of respondents reported being very unhappy with the hours they work compared to the 34% who reported being satisfied. Remuneration is other source of high job dissatisfaction, although 45.5% reported being satisfied with their remuneration versus compared to 41% being dissatisfied. They also report an average life satisfaction analysis for each of the eight cross sections that have been carried out so far: the relationship between average life satisfaction and average hours worked across surveys is negative but almost flat and the relationship between satisfaction and hours is not well-fitting. Unfortunately, the individual data from these publicly funded surveys is not made available to other researchers and, so, it is not possible to conduct any secondary analysis of the type conducted here on the APS data.

The traditional labour supply literature has relevance to our analysis. It has been conventional to think of hours of work being determined by maximising an objective $U(\cdot)$ function, defined on consumption expenditure, c, and hours of

work, h, subject to the constraint that consumption expenditure equals unearned income, m, plus earned income, $w \cdot h$, where w is the hourly wage rate. This determines the optimal hours of work, $h^* = h(w, m)$, consumption $c^* = m + w \cdot h(w, m)$ and the maximised level of the objective function, $U^* = U(h^*, c^*)$. Since the arguments of $U(\cdot)$ are functions of w and m it follows that U^* can be rewritten such that $U^* = V(w, m)$ which is sometimes referred to as the indirect utility function. The shapes of $V(\cdot)$ and the labour supply function, $h(\cdot)$, are determined by the assumed shape of $U(\cdot)$. It is possible to depict $V(\cdot)$ in Figure 4.1, which is drawn for an arbitrary fixed level of m which is assumed to be exogenous (and which we will henceforth omit).

The typical sources of data used to estimate $h(w)$ do not provide measures of V directly – only w (and other determinants of h) and the choice of h are directly observed. However, there is a direct correspondence between the shape of $V(\cdot)$ and that of $h(\cdot)$, which we can observe. The traditional labour supply literature estimates $h(\cdot)$, using observable data on the levels of h and w in large samples of individuals, and backs out from those estimates the shape of $V(\cdot)$, which can then be used to make inferences.

At a wage rate of w_0, in Figure 4.1, the optimal level of hours lies on $h(w)$ and is given by $h_0 = h(w_0)$. The level of indirect utility is $V_0 = V(w_0)$. Note that $V_A$must be lower than V_0 for any value of $h \neq h_0$ (for example, points A and A') and will decrease the further away from the labour supply curve, $h(w)$. That is any other value of h will be "off" the labour supply curve. Note also that the value of V is monotonically increasing in w along $h(w)$ as w rises, indicated by the arrow in Figure 4.1. So, at w_1, for example, optimal hours are higher and $V_1 = V(w_1) > V_0$.

If the individual is working the desired level of hours at any wage, then the shape of $V(\cdot)$ around the intersection with $h(w)$ is locally flat by definition. The empirical implication of this is that the effect of a marginal increase in working hours, from $h(w)$, at a given hourly wage, w, would have only a very small impact on the level of V. In contrast, suppose the individual were "off" the labour

supply curve, sat at A or A' - perhaps because the employer can, at least in the short run, dictate hours of work (although in the longer run this might result in the worker moving jobs to get a better match to the desired level of hours). Then the slope of $V(\cdot)$ would be positive or negative depending on whether hours were above, at A, or below (i.e. to the left of) $h^*(w)$, at A'. That is, a marginal increase (decrease) in hours if $h > h^*(w)$) at A would decrease (increase) V, and vice versa if $h < h^*(w)$ at A'.

Thus, if there is an observable metric for V, it could be possible to explore the effects of hours of work, and wanting to work more of fewer hours, on V. What is interesting is the relationship between the well-being outcomes and hours of work. This stems from the desire to explore the possibility that there is potential for expansion of supply along the intensive margin since this is likely to be an inexpensive solution to the perceived shortage in the supply of GP time, for example.

Figure 4.2, below, attempts to operationalise the implications of the theory to evaluate the effect of being "off" the labour supply curve on the level of well-being. Suppose the wage is w_0 and the corresponding optimal labour supply were h_0 and the level of indirect utility would be V_0. However, an individual who reported wanting to work more hours at the existing wage might be constrained to work a level of hours equal to $h_r < h_0$. In this case, the level of well-being V_0 could only be attained if the individual were paid a wage equal to $w_r > w_0$, where w_r is defined, implicitly, by $V(w_r|h_r) = V(w_0)$. Thus, an individual who was constrained to work $h_r < h_0$ would attain the same level of indirect utility if paid w_r per hour rather than being unconstrained with a wage of w_0. Thus, the value of relaxing the constraint is approximately $w_r - w_0$ per hour, given in Figure 4.2 by the angle θ. The approximation is better the shallower is the shape of the indirect utility line and the smaller is the constraint on hours. The approximation provided by this linear approximation will, in general, be an upper bound to the exact welfare loss.

The theory described above is quite standard and it presumes that individuals are motivated to work by the financial return (i.e. w). There is a literature that suggests that public sector workers may have *mission orientation* that provides (additional) motivation. There is a suggestion here that the supply decisions of public sector workers might be less sensitive to financial considerations. In the context of our theory such mission orientation might be manifested in the desire to deal with whatever workload that their patient lists throw at them. Greater reliance in community-based care and the increase in conditions associated with old age are likely to add disproportionately to their workload. Indeed, Gibson et al report that 95% of respondents to the 2015 survey agree or strongly agree that they "have to work intensively", 89% report that they" have to work too fast", and 80% say that "they do not have time to carry out all work". All these adverse responses have grown consistently over successive workload surveys. Unfortunately, it is not possible to assess the impact of the 2004 contract on well-being, before and after, as APS data go from fiscal year 2011/12 onwards.

Figure 4.1 Desired Hours and Well-being

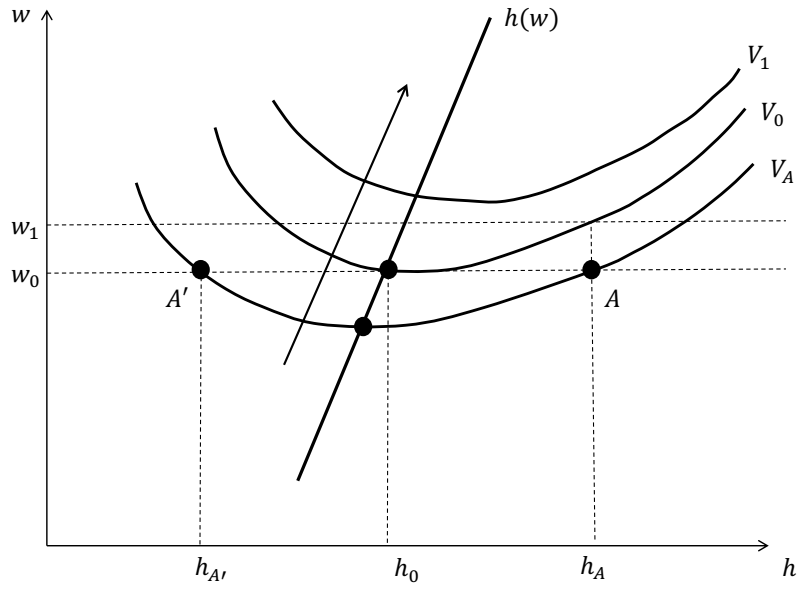


Figure 4.2 The Welfare Effect of Working Fewer than Desired Hours

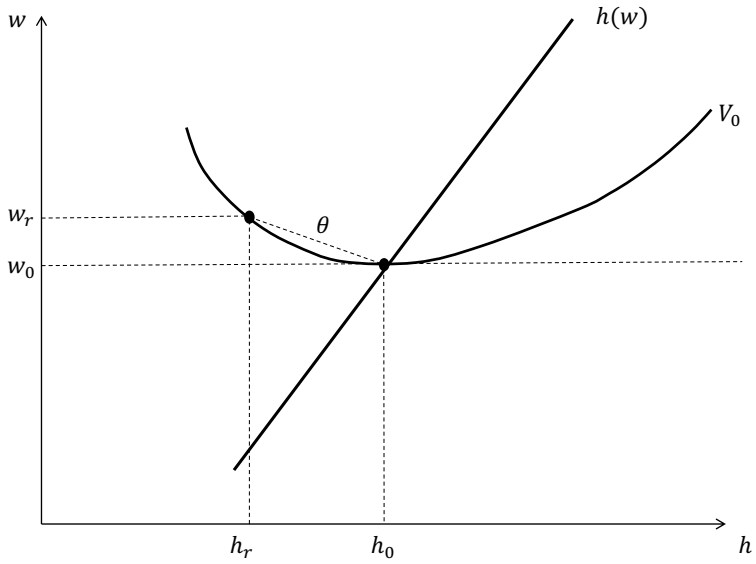


Table 4.1 provides some summary statistics that depicts the extent of "*off the labour supply curve*" behaviour since 2011 quarter 2. The proportion of individuals wanting more hours differs little across occupations, except for male salaried GPs. Indeed, it is a modest proportion for all occupations (about 4%).

The number of additional hours per week of those who say wanting to work fewer hours is quite considerable – 13.31 hours for partner GPs, 10.82 hours for salaried GPs and 11.76 hours for hospital doctors. The proportion who want to work fewer hours for less pay is much larger – averaging over 20% for all doctors (salaried GPs and hospital doctors), slightly more for women (20.75% of all female doctors) than men (19.24%). The proportions for lawyers (15.46%) and accountants (12.22%) are somewhat smaller, but still sizeable. The number of hours they would like to cut is slightly larger for lawyers (around 12 hours per week on average) but similar to salaried GPs for accountants (10.82 hours per week).

Table 4.1 "Off" the Labour Supply Curve Behaviour (data from 2011)

		Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
N	Males	587	148	1,705	2,069	6,203
	Females	343	375	1,359	1,980	4,112
	Total	930	523	3,064	4,049	10,315
Average weekly hours worked	Males	43.95	40.76	48.16	45.91	42.15
	Females	33.03	33.37	43.31	39.90	37.20
	Total	39.92	35.46	46.01	42.97	40.18
Want more hours (N)	Males	9	14	79	67	274
	%	**1.53%**	**9.46%**	**4.63%**	**3.24%**	**4.42%**
	Females	13	10	32	84	182
	%	**3.79%**	**2.67%**	**2.35%**	**4.24%**	**4.43%**
	Total	22	24	111	151	456
	%	**2.37%**	**4.59%**	**3.62%**	**3.73%**	**4.42%**
Number more hours wanted	Males	6.63	12.86	11.00	8.89	9.03
	Females	9.00	8.90	8.64	11.01	7.49
	Total	8.10	11.21	10.31	10.06	8.41
Average weekly hours worked	Males	25.33	32.21	45.27	34.01	36.62
	Females	24.23	25.30	37.95	28.35	30.01
	Total	24.68	29.33	43.16	30.86	33.98
Want fewer hours less pay (N)	Males	152	24	266	313	659
	%	**25.89%**	**16.22%**	**15.60%**	**15.13%**	**10.62%**
	Females	78	67	294	313	601
	%	**22.74%**	**17.87%**	**21.63%**	**15.81%**	**14.62%**
	Total	230	91	560	626	1,260
	%	**24.73%**	**17.40%**	**18.28%**	**15.46%**	**12.22%**
Number fewer hours for less pay wanted	Males	13.22	13.48	12.03	14.15	11.28
	Females	13.50	9.95	11.53	12.51	10.70
	Total	13.31	10.82	11.76	13.32	11.00
Average weekly hours worked	Males	49.02	42.38	52.53	49.81	44.92
	Females	40.15	37.12	47.17	45.40	41.01
	Total	46.01	38.51	49.72	47.60	43.06

4.3. DATA

This chapter benefits from data on individuals in specific occupation groups, drawn from the Annual Population Survey (secure access version, SN7961). These datasets provide information on well-being variables from 2011 quarter 2 (April-June) to 2015 quarter 1 (January-March). These data are rich and comprehensive enough to generate the required variables for occupation groups (GPs, hospital doctors, lawyers and accountants). The coding of occupation reflects that used in earlier chapters (chapter 2 and 3) that were based on using the QLFS (that makes up the APS) over a longer period. Here, the well-being variables are only available from 2011 because those questions were only asked from that point. So, now, the sample size shrinks compared with former chapters. The questions that are of most interest for the well-being issue are:

- Anxiety – How anxious did you feel yesterday? (where nought is 'not at all anxious' and 10 is 'completely anxious').
- Happiness – How happy did you feel yesterday? (where nought is 'not at all happy' and 10 is 'completely happy')
- Satisfaction – Overall, how satisfied are you with your life nowadays? (where nought is 'not at all satisfied' and 10 is 'completely satisfied')
- Worthwhile – Overall, to what extent do you feel the things you do in your life are worthwhile? (where nought is 'not at all worthwhile' and 10 is 'completely worthwhile')

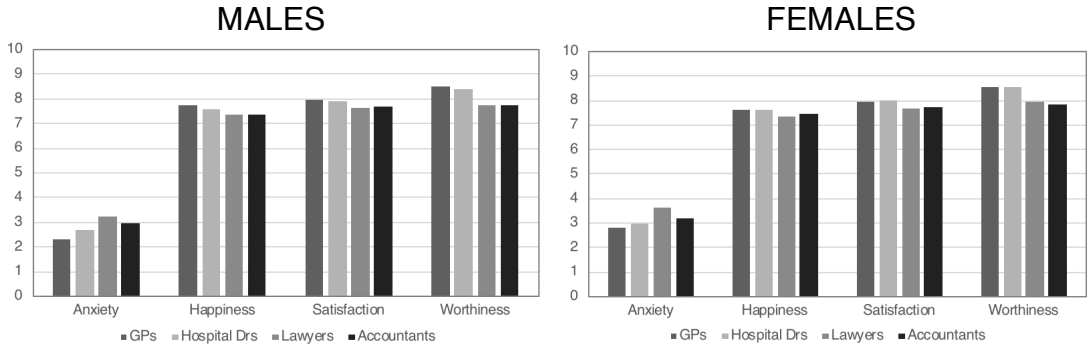
Data accessed from the secure server of the UK Data Service requires collapsing the bins of several of the available variables when needed because of the small numbers of observations in certain cells. In any event, the distribution of the responses in raw data is not presented, because the shapes of the distributions are very similar across occupations. What is interesting is that these comparisons can be best summarised by the means of these distributions. These averages of responses are depicted in Figure 4.3, for males and females separately because there are well known differences in

some of these variables by gender in the existing literature, and in the data the gender balance differs across these professions.

Anxiety is clearly less of an issue for GPs and hospital doctors overall. The distribution of happiness responses shows that, on average, doctors are slightly happier than lawyers, again with accountants somewhere in between. Similar patterns can be seen for life satisfaction and feeling their lives are worthwhile. There is no evidence in any of these metrics that doctors, both GPs and hospital doctors, have lower well-being than other professions. In anything, the evidence points they have higher well-being.

These conclusions are robust over time. Looking at differences by year there is no substantive changes across time despite the advent of austerity policies that begin to impact, in the middle of our period, on public sector workers. The consistency of the results across time is remarkable, despite limitations in sample cell sizes.

Figure 4.3 Average Measures of Well-being by Gender (10-categories scale)

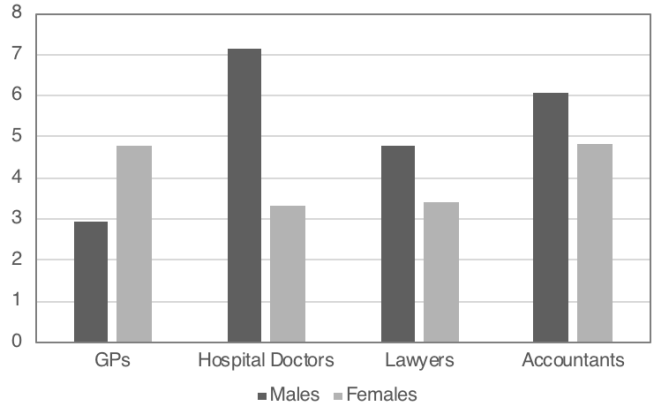


Low levels of wellbeing might generate different health problems. This possibility motivates our work to expand our wellbeing analysis exploring health status. We investigate two self-reported variables reporting information on health problems. The survey question asks whether “Do you have any of the following…?”. The 17 possible responses include hypertension (“… heart, blood pressure, or circulation problems”?), and depression (the question asks, “*Do you have depression, bad nerves or anxiety?”).* Workers are also asked “*Does your health problems limit your work activity?”.*

Table 4.2 shows the raw data on the three main health variables that we generate from the original question on health problems, available since 2011 quarter 2. These three variables are binary, taking value 1 if respondents reported suffering the health problem in question (depression, hypertension or whether their health problem limit their amount of work). Approximately, 27% (19%) of GPs (hospital doctors) self-reported suffering from any of the 19 illnesses alternatives. About 21% (12%) of these illnesses limit their activity at work, while 24% of lawyers (25% of accountants) self-report illness with 17% (17%) being work limiting. Hypertension rates are slightly larger for doctors, both GPs (4.9%) and hospital doctors (3.5%), than lawyers (3.2%) and accountants (3.5%). Depression rates for hospital doctors (1%) are similar to accountants (1.2%), but larger for GPs (1.8%) and lawyers (1.9%).

Figure 4.4 shows the proportion of each occupation group, by gender, who say that they would like to work more hours Despite the reputation that doctors have for claiming to be overworked, the occupational group who are most likely to claim to want to work *more* hours is male hospital doctors (7%) compared to 6% of male accountants and 5% of male lawyers. Among females, 5% of GPs and accountants want more hours, compared to 3% of hospital doctors and lawyers. Unfortunately, data restrictions prevent this work from looking at the proportion who say that they would like to work *fewer* hours[43].

Figure 4.4 Percentage Wanting to Work More Hours



[43] Variable reporting wanting to work fewer hours than at current or for less pay are not included in the dataset.

Table 4.2 Health Problems

	GPs	Hospital doctors	Lawyers	Accountants
DNA	660	1,534	1,650	5,151
ALL ill	248	360	521	1,698
N	908	1,894	2,171	6,849
% ill over sample size	27.31%	19.01%	24.00%	24.79%
Depression (n)	16	19	41	82
% over sample size	1.76%	1.00%	1.89%	1.20%
% over ill	6.45%	5.28%	7.87%	4.83%
Hypertension (n)	44	67	69	242
% over sample size	4.85%	3.54%	3.18%	3.53%
% over ill	17.74%	18.61%	13.24%	14.25%
Health problem limits work (n)	53	42	86	288
% over sample size	5.84%	2.22%	3.96%	4.20%
% over ill	21.37%	11.67%	16.51%	16.96%

The regression analysis, below, explores the role that hours, and hours constraints, have in well-being across occupations. The above proposition stated in the theoretical background from is that if hours of work are such that individuals are “overworked” (i.e. working to the right of the labour supply curve) would have a negative effect on well-being measures. The effect is likely to be smaller, perhaps zero, for intrinsically motivated doctors.

4.4. REGRESSION ANALYSIS

There is a considerable literature on the determinants of well-being measures. Comparing the raw data responses across occupational groups fails to account for the differences in the determinants of well-being across groups. For example, it is well known that well-being varies across the lifecycle, following a U-shaped pattern. Thus, part of the variation in well-being variables (anxiety, happiness, life satisfaction and worthwhile) in the raw data may be due to differences in average age, sex or other specific characteristics of the relevant occupational workforces. Here, we explore the use of regression analysis to

control for these cofounding differences to examine whether any remaining differences across occupations remain.

The workhorse of this specification is given by

$$W = \beta X_i + \delta T_i + \gamma \ln(w_i) + \zeta H_i + \varepsilon\_i$$

where **W** is a vector of outcomes (anxiety, happiness, life satisfaction, and feel that life is worthwhile). Dependent variable is standardised in mean and standard deviation so that $W_z = \frac{W - \mu_W}{sd(W)}$. **T** is a vector of occupations; **X** is a set of labour market variables and characteristics (including Female, age, age square); the wage is denoted **w**; and **H** is a vector of measures of hours of work. Estimates of these equations are reported in Table 4.3 and the following tables. The variable explaining total hours encompasses main and second job, which includes basic and overtime hours in main job and hours in second job.

We refrain to control for unearned income in our regression analysis. Firstly, we cannot work out the variable because the household identifier variable (hserialp) is not available in the data. Also, that variable could be more useful to examine well-being amongst unemployed, but we are focusing our analysis on people working in week of reference. Besides, introducing this variable could introduce endogeneity in our analysis failing to show any causal effect on every estimated parameter. Moreover, assuming we could have arranged our data by household, there is no point on controlling by partner's education/occupation because that would cause endogeneity in the model. We did not include in our analysis because we selected our sample to be relatively homogeneous where all are professional workers and married with partners with similar education levels and professional characteristics.

Table 4.3 portrays that females have significantly higher anxiety. Since the dependent variable is standardised this coefficient of 0.10 in Table 4.3 implies that females are 10% of a standard deviation (SD) more anxious than males. There is a correspondingly positive effect on feeling that life is worthwhile of 15% of a SD. The occupation effects (relative to accountants) convey that hospital doctors are 0.18 of a SD more satisfied with life, and 0.13 of a SD

happier, relative to an accountant, and lawyers 0.07 of an SD less satisfied. Coefficient for GPs is not significantly different from accountants in terms of happiness, life satisfaction and anxiety.

However, Table 4.3 restricts the effects of hours of work to be the same across occupational groups. Tables 4.6 to 4.9 contain separated coefficients of models conditioned on occupations for each of the four well-being measures. Thus, each column provides estimates that are conditional on working in that occupation.

Table 4.4 confirms that women tend to be more anxious but the coefficient effect for GPs is not statistically significant, although it is for hospital doctors at a 10 % significance level. There is no significant effect of hours on anxiety. Former results suggest that the significant coefficients for lawyers and accountants are mostly explained by the effect of overtime hours on total hours. The idea that burnout might occur posits that anxiety rises across the lifecycle and well-being measures might fall. Neither age nor age-square are significant in Table 4.4 which does not support the idea that burnout occurs. However, this is supported in Table 4.5 when the hourly wage variable is ruled out. Although the effect of overtime hours might reflect stress experienced when one is under pressure of work, this is something that does not seem to be a feature for doctors (GPs and hospital doctors).

Table 4.6 looks at happiness and, contrary to the literature, there does not seem to be systematic effects of gender or age. However, the adverse effect of hours for lawyers and accountants support the findings in Table 4.4, although it is not significant for GPs.

Table 4.3 OLS Estimates (pooled model)

VARIABLES	Anxiety	Happiness	Satisfaction	Worthiness
Female	0.107***	0.018	0.020	0.151***
	(0.024)	(0.023)	(0.022)	(0.023)
Age	0.008	-0.021***	-0.051***	-0.020***
	(0.008)	(0.008)	(0.008)	(0.008)
Age2	-0.000	0.000**	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job) *(Accountants reference group)*				
GPs	-0.060	0.115*	0.110*	0.603***
	(0.066)	(0.066)	(0.063)	(0.063)
Hospital doctors	-0.132***	0.138***	0.179***	0.574***
	(0.030)	(0.030)	(0.028)	(0.029)
Lawyers	0.164***	-0.031	-0.081***	0.025
	(0.032)	(0.032)	(0.030)	(0.031)
Hourly wage (log)	-0.028	0.034	0.095***	-0.054**
	(0.024)	(0.024)	(0.022)	(0.023)
Total hours (main & 2nd job)	0.005***	-0.006***	-0.006***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
More hours wanted	0.106**	-0.003	-0.202***	-0.007
	(0.051)	(0.051)	(0.049)	(0.049)
Constant	-0.339**	0.547***	1.132***	0.340**
	(0.168)	(0.167)	(0.159)	(0.161)
Observations	8,011	8,011	8,011	8,011
R-squared	0.013	0.008	0.024	0.066
Adj. R-squared	0.012	0.007	0.023	0.065
F-test	11.520	7.117	22.150	62.920
Prob>F	0.000	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.4 OLS Estimates - Anxiety

	ANXIETY			
VARIABLES	GPs	HOSPITAL DOCTORS	LAWYERS	ACCOUNTANTS
Female	0.172	0.091*	0.225***	0.071**
	(0.165)	(0.052)	(0.062)	(0.030)
Age	-0.045	-0.005	0.018	0.011
	(0.049)	(0.018)	(0.019)	(0.011)
Age2	0.001	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Hourly wage (log)	0.163	-0.004	-0.011	-0.048
	(0.144)	(0.061)	(0.059)	(0.030)
Total hours (main & 2nd jobs)	0.004	0.001	0.012***	0.005***
	(0.006)	(0.002)	(0.003)	(0.001)
More hours wanted	0.280	-0.080	0.180	0.157**
	(0.269)	(0.105)	(0.154)	(0.066)
Constant	-0.150	-0.002	-0.841**	-0.336
	(1.119)	(0.359)	(0.396)	(0.222)
Observations	245	1,595	1,234	4,937
R-squared	0.024	0.006	0.025	0.005
Adj. R-squared	0.000	0.002	0.020	0.004
F-test	0.987	1.530	5.201	4.162
Prob>F	0.434	0.165	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.5 OLS Estimates – Anxiety (no wage)

	ANXIETY			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.291***	0.090*	0.182***	0.098***
	(0.074)	(0.047)	(0.047)	(0.026)
Age	0.046**	-0.014	0.033***	0.015*
	(0.019)	(0.014)	(0.013)	(0.007)
Age2	-0.000**	0.000	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Hourly wage (log)				
Total hours (main & 2nd jobs)	0.006***	0.001	0.009***	0.002**
	(0.002)	(0.002)	(0.002)	(0.001)
More hours wanted	0.246	-0.085	0.160	0.095*
	(0.165)	(0.099)	(0.112)	(0.053)
Constant	-1.731***	0.193	-1.067***	-0.421**
	(0.452)	(0.301)	(0.281)	(0.163)
Observations	904	1,886	2,171	6,849
R-squared	0.028	0.006	0.024	0.005
Adj. R-squared	0.023	0.003	0.022	0.004
F-test	5.237	2.203	10.750	6.914
Prob>F	0.000	0.052	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.6 OLS Estimates - Happiness

	HAPPINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.019	-0.007	-0.090	0.055*
	(0.169)	(0.052)	(0.061)	(0.030)
Age	-0.012	-0.015	-0.029	-0.019*
	(0.050)	(0.018)	(0.018)	(0.011)
Age2	0.000	0.000	0.000	0.000*
	(0.001)	(0.000)	(0.000)	(0.000)
Hourly wage (log)	-0.115	-0.049	0.042	0.072**
	(0.148)	(0.061)	(0.057)	(0.030)
Total hours (main & 2nd jobs)	-0.003	-0.005**	-0.012***	-0.005***
	(0.006)	(0.002)	(0.003)	(0.001)
More hours wanted	-0.260	0.194*	-0.090	-0.049
	(0.276)	(0.105)	(0.150)	(0.066)
Constant	1.069	0.858**	1.147***	0.293
	(1.148)	(0.359)	(0.386)	(0.222)
Observations	245	1,595	1,234	4,937
R-squared	0.02	0.01	0.02	0.01
Adj. R-squared	-0.01	0.01	0.02	0.00
F-test	0.80	2.70	4.97	4.13
Prob>F	0.58	0.01	0.00	0.00

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.7 shows the usual life satisfaction U-shape with age, but the effect of females is not statistically significant (ruling out the wage variable in Table 4.8, females is significant for GPs). The hourly wage effect is positive and significant for lawyers and accountants, but not significantly different from zero for hospital doctors, and strongly (and perversely) significantly negative for GPs. The latter effect is difficult to rationalise, but it might reflect differences in the type of work done by better paid GPs. The 8th report of the NGPWLS (Gibson et al, 2015) posits that 80% of GPs say that they find that unimportant work prevents completion of more important work. One might speculate that it is the higher paid GPs (those who receive higher hourly wage) who carry more administrative responsibility and do more bureaucratic work, while they would rather spend their time seeing patients (which the survey reckons accounts for only 80% of GP time).

Table 4.9 explores the effect on feeling that life is worthwhile. This feeling is much greater for females, in all occupations, although that for GPs is not statistically significant. The negative effect on the wage for GPs is repeated here. The effect of total hours in lawyers and accountants may be driven by hours in main job (basic and overtime), which is confirmed after running the model with the breakdown of hours. In Table 4.10, excluding the hourly wage variable (logs), the coefficient for more hours has a negative effect on worthiness as it would be expected. And it is significant for accountants.

Table 4.7 OLS Estimates - Life Satisfaction

	SATISFACTION			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.162	0.055	-0.042	0.031
	-0.159	-0.049	-0.059	-0.028
Age	-0.009	-0.049***	-0.091***	-0.039***
	-0.047	-0.016	-0.018	-0.01
Age2	0.000	0.001***	0.001***	0.000***
	-0.001	0.000	0.000	0.000
Hourly wage (log)	-0.385***	0.055	0.089	0.133***
	-0.139	-0.057	-0.056	-0.028
Total hours (main & 2nd jobs)	-0.002	-0.003	-0.011***	-0.007***
	-0.005	-0.002	-0.002	-0.001
More hours wanted	-0.081	-0.02	-0.346**	-0.246***
	-0.261	-0.098	-0.146	-0.062
Constant	1.691	1.150***	2.247***	0.795***
	-1.083	-0.337	-0.376	-0.21
Observations	245	1,595	1,234	4,937
R-squared	0.055	0.010	0.048	0.018
Adj. R-squared	0.031	0.006	0.044	0.017
F-test	2.311	2.733	10.420	14.950
Prob>F	0.035	0.012	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.8 OLS Estimates - Life Satisfaction (no wage)

	SATISFACTION			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	-0.164**	0.018	-0.002	0.028
	(0.076)	(0.045)	(0.048)	(0.025)
Age	-0.058***	-0.042***	-0.086***	-0.043***
	(0.020)	(0.013)	(0.013)	(0.007)
Age2	0.001**	0.000***	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Hourly wage (log)				
Total hours (main & 2nd jobs)	-0.007***	-0.001	-0.004***	-0.004***
	(0.002)	(0.002)	(0.002)	(0.001)
More hours wanted	-0.370**	-0.018	-0.315***	-0.292***
	(0.171)	(0.095)	(0.116)	(0.052)
Constant	2.074***	1.115***	2.125***	1.116***
	(0.469)	(0.289)	(0.290)	(0.162)
Observations	904	1,886	2,171	6,849
R-squared	0.029	0.008	0.030	0.014
Adj. R-squared	0.024	0.005	0.028	0.013
F-test	5.419	2.843	13.510	19.140
Prob>F	0.000	0.015	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.9 OLS Estimates - Worthiness

	WORTHINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.214	0.176***	0.170***	0.139***
	(0.150)	(0.048)	(0.064)	(0.028)
Age	0.015	-0.019	-0.005	-0.027***
	(0.045)	(0.016)	(0.019)	(0.010)
Age2	-0.000	0.000	0.000	0.000***
	(0.001)	(0.000)	(0.000)	(0.000)
Hourly wage (log)	-0.280**	0.061	-0.069	-0.042
	(0.131)	(0.056)	(0.060)	(0.028)
Total hours (main & 2nd jobs)	0.008	0.001	-0.005*	-0.004**
	(0.005)	(0.002)	(0.003)	(0.001)
More hours wanted	-0.046	0.019	-0.034	0.000
	(0.245)	(0.097)	(0.158)	(0.063)
Constant	0.741	0.541	0.163	0.477**
	(1.019)	(0.331)	(0.407)	(0.212)
Observations	245	1,595	1,234	4,937
R-squared	0.059	0.013	0.017	0.014
Adj. R-squared	0.035	0.009	0.012	0.013
F-test	2.487	3.474	3.444	11.690
Prob>F	0.024	0.002	0.002	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.10 OLS Estimates – Worthiness (no wage)

	WORTHINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.038	0.119***	0.185***	0.147***
	(0.066)	(0.044)	(0.049)	(0.025)
Age	-0.061***	-0.020	-0.040***	-0.030***
	(0.017)	(0.013)	(0.013)	(0.007)
Age2	0.001***	0.000	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Hourly wage (log)				
Total hours (main & 2nd jobs)	-0.001	0.002	-0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)
More hours wanted	-0.164	0.005	-0.183	-0.147***
	(0.148)	(0.092)	(0.119)	(0.051)
Constant	1.904***	0.673**	0.538*	0.326**
	(0.408)	(0.280)	(0.297)	(0.159)
Observations	904	1,886	2,171	6,849
R-squared	0.018	0.008	0.015	0.017
Adj. R-squared	0.012	0.006	0.012	0.017
F-test	3.269	3.094	6.394	23.920
Prob>F	0.006	0.009	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

A robustness check is included in Appendix 7 expanding the workhorse of the above models to include additional control variables like marital status controls, ethnicity controls and regional and survey year fixed effects. While the effects on some of these additional controls are common in the literature, some are not. The ones that are in the existing literature generate similar effects to the obtained estimates here but are not central to the objective of this chapter. In no case, does the inclusion of the additional covariates make any substantive difference to the central conclusions. Tables A6 to A10 in the Appendix 7 provide estimates of the extended model without the hourly wage variable.

Next, the chapter explores self-reported health problems: work limiting conditions (Table 4.11), hypertension (Table 4.12) and depression (Table 4.13). Since the dependent variables, in these models, are binary, these models make use of a simple probit analysis and report the computed average marginal effects (AME) from those estimates.

In Table 4.11, female lawyers are 4.1% greater to have health problems that limit activity to work than males. The pooled model (last column) suggests that hospital doctors have a -1.7% probability than accountants to suffer from any health problem that limit their activities.

Table 4.11 Average Marginal Effects - Work Limiting Health Condition

Variables	GPs	Hospital doctors	Lawyers	Accountants	Pooled
Female	0.023	0.005	0.041***	0.008	0.015***
	(0.017)	(0.007)	(0.009)	(0.005)	(0.004)
Age	0.004	0.006**	0.002	0.004***	0.004***
	(0.005)	(0.003)	(0.003)	(0.002)	(0.001)
Age2	-0.000	-0.000**	-0.000	-0.000*	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job)					
Accountants					
GPs					0.011
					(0.008)
Hospital doctors					-0.017***
					(0.004)
Lawyers					-0.002
					(0.005)
Total hours (main & 2nd)	-0.000	-0.001**	0.001***	-0.001***	-0.000*
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
More hours wanted	0.070**	0.008	-0.025	-0.019	-0.005
	(0.030)	(0.013)	(0.030)	(0.012)	(0.008)
Observations	904	1,886	2,171	6,849	11,810

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.12 shows estimates for hypertension. Males are more likely to suffer from blood pressure problems than females although the coefficient for GPs is not significant. None of the coefficients reported in the model including all occupations is significant. However, former models that broke down hours in basic, overtime and second job hours provided that the coefficient for hospital doctors was significant about 1.1% higher than accountants. Age is significant meaning that there is a positive correlation between ageing and the likelihood to suffer hypertension problems. This is consistent with that one would expect.

Finally, Table 4.13 contains depression marginal effects. The average marginal effect reported show small changes among occupations (pooled column). Lawyers are 0.7% more likely to have depression than accountants. Coefficients for females are not significant neither extending the model with variables such as more hours or total hours nor with the breakdown of hours (basic, overtime and second job).

Table 4.12 Average Marginal Effects - Hypertension

Variables	GPs	Hospital doctors	Lawyers	Accountants	Pooled
Female	-0.019	-0.031***	-0.028***	-0.014***	-0.020***
	(0.015)	(0.008)	(0.008)	(0.005)	(0.003)
Age	0.012**	0.006**	0.007**	0.007***	0.006***
	(0.006)	(0.003)	(0.003)	(0.002)	(0.001)
Age2	-0.000	-0.000	-0.000*	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job)					
Accountants					
GPs					0.007
					(0.007)
Hospital doctors					0.009
					(0.005)
Lawyers					-0.001
					(0.004)
Total usual hours (main & 2nd)	0.001	-0.000	0.000	-0.000**	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
More hours wanted		0.001		0.010	0.002
		(0.018)		(0.009)	(0.007)
Observations	868	1,886	2,083	6,849	11,810

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table 4.13 Average Marginal Effects - Depression

Variables	GPs	Hospital doctors	Lawyers	Accountants	Pooled
Female	0.010	-0.003	0.008	0.003	0.003
	(0.010)	(0.005)	(0.006)	(0.003)	(0.002)
Age	0.009*	0.001	0.005**	0.002*	0.002***
	(0.005)	(0.002)	(0.002)	(0.001)	(0.001)
Age2	-0.000*	-0.000	-0.000*	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job)					
Accountants					
GPs					0.006
					(0.005)
Hospital doctors					-0.002
					(0.003)
Lawyers					0.007**
					(0.003)
Total usual hours (main & 2nd)	0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
More hours wanted	0.005	0.008	0.007	0.006	0.007*
	(0.019)	(0.008)	(0.014)	(0.005)	(0.004)
Observations	904	1,886	2,171	6,849	11,810

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

4.5. LABOUR SUPPLY AND WELFARE

The raw data suggests that being overworked is much more prevalent than being underworked. Figure 4.5 is, therefore, the empirically more relevant case. Figure 4.2 is a general case, Figure 4.6 is more specific and shows the situation of those wanting to work more hours. Around 20% of doctors are in this position and, on average $h_r - h_0 \approx 10$. Estimates of θ are required, then. This chapter confines to set a theoretical framework for this analysis but the figures below portray the general idea quite well.

The APS data suggests that, although there is a large minority of GPs who would like to work less, there is also some slack for increasing hours, at least for a small minority. The question that arises, then, is how to do this and what it would be the cost. Raising wages overall would clearly generate a large deadweight since this would go to the large majority who do not wish to raise their hours. It would be considerably cheaper to have a nonlinear schedule as in Figure 4.6. However, further work is required to get more reliable estimates before committing to this.

Figure 4.5 The Welfare Effect of Working More than Desired Hours

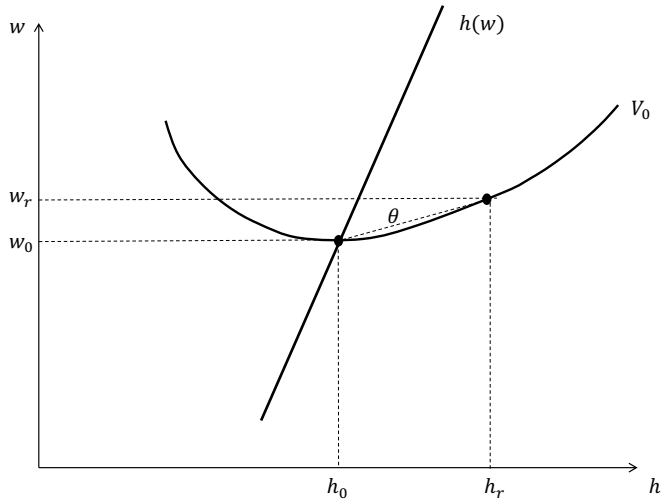
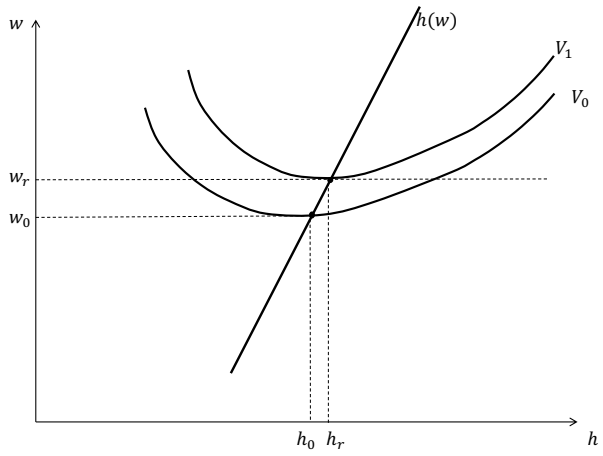


Figure 4.6 Overtime Hours



4.6. CONCLUSION

This chapter explored the relationship between well-being outcomes (anxiety, happiness, satisfaction, worthwhile) and hours of work. This stems from our desire to explore the possibility that there is potential for expansion of the supply of medical services along the intensive margin. Given the large fixed cost of training doctors that are borne almost entirely by taxpayers, exploiting the intensive margin is likely to be a more affordable and inexpensive solution to the perceived shortfall in the supply of GP time and has, so far, been neglected by policymakers.

The chapter addresses some important propositions about the labour market behaviour of doctors. Firstly, doctors are stressed, anxious, have low morale and suffer from depression. This is driven, in part, by occupation considerations such as being overworked. Hence, doctors are to the right of their labour supply curves. However, in the comparative chapter in this thesis (chapter 3) there was no evidence that doctors experience lower well-being than other professionals. Moreover, across all the metrics used, there is still no evidence that the sensitivity of well-being to possible work-related drivers is any greater for doctors than other professionals.

Controlling for hourly wage rate, across all well-being measures, the effect of hours, at the margin is precisely estimated, and it is large and negative for lawyers and accountants but not significantly different from zero for doctors. This could posit that doctors are “on” their labour supply curves and the other professionals may be overworked, more than doctors. However, as we only have information on hourly wages for salaried GPs this conclusion would be taken with caution. Also, the chapter finds that a rather low proportion of respondents declare that they would like to work longer hours. Those hours accountants and lawyers do, are estimated to have much lower well-being than those who do not say that they want to work more. In contrast, those doctors who say they would like to work more hours have smaller and statistically insignificant loss in well-being to those who say that they do not want to work longer hours.

The policy implication of these results will be that only a modest overtime premium should be enough to elicit a large increase in hours of work for doctors. So, expansion along the intensive margin is likely to be a cheaper solution to the shortage in the supply of physician services than the expansion of the number of trainees. Moreover, since the training period of doctors is very long, and expensive, this alternative solution can be implemented very quickly. New estimates using a larger dataset will be required before further analysis could pursue the policy implications of the methodological work here.

Chapter 5

CONCLUDING REMARKS

5.1. SUMMARY OF THE FINDINGS

This thesis explores the main issues on the labour supply of doctors using secondary data from the LFS. Although policymakers have tackled the perceived shortage of doctors from the extensive margin, expanding the headcount of medical practitioners, no attempt has been done in the UK to understand what underlies from the intensive margin. Also, the little existing evidence relies on data which is granted access from the NHS, which is difficult to access and requires special access. So, this thesis narrows these gaps.

Chapter 2 provides comprehensive and detailed results using the LFS. Because the LFS is the main source available to track changes in the labour market regularly, it makes sense to explore this data widely and test the results obtained with those in the literature. We support our results on the methodological identification of GPs and hospital doctors using the Standard Occupation and Industry classifications. The chapter makes the following contributions: firstly, from the extensive margin, the LFS tracks well the headcount of doctors compared to other sources in England, for example. In the UK, the headcount of GPs and hospital doctors grew 44.50% and 136% respectively.

Secondly, it confirms a fall in the year trends of doctors' weekly hours of work which is consistent with results in the literature. The fall of average weekly hours of work was 30% for GPs and 19% for hospital doctors. Hence, the expansion

of headcount did not restrain the fall in hours of work. However, the stock of hours shows that the expansion of headcount only increased the stock of hours of GPs by 1% whereas the hours supplied by the hospital doctors grew by 91%. Therefore, it is the primary care where there may be more problems.

Thirdly, there is a gap in the hours of work of doctors which confirms that female doctors work, on average, fewer hours than males. In fact, the growing feminisation of the medical profession has not helped to expand the stock of hours although the gender gap in hours shortened. One possible explanation of the low average weekly hours of work of female GPs may be due to growing part-time arrangements, which seems to be preferred for female salaried GPs.

Chapter 3 extends the previous analysis exploring the labour supply over the lifecycle of a representative worker. Using simple labour supply models, it investigates what the main determinants of the labour supply are for doctors by gender breakdown. The chapter confirms that GPs work fewer hours compared with hospital doctors and other occupations. Should the feminisation of the medical careers highly impact on the fall of hours, the chapter tests comparing with the other occupations using the proportion of female workers in 1994 as a counterfactual.

Two reduced-form models are included for this purpose. A parsimonious model reports that native and white workers account for a large difference in hours. So, native and white doctors work fewer hours than lawyers and accountants.

The extended version (model 2) adds some additional covariates such as marital status, regional dummies and children. The results are consistent with the literature too and children highly impact on the hours of work supplied, especially, by female GPs, particularly salaried GPs. The second model (the extended version) clearly conveys the fall in hours for females is mainly explained by childbearing. In their 30s, female doctors (especially salaried GPs) supply fewer hours of work for motherhood reasons and to look after children. However, after that time, they slightly increase their hours of work. The analysis

is complemented with extended versions of the model controlling by cohorts and household characteristics.

On average, over the lifecycle, female GPs work 14 hours less than male GPs and children reduce the total hours of work supplied by females about 2,000 hours over their lifetime compared to the parsimonious model.

Finally, chapter 4 explores the main well-being measures (anxiety, happiness, satisfaction and worth of life) using the Annual Population Survey (APS), which is made up with the most relevant variables from the LFS. The main contribution of this chapter is to explain whether it would be possible to expand the labour supply of doctors from the intensive margin rather than the extensive margin. This would be more cost-and-time efficient than expansion from the extensive margin. So, it is possible to do so by offering an overtime premium to doctors. Though this analysis is still very preliminary and needs more robustness checks.

Well-being measures show the opposite reported in other surveys. UK doctors are stressed but they have less anxiety and are happier, have higher life satisfaction and rank high when they report whether their life is worthwhile. The stress finding may be explained by the overwork feeling continuously reported by doctors. If that is true, doctors may be “off” their labour supply and they could be offer an overtime premium to help them to work their optimal hours. However, this is a weak assumption that was not robust with results in chapter 3.

5.2. POLICY IMPLICATIONS

There are two main conclusions that we can get from our results, though we must be cautious because we did not prove any causal-effect. Firstly, the analysis offers strong evidence to the labour supply, which means to be a starting point to help policymakers in their workforce planning decisions for doctors. Perhaps, it would be worth looking at the intensive margin before deciding to expand the headcount of doctors (extensive margin). they should

consider re-thinking the existing contracts incentivising workers that are “off” their labour supply. Also, the medical profession needs to be more attractive for medical students, so designing a more appropriate contract may help more students to find this occupation more appealing or encourage more females to work at the community level.

Secondly, although it has not been tested yet, overtime hours may be the target to incentivise doctors to work more hours. Hence, a modest overtime premium may help to expand the hours of work of doctors. Therefore, the expansion along the intensive margin could be possible, cheaper and would take less time than increasing the headcount of doctors.

5.3. FUTURE RESEARCH

For future research, we would explore other data sources such as BHPS or Understanding Society. To expand and improve the well-being chapter (Chapter 4), we now are aware that year datasets from 2015 may include the missed fewer hours wanted variable and the household variable that would help us to convert individual data into household data.

There are a few topics that were not included in this thesis and are prospective topics for the author, some are ongoing research. For example, the earnings distribution of doctors needs to be explored to explain how the doctors’ income changed over time. This could be useful for the contract design proposed in the previous section. Secondly, using longitudinal data, it would be worth to look at early retirement decisions or decisions to drop out the labour market because of the high stress they report. Finally, it would be more appropriate to work on an evaluation of the 2003/04 contract and see how it impacted on the labour supply of doctors from the intensive margin. Though we include a simple difference-in-differences (DiD) models in chapter 2, we do not attribute any causal effect to hours of work with this model.

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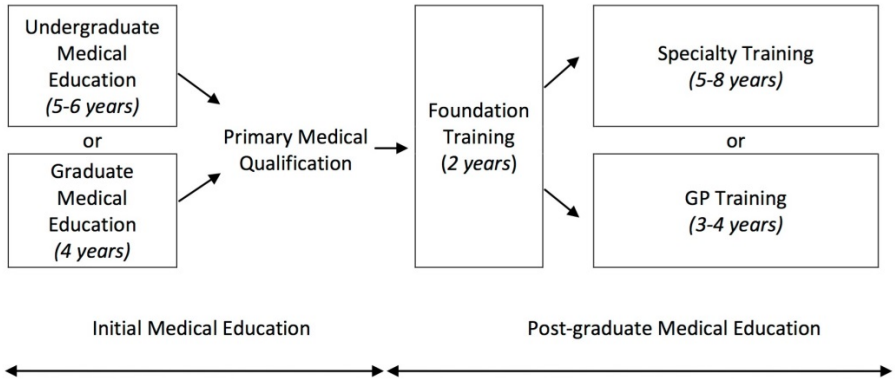
APPENDIX

APPENDIX 1 - MEDICAL CAREERS AND MAIN DEFINITIONS

The figure below summarises medical careers (OECD. 2016).

Medical Education and Training Paths in the UK



There have been some changes since 2005 (see figure below) that introduced some medical postgraduate training (Foundation Programme), increasing the number of years until fully licensed by two.

NHS Medical Career Grades before and after 2005

NHS Medical Career Grades

	Old System		**New System** (*Modernising Medical Careers*)	
Year 1:	Pre-registration House Officer (PRHO) 1 year		Foundation Programme: 2 years	
Year 2:	Senior House Officer (SHO) a minimum of 2 years, although often more.			
Year 3:			Specialty Registrar (StR) in a hospital specialty: 6—8 years	Specialty Registrar (StR) in general practice: 3 years
Year 4:	Specialist Registrar: 4—6 years	GP Registrar: 1 year		
Year 5:				
Years 6-8:		General Practitioner *total time in training: 4 years*		General Practitioner *total time in training: 5 years*
Year 9:	Consultant *total time in training: minimum 7—9 years*		Consultant *total time in training: 8—10 years**	
Optional	*Training may be extended by pursuing medical research (usually two-three years), usually with clinical duties as well*		*Training may be extended by obtaining an Academic Clinical Fellowship for research, or a Clinical Fellowship for sub-specialisation. *due to competition for consultant posts, it may take longer than 8 years to gain Consultant status .*	

Definitions of each of those categories can be found in DDRB reports included in the bibliography[44].

[44] Sources: DDRB reports 31 (2001) to 43(2014), NHS, GMC and BMJ.

APPENDIX 2 – NATIONAL GP WORKLIFE SURVEYS (NGPWLS)

Survey year	Sample size (n)	Data collection	Response rate	Publication
1998	1,817 GPs (1987) 1,474 males (81%) 343 females (19%) 917 GPs (1990) 670 males (73%) 243 females (26%) 1,828 GPs (1998) 1,232 males (67%) 596 females (33%)	Cooper et al from UMITS (University of Manchester Institute Technology) in 1987 and 1990. In 1998, NPCRDC (National Primary Care Research and Development Centre).	45% in 1987 (1,817/4,000) 61% in 1990 (915/1,500) 49% in 1998 (1,828/3,734)	Sibbald B, Enzer I, Cooper C, Rout U, Sutherland V. General practitioner job satisfaction in 1987, 1990 and 1998: lessons for the future. Family Practice 2000; 17: 364-371.
2003	790 GPs (1998) 1,159 GPs (2001)	Random sample 1,848 GPs in England from the 1999 database from Department of Health (DoH).	47% in 1998 (974/2,064 sample in 1998. Only 790 were valid) 56% in 2001 (1,159/2,064)	Sibbald B, Bojke C, Gravelle H. Job satisfaction and retirement among general practitioners in England. British Medical Journal 2003; 326: 22-26.
2004	1,035 GPs (2004) 660 males (64.1%) 369 females (35.9%)	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester The University of York Questionnaire collection Phone interview (100 GPs)	74.4% in 2004 (1,451/1,950 cross-sectional) 415 in blank (21.3%) 1,036 completes (53.1%) 1,035 usable (53.1%) 67.9% in 2001 (1,533/2,258) 54.3% in 2004 (1,226/2,258)	Whalley D, Bojke C, Gravelle H, Sibbald B. 2004 National Survey of General Practitioner Job Satisfaction in England, Spring 2005. Report to the Department of Health.
2005	892 GPs (cross-section) 456 males (55.6%) 390 females (43.7%) 1,378 GPs (longitudinal) 885 males (65.3%) 470 females (34.7%)	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester The University of York Questionnaire collection Approval from The University of Manchester Research Ethical Committee	44.6% (892/2,000) (cross-section) 64.9% (1,378/2,122) 20 excluded (completed by different GP) 1,358 usable (64%)	Whalley D, Gravelle H, Sibbald B. 2005 National survey of general practitioner job satisfaction. Interim Report for Department of Health. January 2006(b). Whalley D, Gravelle H, Sibbald B. Impact of the new general medical services contract on general practitioners' job satisfaction and perceptions of quality of care in the UK, British Journal of General Practice, 2008, 58, 8-14.
2009	1,304 (cross-section) 732 males (56.1%) 572 females (43.9%) 1,366 (longitudinal)	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester Random sample from GMS Statistics maintained by the DoH	44.15% cross-section (1,304/2,953) 69.65% longitudinal (1,366/1,961)	Hann M, Goudie R, Sutton M, Gravelle H, Sibbald B. Fifth National GP Worklife Survey. Final Report for the Department of Health. July 2009.
2011	1,405 overall 1,040 in England 564 males (55.2%) 458 females (44.8%) 18 unknown 231 in Wales 138 males (60.8%) 89 females (39.2%) 4 unknown 69 males (51.5%) 65 females (48.5%) 18 unknown	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester Questionnaire sent out to 4,185 GPs in England (3,000), Wales (750) and Scotland (435)	33.9% (1,405/4,185) 34.9% in England (1,040/2,980) 31.1% in Wales (231/743) 31.5% in Scotland (134/425)	Hann M, Reeves D, Sibbald B. Relationships between job satisfaction, intentions to leave family practice and actually leaving among family physicians in England. European Journal of Public Health 2011; 21(4): 499-503. Hann M, Santos R, Sutton M, Gravelle H, Sibbald B. Sixth National GP Worklife Survey. Final Report to the Department of Health. July 2011. Hann M, Sibbald B. General Practitioners' attitudes towards patients' health and work. Final Report for Health Work and Well-being Delivery Unit. March 2011.
2013	1,189 GPs cross-sectional 2,015 GPs longitudinal	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester	39.7% (1,189/2,995) cross-sectional 61.5% (2,015/3,274) longitudinal	Hann M, McDonald J, Checkland K, Coleman A, Gravelle H, Sibbald B, Sutton M. Seventh National GP Worklife Survey. Final Report to the Department of Health. August 2013.
2015	1,172 GPs cross-sectional 1,576 GPs longitudinal	NPCRDC (National Primary Care Research and Development Centre) funded by DoH. The University of Manchester	34.3% (1,172/3,420) cross-sectional 63.7%	Gibson J, Checkland, K, Coleman, A, Hann M, McCall R, Spooner S, Sutton M. Eight National GP Worklife Survey. Final Report to the

APPENDIX 3 – AVERAGE HOURS BY 5-YEAR INTERVAL

		GPs				Hospital doctors			
		Average weekly hours	Standard deviation	N	%	Average weekly hours	Standard deviation	N	%
MALES	1994-1998	54.00	23.22	1,432	29.06%	58.07	18.36	1,975	22.25%
	1999-2003	48.25	19.66	1,090	22.12%	53.84	17.64	2,083	23.47%
	2004-2008	45.17	16.34	1,191	24.17%	49.02	15.26	2,140	24.11%
	2009-2014	44.20	16.73	1,215	24.66%	48.11	13.85	2,679	30.18%
	Total	48.18	19.79	**4,928**		51.89	16.66	**8,877**	
FEMALES	1994-1998	39.96	19.22	626	18.38%	49.81	19.75	978	17.55%
	1999-2003	36.69	16.99	788	23.14%	46.90	17.33	1,208	21.67%
	2004-2008	34.23	14.33	841	24.70%	43.06	15.20	1,350	24.22%
	2009-2014	33.18	12.94	1,150	33.77%	43.27	12.85	2,038	36.56%
	Total	35.50	15.75	**3,405**		45.16	16.02	**5,574**	
				8,333				**14,451**	

APPENDIX 3.1. – DECOMPOSITION DISTRIBUTION OF HOURS (2ND, 3RD AND 4TH MOMENTS)

GENERAL PRACTITIONERS

	1994-1998			1999-2003			2004-2008			2009-20014		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
N	1,432	626	2,058	1,090	788	1,878	1,191	841	2,032	1,215	1,150	2,365
Mean	54.00	39.96	49.73	48.25	36.69	43.40	45.17	34.23	40.64	44.20	33.18	38.84
Standard deviation	23.22	19.22	23.01	19.66	16.99	19.44	16.34	14.33	16.45	16.73	12.94	15.99
Variance	539.39	369.40	529.26	386.55	288.50	377.80	267.07	205.34	270.48	279.99	167.46	255.55
Standard error (mean)	0.61	0.77	0.51	0.60	0.61	0.45	0.47	0.49	0.36	0.48	0.38	0.33
Skewness	-0.47	0.10	-0.21	-0.60	0.13	-0.22	-0.53	-0.06	-0.22	-0.47	0.07	-0.04
Kurtosis	3.11	2.59	2.74	3.72	2.85	3.01	4.88	3.35	3.84	4.49	3.21	3.67
AVERAGE HOURS BY PERCENTILE												
p1	0	3	0	0	0	0	0	0	0	0	0	0
p5	6	7	6	5	10	7	10	8	8	8	14	10
p10	16	15	15	18	14	15	24	16	18	20	18	18
p25	45	26	36	40	24	30	40	25	30	40	24	29
p50	56	40	51.5	50	37.25	46	47	35	42	46	32	40
p75	70	55	64	60	50	56	55	44.5	50	54	42	50
p90	80	64	79	70	60	65	60	50	60	60	50	58
p95	90	70	85	75	62	71	67	56	64	66	55	62
p99	97	86	97	95	78	90	85	69	80	87	67	80

HOSPITAL DOCTORS

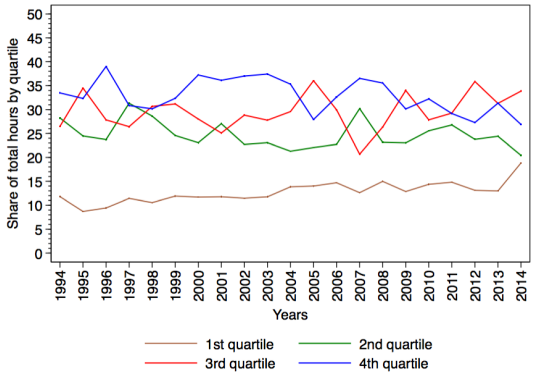
HOSPITAL DOCTORS Distribution Total Hours in Main & Second job

	1994-1998			1999-2003			2004-2008			2009-20014		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
N	1,975	978	2,953	2,083	1,208	3,291	2,140	1,350	3,490	2,679	2,038	4,717
Mean	58.07	49.81	55.34	53.84	46.90	51.29	49.02	43.06	46.71	48.11	43.27	46.02
Standard deviation	18.36	19.75	19.23	17.64	17.33	17.84	15.26	15.20	15.51	13.85	12.85	13.64
Variance	337.04	390.16	369.62	311.03	300.24	318.15	232.93	230.90	240.48	191.77	165.18	185.99
Standard error (mean)	0.41	0.63	0.35	0.39	0.50	0.31	0.33	0.41	0.26	0.27	0.28	0.20
Skewness	-0.21	-0.29	-0.27	-0.70	-0.08	-0.45	-0.79	-0.55	-0.66	-1.03	-0.72	-0.83
Kurtosis	4.09	3.04	3.70	4.97	3.55	4.15	6.35	3.82	5.13	6.92	4.71	5.79
AVERAGE HOURS BY PERCENTILE												
p1	0	0	0	0	0	0	0	0	0	0	0	0
p5	35	10	21	16	18	16	15.5	13	14	22	21	22
p10	40	23.5	36	39	24	30	38	24	28	38	27.5	30
p25	46	40	45	45	38	42	42	36	40	42	38	40
p50	56	49	54.25	55	46	52	50	45	48	48.5	45	48
p75	72	64	70	64	58	60	56	54	56	55	51	54
p90	81.5	75	80	72	70	72	64	60	62	61	58	60
p95	90	80	86	80	75	79.5	70	64	68	68	60	65
p99	101	90	99	96	89	94	90	75	82	80	70	78

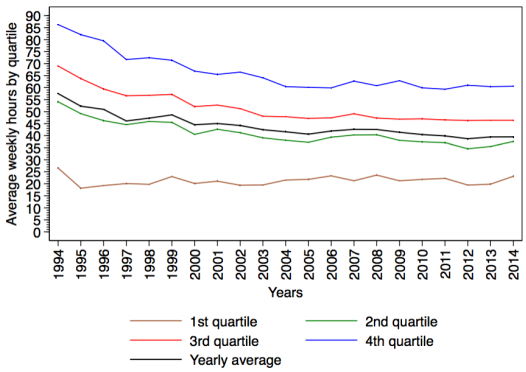
APPENDIX 3.2. – DISTRIBUTION OF HOURS BY QUARTILES (SHARE)

GENERAL PRACTITIONERS

SHARE

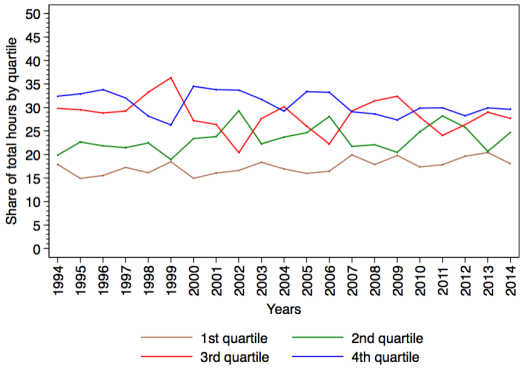


AVERAGE HOURS

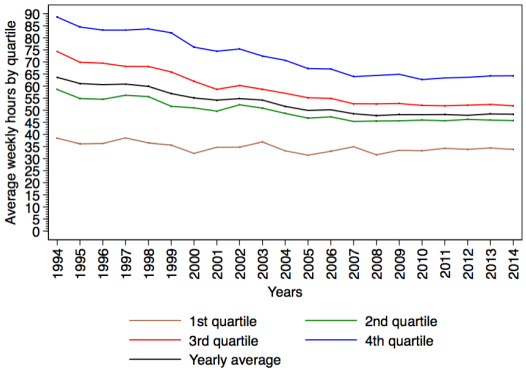


HOSPITAL DOCTORS

SHARE



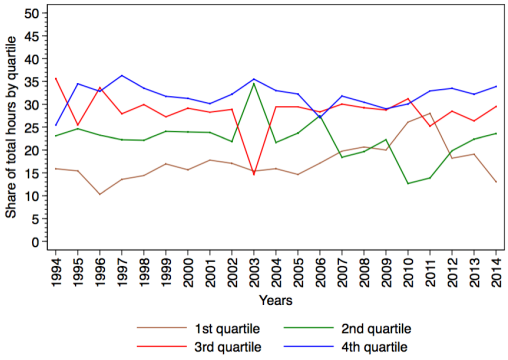
AVERAGE HOURS



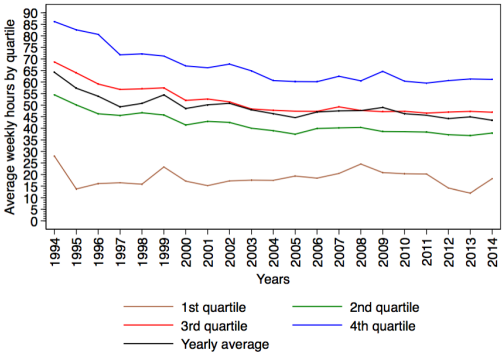
MALES

GPs (proportion over total male GPs)

SHARE

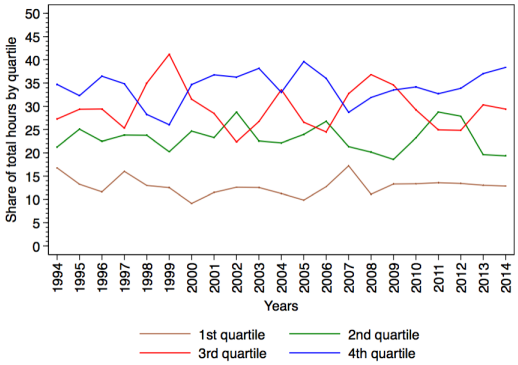


AVERAGE HOURS

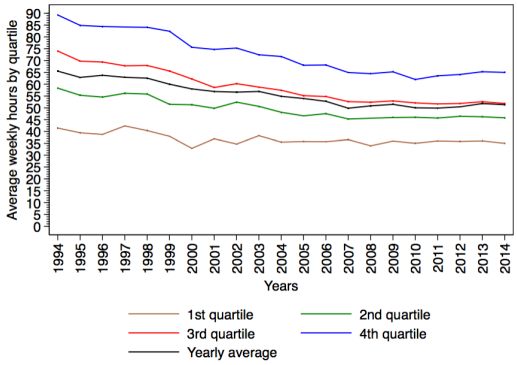


Hospital doctors (proportion over total male Hospital doctors)

SHARE

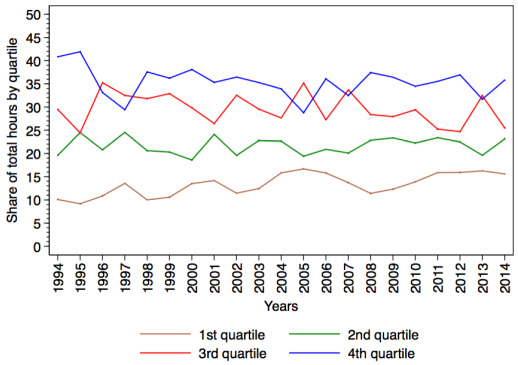


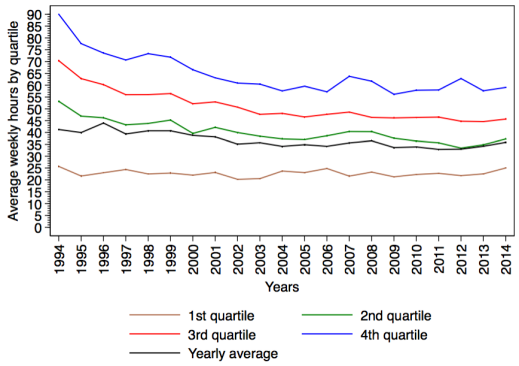
AVERAGE HOURS



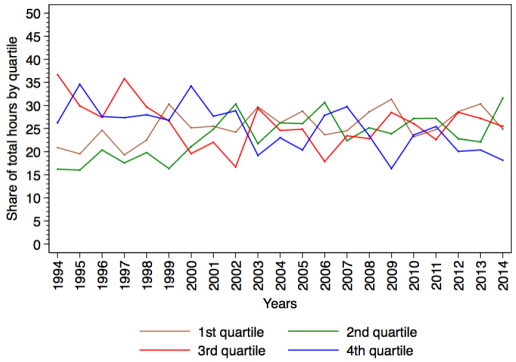
FEMALES

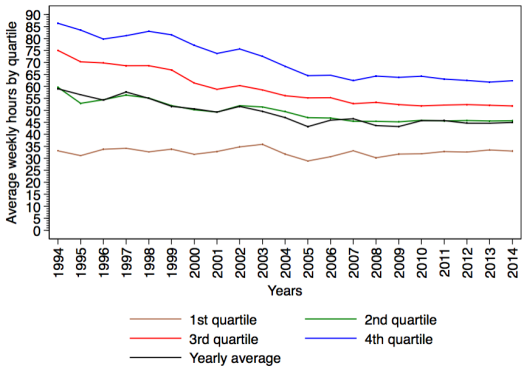
GPs (proportion over total female GPs)





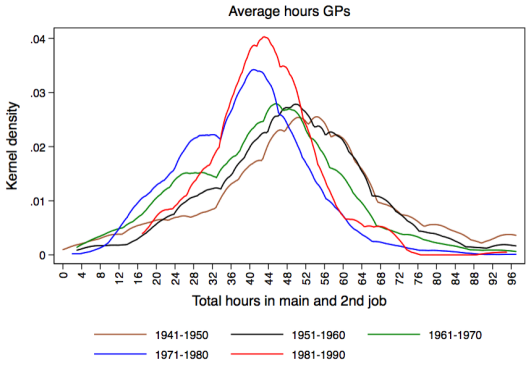
Hospital doctors (proportion over total female Hospital doctors)



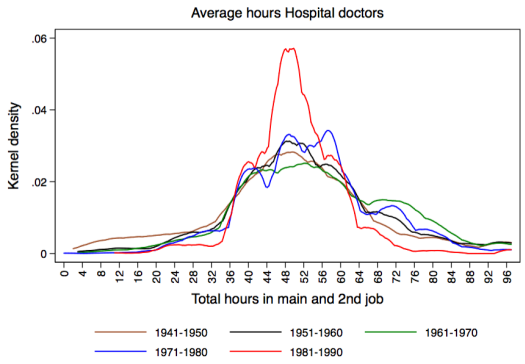


APPENDIX 3.3. – KERNEL DENSITIES TOTAL WEEKLY HOURS (COHORT ANALYSIS)

GPs

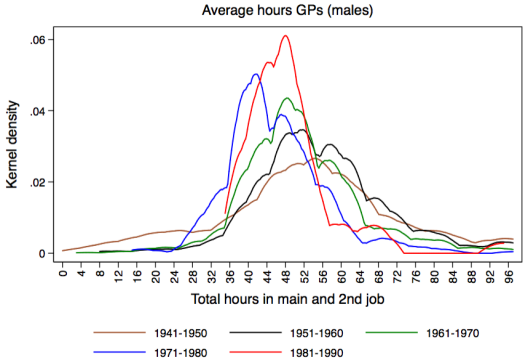


HOSPITAL DOCTORS

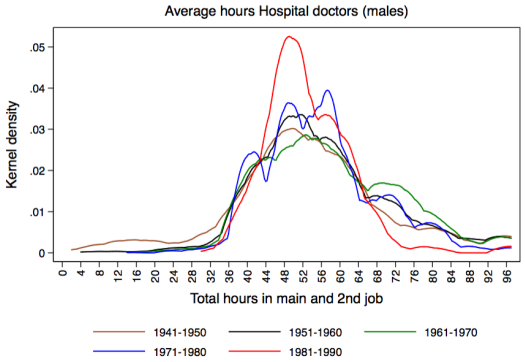


MALES

GPs

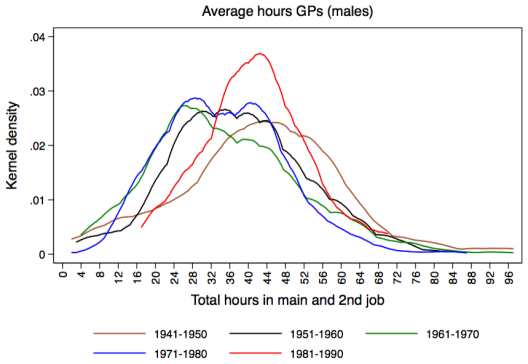


HOSPITAL DOCTORS

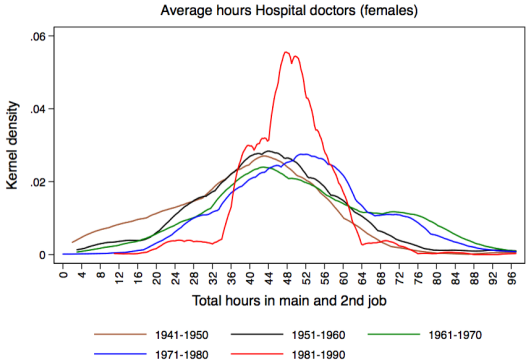


FEMALES

GPs



HOSPITAL DOCTORS



GPs

	Cohort 5 1941-1950			Cohort 6 1951-1960			Cohort 7 1961-1970			Cohort 8 1971-1980			Cohort 9 1981-1990		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
N	1,061	278	1,339	1,637	953	2,590	1,146	1,168	2,314	408	710	1,118	49	183	232
Mean	47.71	38.88	45.88	54.11	36.89	47.77	50.63	34.38	42.43	44.58	34.17	37.96	48.42	40.53	42.19
Standard deviation	22.96	19.48	22.56	16.11	15.36	17.88	13.54	15.94	16.88	12.50	13.05	13.79	10.06	12.68	12.57
Variance	527.28	379.36	509.11	259.53	235.84	319.67	183.29	254.15	284.98	156.34	170.33	190.22	101.25	160.73	158.09
Standard error (mean)	0.70	1.17	0.62	0.40	0.50	0.35	0.40	0.47	0.35	0.62	0.49	0.41	1.44	0.94	0.83
Skewness	-0.16	-0.02	-0.08	-0.27	0.00	-0.13	0.18	0.50	0.08	-0.22	0.24	0.06	2.33	-0.37	-0.15
Kurtosis	2.91	3.04	2.90	5.51	3.16	3.80	5.85	3.42	3.37	7.30	3.25	3.88	10.84	3.98	5.09
AVERAGE HOURS BY PERCENTILE															
p5	5	4	5	31	8	18	32	9	14	30	15	16	38	20	20
p10	12	8	12	40	20	25	39	15	20	33	18	20	40	25	26
p25	35	26	32	45	27	39	44	24	30	40	25	29	43	33	36
p50	50	40	50	54	37	50	50	32	44	44.5	34	40	47	40	42
p75	60	52.5	60	61	47	60	57	45	52	50	43	46	51.5	48	49
p90	76	60	72	72	56	70	66	55	60	58	50	55	60	56	58
p95	84	65	84	80	60	75	75	62	70	63.25	55	60	68	60	65

HOSPITAL DOCTORS

	Cohort 5 1941-1950			Cohort 6 1951-1960			Cohort 7 1961-1970			Cohort 8 1971-1980			Cohort 9 1981-1990		
	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL	MALES	FEMALES	TOTAL
N	1,030	360	1,390	1,997	881	2,878	2,874	1,690	4,564	2,173	1,789	3,962	465	753	1,218
Mean	50.08	38.07	46.97	53.19	42.60	49.95	53.30	45.33	50.35	52.20	48.25	50.42	50.50	46.29	47.89
Standard deviation	20.72	16.66	20.44	16.63	15.92	17.12	16.32	16.06	16.67	13.37	15.54	14.52	13.08	12.36	12.80
Variance	429.49	277.68	417.65	276.40	253.50	293.14	266.33	257.81	277.94	178.69	241.43	210.83	171.03	152.87	163.86
Standard error (mean)	0.65	0.88	0.55	0.37	0.54	0.32	0.30	0.39	0.25	0.29	0.37	0.23	0.61	0.45	0.37
Skewness	-0.33	-0.11	-0.17	-0.26	-0.11	-0.18	-0.25	0.09	-0.11	-0.58	-0.18	-0.41	-1.03	-1.42	-1.18
Kurtosis	3.82	3.31	3.56	5.27	3.80	4.48	5.36	3.60	4.41	6.74	4.16	5.16	9.85	8.13	8.66
AVERAGE HOURS BY PERCENTILE															
p5	3	8	6	30	13.5	20	35	20	24	38	24	28	38	24	27
p10	20	12.875	18	40	24	31	40	26	33	40	30	36	40	37	38
p25	42	27	38	45	34	41	45	37	41	45	40	42	46	41	44
p50	50	40	48	52	44	50	52	45	50	51	48	50	50	48	48
p75	60	50	59	60	52	60	61	54	60	60	57	58	58	53	54
p90	75	58	70	72	60	70	72	68	72	70	69	70	62	58	60
p95	84	60.25	80	80	65	79	80	73	80	73	72	72	66	60	65

APPENDIX 4 – MODEL 2 OLS COEFFICIENTS

MALES

Total hours (main & 2nd)	GP Partners	GP Salaried	Hospital doctors	Lawyers	Accountants
Age	4.432***	2.950***	1.539***	1.713***	1.968***
	(0.273)	(0.458)	(0.170)	(0.105)	(0.064)
Age2	-0.052***	-0.037***	-0.020***	-0.021***	-0.025***
	(0.003)	(0.005)	(0.002)	(0.001)	(0.001)
Native	-2.480***	2.796	2.003***	-0.450	-1.353***
	(0.845)	(1.841)	(0.400)	(0.423)	(0.224)
White	-3.082***	-1.706	-0.031	1.896***	2.086***
	(0.951)	(1.944)	(0.404)	(0.461)	(0.227)
Married	7.680***	2.993	-1.977***	2.193***	2.003***
	(1.214)	(1.859)	(0.503)	(0.319)	(0.177)
London & SE	-0.793	1.112	-0.445	2.010***	0.958***
	(0.559)	(1.326)	(0.336)	(0.213)	(0.135)
Children under 19					
One	2.025**	3.063	0.342	0.654*	0.399*
	(0.830)	(2.375)	(0.571)	(0.380)	(0.235)
Two	-0.582	-1.982	0.449	-1.134***	-0.089
	(0.904)	(2.971)	(0.668)	(0.417)	(0.246)
Three or more	0.355	-0.200	1.186	-0.646	0.172
	(1.148)	(3.685)	(0.853)	(0.477)	(0.267)
Child aged 0-4	-2.050***	-5.669***	-1.553***	-1.136***	-0.968***
	(0.785)	(2.012)	(0.499)	(0.339)	(0.207)
Child aged 05-09	-1.214*	-3.368*	-0.928**	0.570*	0.268
	(0.661)	(1.869)	(0.461)	(0.315)	(0.194)
Child aged 10-15	1.107	2.926	0.711	1.686***	0.878***
	(0.746)	(2.229)	(0.562)	(0.368)	(0.227)
Year 1995	-3.840**	-23.479***	-2.234*	0.905	0.041
	(1.558)	(6.161)	(1.260)	(0.642)	(0.461)
Year 1996	-7.862***	-17.309***	-0.572	2.283***	0.677
	(1.607)	(5.566)	(1.267)	(0.664)	(0.436)
Year 1997	-12.663***	-13.895**	-2.716**	2.118***	-0.371
	(1.579)	(5.555)	(1.345)	(0.633)	(0.452)
Year 1998	-12.143***	-13.593**	-1.822	1.838***	0.106
	(1.575)	(6.016)	(1.248)	(0.599)	(0.449)
Year 1999	-9.347***	-17.900***	-3.489***	1.626***	-0.123
	(1.498)	(5.525)	(1.184)	(0.604)	(0.438)
Year 2000	-13.212***	-21.429***	-5.706***	0.490	-0.722*
	(1.792)	(5.211)	(1.209)	(0.640)	(0.427)
Year 2001	-13.360***	-19.283***	-5.584***	0.105	-0.564
	(1.581)	(6.332)	(1.315)	(0.677)	(0.517)
Year 2002	-13.949***	-16.799***	-6.099***	0.034	-1.581***
	(1.537)	(5.705)	(1.198)	(0.656)	(0.452)
Year 2003	-16.572***	-18.980***	-4.930***	0.652	-1.385***
	(1.707)	(4.918)	(1.196)	(0.648)	(0.433)

…continues Males

Year 2004	-16.613***	-20.290***	-7.080***	-0.541	-1.398***
	(1.562)	(5.188)	(1.234)	(0.678)	(0.483)
Year 2005	-18.037***	-22.728***	-8.772***	-1.309**	-2.195***
	(1.516)	(5.209)	(1.144)	(0.657)	(0.454)
Year 2006	-16.981***	-17.787***	-9.028***	0.255	-1.348***
	(1.507)	(5.141)	(1.143)	(0.662)	(0.446)
Year 2007	-17.423***	-19.050***	-11.805***	-0.174	-1.448***
	(1.541)	(5.414)	(1.115)	(0.649)	(0.446)
Year 2008	-17.293***	-19.115***	-10.948***	1.354**	-0.553
	(1.428)	(5.000)	(1.086)	(0.660)	(0.463)
Year 2009	-16.150***	-14.518***	-9.805***	0.153	-1.427***
	(1.666)	(5.309)	(1.085)	(0.693)	(0.464)
Year 2010	-16.792***	-20.588***	-10.525***	1.046	-1.603***
	(1.564)	(4.982)	(1.103)	(0.693)	(0.447)
Year 2011	-19.554***	-18.458***	-10.655***	0.656	-0.543
	(1.603)	(5.081)	(1.083)	(0.736)	(0.423)
Year 2012	-16.545***	-25.176***	-10.639***	1.052	-1.237***
	(1.613)	(5.200)	(1.101)	(0.710)	(0.413)
Year 2013	-16.288***	-26.583***	-9.750***	1.342*	-0.912**
	(1.671)	(5.312)	(1.113)	(0.688)	(0.428)
Year 2014	-16.082***	-20.111***	-9.962***	1.643**	-0.913**
	(1.699)	(5.217)	(1.148)	(0.751)	(0.407)
Constant	-26.683***	9.245	34.410***	10.684***	5.866***
	(6.321)	(10.801)	(3.507)	(2.170)	(1.317)
N	3,992	662	8,217	11,688	25,047
R2	0.307	0.265	0.136	0.096	0.142
Adj. R2	0.301	0.228	0.132	0.0939	0.141
F-test	41.03	7.694	31.48	26.68	75.73
Prob>F	0	0	0	0	0

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

FEMALES

Total hours (main & 2nd)	GP Partners	GP Salaried	Hospital doctors	Lawyers	Accountants
Age	3.116***	-1.628***	0.902***	1.492***	0.838***
	(0.361)	(0.474)	(0.194)	(0.147)	(0.108)
Age2	-0.035***	0.014**	-0.016***	-0.020***	-0.013***
	(0.004)	(0.006)	(0.002)	(0.002)	(0.001)
Native	1.542	-5.783***	-0.735	-1.632***	-1.297***
	(1.052)	(1.263)	(0.523)	(0.421)	(0.288)
White	-7.487***	-1.853	-2.368***	0.701*	0.892***
	(1.255)	(1.170)	(0.523)	(0.396)	(0.285)
Married	-2.706***	-2.467**	-2.717***	-0.974***	-0.804***
	(1.010)	(1.138)	(0.489)	(0.273)	(0.202)
London & SE	1.869***	-0.975	0.960**	1.076***	0.843***
	(0.685)	(0.835)	(0.419)	(0.253)	(0.190)
Children under 19					
One	-2.325**	0.232	-1.508**	-4.106***	-1.907***
	(1.163)	(1.542)	(0.743)	(0.486)	(0.368)
Two	-7.095***	-4.986***	-3.785***	-5.039***	-5.253***
	(1.202)	(1.512)	(0.858)	(0.616)	(0.434)
Three or more	-8.752***	-5.687***	-3.523***	-2.891***	-3.094***
	(1.618)	(1.829)	(1.023)	(0.480)	(0.420)
Child aged 4	-1.799*	-6.748***	-6.798***	-4.687***	-5.230***
	(1.073)	(1.380)	(0.695)	(0.505)	(0.370)
Children aged 05-09	-4.065***	-3.991***	-1.757***	-4.522***	-3.418***
	(0.871)	(1.264)	(0.651)	(0.473)	(0.344)
Children aged 10-15	2.198**	4.285***	-1.915**	-1.409**	-1.447***
	(1.055)	(1.528)	(0.751)	(0.552)	(0.413)
Year 1995	-3.417	-6.946	0.896	-0.639	-1.337
	(2.413)	(6.166)	(2.048)	(1.039)	(0.829)
Year 1996	-3.153	2.165	0.815	1.013	0.337
	(2.543)	(4.628)	(1.913)	(0.931)	(0.719)
Year 1997	-6.117***	0.816	4.065**	2.244**	0.200
	(2.273)	(4.192)	(1.964)	(1.012)	(0.743)
Year 1998	-5.116*	-6.943	1.825	1.993**	-0.684
	(2.677)	(4.710)	(1.820)	(0.971)	(0.723)
Year 1999	-4.885**	-5.943	0.363	1.878*	-2.135***
	(2.366)	(3.914)	(1.743)	(0.964)	(0.729)
Year 2000	-7.146***	-3.391	-0.101	2.524***	-0.768
	(2.292)	(4.603)	(1.787)	(0.968)	(0.741)
Year 2001	-7.971***	-6.530	0.957	2.571**	-1.206
	(2.356)	(4.068)	(1.830)	(1.021)	(0.769)
Year 2002	-8.028***	-8.278**	1.886	0.964	-1.444**
	(2.238)	(3.960)	(1.746)	(0.964)	(0.721)
Year 2003	-10.512***	-10.106***	-0.151	1.582*	-1.844**
	(2.218)	(3.744)	(1.723)	(0.937)	(0.718)

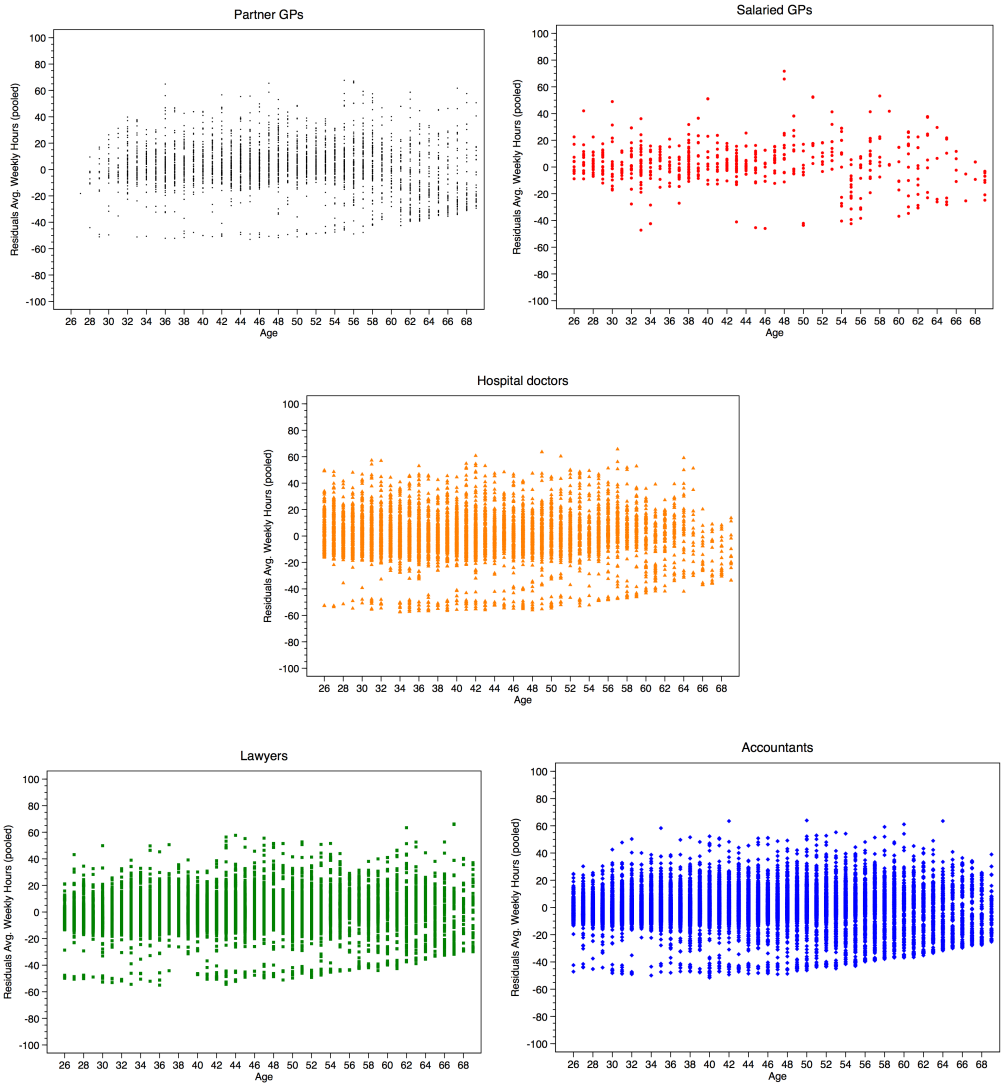
…continues Females

Year 2004	-10.424***	-10.405***	-2.894*	1.509	0.710
	(2.249)	(3.910)	(1.721)	(0.998)	(0.749)
Year 2005	-8.043***	-8.301**	-3.804**	1.704*	-0.038
	(2.245)	(3.598)	(1.682)	(1.006)	(0.712)
Year 2006	-12.786***	-7.319**	-1.535	1.078	-1.533**
	(2.135)	(3.699)	(1.636)	(0.985)	(0.678)
Year 2007	-12.169***	-7.421**	-1.101	0.311	-0.594
	(2.359)	(3.744)	(1.601)	(0.919)	(0.673)
Year 2008	-10.500***	-4.432	-2.595	1.995**	-1.948***
	(2.338)	(3.811)	(1.617)	(0.901)	(0.699)
Year 2009	-12.214***	-12.170***	-1.674	1.501	-2.128***
	(2.251)	(3.562)	(1.615)	(0.924)	(0.704)
Year 2010	-13.321***	-6.564*	-0.672	1.160	-1.519**
	(2.213)	(3.521)	(1.615)	(0.911)	(0.701)
Year 2011	-14.984***	-8.147**	-1.768	1.235	-0.896
	(2.249)	(3.504)	(1.624)	(0.963)	(0.681)
Year 2012	-15.267***	-6.864**	-1.876	2.146**	-0.609
	(2.276)	(3.450)	(1.593)	(0.912)	(0.664)
Year 2013	-12.059***	-6.162*	-1.317	1.636*	-1.210*
	(2.320)	(3.518)	(1.561)	(0.934)	(0.648)
Year 2014	-10.098***	-6.366*	-1.809	1.874**	0.138
	(2.272)	(3.556)	(1.585)	(0.936)	(0.647)
Constant	-8.532	94.327***	43.951***	17.836***	30.109***
	(8.026)	(10.196)	(4.085)	(2.940)	(2.149)
N	2,223	1,070	4,931	8,194	12,373
R2	0.158	0.345	0.216	0.160	0.185
Adj. R2	0.146	0.325	0.211	0.156	0.183
F-test	13.63	20.45	40.95	46.96	89.09
Prob>F	0	0	0	0	0

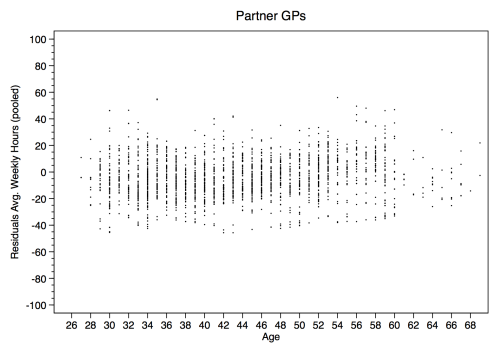
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

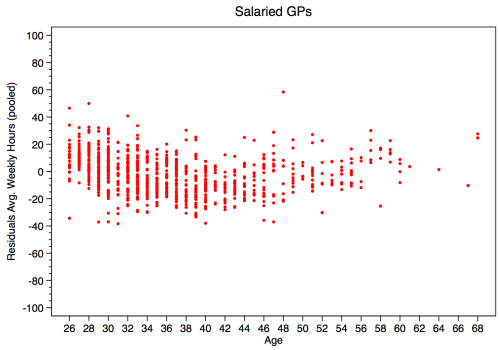
APPENDIX 4.1 – OLS RESIDUALS (extended model)

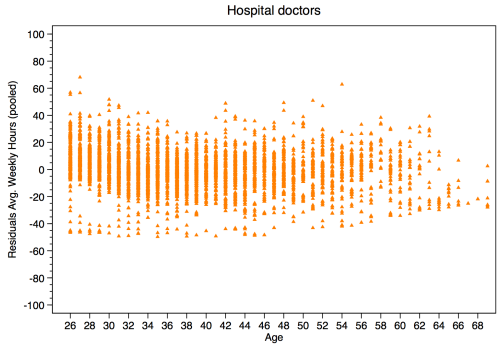
MALES (pooled models)

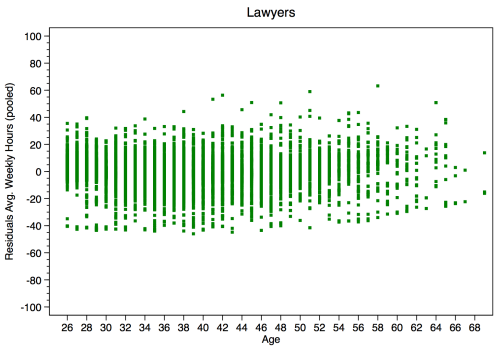


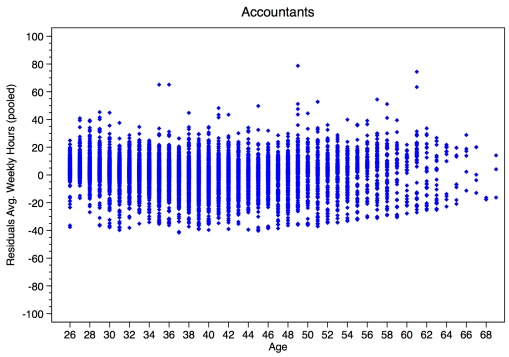
FEMALES (pooled models)



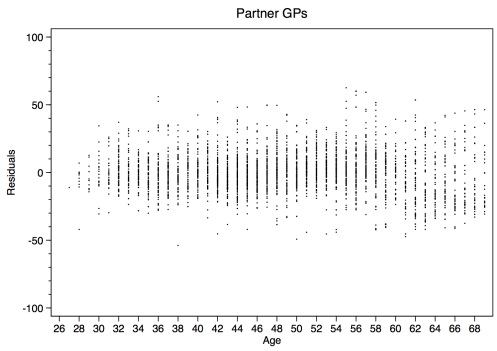


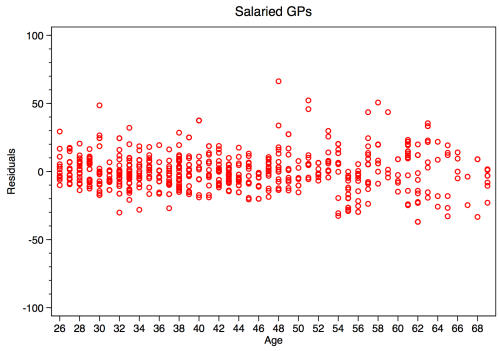


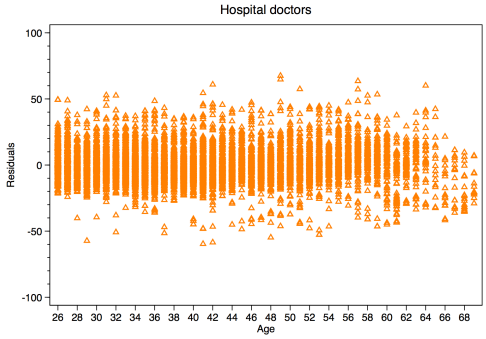


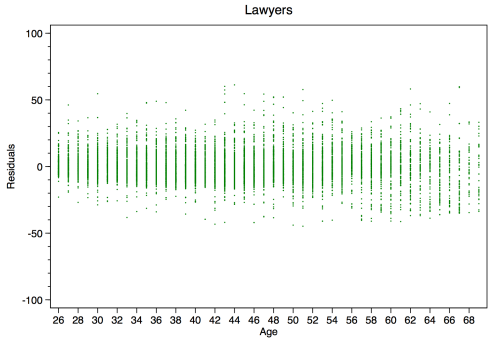


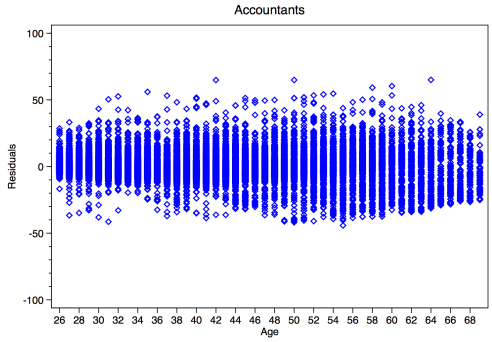
MALES (conditioned model)



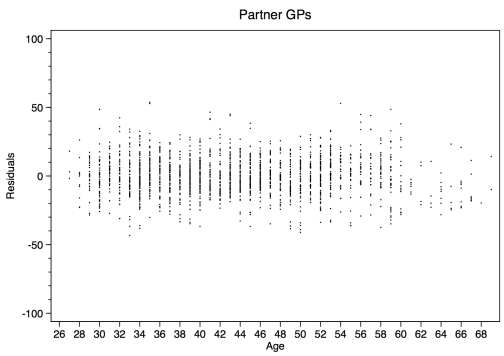


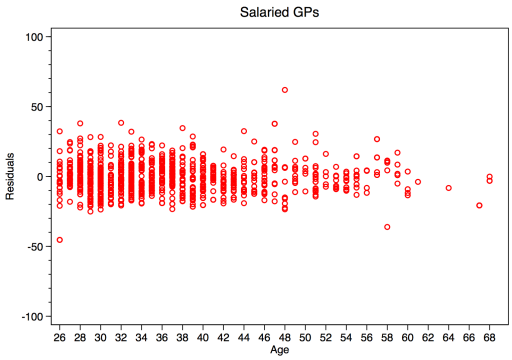


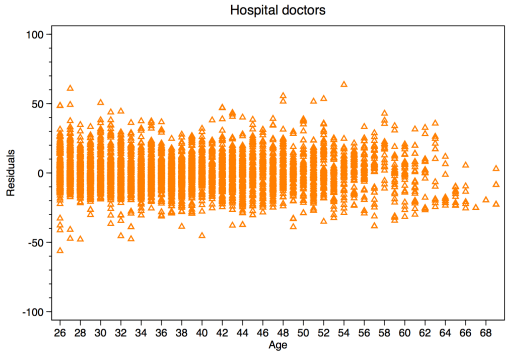


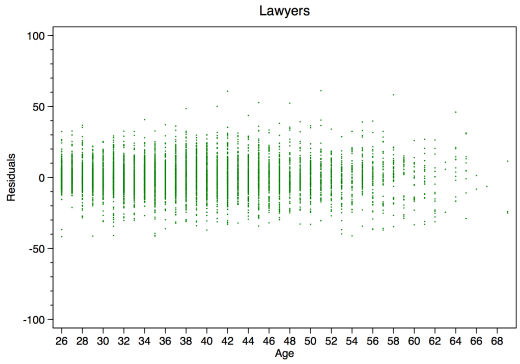


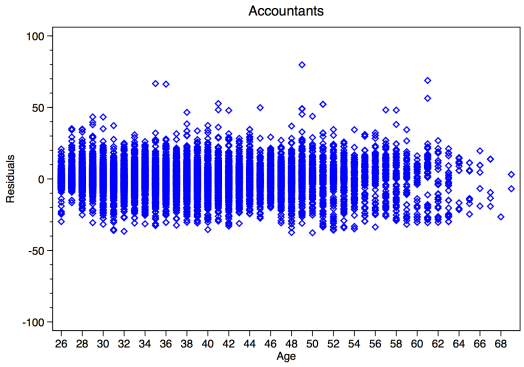
FEMALES (conditioned model)











APPENDIX 5 – PREDICTED AVERAGE HOURS (EXTENDED MODEL)

MALES

Age	GP Partner	C.I. (95%)		GP Salaried	C.I. (95%)		Hospital doctor	C.I. (95%)		Lawyers	C.I. (95%)		Accountants	C.I. (95%)	
30	51.31	48.93	53.68	46.59	45.13	48.06	55.29	54.80	55.77	47.06	46.86	47.26	43.71	43.61	43.82
35	53.84	52.70	54.98	47.24	44.67	49.82	54.97	54.52	55.43	48.79	48.63	48.95	45.68	45.58	45.78
40	57.92	56.82	59.01	50.79	47.86	53.71	55.09	54.61	55.56	50.06	49.88	50.24	46.83	46.72	46.93
45	56.73	55.65	57.81	49.68	47.55	51.80	54.23	53.71	54.75	50.47	50.29	50.65	46.51	46.41	46.61
50	56.45	55.51	57.39	50.16	47.69	52.63	52.92	52.36	53.48	49.12	48.93	49.31	44.65	44.55	44.75
55	48.79	47.93	49.65	39.83	37.70	41.96	49.97	49.35	50.59	46.34	46.14	46.54	40.93	40.83	41.02
60	41.93	40.81	43.04	35.94	32.27	39.62	45.50	44.62	46.38	42.88	42.62	43.13	36.46	36.34	36.57
65	31.31	30.45	32.17	30.44	26.04	34.84	40.85	38.81	42.89	37.91	37.63	38.18	30.62	30.45	30.79

FEMALES

Age	GP Partner	C.I. (95%)		GP Salaried	C.I. (95%)		Hospital doctor	C.I.	(95%	Lawyers	C.I. (95%)		Accountants	C.I. (95%)	
30	38.24	36.94	39.54	38.92	37.61	40.23	50.15	49.46	50.84	43.29	42.85	43.72	40.66	40.37	40.96
35	36.47	35.26	37.68	28.48	26.30	30.66	45.64	44.66	46.61	40.75	40.17	41.33	37.17	36.69	37.65
40	35.78	34.63	36.94	27.12	24.83	29.41	43.40	42.50	44.30	39.46	38.86	40.06	36.26	35.77	36.75
45	36.27	35.00	37.54	28.74	27.28	30.20	43.20	42.31	44.10	39.71	39.16	40.26	36.98	36.48	37.48
50	39.00	37.73	40.27	31.84	30.44	33.23	41.50	40.68	42.31	40.92	40.40	41.44	36.89	36.42	37.36
55	37.66	36.58	38.74	30.09	28.46	31.73	39.63	38.94	40.33	40.29	39.86	40.72	35.97	35.49	36.45
60	35.93	33.49	38.37	32.24	25.86	38.63	34.76	34.00	35.52	36.15	35.75	36.55	33.48	33.11	33.85
65	32.29	29.57	35.02	36.61	-	-	29.18	28.11	30.24	31.99	31.20	32.78	29.58	28.86	30.31

APPENDIX 6 – EXTENDED COHORT MODEL

Total hours (main & 2nd)	POOLED MODEL	CONDITIONED MODELS									
		MALES					FEMALES				
		Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants	Partner GPs	Salaried GPs	Hospital doctors	Lawyers	Accountants
Occupation											
Partner GPs	4.610***										
	(0.366)										
Salaried GPs	0.531										
	(0.530)										
Hospital doctors	7.431***										
	(0.294)										
Lawyers	3.833***										
	(0.223)										
Accountants	-										
	-										
Female	-7.958***										
	(0.206)										
Native	-1.332***	-3.105*	2.252	2.998**	-4.380***	-1.541	0.434	-2.260	-2.292*	1.119	-1.548
	(0.453)	(1.681)	(2.583)	(1.215)	(1.290)	(1.005)	(2.016)	(2.159)	(1.345)	(1.196)	(1.253)
White	-0.118	-1.859	-1.427	-1.029	4.800***	3.063***	-6.602***	-4.636**	-4.158***	1.743	-0.538
	(0.509)	(2.012)	(2.615)	(1.217)	(1.546)	(1.155)	(2.527)	(2.154)	(1.371)	(1.351)	(1.315)
Married	-1.293***	6.593***	2.746	-1.195	1.163	-1.102	-4.435**	-0.572	-5.081***	-1.116	-1.422*
	(0.374)	(2.028)	(2.849)	(1.258)	(0.945)	(0.906)	(1.755)	(1.878)	(1.185)	(0.825)	(0.838)
Live London & South East	-2.025***	-3.926	-7.282*	0.737	-2.014	0.688	2.188	1.583	0.011	-2.809*	-0.674
	(0.679)	(2.490)	(4.325)	(2.064)	(1.644)	(1.248)	(2.327)	(2.958)	(3.719)	(1.697)	(1.258)
Work London & South East	2.644***	3.833	9.311**	-1.159	3.254*	0.681	0.604	-2.644	1.600	5.822***	0.798
	(0.707)	(2.698)	(4.556)	(2.235)	(1.673)	(1.274)	(2.480)	(3.182)	(3.796)	(1.729)	(1.317)
Number of children & Age youngest children under 16											
1 child & age youngest child 0-2	5.444	8.693	-3.520	33.082***	-10.231	7.748	6.194	-3.015	-3.688	-8.595***	-15.143*
	(4.825)	(16.691)	(2.997)	(11.108)	(9.243)	(8.559)	(15.243)	(3.485)	(18.945)	(1.756)	(8.781)
1 child & age youngest child 2-4	0.024	1.790	108.329	18.798	1.837	16.514*	-0.837	-6.543	-14.812	-23.795**	-1.124
	(4.620)	(19.105)	(72.269)	(12.256)	(9.408)	(9.197)	(18.701)	(18.315)	(18.653)	(11.027)	(2.084)
1 child & age youngest child 5-9	0.919	-	132.219*	16.806*	5.312	-1.432	-6.629	-6.179	-7.947	-9.132	4.969
	(3.602)	-	(69.594)	(8.694)	(6.438)	(5.913)	(11.903)	(21.927)	(16.815)	(9.986)	(8.465)
1 child & age youngest child 10-15	0.089	20.873	16.302	-	-	-	-	-42.741	-	15.380	21.222*
	(0.767)	(14.989)	(12.593)	-	-	-	-	(67.378)	-	(13.874)	(12.135)
2 children & age youngest child 0-2	1.793	-3.063	13.428	-4.217	9.967*	3.685	1.756	-3.520	9.412*	-4.766	6.356
	(1.787)	(6.459)	(9.365)	(2.923)	(5.504)	(2.892)	(5.567)	(7.738)	(5.117)	(8.089)	(6.368)
2 children & age youngest child 2-4	-0.829	-3.786	11.313	-4.266	-4.471	-	-0.031	-5.133	0.616	1.025	7.931*
	(1.737)	(5.200)	(9.616)	(7.187)	(4.401)	-	(6.533)	(7.206)	(5.184)	(7.188)	(4.517)
2 children & age youngest child 5-9	-2.095**	-0.953	3.663	-4.982	-0.716	1.124	-4.818	-6.621	3.971	-0.131	3.942
	(1.012)	(2.777)	(6.789)	(5.650)	(3.658)	(2.454)	(4.729)	(6.269)	(3.392)	(3.952)	(2.707)
2 children & age youngest child 10-15	-0.380	-	-	3.228	-	2.640	-	-	-	-	-
	(0.927)	-	-	(6.536)	-	(4.572)	-	-	-	-	-
3+ children & age youngest child 0-2	-3.146	1.852	-137.744	-2.341	-0.019	-1.662	-10.174**	-35.364*	-17.763**	25.896*	-7.683
	(2.073)	(15.459)	(85.836)	(5.332)	(3.972)	(2.052)	(4.319)	(18.794)	(7.091)	(13.760)	(19.767)
3+ children & age youngest child 2-4	-1.243	-2.090	-132.442	-2.340	9.913	-2.577	-3.173	-32.956*	-21.784**	33.566***	3.979
	(2.184)	(16.309)	(86.447)	(8.427)	(8.037)	(3.440)	(6.966)	(18.189)	(10.012)	(10.227)	(21.276)
3+ children & age youngest child 5-9	-0.433	4.537	-130.162	4.353	15.990*	-5.375	-4.118	-26.610	-23.777**	19.016**	-8.713
	(1.197)	(16.278)	(84.510)	(7.682)	(8.235)	(3.591)	(7.864)	(18.121)	(9.809)	(8.622)	(20.399)
3+ children & age youngest child 10-15	2.253	-4.929	-149.150*	7.544	19.490**	-6.376	-0.519	-	-4.988	-	-14.626
	(2.267)	(16.217)	(86.210)	(7.881)	(8.916)	(5.374)	(8.695)	-	(13.296)	-	(23.099)
Number of children & Age eldest children under 16											
1 child & age eldest child 0-2	-7.562	-10.513	-	-31.063***	12.227	-6.895	-7.432	-	-2.849	-	10.959
	(4.892)	(17.025)	-	(11.170)	(9.387)	(8.782)	(15.961)	-	(19.058)	-	(8.927)
1 child & age eldest child 2-4	-5.797	-5.598	-109.799	-29.736**	0.042	-17.163*	-3.105	-4.821	1.042	19.962*	-
	(4.752)	(19.216)	(72.484)	(12.511)	(10.111)	(9.321)	(19.522)	(17.425)	(19.038)	(10.983)	-
1 child & age eldest child 5-9	-2.728	7.053	-134.436*	-20.230**	-3.226	-0.288	-4.054	1.666	4.448	5.690	-13.691*
	(3.772)	(7.171)	(70.371)	(9.775)	(6.872)	(6.445)	(12.636)	(21.040)	(17.305)	(9.474)	(7.965)
1 child & age eldest child 10-15	-	-10.952	-17.624	-2.066	3.239*	0.247	1.339	42.407	-1.911	-21.640	-23.658**
	-	(14.480)	(12.090)	(1.793)	(1.848)	(1.836)	(2.340)	(66.501)	(2.136)	(13.696)	(11.797)
2 children & age eldest child 0-2	-7.431***	3.068	-18.394*	-	-11.235*	-6.002*	-2.231	-16.775**	-12.990*	-	-16.931**
	(2.184)	(7.352)	(10.807)	-	(5.832)	(3.246)	(9.742)	(8.133)	(7.581)	-	(6.951)
2 children & age eldest child 2-4	-6.901***	2.897	-17.274*	-2.408	-10.601*	2.128	-9.786	-18.249**	-17.476***	-12.003	-15.869**
	(2.017)	(6.592)	(9.791)	(5.909)	(5.745)	(4.011)	(6.198)	(8.081)	(5.686)	(9.748)	(6.839)
2 children & age eldest child 5-9	-2.892**	5.938	-16.965**	5.576	1.506	0.954	-5.111	-6.025	-10.691**	-6.516	-16.542***
	(1.414)	(4.894)	(8.392)	(4.693)	(4.088)	(1.949)	(5.438)	(6.908)	(4.692)	(9.427)	(3.094)
2 children & age eldest child 10-15	-	4.603*	-5.669	2.650	1.028	-0.583	1.697	-1.006	-11.455***	-7.312	-6.861***
	-	(2.504)	(5.741)	(5.943)	(2.553)	(3.684)	(2.577)	(3.063)	(2.778)	(5.265)	(2.072)
3+ children & age eldest child 0-2	2.238	-	-	-	8.420	-	-20.491	67.896	1.042	-26.387*	-
	(3.579)	-	-	-	(12.150)	-	(13.498)	(101.162)	(14.321)	(14.538)	-
3+ children & age eldest child 2-4	-2.279	5.062	146.015*	0.002	-	-9.388***	-	14.244	-	-30.710**	-20.896
	(3.531)	(23.531)	(85.615)	(9.405)	-	(3.040)	-	(19.207)	-	(14.167)	(27.282)
3+ children & age eldest child 5-9	-2.304	2.793	136.205	6.574	-8.050	5.191*	-4.543	15.033	16.531*	-41.178***	-13.369
	(2.269)	(16.009)	(85.641)	(5.589)	(8.539)	(2.785)	(4.865)	(18.383)	(9.491)	(11.108)	(20.113)
3+ children & age eldest child 10-15	-	-0.001	129.502	-3.559	-13.197*	8.559**	-0.257	23.424	21.263**	-14.001*	7.317
	-	(16.016)	(85.506)	(6.954)	(7.828)	(3.447)	(7.808)	(17.431)	(8.966)	(7.753)	(20.683)

… continues

Cohorts											
Cohort 1941-1945	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-
Cohort 1946-1950	0.570	-0.606	-3.378	0.265	-0.306	0.279	-2.252	11.701	2.239	0.763	0.035
	(0.652)	(2.180)	(5.872)	(1.875)	(1.439)	(0.973)	(3.273)	(7.839)	(2.407)	(2.318)	(2.900)
Cohort 1951-1955	0.695	-0.978	-5.427	-2.120	0.635	-1.154	-2.463	3.387	3.734	3.255	1.659
	(0.633)	(2.117)	(6.123)	(1.952)	(1.310)	(0.944)	(3.513)	(6.074)	(2.405)	(2.150)	(2.684)
Cohort 1956-1960	-0.313	-3.850*	1.348	-4.664**	-0.253	0.198	-9.037***	0.461	5.586**	2.560	0.239
	(0.668)	(2.200)	(6.871)	(1.987)	(1.395)	(0.969)	(3.395)	(5.610)	(2.458)	(2.295)	(2.687)
Cohort 1961-1965	-2.025***	-9.865***	-9.292	-8.588***	-1.111	-0.154	-9.633***	-0.251	4.563*	1.340	1.215
	(0.694)	(2.355)	(7.063)	(2.161)	(1.453)	(0.981)	(3.587)	(6.255)	(2.512)	(2.254)	(2.728)
Cohort 1966-1970	-2.487***	-12.965***	-6.686	-10.333***	-1.920	0.114	-13.505***	-0.871	5.412**	2.547	2.126
	(0.726)	(2.432)	(7.028)	(2.117)	(1.649)	(1.057)	(3.676)	(6.552)	(2.639)	(2.278)	(2.774)
Cohort 1971-1975	-3.225***	-17.279***	-10.923	-12.549***	-1.864	-1.042	-14.285***	-0.257	4.134	3.053	2.134
	(0.749)	(2.582)	(7.208)	(2.211)	(1.605)	(1.133)	(3.834)	(6.440)	(2.672)	(2.306)	(2.836)
Cohort 1976-1980	-4.814***	-22.605***	-15.232**	-18.403***	-1.246	-0.503	-21.005***	-4.373	1.929	3.055	-0.126
	(0.799)	(3.654)	(7.539)	(2.361)	(1.732)	(1.178)	(4.291)	(6.592)	(2.748)	(2.353)	(2.958)
Constant	26.393***	16.810***	43.570***	20.205***	22.310***	22.560***	25.989***	61.633***	29.551***	26.816***	32.744***
	(1.305)	(3.541)	(10.808)	(4.607)	(2.975)	(2.027)	(5.025)	(2.629)	(7.089)	(4.167)	(5.043)
N	14,606	1,211	392	1,818	2,202	2,878	800	457	1,356	1,643	1,849
R2	0.32	0.497	0.540	0.314	0.312	0.478	0.287	0.491	0.350	0.228	0.222
Year dummies	No	No	No	No	No	No	No	No	No	No	No
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cohort dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

APPENDIX 7 – ROBUSTNESS CHECK

Table A1 OLS estimates (POOLED MODEL)

VARIABLES	Anxiety	Happiness	Satisfaction	Worthiness
Female	0.100***	0.040*	0.062***	0.169***
	(0.024)	(0.024)	(0.022)	(0.023)
Age	0.013	-0.040***	-0.077***	-0.050***
	(0.008)	(0.008)	(0.008)	(0.008)
Age2	-0.000	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job)				
(Accountants reference group)				
GPs	-0.046	0.076	0.052	0.536***
	(0.067)	(0.066)	(0.062)	(0.063)
Hospital doctors	-0.124***	0.100***	0.126***	0.512***
	(0.033)	(0.032)	(0.030)	(0.031)
Lawyers	0.154***	-0.019	-0.076**	0.029
	(0.032)	(0.032)	(0.030)	(0.031)
Immigrant	-0.006	0.060*	0.049	0.103***
	(0.033)	(0.032)	(0.030)	(0.031)
Hourly wage (log)	-0.059**	0.034	0.109***	-0.046*
	(0.025)	(0.025)	(0.023)	(0.024)
Basic usual hours (main job)	0.002*	-0.003**	-0.002*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Overtime hours (main job)	0.013***	-0.011***	-0.011***	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)
Actual hours (2nd job)	-0.001	0.004	0.005*	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)
Marital status				
(single reference group)				
Married	-0.019	0.238***	0.303***	0.299***
	(0.028)	(0.028)	(0.026)	(0.026)
Divorced	-0.062	0.152***	0.079*	0.145***
	(0.050)	(0.050)	(0.047)	(0.048)
Separated	-0.012	-0.045	-0.236***	0.090
	(0.071)	(0.071)	(0.066)	(0.068)
Widowed	0.154	0.049	-0.330**	-0.077
	(0.146)	(0.145)	(0.136)	(0.138)
Ethnic group				
(white reference group)				
Black	-0.057	0.074	0.016	0.197**
	(0.081)	(0.080)	(0.075)	(0.077)
Asian	0.065	-0.042	-0.143***	-0.167***
	(0.041)	(0.041)	(0.039)	(0.039)
Other	0.112*	-0.164**	-0.184***	0.015
	(0.068)	(0.067)	(0.063)	(0.064)

Continues ….

Region				
(London reference group)				
North East	-0.075	-0.050	0.093*	0.129**
	(0.058)	(0.058)	(0.054)	(0.055)
North West	-0.077*	0.057	0.083**	0.218***
	(0.045)	(0.045)	(0.042)	(0.043)
Yorkshire and Humberside	-0.045	-0.037	0.015	0.158***
	(0.051)	(0.050)	(0.047)	(0.048)
East Midlands	-0.016	-0.071	0.056	0.213***
	(0.062)	(0.061)	(0.057)	(0.058)
West Midlands	-0.087	-0.040	0.019	0.115**
	(0.054)	(0.054)	(0.050)	(0.051)
Easter	-0.039	-0.002	0.115**	0.199***
	(0.057)	(0.056)	(0.053)	(0.054)
London				
South East	-0.048	0.002	-0.033	0.110***
	(0.042)	(0.041)	(0.039)	(0.039)
South West	-0.057	0.009	0.094**	0.066
	(0.049)	(0.048)	(0.045)	(0.046)
Wales	0.010	-0.015	0.146***	0.191***
	(0.048)	(0.047)	(0.044)	(0.045)
Scotland	-0.137***	0.046	0.170***	0.264***
	(0.043)	(0.043)	(0.040)	(0.041)
Northen Ireland	-0.285***	0.057	0.131	0.096
	(0.102)	(0.101)	(0.095)	(0.097)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	0.030	-0.033	-0.024	-0.031
	(0.030)	(0.029)	(0.028)	(0.028)
FY 2013/14	0.014	0.028	-0.013	0.006
	(0.030)	(0.029)	(0.028)	(0.028)
FY 2014/15	-0.008	0.054*	0.099***	0.064**
	(0.032)	(0.032)	(0.030)	(0.030)
Constant	-0.238	0.768***	1.320***	0.639***
	(0.178)	(0.176)	(0.166)	(0.169)
Observations	7,970	7,970	7,970	7,970
R-squared	0.020	0.025	0.062	0.096
Adj. R-squared	0.016	0.021	0.058	0.092
F-test	5.047	6.277	16.280	26.260
Prob>F	0.000	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A2 OLS estimates – Anxiety (controlling by occupation)

	ANXIETY			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.144	0.139**	0.175***	0.064**
	(0.181)	(0.055)	(0.063)	(0.031)
Age	-0.091*	-0.023	0.021	0.020*
	(0.054)	(0.019)	(0.020)	(0.011)
Age2	0.001*	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)
Immigrant	-0.255	0.164**	-0.184**	-0.003
	(0.220)	(0.064)	(0.093)	(0.043)
Hourly wage (log)	0.169	0.034	-0.046	-0.088***
	(0.155)	(0.064)	(0.064)	(0.032)
Basic usual hours (main job)	-0.001	0.001	0.006	0.003
	(0.007)	(0.003)	(0.004)	(0.002)
Overtime hours (main job)	0.024	0.008**	0.025***	0.012***
	(0.021)	(0.004)	(0.005)	(0.003)
Actual hours (2nd job)	-0.012	0.005	0.010	-0.002
	(0.016)	(0.006)	(0.011)	(0.004)
Marital status				
(single reference group)				
Married	0.069	0.069	-0.029	-0.041
	(0.173)	(0.067)	(0.069)	(0.035)
Divorced	0.675*	-0.028	-0.022	-0.098
	(0.376)	(0.136)	(0.125)	(0.062)
Separated	-0.055	-0.111	0.186	0.014
	(0.311)	(0.174)	(0.198)	(0.090)
Widowed	1.320		-0.604	0.202
	(0.998)		(0.462)	(0.158)
Ethnic group				
(white reference group)				
Black	1.486***	-0.320**	0.007	0.011
	(0.569)	(0.141)	(0.223)	(0.114)
Asian	0.348	-0.004	0.107	0.040
	(0.227)	(0.070)	(0.125)	(0.062)
Other	0.561*	0.019	-0.028	0.124
	(0.310)	(0.102)	(0.264)	(0.104)

Continues ….

Region				
(London reference group)				
North East	0.315	-0.016	0.037	-0.178**
	(0.348)	(0.113)	(0.154)	(0.082)
North West	0.271	-0.168	-0.096	-0.049
	(0.323)	(0.103)	(0.115)	(0.060)
Yorkshire and Humberside	0.297	-0.095	0.023	-0.059
	(0.321)	(0.113)	(0.126)	(0.067)
East Midlands	0.832*	0.073	0.023	-0.104
	(0.429)	(0.144)	(0.155)	(0.079)
West Midlands	0.385	-0.274**	0.118	-0.109
	(0.357)	(0.128)	(0.139)	(0.070)
Easter	0.696*	-0.063	-0.250	-0.040
	(0.388)	(0.142)	(0.160)	(0.070)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	0.459	-0.138	0.090	-0.072
	(0.315)	(0.110)	(0.112)	(0.051)
South West	0.389	-0.164	0.123	-0.088
	(0.325)	(0.112)	(0.129)	(0.062)
Wales	0.367	-0.035	-0.105	0.033
	(0.313)	(0.109)	(0.126)	(0.062)
Scotland	0.162	-0.173	-0.024	-0.173***
	(0.339)	(0.105)	(0.105)	(0.055)
Northen Ireland	-0.067	-0.393*	-0.739**	-0.189
	(0.629)	(0.222)	(0.287)	(0.129)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.174	0.047	-0.113	0.070*
	(0.187)	(0.066)	(0.077)	(0.038)
FY 2013/14	-0.056	-0.004	0.055	0.004
	(0.171)	(0.067)	(0.077)	(0.038)
FY 2014/15	0.072	0.015	-0.085	-0.014
	(0.169)	(0.067)	(0.087)	(0.041)
Constant	0.499	0.255	-0.546	-0.278
	(1.217)	(0.396)	(0.420)	(0.237)
Observations	245	1,585	1,227	4,913
R-squared	0.143	0.027	0.060	0.014
Adj. R-squared	0.027	0.009	0.037	0.008
F-test	1.237	1.535	2.639	2.348
Prob>F	0.198	0.037	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A3 OLS estimates – Happiness

	HAPPINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	-0.093	-0.006	-0.053	0.061**
	(0.185)	(0.054)	(0.061)	(0.030)
Age	-0.020	-0.049**	-0.061***	-0.029***
	(0.055)	(0.019)	(0.019)	(0.011)
Age2	0.000	0.000**	0.001**	0.000**
	(0.001)	(0.000)	(0.000)	(0.000)
Immigrant	-0.019	-0.130**	0.103	0.114***
	(0.226)	(0.064)	(0.090)	(0.043)
Hourly wage (log)	-0.115	-0.071	0.043	0.073**
	(0.159)	(0.064)	(0.062)	(0.032)
Basic usual hours (main job)	-0.004	-0.003	-0.006*	-0.004*
	(0.007)	(0.003)	(0.003)	(0.002)
Overtime hours (main job)	-0.007	-0.004	-0.022***	-0.011***
	(0.021)	(0.004)	(0.004)	(0.003)
Actual hours (2nd job)	0.013	-0.001	-0.007	0.007**
	(0.016)	(0.006)	(0.011)	(0.004)
Marital status				
(single reference group)				
Married	0.432**	0.311***	0.334***	0.176***
	(0.177)	(0.067)	(0.066)	(0.035)
Divorced	-0.229	0.253*	0.361***	0.072
	(0.386)	(0.136)	(0.121)	(0.062)
Separated	-0.043	0.166	0.114	-0.141
	(0.319)	(0.174)	(0.191)	(0.089)
Widowed	1.009		0.356	-0.054
	(1.024)		(0.445)	(0.157)
Ethnic group				
(white reference group)				
Black	0.354	0.167	0.346	-0.058
	(0.584)	(0.141)	(0.215)	(0.114)
Asian	-0.094	0.123*	-0.290**	-0.064
	(0.233)	(0.070)	(0.120)	(0.061)
Other	-0.394	-0.266***	-0.021	-0.028
	(0.318)	(0.101)	(0.254)	(0.104)

Continues ….

Region				
(London reference group)				
North East	-0.230	-0.071	-0.014	-0.025
	(0.357)	(0.113)	(0.149)	(0.082)
North West	-0.112	0.184*	-0.053	0.046
	(0.331)	(0.103)	(0.111)	(0.059)
Yorkshire and Humberside	-0.221	0.044	-0.020	-0.053
	(0.329)	(0.113)	(0.122)	(0.067)
East Midlands	-0.692	-0.100	0.151	-0.104
	(0.440)	(0.144)	(0.150)	(0.079)
West Midlands	-0.316	0.117	-0.150	-0.031
	(0.366)	(0.127)	(0.134)	(0.069)
Easter	-0.151	0.156	0.111	-0.055
	(0.398)	(0.141)	(0.154)	(0.070)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.980***	0.175	-0.022	-0.008
	(0.323)	(0.110)	(0.108)	(0.051)
South West	-0.459	0.123	-0.073	-0.003
	(0.334)	(0.112)	(0.125)	(0.062)
Wales	-0.173	0.109	-0.027	-0.033
	(0.321)	(0.109)	(0.122)	(0.062)
Scotland	-0.459	0.028	0.081	0.070
	(0.348)	(0.105)	(0.101)	(0.055)
Northen Ireland	0.125	0.236	0.309	-0.040
	(0.646)	(0.221)	(0.277)	(0.129)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.196	0.051	-0.046	-0.050
	(0.192)	(0.066)	(0.074)	(0.038)
FY 2013/14	-0.202	0.066	0.074	0.019
	(0.175)	(0.067)	(0.074)	(0.038)
FY 2014/15	-0.103	0.017	0.095	0.066
	(0.173)	(0.067)	(0.084)	(0.041)
Constant	1.563	1.307***	1.477***	0.423*
	(1.249)	(0.395)	(0.405)	(0.236)
Observations	245	1,585	1,227	4,913
R-squared	0.138	0.041	0.073	0.021
Adj. R-squared	0.021	0.024	0.051	0.015
F-test	1.182	2.386	3.253	3.529
Prob>F	0.248	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A4 OLS estimates – Satisfaction

	SATISFACTION			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.052	0.042	0.025	0.067**
	(0.173)	(0.051)	(0.059)	(0.028)
Age	-0.024	-0.056***	-0.125***	-0.064***
	(0.052)	(0.018)	(0.019)	(0.010)
Age2	0.000	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Immigrant	0.099	-0.125**	0.128	0.103**
	(0.211)	(0.060)	(0.087)	(0.040)
Hourly wage (log)	-0.505***	0.019	0.123**	0.160***
	(0.148)	(0.060)	(0.060)	(0.029)
Basic usual hours (main job)	-0.005	-0.001	-0.004	-0.004**
	(0.006)	(0.003)	(0.003)	(0.002)
Overtime hours (main job)	0.021	-0.005	-0.022***	-0.012***
	(0.020)	(0.004)	(0.004)	(0.002)
Actual hours (2nd job)	0.021	0.001	0.005	0.007**
	(0.015)	(0.006)	(0.010)	(0.003)
Marital status				
(single reference group)				
Married	0.348**	0.150**	0.309***	0.336***
	(0.165)	(0.063)	(0.064)	(0.032)
Divorced	-0.063	0.053	0.253**	0.042
	(0.360)	(0.128)	(0.117)	(0.057)
Separated	-0.373	0.189	-0.487***	-0.287***
	(0.297)	(0.164)	(0.184)	(0.083)
Widowed	0.368		0.512	-0.413***
	(0.955)		(0.430)	(0.146)
Ethnic group				
(white reference group)				
Black	-0.436	0.047	0.116	-0.019
	(0.545)	(0.133)	(0.208)	(0.105)
Asian	-0.433**	-0.002	-0.262**	-0.164***
	(0.217)	(0.066)	(0.116)	(0.057)
Other	-0.172	-0.175*	-0.178	-0.068
	(0.297)	(0.095)	(0.245)	(0.096)

Continues ……

Region				
(London reference group)				
North East	0.015	-0.003	0.128	0.169**
	(0.333)	(0.107)	(0.144)	(0.076)
North West	-0.244	0.075	-0.105	0.167***
	(0.309)	(0.097)	(0.107)	(0.055)
Yorkshire and Humberside	0.151	0.037	-0.038	0.014
	(0.307)	(0.106)	(0.118)	(0.062)
East Midlands	0.221	0.019	0.364**	0.012
	(0.410)	(0.135)	(0.145)	(0.073)
West Midlands	-0.172	0.050	-0.045	0.075
	(0.341)	(0.120)	(0.129)	(0.064)
Easter	-0.295	-0.011	0.427***	0.122*
	(0.371)	(0.133)	(0.149)	(0.064)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.535*	0.107	0.100	-0.065
	(0.301)	(0.104)	(0.104)	(0.047)
South West	-0.383	0.238**	0.090	0.064
	(0.311)	(0.105)	(0.120)	(0.057)
Wales	0.117	0.200*	0.027	0.176***
	(0.300)	(0.103)	(0.117)	(0.057)
Scotland	0.003	0.179*	0.166*	0.190***
	(0.324)	(0.099)	(0.098)	(0.051)
Northen Ireland	-0.457	0.185	0.155	0.169
	(0.602)	(0.208)	(0.267)	(0.120)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	0.288	-0.076	-0.056	-0.002
	(0.179)	(0.062)	(0.072)	(0.035)
FY 2013/14	-0.143	0.027	-0.033	-0.007
	(0.163)	(0.063)	(0.072)	(0.035)
FY 2014/15	0.045	0.028	0.168**	0.121***
	(0.162)	(0.063)	(0.081)	(0.038)
Constant	2.437**	1.228***	2.453***	0.925***
	(1.165)	(0.372)	(0.391)	(0.219)
Observations	245	1,585	1,227	4,913
R-squared	0.188	0.034	0.118	0.069
Adj. R-squared	0.078	0.016	0.097	0.064
F-test	1.712	1.946	5.527	12.570
Prob>F	0.017	0.002	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A5 Model 2 - OLS estimates (Worthiness)

	WORTHINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.096	0.171***	0.209***	0.144***
	(0.167)	(0.050)	(0.064)	(0.029)
Age	0.007	-0.045**	-0.048**	-0.053***
	(0.050)	(0.018)	(0.020)	(0.010)
Age2	-0.000	0.000**	0.001**	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Immigrant	-0.110	0.061	0.156*	0.151***
	(0.204)	(0.059)	(0.094)	(0.041)
Hourly wage (log)	-0.319**	0.058	-0.051	-0.021
	(0.143)	(0.058)	(0.064)	(0.030)
Basic usual hours (main job)	0.008	0.000	0.002	-0.004*
	(0.006)	(0.003)	(0.004)	(0.002)
Overtime hours (main job)	0.011	0.006*	-0.010**	-0.002
	(0.019)	(0.004)	(0.005)	(0.002)
Actual hours (2nd job)	0.023	0.011*	-0.017	0.008**
	(0.014)	(0.006)	(0.011)	(0.003)
Marital status				
(single reference group)				
Married	0.341**	0.231***	0.385***	0.288***
	(0.160)	(0.062)	(0.069)	(0.033)
Divorced	-0.019	0.153	0.269**	0.099*
	(0.348)	(0.125)	(0.126)	(0.058)
Separated	-0.190	0.556***	0.037	0.020
	(0.287)	(0.160)	(0.199)	(0.084)
Widowed	1.381		-0.043	-0.131
	(0.923)		(0.464)	(0.148)
Ethnic group				
(white reference group)				
Black	-0.261	-0.012	0.335	0.274**
	(0.527)	(0.130)	(0.224)	(0.107)
Asian	-0.120	-0.187***	-0.204	-0.117**
	(0.210)	(0.064)	(0.125)	(0.058)
Other	-0.219	0.014	0.045	0.066
	(0.287)	(0.093)	(0.265)	(0.098)

Continues…..

Region				
(London reference group)				
North East	-0.111	-0.191*	-0.042	0.384***
	(0.322)	(0.104)	(0.155)	(0.077)
North West	-0.014	0.057	0.047	0.352***
	(0.299)	(0.095)	(0.116)	(0.056)
Yorkshire and Humberside	0.146	0.135	0.119	0.172***
	(0.297)	(0.104)	(0.127)	(0.063)
East Midlands	0.198	-0.025	0.723***	0.165**
	(0.396)	(0.132)	(0.156)	(0.074)
West Midlands	-0.247	0.119	-0.111	0.203***
	(0.330)	(0.117)	(0.140)	(0.065)
Easter	0.216	0.163	0.369**	0.187***
	(0.359)	(0.130)	(0.161)	(0.065)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	0.030	0.106	0.048	0.130***
	(0.291)	(0.101)	(0.113)	(0.048)
South West	-0.007	0.142	-0.040	0.048
	(0.301)	(0.103)	(0.130)	(0.058)
Wales	0.129	0.163	-0.091	0.281***
	(0.290)	(0.100)	(0.127)	(0.058)
Scotland	0.015	-0.010	0.338***	0.343***
	(0.313)	(0.097)	(0.106)	(0.051)
Northen Ireland	0.374	-0.086	-0.121	0.196
	(0.582)	(0.204)	(0.289)	(0.121)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	0.014	-0.057	-0.129*	0.004
	(0.173)	(0.060)	(0.077)	(0.035)
FY 2013/14	-0.203	-0.017	-0.071	0.046
	(0.158)	(0.061)	(0.078)	(0.035)
FY 2014/15	-0.128	0.045	0.040	0.088**
	(0.156)	(0.062)	(0.087)	(0.039)
Constant	0.957	1.006***	0.539	0.649***
	(1.126)	(0.363)	(0.422)	(0.222)
Observations	245	1,585	1,227	4,913
R-squared	0.146	0.048	0.096	0.057
Adj. R-squared	0.031	0.031	0.074	0.051
F-test	1.265	2.829	4.360	10.090
Prob>F	0.175	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A6 Model 3 - OLS estimates (POOLED MODEL)

VARIABLES	Anxiety	Happiness	Satisfaction	Worthiness
Female	0.126***	0.030	0.048**	0.169***
	(0.020)	(0.020)	(0.020)	(0.019)
Age	0.019***	-0.045***	-0.075***	-0.059***
	(0.006)	(0.006)	(0.006)	(0.006)
Age2	-0.000***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Occupation (main job)				
(Accountants reference group)				
GPs	-0.176***	0.099***	0.135***	0.479***
	(0.036)	(0.036)	(0.035)	(0.035)
Hospital doctors	-0.133***	0.110***	0.168***	0.461***
	(0.028)	(0.028)	(0.028)	(0.027)
Lawyers	0.117***	-0.013	-0.039	0.032
	(0.025)	(0.025)	(0.024)	(0.024)
Immigrant	-0.009	0.040	0.027	0.077***
	(0.027)	(0.027)	(0.026)	(0.026)
Hourly wage (log)				
Basic usual hours (main job)	0.002***	-0.003***	-0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Overtime hours (main job)	0.010***	-0.010***	-0.009***	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Actual hours (2nd job)	0.001	0.003	0.005**	0.006**
	(0.002)	(0.002)	(0.002)	(0.002)
Marital status				
(single reference group)				
Married	-0.026	0.215***	0.325***	0.309***
	(0.024)	(0.024)	(0.023)	(0.023)
Divorced	-0.055	0.127***	0.089**	0.184***
	(0.042)	(0.042)	(0.041)	(0.040)
Separated	0.012	-0.044	-0.264***	0.077
	(0.058)	(0.058)	(0.057)	(0.056)
Widowed	0.146	-0.019	-0.345***	0.002
	(0.103)	(0.103)	(0.101)	(0.100)
Ethnic group				
(white reference group)				
Black	-0.108*	0.074	-0.128**	0.065
	(0.064)	(0.064)	(0.063)	(0.062)
Asian	0.049	-0.014	-0.140***	-0.156***
	(0.034)	(0.034)	(0.033)	(0.033)
Other	0.090	-0.103*	-0.171***	0.002
	(0.055)	(0.055)	(0.054)	(0.053)

Continues…

Region				
(London reference group)				
North East	-0.089*	-0.057	0.032	0.106**
	(0.049)	(0.049)	(0.048)	(0.047)
North West	-0.052	0.017	-0.008	0.151***
	(0.037)	(0.037)	(0.036)	(0.035)
Yorkshire and Humberside	-0.054	-0.053	-0.050	0.115***
	(0.042)	(0.042)	(0.041)	(0.041)
East Midlands	-0.078	-0.034	0.075	0.211***
	(0.052)	(0.052)	(0.051)	(0.050)
West Midlands	-0.104**	-0.063	-0.031	0.082**
	(0.043)	(0.043)	(0.042)	(0.042)
Easter	-0.108**	-0.003	0.100**	0.232***
	(0.045)	(0.045)	(0.045)	(0.044)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.065*	-0.010	-0.032	0.096***
	(0.033)	(0.033)	(0.033)	(0.032)
South West	-0.050	0.009	0.069*	0.070*
	(0.040)	(0.040)	(0.039)	(0.038)
Wales	-0.041	0.016	0.102***	0.199***
	(0.039)	(0.039)	(0.038)	(0.038)
Scotland	-0.105***	0.024	0.098***	0.209***
	(0.035)	(0.035)	(0.034)	(0.034)
Northen Ireland	-0.218***	0.172**	0.166**	0.179**
	(0.079)	(0.079)	(0.077)	(0.076)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.011	0.013	-0.002	-0.028
	(0.025)	(0.024)	(0.024)	(0.024)
FY 2013/14	0.007	0.055**	0.026	0.028
	(0.024)	(0.024)	(0.024)	(0.024)
FY 2014/15	-0.050*	0.097***	0.135***	0.073***
	(0.026)	(0.026)	(0.026)	(0.026)
Constant	-0.498***	0.940***	1.536***	0.636***
	(0.126)	(0.126)	(0.124)	(0.122)
Observations	11,747	11,747	11,747	11,747
R-squared	0.021	0.024	0.057	0.084
Adj. R-squared	0.018	0.021	0.054	0.082
F-test	8.109	9.250	22.800	34.820
Prob>F	0.000	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A7 Model 3 - POOLED MODEL - ANXIETY

	ANXIETY			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.280***	0.140***	0.134***	0.097***
	(0.077)	(0.050)	(0.048)	(0.026)
Age	0.048**	-0.026	0.040***	0.020**
	(0.020)	(0.016)	(0.014)	(0.008)
Age2	-0.000**	0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	-0.040	0.121**	-0.146**	-0.005
	(0.099)	(0.059)	(0.068)	(0.036)
Hourly wage (log)				
Basic usual hours (main job)	0.005*	0.001	0.006***	0.001
	(0.003)	(0.003)	(0.002)	(0.001)
Overtime hours (main job)	0.013	0.006*	0.021***	0.007***
	(0.009)	(0.003)	(0.003)	(0.002)
Actual hours (2nd job)	0.006	0.001	0.008	-0.002
	(0.008)	(0.005)	(0.006)	(0.003)
Marital status				
(single reference group)				
Married	-0.113	0.059	-0.055	-0.021
	(0.102)	(0.063)	(0.054)	(0.031)
Divorced	0.003	-0.137	0.006	-0.067
	(0.164)	(0.125)	(0.098)	(0.053)
Separated	-0.380*	-0.007	0.024	0.077
	(0.198)	(0.151)	(0.143)	(0.076)
Widowed	-0.285	-0.180	0.271	0.221*
	(0.306)	(0.989)	(0.252)	(0.125)
Ethnic group				
(white reference group)				
Black	0.441*	-0.325**	-0.302*	-0.010
	(0.263)	(0.132)	(0.154)	(0.089)
Asian	0.044	0.016	0.169*	-0.001
	(0.113)	(0.064)	(0.088)	(0.052)
Other	0.034	0.027	0.142	0.113
	(0.170)	(0.093)	(0.167)	(0.085)

Continues …

Region				
(London reference group)				
North East	0.105	-0.011	-0.124	-0.162**
	(0.178)	(0.106)	(0.117)	(0.071)
North West	0.076	-0.136	-0.064	-0.027
	(0.137)	(0.093)	(0.084)	(0.050)
Yorkshire and Humberside	0.325**	-0.042	-0.014	-0.129**
	(0.157)	(0.103)	(0.100)	(0.057)
East Midlands	0.191	0.130	-0.029	-0.187***
	(0.196)	(0.134)	(0.120)	(0.068)
West Midlands	0.270	-0.277**	-0.035	-0.127**
	(0.181)	(0.110)	(0.103)	(0.056)
Easter	0.213	-0.048	-0.238**	-0.119**
	(0.193)	(0.128)	(0.105)	(0.058)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	0.034	-0.126	0.028	-0.088**
	(0.136)	(0.101)	(0.083)	(0.042)
South West	0.275*	-0.099	0.107	-0.128**
	(0.154)	(0.104)	(0.095)	(0.052)
Wales	0.212	-0.039	-0.171*	-0.043
	(0.143)	(0.099)	(0.094)	(0.052)
Scotland	-0.009	-0.051	0.047	-0.190***
	(0.137)	(0.095)	(0.077)	(0.046)
Northen Ireland	-0.237	-0.148	-0.534***	-0.158
	(0.257)	(0.203)	(0.188)	(0.104)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.147*	0.008	-0.092	0.033
	(0.088)	(0.061)	(0.058)	(0.032)
FY 2013/14	0.072	-0.035	0.036	-0.003
	(0.089)	(0.061)	(0.058)	(0.032)
FY 2014/15	0.027	-0.036	-0.069	-0.064*
	(0.088)	(0.062)	(0.065)	(0.035)
Constant	-1.751***	0.344	-1.051***	-0.406**
	(0.476)	(0.336)	(0.292)	(0.170)
Observations	903	1,870	2,157	6,817
R-squared	0.058	0.022	0.053	0.013
Adj. R-squared	0.028	0.008	0.040	0.009
F-test	1.932	1.509	4.241	3.154
Prob>F	0.003	0.043	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A8 Model 3 - HAPPINESS

	HAPPINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	-0.184**	0.004	0.004	0.064**
	(0.075)	(0.050)	(0.047)	(0.026)
Age	-0.071***	-0.059***	-0.087***	-0.026***
	(0.020)	(0.016)	(0.013)	(0.008)
Age2	0.001***	0.001***	0.001***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.176*	-0.116**	0.079	0.065*
	(0.096)	(0.059)	(0.067)	(0.036)
Hourly wage (log)				
Basic usual hours (main job)	-0.007***	0.001	-0.004**	-0.002*
	(0.002)	(0.003)	(0.002)	(0.001)
Overtime hours (main job)	0.005	-0.004	-0.020***	-0.009***
	(0.009)	(0.003)	(0.003)	(0.002)
Actual hours (2nd job)	0.013	0.000	-0.000	0.004
	(0.008)	(0.005)	(0.006)	(0.003)
Marital status				
(single reference group)				
Married	0.222**	0.320***	0.339***	0.149***
	(0.099)	(0.062)	(0.054)	(0.031)
Divorced	0.209	0.337***	0.247**	0.028
	(0.160)	(0.125)	(0.097)	(0.053)
Separated	-0.136	0.180	0.243*	-0.170**
	(0.193)	(0.151)	(0.142)	(0.076)
Widowed	0.483	1.136	-0.153	-0.150
	(0.298)	(0.987)	(0.251)	(0.125)
Ethnic group				
(white reference group)				
Black	-0.119	0.224*	0.279*	-0.025
	(0.256)	(0.132)	(0.153)	(0.089)
Asian	-0.100	0.124*	-0.298***	0.000
	(0.110)	(0.064)	(0.088)	(0.052)
Other	-0.027	-0.296***	0.013	0.035
	(0.166)	(0.093)	(0.166)	(0.085)

Continues ….

Region				
(London reference group)				
North East	0.005	-0.033	-0.102	-0.061
	(0.173)	(0.105)	(0.116)	(0.072)
North West	-0.111	0.160*	-0.088	0.008
	(0.133)	(0.093)	(0.083)	(0.051)
Yorkshire and Humberside	-0.360**	-0.006	-0.083	-0.003
	(0.153)	(0.102)	(0.099)	(0.058)
East Midlands	-0.374*	-0.180	0.150	-0.029
	(0.191)	(0.134)	(0.120)	(0.068)
West Midlands	-0.243	0.081	-0.197*	-0.030
	(0.176)	(0.110)	(0.102)	(0.057)
Easter	0.113	0.082	0.084	-0.054
	(0.188)	(0.128)	(0.104)	(0.058)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.443***	0.148	-0.034	0.001
	(0.132)	(0.101)	(0.082)	(0.042)
South West	-0.367**	0.119	-0.058	0.030
	(0.150)	(0.104)	(0.095)	(0.052)
Wales	-0.169	0.133	-0.003	0.018
	(0.139)	(0.098)	(0.094)	(0.052)
Scotland	-0.139	0.026	-0.065	0.078*
	(0.133)	(0.095)	(0.076)	(0.046)
Northen Ireland	0.366	0.222	0.361*	0.073
	(0.250)	(0.203)	(0.187)	(0.105)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	0.096	0.039	0.044	-0.017
	(0.086)	(0.061)	(0.058)	(0.032)
FY 2013/14	-0.009	0.068	0.091	0.050
	(0.086)	(0.061)	(0.057)	(0.032)
FY 2014/15	0.055	0.042	0.120*	0.111***
	(0.086)	(0.062)	(0.064)	(0.035)
Constant	2.231***	1.132***	2.031***	0.464***
	(0.463)	(0.335)	(0.290)	(0.170)
Observations	903	1,870	2,157	6,817
R-squared	0.080	0.041	0.069	0.018
Adj. R-squared	0.051	0.026	0.057	0.014
F-test	2.721	2.783	5.651	4.474
Prob>F	0.000	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Same effect on hours. Married does not seem to be hugely affected.

Table A9 Model 3 - SATISFACTION

	SATISFACTION			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	-0.182**	0.022	0.066	0.065***
	(0.079)	(0.048)	(0.048)	(0.025)
Age	-0.066***	-0.061***	-0.115***	-0.065***
	(0.021)	(0.015)	(0.014)	(0.008)
Age2	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.131	-0.072	0.083	0.033
	(0.102)	(0.057)	(0.068)	(0.035)
Hourly wage (log)				
Basic usual hours (main job)	-0.006**	0.003	-0.001	-0.002
	(0.003)	(0.002)	(0.002)	(0.001)
Overtime hours (main job)	-0.018**	-0.005*	-0.016***	-0.008***
	(0.009)	(0.003)	(0.003)	(0.002)
Actual hours (2nd job)	0.007	0.004	0.011*	0.004
	(0.009)	(0.005)	(0.006)	(0.003)
Marital status				
(single reference group)				
Married	0.224**	0.184***	0.414***	0.349***
	(0.105)	(0.060)	(0.054)	(0.030)
Divorced	0.259	0.146	0.079	0.064
	(0.169)	(0.120)	(0.098)	(0.051)
Separated	-0.243	0.192	-0.275*	-0.388***
	(0.204)	(0.145)	(0.144)	(0.074)
Widowed	0.346	-0.301	-0.659***	-0.374***
	(0.315)	(0.947)	(0.254)	(0.121)
Ethnic group				
(white reference group)				
Black	-0.161	0.052	-0.130	-0.208**
	(0.271)	(0.127)	(0.155)	(0.086)
Asian	-0.233**	-0.023	-0.374***	-0.122**
	(0.116)	(0.061)	(0.089)	(0.050)
Other	-0.062	-0.240***	-0.268	-0.046
	(0.176)	(0.089)	(0.169)	(0.082)

Continues….

Region				
(London reference group)				
North East	0.164	0.073	-0.212*	0.087
	(0.183)	(0.101)	(0.118)	(0.069)
North West	-0.290**	0.105	-0.219***	0.085*
	(0.141)	(0.089)	(0.085)	(0.049)
Yorkshire and Humberside	-0.248	0.017	-0.092	-0.016
	(0.162)	(0.098)	(0.100)	(0.056)
East Midlands	0.172	0.011	0.171	0.056
	(0.202)	(0.129)	(0.121)	(0.066)
West Midlands	-0.101	0.043	-0.247**	0.045
	(0.186)	(0.105)	(0.104)	(0.055)
Easter	0.061	-0.048	0.297***	0.099*
	(0.199)	(0.123)	(0.106)	(0.057)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.355**	0.116	0.077	-0.040
	(0.140)	(0.097)	(0.083)	(0.041)
South West	-0.176	0.285***	-0.024	0.070
	(0.159)	(0.099)	(0.096)	(0.051)
Wales	-0.033	0.223**	-0.105	0.143***
	(0.147)	(0.094)	(0.095)	(0.050)
Scotland	-0.116	0.215**	-0.008	0.146***
	(0.141)	(0.091)	(0.077)	(0.045)
Northen Ireland	0.269	0.157	0.330*	0.119
	(0.265)	(0.195)	(0.189)	(0.101)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.025	-0.094	-0.010	0.028
	(0.091)	(0.058)	(0.059)	(0.031)
FY 2013/14	-0.062	0.009	0.007	0.050
	(0.091)	(0.059)	(0.058)	(0.031)
FY 2014/15	0.047	0.045	0.187***	0.173***
	(0.091)	(0.059)	(0.065)	(0.034)
Constant	2.215***	1.212***	2.511***	1.270***
	(0.490)	(0.322)	(0.295)	(0.165)
Observations	903	1,870	2,157	6,817
R-squared	0.071	0.036	0.105	0.059
Adj. R-squared	0.042	0.022	0.093	0.055
F-test	2.399	2.464	8.934	15.090
Prob>F	0.000	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Table A10 Model 3 - WORTHINESS

	WORTHINESS			
VARIABLES	**GPs**	**HOSPITAL DOCTORS**	**LAWYERS**	**ACCOUNTANTS**
Female	0.042	0.114**	0.235***	0.168***
	(0.069)	(0.046)	(0.050)	(0.025)
Age	-0.061***	-0.048***	-0.078***	-0.053***
	(0.018)	(0.015)	(0.014)	(0.008)
Age2	0.001***	0.000***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Immigrant	0.092	0.055	0.053	0.121***
	(0.089)	(0.055)	(0.070)	(0.035)
Hourly wage (log)				
Basic usual hours (main job)	-0.001	0.004*	0.004**	0.001
	(0.002)	(0.002)	(0.002)	(0.001)
Overtime hours (main job)	0.003	0.003	-0.010***	-0.002
	(0.008)	(0.003)	(0.004)	(0.002)
Actual hours (2nd job)	0.007	0.009*	-0.002	0.006**
	(0.008)	(0.005)	(0.006)	(0.003)
Marital status				
(single reference group)				
Married	0.133	0.257***	0.412***	0.302***
	(0.092)	(0.058)	(0.056)	(0.029)
Divorced	0.172	0.229**	0.262***	0.136***
	(0.147)	(0.116)	(0.101)	(0.050)
Separated	-0.263	0.596***	0.252*	-0.049
	(0.178)	(0.140)	(0.149)	(0.073)
Widowed	0.136	0.446	-0.295	0.012
	(0.275)	(0.916)	(0.262)	(0.120)
Ethnic group				
(white reference group)				
Black	-0.271	-0.030	0.214	0.094
	(0.237)	(0.122)	(0.160)	(0.085)
Asian	-0.163	-0.214***	-0.142	-0.108**
	(0.101)	(0.059)	(0.092)	(0.050)
Other	-0.024	-0.022	-0.020	0.042
	(0.153)	(0.086)	(0.174)	(0.081)

Continues…..

Region				
(London reference group)				
North East	-0.095	-0.151	-0.097	0.302***
	(0.160)	(0.098)	(0.121)	(0.068)
North West	-0.124	0.016	-0.073	0.301***
	(0.123)	(0.086)	(0.087)	(0.048)
Yorkshire and Humberside	-0.256*	0.039	0.113	0.188***
	(0.141)	(0.095)	(0.104)	(0.055)
East Midlands	0.123	-0.103	0.473***	0.210***
	(0.176)	(0.124)	(0.125)	(0.065)
West Midlands	-0.258	-0.001	-0.253**	0.239***
	(0.162)	(0.102)	(0.107)	(0.054)
Easter	0.323*	0.102	0.372***	0.213***
	(0.173)	(0.119)	(0.109)	(0.056)
London	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
South East	-0.052	0.076	0.038	0.133***
	(0.122)	(0.094)	(0.086)	(0.040)
South West	-0.141	0.141	-0.053	0.094*
	(0.138)	(0.096)	(0.099)	(0.050)
Wales	-0.031	0.144	-0.068	0.311***
	(0.128)	(0.091)	(0.098)	(0.050)
Scotland	-0.144	-0.016	0.195**	0.321***
	(0.123)	(0.088)	(0.080)	(0.044)
Northen Ireland	0.131	-0.178	0.420**	0.194*
	(0.231)	(0.188)	(0.196)	(0.100)
Fiscal year dummies				
(FY 2011/12 reference group)				
FY 2012/13	-0.011	-0.047	-0.061	-0.010
	(0.079)	(0.056)	(0.061)	(0.031)
FY 2013/14	-0.091	-0.024	0.034	0.055*
	(0.080)	(0.057)	(0.060)	(0.031)
FY 2014/15	-0.081	0.089	0.117*	0.085**
	(0.079)	(0.057)	(0.067)	(0.034)
Constant	1.899***	1.082***	0.981***	0.419***
	(0.428)	(0.311)	(0.304)	(0.162)
Observations	903	1,870	2,157	6,817
R-squared	0.053	0.042	0.076	0.052
Adj. R-squared	0.023	0.027	0.064	0.048
F-test	1.755	2.866	6.250	13.220
Prob>F	0.009	0.000	0.000	0.000

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10