Health Policy 123 (2019) 666–674

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Gender differences in the incomes of self-employed French physicians: The role of family structure

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ARTICLE INFO

Article history:
Received 13 June 2018
Received in revised form 11 March 2019
Accepted 5 May 2019

Keywords:
Physicians' income
Fee-for-service
Gender differences
Maternity

ABSTRACT

In most developed countries, the average income of female physicians remains much lower than that of their male counterparts. This paper analyses how much of the gender earnings gap among French self-employed physicians can be attributed to women's family responsibilities, choice of medical specialty, and opportunity to charge extra billings. The question is of growing concern for regulators because it may influence patients' future access to care. We used an exhaustive administrative database that merges information on the medical activity, earnings, and family structure of self-employed doctors in 2005, 2008, and 2011. Using the 2011 database, results suggest that when demographic and professional characteristics are controlled, female physicians still exhibit an annual earnings gap that varies according to family structure: having young children worsens the situation of female physicians, particularly GPs. Using our panel datasets from 2005, we show that there is a 'carer effect' of having children for female doctors that exacerbates the gender income gap, particularly for GPs. We do not highlight any real strategic behaviour of female specialists authorised to charge extra fees to increase their extra billings after a birth to maintain their previous income.

1. Introduction

In most OECD countries, the share of female physicians has dramatically increased [36]. In 2015, the percentage of women in the medical profession was 46% in the UK and in Germany, 44% in France, and 35% in the US compared to 35%, 36%, 37%, and 25% respectively in 2000; the growth rate ranged from 21% (France) to 38% (US) over those 15 years. In France, the percentage of self-employed female physicians grew from 30% in 1990 [6] to 45% in 2016 (representing 60% of all doctors).

Numerous studies have already highlighted significant differences between male and female doctors in terms of both medical practices and work-leisure trade-offs [2,11,18,28]. In terms of medical practice, for instance, consultations appear to be longer for female doctors in France [28], Australia [29], and the UK [12] and male doctors are more likely to shorten the length of their consultations to see more patients in the same working time when their income falls below their 'income reference' (in the US [39]). At the same time, female doctors often use less invasive procedures and more preventative measures than men for the same treatments (for the treatment of diabetic patients in Quebec, for instance [9]). In terms of work-leisure trade-offs, studies usually analyse the respective number of working hours of male and female doctors and show that gender -and particularly the combination of gender and parenting- significantly influences physicians' working hours [27,41,43]. Several reasons may explain the difference in the number of hours worked depending on gender [27], including social learning through for instance, anticipated disparities at the beginning of medical school (in terms of income [25]). Clearly, family status and the presence of children quantitatively influence male and female doctors' labour supply: while there is little difference in labour supply depending on gender for doctors who have never been married or have no children, marriage – through the fact that a spouse's income offers greater flexibility [27] – and the presence of children both have a strong influence on the number of hours worked, depending on gender and on the number of children. While female doctors usually reduce the number of hours worked after a birth, male doctors tend to increase their working hours [27,43]. The increasing feminisation of the medical workforce is therefore of growing concern for regulators, particularly in countries that offer social policies to promote birth rates. The sources of differences between male and female doctors' market labour sup-

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https://doi.org/10.1016/j.healthpol.2019.05.002
0168-8510/

ply need to be understood to prevent any additional rationing of supply in a context of increasing demand for ambulatory care.

Many previous studies discuss the gender earnings gap in the light of discrimination against female doctors [42,23,18,40]. According to Schurer et al, from a theoretical perspective, gender discrimination among GPs is become unlikely because of the high share of women and self-employment and thus, the main reason for the persistence of doctors' gender income gaps appears to be the differences in hours worked [41]. Actually, if income disparities between self-employed doctors are very large depending on specialties, the most salient disparity is due to gender: for instance, female GPs earn on average 30% less than their male counterparts in France [17,18,31] as in England [23], and 32% less in Austria [42]. Gender income gaps are not limited to self-employed physicians [20,33,34] and usually one of the arguments is that women still perform most of the parenting tasks [10]. Female doctors appear to be more often the ones who reduce their professional activity like other female professionals after the birth of a child [37] (for example, in management [24], for lawyers [34], and in the financial and corporate sectors [8]), resulting in a loss of professional experience, a reduced probability of holding a managerial position, and, consequently, lower wages [32,24]. Due to the impossibility of properly measuring differences in productivity and preferences between men and women in the labour market, which can also explain these gender income gaps, we will study within-gender comparisons depending on the presence of children and on the family status [40,41]. In France, empirical studies typically show a significant wage loss for salaried women after the birth of a child, which increases with the number of children: from approximately 2% to 10% for the first child to 10% to 15% for the second one, compared with a woman without children [19,30]. At the same time, having a new child tends to increase a household's financial needs [26] and to increase the number of hours worked (by the parents), according to any classical model of utility maximisation built on the 'work-leisure' trade-off. At the individual level, the magnitude of such an effect depends upon the spouse's income, if any, under the assumption that individual choices regarding labour supply are endogenously correlated between spouses ('collective models') [13]. The 'spouse' dimension may be particularly relevant for self-employed physicians, as their professional status allows them to partially choose the number of working hours and sometimes the tariffs. Considering spouse's income is particularly relevant for female doctors because their partners, whatever their professional status, typically belong to the same socio-economic status, which is much less the case for male physicians' spouses [4].

1.1. The institutional context in France

In France, self-employed doctors are mainly paid for by a fee-for-service scheme (FFS) with regulated fees for outpatient care. Very few lump sum payments are given and they mainly concern GPs (an additional lump sum payment for chronic and long-term patients, and another one given annually per patient for the referral role of the *médecin traitant* or GP). When setting up a private practice, doctors must choose to belong to either Sector 1 (S1), where they are not allowed to charge extra fees (over the regulated price) in return for tax cuts, or Sector 2 (S2), where doctors are permitted to charge extra fees for any service except for the poorest and, within 'ethical limits'. Since 1990, access to S2 has been restricted to physicians who are able to demonstrate a qualifying hospital practice (head of clinic, university teacher, etc.). For this reason, the great majority of GPs belong to S1 (close to 90% in 2011 [31]), and the GPs in S2 are quite different, as they tend to be older and perform fewer services and fewer home visits. In addition, they are less likely to be located in a rural area than 'S1' GPs [17]. In contrast, almost half of the specialists belong to S2 (41%). Among young physicians—those who set up in private practice between 2006 and 2011—, more than 59% of specialists and less than 2% of GPs choose S2 [31]. In theory, under FFS, each physician can adjust the number of working hours based on both time and budget constraints. In practice, physicians are also constrained by demand—in a context in which patients freely choose their physicians—, which is closely related to local medical density [15]. Doctors and particularly specialists may also provide more 'technical procedures' (which are usually more lucrative). Doctors may also decide to have a side salaried activity [28] such that in 2011, two out of three French doctors had a side-salaried activity (27% of GPs and 44% of specialists); the share of wages in the total income of French self-employed doctors is known to represent on average less than 15% (6% for GPs and 18% for specialists) [31]. S2 doctors have an additional tool compared to others, as they can charge extra fees in addition to regulated fees to maintain their earnings when deciding to work fewer hours, even if their consultations appear to be on average significantly longer [22].

The paper contributes to the current literature by exploring the assumption that the distribution of family responsibilities exacerbates the earning gaps between both male and female GPs and specialists, as a result of an exacerbation of gender gaps in labour supply. The paper also explores the assumption that extra fees, when available, are an additional tool to compensate any variation in work-leisure trade-offs.

Using an original and exhaustive administrative database on self-employed physicians, we first confirm that the gender income gap is wider for physicians who have children, regardless of medical specialties. We then highlight the asymmetric effects of having children: a 'breadwinner effect' for male GPs and for female doctors, a 'carer effect' whatever their specialty and sector. Indeed, having a new child significantly retards the growing trend of earnings in the careers of female physicians. In contrast, no downward effect of children is observed on male doctors' earnings and even an increasing effect has been seen in the case of GPs (the 'breadwinner effect'). Moreover, we were not able to highlight any strategic behaviour of S2 female physicians with regard to charging more extra fees after a birth to maintain their income.

The paper is structured as follows: in section 2, we describe our data, and in section 3 our empirical strategy. Section 4 presents the descriptive statistics of the activity and income of self-employed male and female physicians, followed by the results of the estimation of the 'carer effect' of having a child for female doctors, and section 5 offers our conclusion.

2. Data

We used a French exhaustive administrative data set that merges information on self-employed doctors' medical activity, collected by the Public Health Insurance (PHI) system, and on doctors' income and family structure based on household tax income declarations (General Directorate of Public Finances, DGFiP) for 2005, 2008, and 2011. Thus, we observed doctors' career and earnings paths over this period through the three points in time.

2.1. Medical activity and fees

We had information on doctors' annual total fees (TF), which can be divided into 'regulated fees' (RF), extra billings, if any, and lump sum payments for specific patients (children, chronic disease patients, etc.). We also had information on the total activity of doctors and their locums: the number of consultations and the number of technical procedures. As PHI information did not make it possible to directly study doctors' activity, we used variables related to the patterns of activity (e.g. the contribution of technical procedures

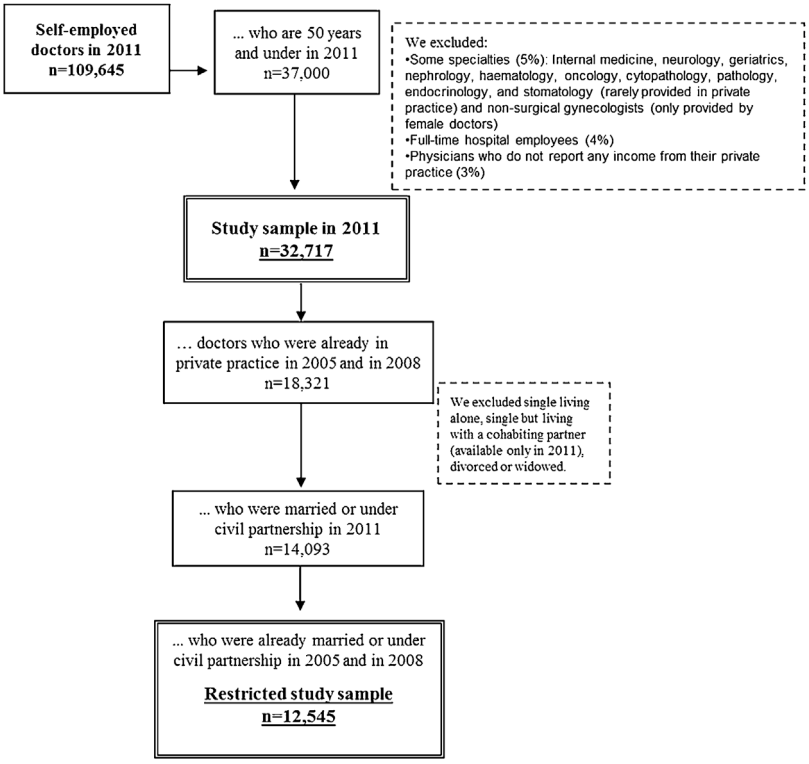

Fig. 1. study sample and restricted study sample.

to TF and share of extra billings, if any, relative to TF) that should be relatively unaffected by temporary locum placements. We also included patient case mix, doctors' seniority in private practice, and location (region).

2.2. Income and family structure

The total labour income (W) corresponds to the sum of the total net revenue from private practice (TF minus professional expenses like social contributions, office rent, secretarial services, etc.), and of the wages from side salaried activities, if any. The data also included the spouse's earnings (for married doctors and those living under a civil partnership, all referred to as 'married' in the paper), and the number of children and their respective years of birth. We also had information on the physician's cohabiting partner (if any) and his/her earnings (for 2011 only).

2.3. Physician population, study sample, and restricted study sample

To target physicians around childbearing age, we restricted the study to doctors who were 50 years old or less in 2011, reducing the size of the population by two-thirds (*see* Fig. 1). Narrowing the age range was also useful to remove disparities between young and old doctors in terms of activity and income [31]. We included almost all medical specialties: our study sample included 32,717 physicians out of the 109,645 self-employed doctors in 2011, and the restricted study sample included 12,545 'married' physicians over the period 2005–2011.

3. Empirical strategy

First, we used simple descriptive statistics to present our study sample and restrictive samples depending on gender for GPs and Sector 1 and 2 specialists, testing the significance of the differences between male and female doctors (*F-test*).

Then, we studied differences in the total labour income among female and male doctors according to their family structure by conducting an Ordinary Least Squares (OLS) regression in 2011. Finally, we used the restricted study sample in 2005, 2008, and 2011 to run a fixed-effects model to control for potential selection into parenthood.

3.1. OLS regression

Based on the Sasser (2005) method to study the gender income gap [42], we used OLS to estimate the model for any doctor i in 2011:

$$\begin{aligned} lnW_i = {} & \beta_0 + \beta_1 Xi + \beta_2 FEMALE_i + \beta_3 MSTATUS_i \\ & + \beta_4 FEMALE_i{}^{*}MSTATUS_i + \beta_5 CHILD_i + \beta_6 FEMALE_i{}^{*}CHILD_i \\ & + \beta_7 SPOUSEW_i + \beta_8 FEMALE_i{}^{*}SPOUSEW_i + \beta_9 Z_i \\ & + \beta_{10} FEMALE_i{}^{*}Z_i + \varepsilon_i \end{aligned}$$

With $\ln W_i$: the log total labour income; X_i a vector of observable characteristics known to influence doctors' earnings: age, specialty, seniority (duration in private practice) and its square, the contribution of technical procedures to TF, and patient case mix (share of the over-65 s, of patients with chronic diseases, and of low-income patients for whom no doctors are supposed to charge extra fees) [7,31]. For GPs, we added a dummy variable identifying Sector 2 and another dummy identifying those who reported 'special' practices to PHI (like homeopathy, acupuncture, etc.); $FEMALE_i$ is a dummy variable equal to 1 for females and 0 otherwise; $MSTATUS$ defines whether the doctor i is married, divorced (or widowed), single but living with a cohabiting partner, or single and living alone; $CHILD_i$ is a categorical variable that describes both the number of children and the age of the youngest for i in 2011; $SPOUSEW_i$ is the log

spouse's earnings of *i* (if any) in 2011. Lastly, Z_i represents another vector of observable characteristics that should influence earnings differently depending on gender: an indicator for practising (or not) a side salaried activity and a standardised index to measure the local medical density, the Local Potential Accessibility (LPA) index. This index is provided by the French Ministry of Health and combines the supply of medical services (local doctors' volume of activity) and the demand for services (local population size differentiated by age structure) [5].

To capture the effect of family responsibilities on the gender gap, we included interactions between the indicator *FEMALE* and *MSTATUS*, *SPOUSEW* (if any), *CHILD*, and Z_i respectively.

3.2. Fixed-effects model

We used fixed-effects models to study the impact of the birth of a child on the evolution of the annual labour income *(W)* by gender and medical specialty, among married physicians: only the restricted sample allowed us to accurately locate the presence of children in doctors' households (*see* Fig. 1). Following Schurer et al. (2016) [41], the analysis focused on within-gender comparisons by using within-individuals variations in both *W* and family status over two periods (2005–2008 and 2008–2011), which made it possible to control for unobservable characteristics like gender-differences in productivity, practice styles, choice of self-employment status (that may have been an endogenous choice depending more or less on the partner's self-employed status [1]) and time-invariant unobservable characteristics potentially correlated with selection into parenthood. Because individuals were only observed at three points in time, the basic equation is a first-difference specification for the two periods, 2005–2008 and 2008–2011:

$$\Delta lnW_{i,t} = \beta_1 \Delta X_{i,t} + \beta_2 \tau_t + \beta_3 \Delta CHILD_{i,t} + \Delta\alpha_i + \Delta u_{i,t}$$

Note that $\Delta lnW_{i,1} = \left(lnW_{i,2008} - lnW_{i,2005}\right)$ for $t = 1$ and $\Delta lnW_{i,2} = (lnW_{i,2011} - lnW_{i,2008})$ for $t = 2$ are the differences in the doctor's log total labour income during the corresponding period of three years; $X_{i,t}$ is the same vector of time-varying observable characteristics used in the OLS regression; τ_t is a time indicator equal to 1 for the period of observation (2008–2011) and to 0 for the other period (2005–2008). $CHILD_{it}$ is rather similar to $CHILD_i$ used in the OLS regression, except that the '2 years old or below' category is divided into 'children born in the current year' (2005, 2008, or 2011) and 'children aged 1 or 2 years'; α_i is the individual fixed effect that is supposed to vary across individuals but not over time, corresponding for instance to unobserved individual characteristics, such as productivity, preferences, motivation and skills such that $\Delta\alpha_i = 0$. As the fixed effects model does not allow for inclusion of time invariant covariates, we do not control here for specialty and sector.

To measure whether extra billings were actually used by S2 specialists as a means to financially compensate for any decline in activity and income, we ran the same fixed-effect model specification on S, the share of extra billings (relative to RF), by replacing $\Delta \ln W_{it}$ by ΔS_{it}.

4. Results

4.1. Descriptive statistics

Table 1 presents the characteristics of our study samples in 2011: the share of women was around 45% for GPs and 35% for specialists. Annual regulated fees (RF) and total fees (TF) of female doctors were significantly lower than those of men, especially for specialists (around -40%). The gap was of the same magnitude for total labour income *W*. As expected, the structure of medical activity differed with gender: the contribution of technical procedures to total fees was significantly lower among female than among male specialists. Female specialists set up practice as S2 doctors less often than men, but their share of extra billings relative to RF was very similar to that of the male specialists (no significant difference). Wages—difference between *W* and Revenue from private practice—were marginal compared with TF and did not play a role in the gender income gap.

More than two thirds of doctors lived as couples, whether in marriage, civil unions, or cohabiting partners. Only 20% of GPs and 15% of specialists were childless, regardless of their gender. Doctors who had 3 or more children were quite numerous, particularly among male specialists (33%).

When living as a couple, the spouse's income appeared to partially compensate the female doctors' financial disadvantage: indeed, spousal earnings were much higher for female doctors, such that for GPs the living standards (i.e. total household income) were equivalent regardless of the GP's gender.

Note that both samples, the study and restricted samples, were significantly different for almost all variables, as shown in Table 1. These differences, observed in 2011, were expected since the subpopulations concern very different physicians: the restricted sample includes only the subpopulation of married doctors (married and civil union), already independent doctors in 2005 and 2008.

4.2. A gender income gap that is clearly widening with the number of children

OLS estimates are presented in Table 2 (*see* Appendix A.1 for complete results). Compared with descriptive statistics, we show that the gender income gap is significantly lower when considering the family structure, the interaction terms for marital status, and the presence of children. Therefore, the minimum difference in income between men and women is 16% for GPs to 19% for S2 specialists respectively when all other characteristics are being set at their reference level. The gender gap appears to become insignificant for S1 specialists. As the reference for the marital status is "single, living alone", the corresponding "spouse's income" is mechanically equal to 0. Thus, all coefficients being negative, any difference in the characteristics that are interacted with the FEMALE coefficient may exacerbate the gender income gap.

A significant premium is associated with marriage (or civil partnership) and is much higher for men than for women, at least for GPs and S1 specialists. The spouse's earnings also have a higher negative effect on females' total labour income than on that of men. Consistent with previous results [38] income elasticity to spouse's earnings (percentage change in doctors' income following a 1% increase in the spouse's pay) is approximately -0.02 for female physicians compared with -0.01 for their male counterparts.

Everything else being equal, the gender income gap significantly widens where children are present, regardless of specialty and sector and regardless of the age of the youngest child and the number of children. For GPs, the gender gap increases significantly when the youngest child is under 2 years old (-16% to the disadvantage of women) and is the highest when this child is the third one or more in the household (-25% to the disadvantage of female GPs and +4% for male GPs). Although similar for specialists, the effects are on average smaller and mainly concern female specialists whose youngest child is less than 2 years old. The 'carer effect' for women becomes quite low when the youngest child reaches the age of six (approximately -5%), except in large families (-14% for female GPs and -11% for S1 female specialists). Actually, from three children, the income gender gap remains quite high, regardless of the youngest child's age.

Table 1
Description in 2011 of the study and restricted samples of self-employed doctors.

	STUDY SAMPLE (n=32 717)						*RESTRICTED SAMPLE (n=12 545)*					
	GPs n = 19 875		**Sector 1 Specialists n = 5 806**		**Sector 2 Specialists n = 7 036**		**GPs n = 8 254**		**Sector 1 Specialists n = 2 364**		**Sector 2 Specialists n = 1927**	
	F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**
Gender *(%)*	**45**	**55**	**41**	**59**	**29**	**71**	**35**	**65**	**34**	**66**	**28**	**72**
Age *(mean)*	**42.1**	**43.5**	**43.4**	**44.5**	**41.7**	**42.5**	**45.0**	**45.7**	**45.6**	**46.0**	45.2	45.4
Age of installation in private practice	**32.6**	**32.5**	**34.1**	**34.5**	**35.4**	**35.1**	31.7	31.6	**32.7**	**33.1**	**33.9**	**34.3**
Regulated fees (RF) *(€, mean)*	**1,05,909**	**1,48,179**	**2,04,729**	**3,45,899**	**1,35,947**	**2,34,803**	**1,17,290**	**1,60,858**	**2,06,405**	**3,40,968**	**1,56,054**	**2,48,412**
Δ female/male	*-29%*		*-41%*		*-42%*		*-27%*		*-39%*		*-37%*	
Total fees (TF) *(€, mean)*	**1,11,576**	**1,57,035**	**2,09,561**	**3,52,305**	**2,05,440**	**3,48,922**	**1,24,049**	**1,70,984**	**2,11,192**	**3,47,033**	**2,38,881**	**3,75,189**
Δ female/male	*-29%*		*-41%*		*-41%*		*-27%*		*-39%*		*-36%*	
Revenue from private practice *(€, mean)*	**59,062**	**89,335**	**94,324**	**1,61,370**	**1,02,019**	**1,78,259**	**64,794**	**97,308**	**94,885**	**1,63,155**	**1,09,948**	**1,95,151**
Δ female/male	*-34%*		*-42%*		*-43%*		*-33%*		*-42%*		*-44%*	
Total labour Income (*W*) *(€, mean)*	**61,333**	**93,167**	**1,00,239**	**1,69,960**	**1,09,612**	**1,87,614**	**66,463**	**1,00,554**	**99,370**	**1,70,771**	**1,15,707**	**2,03,308**
Δ female/male	*-34%*		*-41%*		*-42%*		*-34%*		*-42%*		*-43%*	
Have a side-salaried activity *(%)*	**19**	**22**	32.0	33.0	45	37	16	21	31	35	41.0	37.0
Share of technical procedures to TF *(%)*	6.0	6.0	49	67	46	64	7	4	48	67	44	64
Share of extra-billing to RF *(%)*	-	-	-	-	65.0	62.0	-	-	-	-	65.0	63.0
Marital Status *(%)*												
Single	**22.2**	**11.8**	**18.9**	**8.0**	**20.2**	**10.7**	-	-	-	-	-	-
Divorced or Widower	10.4	8.3	10.6	7.9	10.2	7.4	-	-	-	-	-	-
Married or Living under Civil Partnership	**67.4**	**79.9**	**70.5**	**84.1**	**69.5**	**82.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Presence of a Spouse (whether married,	**77.7**	**87.4**	**78.7**	**90.0**	**79.4**	**88.9**	100.0	100.0	100.0	100.0	100.0	100.0
Nb of children < 18 *(%)*												
No child	21.0	20.0	16.3	15.0	14.9	16.7	**11.4**	**9.1**	6.9	6.2	5.6	5.2
1 child	**22.4**	**19.8**	19.4	17.6	**18.5**	**14.9**	**22.6**	**19.6**	17.5	16.5	15.2	12.8
2 children	**35.6**	**34.2**	**37.4**	**34.0**	**39.3**	**35.7**	39.6	37.8	**41.4**	**36.7**	**47.1**	**40.2**
3 children or more	**21.0**	**25.9**	**27.0**	**33.4**	**27.3**	**32.7**	**26.4**	**33.5**	34.1	40.6	**32.2**	**41.8**
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Age of the youngest child, if any* *(%)*												
2 years old or below	18.9	19.8	**12.9**	**15.6**	**21.6**	**26.9**	**4.6**	**6.8**	**2.7**	**4.9**	4.9	7.4
Between 3 and 5 years old	**18.7**	**17.2**	18.3	18.0	21.8	21.9	12.2	12.9	**9.9**	**13.9**	**10.9**	**15.1**
6 years old or above	62.3	63.0	68.8	66.4	**56.6**	**51.3**	**83.2**	**80.3**	**87.3**	**81.2**	**84.2**	**77.4**
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Had a child when first settled as a private	**74.0**	**67.0**	**78.0**	**78.0**	**85.0**	**83.0**	**71.0**	**65.0**	77.0	77.0	**79.0**	**83.0**
Spouse (if any) is also physician** *(%)*	**18.7**	**10.1**	**32.2**	**13.3**	**31.2**	**14.5**	**24.4**	**11.2**	**39.9**	**15.2**	**39.9**	**16.2**
Spouse's earnings** *(€, mean)*	**51,806**	**24,400**	**75,749**	**28,541**	**90,025**	**32,622**	**66,299**	**26,875**	**94,293**	**31,879**	**1,12,954**	**35,661**
Total household income *(€, mean)*	**1,11,536**	**1,19,690**	**1,77,580**	**2,08,889**	**1,97,850**	**2,30,340**	**1,39,169**	**1,30,915**	2,06,954	2,12,663	2,41,365	2,50,873

Source: Insee-Cnamts-DGFiP 2011
* Among physicians whose household includes at least 1 child under 18 years.
** Among doctors living as couples.
The colored cells correspond to the **non-statistically different** variables between the two samples. Conversely, all other cells correspond to statistically different variables between the two samples.
For the figures in bold, the differences between men and women are significant at the 5% threshold while for the figures in light gray, these differences are not significant at this threshold.

Whatever the speciality and sector, due to competition, the doctors' income decreases as the local medical density (of the corresponding specialty) increases. Interestingly, the effect appears to play a significant role in the GPs' income gender gap only: when the density of GPs is high, the labour income is low particularly, for female GPs. This could be the result of a selection bias, given that the choice of location may be potentially endogenous: female GPs wishing to work less may prefer to settle in urban centres, in which medical density is higher. It is interesting to note that having a side salaried activity has a positive effect on income for GPs and a negative one on specialists (regardless of the sector), mainly due to opportunity cost, but this does not seem to play a role in the gender income gap.

For S2 specialists, consistently with descriptive statistics, men and women do not seem to behave differently in terms of share of extra billings. S_i is all the greater when specialists have been practising for a long time, the competition is high (high local medical density), and the share of the technical procedures is high. Conversely, the higher the proportion of old or poor patients, the smaller is S_i.

Accounting for unobserved heterogeneity: longitudinal evidence

Using the restricted sample, we present the results in Table 3 (simplified illustrations are provided in Appendix A.2)

All else being equal and as expected for young physicians early in their career, there was a strong increase in income driven by a rapid rise in private practice earnings (between +4 and +8% per year at constant prices), known to reach a peak after 10–15 years [7]. Note that the 2005–2011 period was characterised by an increase in French doctors' nominal regulated fees [31] which may have contributed to increasing seniority performance. The underlying growth in women's income appeared at least as dynamic as that of their counterparts for GPs and S1 specialists. S2 specialists seemed to leverage their duration in private practice with an increase in their extra-billing rates, and the growth of labour income was particularly strong among men for each additional year in private practice (+8%).

For married female physicians, there was a strong 'carer effect' of having a child in the year of the birth that was even larger from the third child in the household (up to -33% for GPs). The negative effect in the year of birth was of the same magnitude among female GPs and specialists, regardless of the sector. S2 female specialists appeared to compensate the gap a little bit faster than their female colleagues, maybe because their workload previous the child's birth was already quite compatible with family responsibilities: regulated fees (RF) corresponding to a proxy of the workload were significantly lower for S2 specialists than those of S1 specialists, such that it was easier for them to quickly resume their previous

Table 2
Effect of family structure on the total gender income gap in 2011: OLS estimation.

		Total Labour Income *Wi* (in LOG)						% Extra-billings *Si*	
		GPs		Sector 1 Specialists		Sector 2 Specialists		Sector 2 specialists	
PARAMETERS		Est.	Sign.	Est.	Sign.	Est.	Sign.	Est.	Sign.
Intercept		10.691	***	10.849	***	11.083	***	1.265	***
Age	46 to 50 y.o.	−0.168	***	−0.110	***	−0.089	***	0.032	ns
	41 to 45 y.o.	−0.088	***	−0.096	***	−0.092	***	0.009	ns
	40 y.o. or less (Ref)	*0.000*		*0.000*		*0.000*		*0.000*	
Duration in private practice		0.038	***	0.031	***	0.056	***	0.022	***
(Duration in private practice)^2		−0.001	***	−0.001	***	−0.002	***	−0.001	***
Yougest child age	2 y.o. or below, <=2 children	−0.019	ns	−0.003	ns	0.024	ns	0.059	*
x nb of children	2 y.o. or below, >=3 children	0.046	**	0.060	ns	0.049	ns	0.007	ns
	Between 3 and 5 y.o., <=2 children	0.015	ns	0.073	*	0.010	ns	−0.013	ns
	Between 3 and 5 y.o., >=3 children	0.035	^	0.084	**	0.115	***	−0.004	ns
	6 y.o. or above, <=2 children	0.028	*	0.047	^	0.058	**	0.017	ns
	6 y.o. or above, >=3 children	0.065	***	0.086	**	0.118	***	−0.029	ns
	No child (Ref)	*0.000*		*0.000*		*0.000*		*0.000*	
Marital status	Single, but living as a couple	0.152	***	0.200	***	0.107	**	−0.064	ns
	Divorced or Widower	0.172	***	0.222	***	0.138	***	0.055	ns
	Married or Living under Civil Part.	0.314	***	0.252	***	0.249	***	−0.039	ns
	Single, living alone (Ref)	*0.000*		*0.000*		*0.000*		*0.000*	
Spouse's earnings (in Log)		−0.014	***	−0.007	***	−0.010	***	−0.004	*
Medical density of the corresponding specialty		−0.049	***	−0.028	***	−0.016	*	0.119	***
Having a side-salaried activity (>1000€/year)		0.046	***	−0.026	ns	−0.076	***	0.025	ns
FEMALE		−0.160	***	−0.076	ns	−0.192	***	−0.070	ns
Yougest child age	2 y.o. or below, <=2 children	−0.161	***	−0.131	**	−0.118	**	−0.008	ns
x nb of children	2 y.o. or below, >=3 children	−0.245	***	−0.127	*	−0.131	*	0.017	ns
***FEMALE**	Between 3 and 5 y.o., <=2 children	−0.054	*	−0.089	^	−0.053	ns	−0.032	ns
	Between 3 and 5 y.o., > = 3 children	−0.125	***	−0.086	ns	−0.151	**	−0.056	ns
	6 y.o. or above, <=2 children	−0.045	**	−0.049	ns	−0.068	ns	−0.066	ns
	6 y.o. or above, >=3 children	−0.138	***	−0.112	**	−0.094	^	−0.015	ns
	No child (Ref)	*0.000*		*0.000*		*0.000*		*0.000*	
Marital status	Single, but living as a couple	0.063	^	−0.100	ns	0.041	ns	0.062	ns
***FEMALE**	Divorced or Widower	−0.061	*	−0.209	***	0.007	ns	0.025	ns
	Married or Living under Civil Part.	−0.089	**	−0.138	*	−0.006	ns	0.040	ns
	Single, living alone (Ref)	*0.000*		*0.000*		*0.000*		*0.000*	
Spouse's earnings (in Log)***FEMALE**		−0.007	***	−0.010	**	−0.010	*	0.008	ns
Medical density *FEMALE		−0.037	***	0.002	ns	0.000	ns	0.010	ns
Having a side-salaried activity (>1000€/year) ***FEMALE**		−0.011	ns	−0.014	ns	−0.003	ns	−0.026	ns
Technical procedures contribution to total fees		0.071	***	0.133	***	0.165	***	0.073	***
Case-mix: share of	patients aged >=65 y.o.	−0.001	ns	0.005	***	0.003	***	−0.011	***
	patients with chronic disease	0.005	***	0.005	***	0.000	ns	−0.001	ns
	low income patients	0.010	***	0.006	***	−0.003	*	−0.037	***
GPs declaring special practice (homeopathy, etc.)		−0.122	***	–		–		–	
Sector 2		0.050	^	–		–		–	
R-Square		**0.270**		**0.451**		**0.396**		**0.353**	
Number of observations		**19875**		**5806**		**7036**		**7036**	

Source: *Insee-Cnamts-DGFiP 2011. Study sample*
***Statistically significant at the 1% level; **significant at the 5% level; *significant at the10% level; ŝignificant at the 15% level.
Low-income patients correspond to patients covered by the "CMU-C" French health insurance, for whom doctors are not permitted to charge extra fees. The local medical density variable ("APL") has been standardized before being introduced in the model. Note that the model is also controlled for region, type of specialities for specialists and legal status of the private practice.

medical activities (*see* Table 1). All else being equal, from the 3rd child, it took years for female doctors (whatever the specialities and sectors) to compensate for the corresponding income gap, compared to a colleague who had not had a child; for female GPs, the 'carer effect' remained rather high (-6%) 6 years after the birth of their youngest child. For male GPs in the same situation, the gap with male GPs who had not had a child was nearly of the same magnitude but in the opposite way (+6%). And more generally, there was no 'carer effect' on any male physicians' labour income, but instead a 'breadwinner effect', particularly for male GPs.

S2 male specialists were more likely to increase extra billings after the birth of a child than their female counterparts. As mentioned earlier, increasing the level of extra billings could theoretically allow S2 physicians to counterbalance the effect of a potential decrease in working hours on income. We did not observe this behaviour for female specialists, at least in the medium term. In contrast, male S2 specialists appeared to significantly increase the share of extra billings in the years following a birth, particularly that of a third child, increasing the 'breadwinner effect' (+8 to 12% than that in the absence of such an event). Following a birth, S2 female specialists reduced their working hours (at least in the short term) and suffered a loss of income, as did other female doctors. It was probably difficult for female specialists to increase extra billings while decreasing their availability for patients [21]. In contrast, male doctors could legitimately increase the share of extra billings over time because their working hours remained unchanged after a birth.

5. Discussion

For the first time, we have analysed the effect of a child's birth on a French self-employed doctor's earning path and its contribution to the gender income gap. After controlling for numerous observable characteristics, such as medical specialty (GPs and specialists), sector (regulated fees for S1 or additional extra billings for S2),

Table 3
'Child penalty' on the total income of male and female married physicians and on the share of extra billings for S2 physicians.

		Total Labour Income *Wi* (in LOG)						% Extra-billings *Si*	
		GPs		Sector 1 Specialists		Sector 2 Specialists		Sector 2 specialists	
		Male	Female	Male	Female	Male	Female	Male	Female
Duration in private practice		0.0389***	0.0688***	0.0448***	0.0493***	0.0825***	0.0525***	0.0253***	0.0378***
(Duration in private practice)²		−0.000320***	−0.00138***	−0.000963***	−0.00143***	−0.00224***	−0.00124**	0.000478***	−0.0000833
Yougest child age x nb of children *No child (Ref)*									
	Born in the year, <=2 children	−0.000206	−0.267***	0.0182	−0.247***	0.00815	−0.285*	0.00665	0.0691*
	Born in the year, >=3 children	0.0473***	−0.332***	0.0154	−0.291*	0.00840	−0.328**	0.124*	0.0344
	1 or 2 y.o., <=2 children	0.0118	0.0234	0.0106	−0.0691^	0.0126	0.0170	0.0553	−0.0336
	1 or 2 y.o., >=3 children	0.0601***	−0.0538*	0.0216	−0.141**	0.0397	−0.000890	0.0997*	0.0181
	Between 3 and 5 y.o., <=2 children	0.0419***	0.00587	0.0230	−0.0666**	0.0359	−0.0320	0.0646^	0.00306
	Between 3 and 5 y.o., >=3 children	0.0655***	−0.0595**	0.0355	−0.0794^	0.0373	−0.0789	0.104**	0.00545
	6 y.o. or above, <=2 children	0.0351***	−0.00155	0.0295	−0.0558*	−0.00131	0.00316	0.0713**	0.00254
	6 y.o. or above, >=3 children	0.0565***	−0.0627**	0.0206	−0.0543	0.0360	−0.0391	0.0838**	−0.0115
Period 2008-2011 *Period 2005-2008 (Ref)*		−0.0436***	−0.0741***	−0.0340	−0.0323	−0.0219	−0.0256	0.0137	−0.0286*
Medical density of the corresponding specialty		0.0000288	−0.00969	−0.0136***	0.00303	−0.00781	−0.0308	0.00393	−0.0283
Case-mix: share of									
	patients aged >=65 y.o.	0.0102***	0.0129***	0.00865	0.00503	0.00400	0.00444	0.000487	0.00909***
	patients with chronic disease	0.00512***	0.00779***	0.00152	0.00658*	0.00114	0.000984	−0.00463***	−0.00689**
	low income patients	−0.00566***	0.00257	0.00424***	0.00942*	0.00242	0.0150***	−0.00117	0.00995**
Technical procedures contribution to total fees		0.0315***	0.0502**	0.0780***	0.204*	0.108***	0.0349	0.00270	−0.0639**
Spouse's earnings (in Log)		−0.00255***	−0.00772***	0.00199^	−0.0164**	−0.00234^	−0.0107	−0.00168*	−0.00299
Having a side-salaried activity *(>1000€/year)*		0.0527***	0.0527***	0.00955	0.0403	0.0106	−0.00439		
Legal category of private practice *SEL (y/n)*		−0.306***	−0.437***	−0.269***	−0.456+	−0.231***	−0.914**	−0.00384	−0.0383
Intercept		10.87***	10.24***	11.31***	10.81***	11.37***	10.93***	0.307***	0.148
R-Square within (FE)		0.125	0.150	0.112	0.186	0.231	0.282	0.184	0.293
Number of observations		**5,404**	**2,850**	**1,551**	**813**	**1,501**	**426**	**1,501**	**426**

Source: *Insee-Cnamts-DGFiP 2005, 2008 and 2011. Restricted study sample.*
***Statistically significant at the 1% level; **significant at the 5% level; *significant at the 10% level; ŝignificant at the 15% level.
Note: legal category of the private practice only identifies whether the private practice is registered as a limited liability company for non-commercial services named in French "Sociétés d'exercice liberal" (SEL).

duration in private practice and spouse's income, if any, we show that having children contributes significantly to the gender income gap. Indeed, French female physicians face a sharp drop in their labour income—a 'carer effect' of having a child—, which is particularly important in the year in which a child is born (−25% to −30%), which takes years to be reversed. This means that female doctors reduce their labour supply when they have a child and it takes years for them to completely resume their activity. On the contrary, there is no downward effect on male physicians' income and the income of male GPs even increases significantly after the birth of a child in their household— the 'breadwinner effect'—, which further reinforces the father to mother income gap. These results are rather consistent with the literature on American self-employed physicians [42], Australian GPs [41] and Japanese surgeons [35].

The 'carer effect' of having a child for female doctors is particularly high in the year in which a child is born, and is much higher than the maternity allowance, which for Sector 1 female specialists in France corresponded (in 2016) to roughly 9% (15% for GPs) of the revenue from private practice for a maternity leave of 16 weeks and to roughly 13% (21% for GPs) for a maternity leave of 26 weeks (after the birth of a third child). This mechanism may partially explain why the 'carer effect' is higher after the birth of a third child. Clearly, the fact that the spouses of female doctors have rather high incomes (so that, on average, household income is independent of a doctor's gender) makes it possible to greatly reduce the labour supply following the birth of a child, even if the maternity allowance does not compensate for the loss of income. It is interesting to note that the medical unions had been asking for better maternity leave coverage for several years, and particularly for female doctors—a better level of maternity leave benefits, considering that the levels were too low compared to the compensations granted for other professions, in particular for salaried females. The PHI has increased the maternity allowance in 2017, providing an additional 10% of the private practice income for S1 specialists (+16% for GPs). Although this increase can probably be justified by arguments related to both

the national birth promotion policy and the equality with salaries workers, it must be considered that this could also contribute to further exacerbating the gaps in the labour supply of male and female doctors, and further constrain the time spent with patients. By graphically presenting doctors' income paths using the results of the fixed-effects model in a very simplified way characterising 3 situations—no new child, a first or second child born in year N, and a third child born in year N (see Appendix A.2 for the figure)—, we can notice that 5 years after the birth of a child female physicians still receive an income 10% to 15% lower than what they would have had without this child, roughly corresponding to a labour supply that is 10 to 15% lower. We can also notice that every new child born in this period is equivalent for women to a 'delay' of nearly two years of experience due to the strong income growth in their early career.

Contrariwise, the 'breadwinner effect' of having children remains specific to GPs, and is not observed for specialists in any sector. Note, however, that S2 male specialists significantly increase the share of extra billings in their labour income after the birth of a child, illustrating a potential combination of another type of 'breadwinner effect' and a 'carer effect': indeed, extra billings may allow them to reorganize their labour supply without significantly changing their income. Actually, in the French context, regulated fees (RF) are strongly linked to the medical activity level for GPs and S1 specialists; this is not so much the case for S2 specialists due to extra billings.

Besides, the situation for S2 female specialists is rather different from that of their S1 counterparts: even if their labour incomes appear as strongly affected by the birth of a child as the incomes of S1 female specialists, at least in the short term, it appears that their income increases more rapidly in the medium term. As long as we did not manage to emphasise a change in extra-billing strategy, we can interpret from the result that it takes less time for an S2 female specialist to reach the same level of activity as before the birth of a child. Although this result should be viewed with caution due to the size of the restricted sample, it nevertheless confirms the financial advantage offered by the possibility of charging extra billings. It actually offers more flexibility to S2 female physicians to freely adapt their working time. Thus, it would have been interesting to study the special case of self-employed doctor in couples where both partners have flexible working hours [3]. Note that 28% of female GPs have a spouse who is a doctor (only 11% of their male counterparts) and 50% of female specialists compared with 15% of male specialists.

Our results are original due to the combination of an exhaustive data set and very detailed variables like the partner's income from tax records (not self-reported as in other studies). While we find the same effects for GPs as those previously defined for GPs by Schurer et al. we are broadening their results by highlighting the same effect for female specialists (whatever their ability to charge extra billings). In addition, compared to previous studies, we can also study the strategies in terms of charging extra billings: while male specialists (S2) do not seem to change their labour supply, it appears that they increase their tariffs (increase the share of extra billings), which is another type of 'breadwinner effect'. Another strength of our study is that it covers all medical specialties, whereas the vast majority of the studies on doctors' earnings paths focus on GPs [16,14] or on a particular medical specialty [35]. Despite our rich data set, we still have no information on the number of hours worked. This limit has obliged us to make some assumptions in terms of constant productivity; otherwise doctors could reduce the duration of visits to maintain a constant income while reducing the total working time. We also have no information on the activity provided by locum physicians, and no data on group practices. Despite these limits, our results appear to be robust and coherent with literature.

6. Conclusion and policy implications

The demand for private practitioners will continue to grow in the coming years in France. Due to the increasing share of women among young self-employed physicians, there is an urgent need to adequately plan and organise the provision of care depending on the supply and the availability of total medical time. It is therefore essential to identify the determinants of doctors' labour supply depending on their gender and sector (regulated fees or additional extra billings) in order to deduce the medical time available. From the point of view of the public decision-maker, it is also important to maintain the attractiveness of S1 for physicians, as this ensures that patients have easier access to care. Thus, policy makers need to think about how to improve the attractiveness of S1 for specialists, particularly for female doctors, who are more numerous among young doctors.

For ethical agreements, all precautions were taken by the French Ministry of Health to ensure anonymity of the data, in agreement with the CNIL (Commission Nationale de l'Informatique et des Libertés, French law no. 78-17).

Acknowledgements

With the financial support of the « Direction de la Recherche, de l'Évaluation et des Statistiques » (DREES) from French Ministry of Health, and with the support of Health Chair – a joint initiative by PSL, Université Paris-Dauphine, ENSAE, MGEN and ISTYA under the aegis of the Fondation du Risque (FDR).

The authors thank Marie Allard for her valuable suggestions and insights, as well as Eric Delattre for his useful comments in the EuHEA PhD student-supervisor and early career researcher conference in Barcelona in September 2016, all the participants of the Inserm-CESP seminar in November 2016 and also the participants of the 66th AFSE (Association Française de Sciences Economiques) meeting in Nice in June 2017. The authors thank two anonymous reviewers for their very relevant and helpful comments.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.healthpol.2019.05.002.

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