High turnover among nursing staff in private nursing homes for dependent elderly people (EHPADs) in France: impact of the local environment and the wage

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Abstract – The high turnover among nursing staff working in nursing homes for dependent elderly people (EHPADs) in France has negative consequences in terms both of cost and of quality of care for the residents. We study the causes of this staff turnover using the estimate from a *probit* model estimated on two samples, one of 5,478 nurses and the other of 13,444 nursing auxiliaries working in private EHPADs under open-ended contracts. The probability of the nurses and nursing auxiliaries leaving is significantly influenced by factors t related to the environment around the employee's place of residence, computed at a highly disaggregated geographical level, including closeness to a hospital, competition between residential care facilities for elderly people, shortage of nursing staff, and attractiveness of the self-employed professional sector for nurses. The wage level, corrected for endogeneity, has a positive effect on the retention of nursing auxiliaries working in EHPADs, but it does not seem to have an influence in the case of nurses.

JEL codes : C25, I11, J63.
Keywords: staff turnover, nursing homes for dependent elderly people, care quality.

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In view of the increasing medicalisation of nursing homes for dependent elderly people (*Etablissements d'hébergement pour personnes âgées dependantes*, hereafter EHPADs), use of nursing staff in such facilities should intensify in the coming years. Nurse and nursing auxiliary positions already accounted for 4 out of 10 full-time equivalent jobs (FTEs) in nursing homes for dependent elderly people in 2007 and in 2011[1]. The sector suffers from difficulties in attracting and retaining these professions, in particular in private facilities, and this has detrimental effects on the quality of the care. The mean exit rates were 61% for nurses and 68% for nursing auxiliaries in EHPADs in 2008[2]. Those rates are higher than in the hospital sector: for nurses, the turnover rates[3] were only 22% in non-profit private hospitals and 30% in for-profit private hospitals in 2011 (Loquet & Nagou, 2014). There are a variety of causes for early leaving of nurses and nursing auxiliaries working in EHPADs. They might prefer to work in a competing EHPADlocated in a more attractive geographical zone. They might also change the mode of practice of their profession and choose to work at a hospital, for a home care service provider, or as a self-employed professional. Barlet and Cavillon (2011) thus show that nurses working in facilities for elderly people are the category that change mode of practice most (on average, 6% per year, as against 3% for all nurses in the period from 2004 to 2008).

This high turnover among nursing staff can degrade the quality of care in EHPADs. Large numbers of leavers among nurses or nursing auxiliaries can lead to the EHPAD being temporarily understaffed, even though it is known that staff-to-resident ratio or staffing level is positively correlated to quality (Martin, 2014). High employee turnover can also cause interruptions in the continuity of care (Cohen-Mansfield, 1997), generate iatrogenic accidents due to prescription errors, and degrade the state of health of residents (Lerner *et al.*, 2014; Antwi & Bowblis, 2016). Finally, it prevents residents from forming relationships of trust with their nursing carers (Wiener *et al.*, 2009). As a former professional from the sector says, "*the high staff turnover of the sector has consequences: the new staff do not know the residents, their pathologies, their assistance needs, or their habits, and do not have the necessary training*" (Nénin & Lapart, 2011, p. 51 – translated from the French). In addition to detrimental consequences on quality, high employee turnover can also generate additional costs for the facility due to the need to recruit replacement staff, sometimes temporary staff. It can also lead to a reduction in productivity, given the time necessary for training new staff (Brannon *et al.*, 2002).

In this study, we analyse the determinants of nursing staff departures in private EHPADs in France. Controlling for the characteristics of the job, of the facility, and of the employees, we analyse, in particular, the effects of the salary and of the environment from different angles – nursing staff shortage in the geographical area, presence of a hospital, competition between facilities for elderly people, attractiveness of the self-employed professional sector – on the probability of nurses and nursing auxiliaries leaving. Our analysis is performed on the basis of two samples of staff working under open-ended contracts in private EHPADs in 2008: a sample of 5,478 nurses and a sample of 13,444 nursing auxiliaries. This study is original on three counts. Firstly, there is no other econometric study that examines the causes of staff turnover in EHPADs in France. Secondly, we take into account the endogenous nature of the wage, which has rarely been done in non-French research devoted to this subject. Thirdly, we incorporate numerous environmental variables making it possible to analyse the reasons why staff leave. For this purpose, we use highly disaggregated geographical data, compiled on the basis of the home address of each employee and computed at the level of the "local area"[4].

In the following section, we present the imperfections of non-French studies analysing the causes of nursing staff turnover. We then describe the variables and the data used, and our approach. Finally, we analyse the results before giving some conclusions.

1. Source: http://www.data.drees.sante.gouv.fr (30 March 2017).
2. The exit rate for nurses (or for nursing auxiliaries) corresponds to the ratio of the number of nurses (or of nursing auxiliaries) having left the facility during the year to the number of positions for nurses (or for nursing auxiliaries) in the facility at the end of the year. The calculations were made on the basis of two samples of 1,393 nursing homes for dependent elderly people (exit rate for nurses) and of 1,392 nursing homes for dependent elderly people (exit rate for nursing auxiliaries). Source: DADS 2008 *(Insee) and* enquête EHPA 2007 *(Drees), authors' calculations.*
3. In this study, the turnover rates correspond to the averages between the entry rates and the exit rates. They can therefore be very different from the exit rates if the staff who leave the facility are not replaced within the same year.
4. See below.

Analysis of nursing staff turnover in non-French research

Various studies using American data have aimed to identify the causes of employee turnover in nursing homes, i.e. in nursing homes for elderly people. However, most of them suffer from two limitations.

Firstly, many of these studies are conducted at the scale of the facility, and the environment-related variables are therefore often poorly incorporated. For example, Castle and Engberg (2006) sought, using a negative binomial regression, to show lower turnover among nursing staff in nursing homes located in rural areas. Indeed, nurses and nursing auxiliaries enjoy fewer job opportunities in such areas. However, they observed the reverse effect, which was probably due to the fact that they took into account the nursing home's location rather than the location of the employees' place of residence. However, employees working in such rural nursing homes may live in towns, so that working in rural areas entails long distance commuting, which is a source of dissatisfaction. Using a multinomial logistic model, Brannon *et al.* (2002) also studied the factors associated with a low turnover of nursing assistants working in nursing homes (lower than 6.6% in 6 months) and the factors associated with a high turnover (higher than 64%). They incorporated some variables related to the market environment, such as the concentration of nursing homes and the local unemployment rate. However, since those variables were constructed again on the basis of the location of the facility and not that of the employees' place of residence, no significant effect was observed.

Secondly, the role of wages or salary is little or poorly studied. It is not always added to the variables explaining staff turnover, like in the work by Brannon *et al.* (2002) and by Castle and Engberg (2006). That omission skews the effects of the environmental variables if the wage adjusts to the local difficulties. On the basis of a qualitative survey conducted on 345 nursing assistants in 18 nursing homes in the USA, Dill *et al.* (2013) showed a positive impact on the employees' intention to stay at the facility when they felt financially rewarded. However, the actual impact of the wage level on staff turnover remains difficult to determine. Some authors have incorporated this wage variable, such as Temple *et al.* (2009) who studied the factors related to a low turnover and to a high turnover of nursing assistants (characterised by the first and last quartile of their sample) using a multinomial logistic regression. Wiener *et al.* (2009) also studied the effect of the wage and the environment on the seniority of nursing assistants working in nursing homes using an ordinary least squares regression. Those authors thus showed that a rise in salary apparently reduces the probability of having a high turnover rate and increases seniority in the nursing homes. However, they did not take into account the possible endogeneity of the wage. Indeed, unobserved factors, such as experience or the propension of the nursing staff to protest, can be correlated both to the wage and the exit rate. Furthermore, someone who changes jobs regularly may have a lower wage because they do not benefit from seniority bonuses.

In this study, we test whether the relationships empirically observed in those studies apply to the French case, by making corrections or adjustments to overcome those two stumbling blocks. Wage endogeneity is corrected for by instrumentation, as performed for the United States by Baughman and Smith (2012) who, using a duration model, analysed the determinants of the probability of nursing assistants leaving the facility at which they work; they observed that the instrumented wage had a negative effect on the probability of leaving, whereas it was not significant when it was not corrected for endogeneity. However, few variables related to the environment are taken into account in their study, and those that are (unemployment rate, average wage in other professions) are calculated at the State level. Unlike those authors, we include several environment variables constructed at a highly disaggregated geographical scale. We use individual data and construct the environmental variables on the basis of the employees' home addresses rather than on the basis of location of the facility.

Variables and data used

We analyse the probability of nurses and nursing auxiliaries leaving their facility (variable "*Départ*"). As with various theoretical models (Cohen-Mansfield, 1997), we assume that nursing staff leaving is related to two types of factors: factors that can generate job dissatisfaction, such as the employee's characteristics, and the characteristics of their job and of their facility; and factors that influence the decision to leave the facility, such as the local labour market. The variables used

to study these determinants empirically are described below and summarised in Table 1.

Individual characteristics of the nurses and nursing auxiliaries

Barlet and Cavillon (2011) observed a relationship between the ages of the nurses and the probability of them changing mode of practice of their profession: this probability seems to be higher before the age of 35 and lower after the age of 45. Retirement, and sometimes early retirement, can however take place after the age of 50. To take account of these reasons for leaving, we include an age variable (*Âge*) in the form of a categorical variable: aged under 35, from 35 to 45, from 45 to 50, from 50 to 55, and over 55. We also add a gender variable (*Homme*). As in Wiener *et al.* (2009), we expect this variable to have a positive effect on the probability of leaving. Finally, the longer the journey (*Distance*) between the workplace and the employee's place of residence, the higher the job dissatisfaction. Since the effect of this variable is doubtless not linear, we categorised it into four modalities: distance less than 5 km, from 5 to 10 km, from 10 to 20 km, and greater than 20 km. We did not have any data on the employees' marital status or the number of children they have. However, Zhang *et al.* (2014), on the basis of data gathered from 1,589 employees working in nursing homes in the United States, did not observe any link between those variables and the intention of staff to leave their facility.

Characteristics of the job and of the facility

Various sources of dissatisfaction are related to employment conditions and can, as a result, constitute levers for nursing home directors who wish to reduce staff turnover (Anderson *et al.*, 1997). According to the wage efficiency theory (Stiglitz, 1974; Salop, 1979), a high wage can be efficient insofar as it encourages staff to stay at the facility where they work, and thus makes it possible to reduce employee turnover. In its Annual report for 2012, the Le Noble Age Group thus indicated it had "*put in place [...] favourable pay management [...] in order to limit the risk of understaffing and of increasing the staff turnover rate*" (p. 41 in French). We thus include the logarithm of the employee's net annual wage (*Log_Salaire*). The possibility of working nights (*Nuit*) in the nursing home can also have an effect on dissatisfaction; that effect can be positive if night work is an obligation that is not desired by the employee, or negative when it is a possibility that can be chosen by the employee. Care quality also probably has an impact on job dissatisfaction, and thus on the probability of employees leaving (Irvine & Evans, 1995). We chose to include, as a quality variable, a ratio related to the staffing level or staff-to-resident ratio of the EHPAD where the employee works. This variable is a good proxy for quality because it has a significant effect on the well-being and on the residents' health status (Spilsbury *et al.*, 2011). In addition, a low staffing level has an impact on working conditions because it necessarily induces a heavier workload. In order to take account of the diversity of the EHPADs' staffing needs, we compute an optimum theoretical staffing level (N^*) as a function of the dependency rating categories of the residents (these categories are related to the *groupes iso-ressources* or *GIR* (groups based on needs and dependence level and going from *GIR 1* for the most severely dependent to *GIR 6* for residents who are not dependent). For this purpose, we used the recommendations of the *Plan Solidarité Grand Âge 2007-2012* (a national solidarity plan for the very old): on a daily basis, a *GIR 1* dependent person needs 1 FTE, a *GIR 2* person needs 0.84 FTE, a *GIR 3* needs 0.66 FTE, a *GIR 4* needs 0.42 FTE, a *GIR 5* needs 0.25 FTE, and finally a *GIR 6* needs 0.07 FTE (Ratte & Imbaud, 2011). We then calculate the ratio of the actual staffing level (excluding administrative and corporate services employees) of the EHPAD (N) to the theoretical staffing level (N/N^*). Various authors have shown that staffing level could have a major impact on job dissatisfaction and on employee turnover in nursing homes in the United States (Temple *et al.*, 2009). However, some authors mention the problem of endogeneity that can arise by including this variable (Kash *et al.*, 2006). In the same way as for the wage, causality can work both ways: a large number of employees leaving can give rise to replacement difficulties and to a staffing level that is temporarily lower. However, the staffing level ratio (N/N^*) is calculated on the basis of all of the staff in contact with the residents, not only the nurses and nursing auxiliaries, and so the risk of endogeneity is lower. We check that the estimation of our model without this staffing level variable did not change the results obtained (cf. on-line supplement C1).

Certain factors specific to the facility's structure can have impacts on staff exits. Various American studies have thus shown that for-profit private nursing homes were confronted with higher staff turnover (Banaszak-Holl & Hines,

Table 1
Definition of the variables

Variable	Definition
Départ	Binary variable equal to 1 if the employee leaves the facility where they used to work during the year, 0 otherwise.
Individual characteristics	
Âge	Category variable indicating the age of the employee: aged under 35, from 35 to 45, from 45 to 50, from 50 to 55, or over 55.
Homme	Binary variable equal to 1 if the employee is male, 0 if they are female.
Distance	Category variable indicating the commuting distance between the employee's home and the EHPAD where they work: less than 5 km, from 5 to 10 km, from 10 to 20 km, or greater than 20 km.
Characteristics of the job and of the facility	
Log_Salaire	Logarithm of the employee's annual net salary, endogeneity corrected for by instrumentation.
Nuit	Binary variable equal to 1 if the employee may work nights in their nursing home, 0 otherwise.
*N/N**	Ratio of the actual staffing level of the EHPAD where the employee works to the calculated staffing needs (calculated on the basis of the degrees of dependency of the residents).
Statut	Binary variable indicating whether the private EHPAD where the employee works has non-profit or for-profit status.
N_Lits	Number of beds at the EHPAD where the employee works.
% GIR1	Proportion of residents with high dependency and rated as having the highest need for resources (*Groupe Iso-Ressources GIR 1*) at the employee's care home.
% GIR2	Proportion of residents with high dependency and rated as having the next highest need for resources (*GIR 2*) at the employee's care home.
% GIR3	Proportion of residents with medium dependency and rated as having the next highest need for resources (*GIR 3*) at the employee's care home.
% GIR4	Proportion of residents with medium dependency and rated as having the next highest need for resources (*GIR 4*) at the employee's care home.
% GIR5	Proportion of residents with low dependency and rated as having the next highest need for resources (*GIR 5*) at the employee's care home.
% GIR6	Proportion of residents with no dependency and rated as having the lowest need for resources (*GIR 6*) at the employee's care home.
Directeur > 2 ans	Binary variable equal to 1 if the director has been in office for more than two years in the employee's residential care home for dependent elderly people, 0 otherwise.
Environment	
Hôpital	Huff model coefficient measuring the attractiveness of hospital jobs on the employee.
‰Inf_libéraux_bv/pop	Ratio of number of self-employed nurses working in the local area of the employee's place of residence to its population (in thousands).
HHI_{Ehpa} *_bv*	Herfindhal-Hirschmann Index measuring the concentration of nursing home jobs in the local area in which the employee lives.
‰Inf_résid_bv/pop	Ratio of number of salaried nurses living in the local area in which the employee lives to the population (in thousands).
‰AS_résid_bv/pop	Ratio of number of salaried nursing auxiliaries living in the local area of the employee's place of residence to the population (in thousands).
Paris	Binary variable equal to 1 if the employee lives in Paris, and to 0 otherwise.
Île-de-France	Binary variable equal to 1 if the employee lives in the Ile-de-France Region (but outside Paris), and to 0 otherwise.
Instruments excluded	
EHPAD non régulé	Binary variable equal to 1 if the accommodation price of the facility at which the employee works is set freely, 0 if it is set administratively.
Taux d'occupation moyen_bv	Mean occupancy rate of the EHPADs in the local area in which the employee works.
Tarif dépendance moyen_dpt	Mean price for dependency care and support for heavily dependent persons (*GIR 1* and *GIR 2*) living in EHPADs in the *département* in which the employee works.
Groupe	Category variable indicating whether the facility where the employee works is independent or is part of a group of EHPADs comprising less than 5 care homes, from 5 to 20 care homes, or more than 20 care homes.

1996; Anderson *et al.*, 1997; Brannon *et al.*, 2002; Castle & Engberg, 2006). According to Wiener *et al.* (2009), "*some advocates argue that nonprofit nursing facilities are more mission driven than for-profit facilities and have higher staffing and other characteristics that may increase job tenure*" (p. 200). Staff may prefer to work in a facility whose purpose is purely societal rather than profit-motivated, i.e. in which the sole objective of the managers is to improve the residents' well-being. We therefore include a binary variable indicating whether the facility at which the employee works has a non-profit or for-profit private status (*Statut*). Facility size, i.e. the number of beds installed (*N_Lits*), seems to be less evident effect on staff leaving: while Castle (in 2005) observed a significant positive effect of the number of beds on the probability of having high turnover among nurses and nursing assistants, Wiener *et al.* (2009) did not obtain a significant effect of facility size on tenure of nursing assistants. We also add the proportions of residents in each GIR category at the employee's nursing home in order to take account of their degree of dependency (*%GIR1* to *%GIR6*). A binary variable indicating whether the director has been in office for more than two years (*Directeur > 2ans*) was also incorporated into the model. Like Castle (2005), we expect greater stability in management to reduce the probability of the employees leaving, for the three reasons mentioned by that author: a higher top management turnover could have a destabilising influence on the organisation, it could lower the nursing staff's commitment to the facility, and it could be detrimental to care quality and therefore increase dissatisfaction among staff.

Environmental factors

External job opportunities can encourage an employee who is not fully satisfied with their job to leave it. For nurses or nursing auxiliaries working in EHPADs, such opportunities can be of various types.

Firstly, they can change mode of practice of their profession by going to work in the hospital sector. Pay for nurses and nursing auxiliaries working in hospitals is close to what they earn in EHPADs. According to the French National Institute of Statistics and Economic Studies (Insee, 2011), in 2008, net annual wage of nursing, care, and social intermediate occupations (including nurses and also midwives, special needs professionals, medical technicians, and social workers) averaged 24,820 euros in for-profit private hospitals and 25,220 euros in non-profit private hospitals. In our sample, nurses working in private EHPADs earn annual net pay of 25,205 euros (cf. Table 2). If the hospital sector is attractive, then that would appear to be related more to the nature of the job. "*Working at a hospital is perceived as being more qualifying [...] and less limited because it seems easier to change department within the hospital than by coming from an EHPAD*" (Josse, 2012, p. 16 – translated from the French). The opportunity of finding a job at the hospital close to their place of residence could therefore be an encouragement to change jobs for nursing staff working at a EHPAD. We calculate Huff coefficients (cf. box 1) for measuring the attractiveness of a nearby hospital on each nurse and on each nursing auxiliary (*Hôpital*). We expect that this variable would have a positive effect on the probability of leaving. Nurses can also go to work in the self-employed sector. To take account of this reason for leaving, we include density per 1,000 people of self-employed nurses working within the area around each nurse's place of residence (*‰Inf_libéraux_bv/pop*). Another possible mode of exercising the profession is through home care services, but we did not have data enabling us to study the attractiveness of that sector.

Departures of staff can also be intra-sector, nurses and nursing auxiliaries then choosing to work in another nursing home for elderly people (EHPA) (cf. Box 2). The possibilities of being hired at another nursing home in the local area around the employee's place of residence can be assessed by the Herfindhal-Hirschmann concentration index ($HHI_{EHPA\_}bv$). To compute this index, we use market share in terms of staff, i.e. share in terms of the theoretical staffing level needs (N^*) of each facility i relative to the needs of the other nursing facilities for elderly people in the local area. The Herfindhal index is then computed in the following manner: $HHI_{EHPA\_}bv = \sum_{i=1}^{n} s_i^2$, where $s_i^2 = N_i^* / \sum_j^n N_j^*$ and n is the number of nursing homes for elderly people in the local area of residence. The higher the Herfindhal index is and the closer it is to 1, the more the job offers are concentrated in a few nursing homes for elderly people, and the more difficult it then is for employees to change facility. Finally, we add a variable of presence of the nursing staff in the employee's local area of residence, computed

as the ratio of the number of salaried nurses (or nursing auxiliaries) domiciled in the local area to the population (in thousands of people) *(‰Inf_résid_bv/pop et ‰AS_résid_bv/pop*). In France, the geographical distribution of nursing staff appears to be uneven. The densities of nurses are, for example, much higher in the southern regions than in the northern regions of France (Barlet & Cavillon, 2011). We expect that this variable would have a negative effect on the probability of nursing staff leaving, or, in other words, a positive effect on the shortage of nursing staff. Such localised staff shortages might indeed explain certain difficulties encountered for retaining staff working in EHPADs, for two reasons. Firstly, an overall shortage of nursing staff might reveal unattractive characteristics of the local area (rural nature, high cost of living, etc.) that might encourage staff to go and live and work in other areas. Secondly, on a market highly constrained by the labour supply, immediate job opportunities for nurses or nursing auxiliaries are numerous and can encourage them to leave their jobs if they are not satisfied with them.

Two binary variables indicate whether or not the employee lives in Paris (*Paris*) or in the Paris Region but excluding Paris (*Île-de-France*) were also included so as to take account of the specificities of those areas.

We choose to construct various environmental variables at the scale of the "local area of residence" ("*bassin de vie*"), which is defined by Insee (2003) as being "the smallest area within which the population has access both to infrastructures and amenities, and to jobs". From 1999 to 2012, there were 1,916 such local areas of residence in France. Although the scale of the "employment area" ("*zone d'emploi*") is more usual for this type of study, finer zoning per local area of residence seemed to us to be more appropriate here. 67% of the nurses and 70% of the nursing auxiliaries in our sample worked in a EHPAD that was located in the local area of their place of residence. This zoning was also constructed so as to qualify the predominantly rural area better. One of our hypotheses is that facilities located in rural areas have more difficulty in recruiting and retaining their staff, because of the small workforce in these areas. However, we tested the robustness of the results by comparing those obtained by regressions conducted using environmental data constructed at the scale of the employment area (cf. on-line supplement C2).

Box 1

THE HUFF MODEL COEFFICIENT

The Huff model is a gravity-based model commonly used in geography (Pumain & Saint-Julien, 2010). We use it in this study to measure the attractiveness of hospitals (public and private hospitals) on nurses and nursing auxiliaries. We consider that, for these professionals, the longer the distance between the place of residence and the hospital, the less the hospital is attractive. Furthermore, the higher the number of nurse or nursing auxiliary positions (*Postes*) at the hospital, the more the hospital is attractive. Formally, a professional living in a local district or "*commune*" *i* is attracted by the hospitals located in another *commune j* proportionally to the number of hospital positions corresponding to him or her in *commune j*, but inversely proportional to the square of the distance between *i* and *j*:

$$A_{ij} = \frac{Postes_j}{D_{ij}^2}$$

where A_{ij} is the attractiveness of the hospital positions of *commune j* on the professionals living in *commune i*; $Postes_j$ is the number of hospital positions in *commune j*; and D_{ij} is the distance between *communes i* and *j*.

By convention, when a *commune* has a hospital, the distance between the professionals living in that *commune* and the hospital is 1 km. When the distance between *communes i* and *j* is greater than 250 km, the attractiveness is considered to be zero.

For each professional living in *commune i*, we are thus able to compute the coefficient (PR_i) defined by Huff (1964), by summing all of the attraction indicators A_{ij} that we divide by 1,000 to reduce the magnitude. We thus obtain a synthetic indicator of the attractiveness of the hospitals of the surrounding *communes j* on the professionals living in *commune i*:

$$PR_i = \frac{1}{1000}\sum_j A_{ij}$$

Databases used

The data on turnover among nurses and nursing auxiliaries working at EHPADs, and on their wages and ages, come from the *Déclarations annuelles de données sociales* (*DADS*, which are administrative data based on annual declarations that employers are bound to fill in and return). All facilities must supply information about each of their employees annually to the *Caisse nationale d'assurance vieillesse* (Cnav, France's national old-age insurance fund): net wage, FTE, age, type of contract, whether they leave during the year, etc. Those data are then re-processed by Insee. They also make it possible to have precise information on the place of residence of each employee, which is a real asset for this type of study. We are thus able to construct environmental variables on the basis of the employee's place of residence, and not merely their place of work. We use the 2008 *DADS* declarations so that we can match up that data with the *EHPA 2007* database on nursing homes for elderly people compiled by the French Health Ministry's directorate for research, evaluation and statistics (*Direction de la recherche, des études, de l'évaluation et des statistiques – Drees*).

The *EHPA* survey (a survey on nursing homes for elderly people) is conducted every four years on all of the residential facilities for elderly people (EHPADs, retirement homes, long-term care units, etc.). 79% of all such facilities in France responded to that survey in 2007 (Perrin-Haynes, 2010). It includes various questions on how the facility operates (prices, number of places, status, etc.), on the employees, on the residents, and on the buildings at 31 December 2007. It therefore provides us with details about most of the variables related to the characteristics of the job and of the facility.

The identifier of the EHPAD that is used in the *DADS* data is the "*Siret*" registration number of the facility, whereas it is the "*Finess*" registration number in the *EHPA* survey. An extraction from the *Finess* database in 2007 enables us to have correspondences between these identifiers and to merge the two databases. However, several of these correspondences were missing, which led us to exclude facilities. The 2007 *Finess* extraction also enables us to obtain the codes of the "*communes*" of the facilities, such codes being necessary in order to measure the distance between the employees' place of residence and their place of work.

The data on the self-employed nurses working the area come from Insee's *base permanente des équipements (BPE) 2007* (2007 permanent facilities database).

Model estimated and study sample

The model estimated

We estimate the probability of a nurse or of a nursing auxiliary leaving their facility using a *probit* model, and correcting for the endogeneity of the wage variable. The model estimated is as follows:

$$y_i^* = \eta + x_i\alpha + \omega_i\beta + \mu_i$$

$$\omega_i = \delta + x_i\Pi_x + z_i\Pi_z + \nu_i$$

where $i \in [1 ; N]$, N corresponding to the number of nurses or of nursing auxiliaries studied, ω_i is the logarithm of the wage of employee i, considered to be endogenous, z_i is a vector of $1*k_z$ instrumental variables, x_i is a vector of $1*k_x$ exogenous variables related to the individual characteristics of employee i, to environmental factors defined on the basis of their place of residence, to their employment conditions, and to the characteristics of the facility at which they work. The error terms (μ_i, ν_i) follow a multivariate normal distribution of null expectation.

We do not observe the latent variable y_i^*, but rather we observe a dichotomous dependent variable:

$$Départ = \begin{cases} 0 & \text{si} \quad y_i^* < 0 \\ 1 & \text{si} \quad y_i^* \geq 0 \end{cases}$$

The model is estimated by maximising a likelihood function. η, α and β correspond to the constant term and to the vectors of the parameters of the model. δ, $\prod_x$ et $\prod_z$ are the constant term and the vectors of the parameters of the wage instrumentation equation. Those parameters were estimated jointly with η, α and β; if the instruments are specified correctly, this method of correcting for endogeneity makes it possible to obtain unbiased estimators (Cameron & Trivedi, 2009).

Various excluded instruments were incorporated into the first-stage estimation (cf. Table 1). They were assumed to have an effect on the wage variable, but not to have any direct effect on the probability of nursing staff leaving.

Firstly, we used a binary variable indicating whether or not the accommodation price of the facility where the employee works is set freely, i.e. not regulated (*EHPAD non régulé*). Freedom to set prices in private EHPADs, and thus to pass on the wage costs, varies depending on the mode of regulation of the facility[5] (cf. Box 2). The facilities whose accommodation prices are not regulated should be able to adjust the salaries in such a manner as to recruit and retain their staff more easily at a desired staffing level or staff-to-resident ratio. However, such EHPADs can be constrained in setting their accommodation prices by the degree of competition on the market and by the solvency of the demand in their geographical area. When the market share of an EHPAD in any given geographical area is small, that care home is a price taker: it cannot adjust its price in response to a necessary adjustment in the salaries. Conversely, it is easier for a single facility or for a facility that has a large market share to adjust its price and therefore the pay

5. Since regulation of accommodation prices concerns to a greater extent nursing homes for dependent elderly people that are not for profit (cf. Text Box 2), it is probable that the variable "EHPAD non régulé" *also has a direct effect on the probability of staff leaving as a result of the status. However, this effect was controlled because a status variable (*statut*) was included in the main regression. This made it possible to guarantee the condition for exclusion of the* EHPAD non régulé *variable.*

Box 2

ADJUSTMENT OF PAY AND REGULATION OF PRICES IN EHPADS

Residential care homes for elderly people (*Etablissements d'hébergement pour personnes âgées*, EHPAs) essentially comprise nursing homes for dependent elderly people (*Etablissements d'hébergement pour personnes âgées dependantes*, EHPADs), but they also include long-term care units (*Unités de soins de longue durée*, USLDs) which are highly medicalised, and, at the other end of the scale, non-medicalised facilities such as retirement homes or sheltered housing for elderly people who are not dependent or not very dependent but at which nursing staff work. In 2007, EHPADs (for dependent elderly people) accounted for 67% of EHPAs (for all elderly people) and for 75% of EHPA places (Prévot, 2009).

Unlike in public facilities where wages are set according to a national scale, directors of private nursing homes for dependent elderly people are constrained only by specific collective bargaining agreements, and even often only for a minimum pay and not for a maximum. In theory, they could therefore raise the pay levels of their employees so as to compensate for the benefits sought through changing jobs, thereby retaining them better. However, such a rise might be limited for budgetary reasons whenever prices cannot mirror changes in salaries, in particular because of being regulated by the public authorities.

EHPADs' pricing system is ternary: three daily rates are set corresponding to the three main activities of EHPADs, namely accommodation, dependency support, and nursing care. The costs are distributed between these three categories according to legally imposed distribution keys. The cost of nursing staff is, for example, in theory covered by the nursing care rate, while the cost related to the nursing auxiliaries is covered in part by the nursing care rate and in part by the dependency support rate. However, the partitions between the rates subdivisions is not always hermetically sealed. Martin (2014) observed that nursing auxiliaries' level of pay could have a positive effect on the accommodation prices in private EHPADs.

The dependency support and care prices are determined administratively by the *Département* Councils and by the Regional Health Authorities (*Agences Régionales de Santé*, ARS) Several rates are set, corresponding to the various categories of dependency of the residents (*groupes iso-ressources*, GIR, which are groups of equal dependency needs). Dependency ratings in EHPADs are defined by a national scale (*AGGIR*) making it possible to sort individuals into six GIRs depending on the activities that they are capable of doing alone, from the most severely dependent (*GIR 1*) to the least dependent (*GIR 6*). Up until 2016, those prices were set retrospectively, depending on the costs announced by the facilities (see Bozio et al., 2016). Since 1 January 2017, overall package prices for nursing care and dependency support are set on the basis of the *GIR* categories and of the residents' pathologies (Decree No. 2016-1814 of 21 December 2016).

Some EHPADs also have accommodation rates set by the *Département* Councils. Those are facilities authorised to accept residents who receive social support from the *Département*, that financial assistance making it possible to cover all or some of the expenses related to accommodation. The other facilities, that are not authorised to accept these residents, can set their accommodation rates freely when the residents arrive, but revaluation is then capped by a percentage set by ministerial order (Article L 342-3 of the Social Action and Families Code (CASF, *Code de l'Action Sociale et des Familles*). This concerned 15% of non-profit private EHPADs and 78% of for-profit private EHPADs in 2007 (Perrin-Haynes, 2010) and, respectively, 10% and 66% in 2011 (Volant, 2014).

for its staff. A variable for the mean occupancy rate of the facilities in the local area around the EHPAD at which the employee works was thus also included (*Taux d'occupation moyen_bv*). When the number of vacant places is high (i.e. when the occupancy rate is low), the possibility of increasing the prices in order to raise the wages is probably more limited. To reflect the degree of competition between EHPADs on the market of residents, zoning by local area is the most appropriate because most of the elderly people living in EHPADs used to live nearby. In 2011, 75% of residents were thus in EHPADs that were located less than 15 kilometres away from their previous place of residence (Martin 2014). Since the prices of dependency care and support are determined by the overseeing authorities (cf. Box 2), we add a variable measuring the choices made by the *Département* Councils in setting these prices; for this purpose, we use the mean of the dependency prices for *GIR 1* and *GIR 2* residents in the *Département* in which the employee works (*Tarif dépendance moyen_dpt*). The higher this price, the more the facilities can propose high wages to their nursing staff. Finally, we incorporate a category variable indicating whether the facility belongs to a group of EHPADs (*Groupe*). This variable is broken down into three modalities: fewer than 5 facilities, from 5 to 20 facilities, and more than 20 facilities. This variable can influence the wages in two opposite directions. Firstly, facilities belonging to a group can benefit from economies of scale, which can enable them to propose higher wages in the event of local difficulties in attracting and retaining staff. Secondly, certain facilities can come under financial pressure exerted by the group's parent company, which can constrain them to limit the pay level for their staff or to reduce the staffing level (the latter being incorporated as a control variable in our main model). Belonging to a group could thus have an indirect effect on employee turnover through the wages and the staffing levels, but it is unlikely for the effect to be direct. On the basis of American data, Castle and Engberg (2006) thus did not observe any significant impact of belonging to a chain on turnover among nursing staff in nursing homes. Brannon *et al.* (2002) and Castle (2005) observed a positive effect of this variable on employee turnover but they did not incorporate the wage as an explanatory variable in their model; the effect observed is thus probably an indirect effect related to the impact of belonging to a chain on the wage.

Study sample

Employee exits can be voluntary (resignations) or involuntary (redundancies, end of contract, retirement, resignations due to being constrained to move for extra-professional reasons). Unfortunately, the reasons for staff leaving are not given in the *DADS 2008* data. Since we are seeking to study the causes of voluntary turnover, we took into account only employees under open-ended employment contracts; and we therefore excluded students on training, temporary staff, and staff on fixed-term contracts. Only employees aged under 60 were included in our samples so as not to take employees retiring into account. However, some employees can retire before they are 60; we incorporated an age category of 55 or older as an explanatory variable in our estimates in order to isolate such exits.

In this study, we look only at turnover among nurses and nursing auxiliaries working in private EHPADs. Those private facilities accounted for 49% of all French EHPADs in 2007 and for 51% in 2011 (Volant, 2014). The mean exit rates are much lower in the public facilities, since they were 26% for nurses and 21% for nursing auxiliaries in 2008[6]. Since the vast majority of those exits were related to staff on fixed-term contracts[7] leaving (59% of the nurses leaving, and 68% of the nursing auxiliaries leaving), the number of voluntary exits from public EHPADs was too low to be able to study the causes of such exits. Two reasons might explain this low number of voluntary exits. Firstly, public nursing homes employ mainly civil servants; they accounted for 71% of nurses and for 75% of nursing auxiliaries in 2008. Such public service workers leave their facility only if they find another job in the public sector, and they therefore might encounter fewer opportunities. Secondly, it is possible that nurses and nursing auxiliaries who have chosen to work in public service might seek job stability more than those working in the private sector.

In Table 2, we present the descriptive statistics for each of the variables used for the nurses and for the nursing auxiliaries. There are few differences between these two categories of

6. The calculations were made on the basis of two samples of 1,169 EHPADs (exit rate for nurses) and of 1,184 EHPADs (exit rate for nursing auxiliaries). Source: DADS 2008 *(Insee) and* enquête EHPA 2007 *(Drees), authors' calculations.*
7. This phenomenon is common to all of the organisations in the tertiary sector (Bourieau et al.*, 2014).*

professional, except that age, wage, and distance from home to work are a little lower for nursing auxiliaries than for nurses.

Results: the reasons for nurses and nursing auxiliaries leaving

We present the effects on salaries of the various variables of the model and of the excluded instruments in Table 3.

Directors of EHPADs do not seem to adapt the wage levels to local difficulties. Only living in Paris or in Île-de-France and the presence of self-employed nurses have significant effects on salaries. The attractivenessof hospitals, shortage of nurses and nursing auxiliaries, and concentration in terms of positions do not have any impact on the pay level. The facilities might be constrained in setting wages by regulated prices, or by prices that are set freely but whose rise is limited by competition. The degree of competition on the market, as measured by the occupancy rate in the local area has a positive impact on the wages of nursing auxiliaries: the higher the occupancy rate, the more the directors of EHPADs can adjust their prices to enable the pay of their staff to be increased.

Various tests were conducted to validate the instruments. Fisher's tests for overall significance, conducted on the basis of ordinary least squares regressions of the wage variable on the exogenous variables and instruments of the model, made it possible to eliminate the null hypothesis of weak instruments. However, the Fisher's statistic was lower for the regression relating to the nurses, the correlation between the instruments and the explanatory variable was thus less strong, which might be detrimental to the accuracy of the results. Amemiya-Lee-Newey overidentification tests made it possible to verify the exogeneity of the instruments. We also conducted Wald tests for the exogeneity of the wage variable. The null hypothesis for exogeneity of wages was rejected for nursing auxiliaries, but not for nurses. The same regression without instrumentation of the wage led to similar estimates of the effects of the environmental factors, but it indicated a positive impact of the wage on the probability of nurses leaving that seems biased (cf. on-line supplement C3). The same impact was observed when correction was not made for the endogeneity of the nursing auxiliaries wage variable. It thus seems preferable to present and to analyse the results of the estimates obtained with the instrumental variable for both categories of staff.

In Table 4, we present the mean of the marginal effects, i.e. the mean impact of each variable on the probability of nursing auxiliaries and nurses leaving. Firstly, as regards the effects of personal characteristics, age seems to have little impact. Only nursing auxiliaries aged from 45 to 50 have a higher probability of leaving (by 4 to 5 percentage points) than nursing auxiliaries aged under 35. As regards the distance from home to work, the impact is, unsurprisingly, positive: the longer the distance, the higher the probability of them leaving. However, the effect is lower for the nurses: only those living more than 20 km away from their place of residence had a higher probability of leaving. Men are also more likely to leave their facility, the probability being higher than women by 7 percentage points.

The impacts of the employment conditions and of the characteristics of the facility varied depending on the profession (nurse or nursing auxiliary). The wage level thus had a highly significant effect on retention of nursing auxiliaries: a rise of 1% in the wage reduces their probability of leaving by from 1.2% to 1.3%. However, it has no significant impact on the probability of nurses leaving. Nurses' wages are higher than those of nursing auxiliaries; actually, they earn 40% more on average (cf. Table 2). They probably therefore face fewer financial difficulties in their daily lives and are more influenced by other dimensions of their working conditions, such as care quality, assessed here by the ratio related to staffing levels. The higher the staffing level, the lower the probability of nurses leaving, even more in facilities having a low staffing level ratio because the coefficient associated with $(N/N^*)^2$ is positive. Night work does not have any direct effect on employee retention, but it can have an indirect effect via its effect on the wage (cf. Table 3). A rise in the proportion of residents who are *GIR 2* and *GIR 3* dependent, compared with the reference category *GIR 1* increases the probability of nurses leaving. Nurses probably prefer to perform more technical care rather than ordinary nursing care, and thus remain longer at EHPADs at which they can put their know-how into practice (i.e. when the residents' state of health is severely degraded). This effect is also positive, but less strongly significant, for nursing auxiliaries. The larger the facility,

Table 2
Descriptive statistics relating to nurses and nursing auxiliaries working under open-ended contracts in EHPADs in France

Variables	Nurses			Nursing auxiliaries		
	Median	Mean	(σ)	Median	Mean	(σ)
Salaire (in euros)	24 449	25 205	(5 629)	17 379	17 848	(3 180)
N/N* (staffing level ratio)	0.783	0.798	(0.173)	0.782	0.801	(0.175)
N_Lits	80	82.94	(34.15)	80	84.48	(36.01)
%GIR1	0.178	0.183	(0.092)	0.176	0.183	(0.095)
%GIR2	0.327	0.328	(0.102)	0.321	0.325	(0.103)
%GIR3	0.140	0.148	(0.065)	0.138	0.145	(0.064)
%GIR4	0.186	0.192	(0.086)	0.186	0.192	(0.085)
%GIR5	0.061	0.073	(0.056)	0.063	0.075	(0.058)
%GIR6	0.051	0.076	(0.087)	0.052	0.080	(0.090)
Hôpital (coeff. de Huff)	0.068	0.860	(2.670)	0.047	0.556	(1.681)
‰Inf_libéraux_bv/pop	0.797	0.992	(0.606)	-	-	-
HHI_{EHPA}_bv (indice H-H)	0.092	0.200	(0.258)	0.110	0.213	(0.263)
‰Inf_{resid}_bv/pop	7.695	7.721	(2.228)	-	-	-
‰AS_{resid}_bv/pop	-	-	-	6.817	7.051	(2.167)
Taux d'occupation moyen_bv	0.949	0.945	(0.038)	0.953	0.948	(0.038)
Tarif dépendance moyen_dpt	17.35	17.45	(1.40)	17.35	17.46	(1.39)

	N	%	N	%
Départ = no	4 371	79.8	11 058	82.3
Départ = yes	1 107	20.2	2 386	17.7
Âge < 35	1 515	27.6	5 191	38.6
Âge [35 ; 45[	1 313	24.0	4 075	30.3
Âge [45 ; 50[	881	16.1	1 960	14.6
Âge [50 ; 55[	1 035	18.9	1 425	10.6
Âge ≥ 55	734	13.4	793	5.9
Homme = no	5 024	91.7	12 464	92.7
Homme = yes	454	8.3	980	7.3
Distance < 5km	1 974	36.0	5 375	40.0
Distance [5km ; 10km[	1 160	21.2	2 842	21.1
Distance [10km ; 20km[	1 360	24.8	3 207	23.9
Distance ≥ 20km	984	18.0	2 020	15.0
Nuit = no	615	11.2	1 457	10.8
Nuit = yes	4 863	88.8	11 987	89.2
Statut = non-profit private	3 514	64.1	9 368	69.7
Statut = for-profit private	1 964	35.9	4 076	30.3
Directeur ≤ 2 ans	1 116	20.4	2 606	19.4
Directeur > 2 ans	4 362	79.6	10 838	80.6
Paris = no	5 425	99.0	13 335	99.2
Paris = yes	53	1.0	109	0.8
Île-de-France = no	4 923	89.9	12 387	92.1
Île-de-France = yes	555	10.1	1 057	7.9
EHPAD non régulé = no	3 102	56.6	8 254	61.4
EHPAD non régulé = yes	2 376	43.4	5 190	38.6
Groupe < 5 EHPAD	4 093	74.7	9 891	73.6
Groupe [5 ; 20[EHPAD	882	16.1	2 425	18.0
Groupe ≥ 20 EHPAD	503	9.2	1 128	8.4

Note: the upper part of the table presents the median, mean, and standard deviation (σ) of the continuous variables used in the estimation. The lower part presents the proportions of each modality of the category variables.
Reading note: in the estimation of leaving, the median percentage of residents rated as GIR 1 *dependent was 17.8% and the mean percentage of those residents was 18.3% in the facilities studied. 64.1% of those facilities were non-profit private EHPADs.*
Coverage: 5,478 nurses and 13,444 nursing auxiliaries working under open-ended contracts in private EHPADs in France.
Sources: Insee, DADS *2008; Drees, enquête* EHPA *2007; Insee, base permanente des équipements (BPE, permanent facilities database) 2007; Drees, répertoire Finess 2007; authors' calculations.*

Table 3
Effects of exogenous variables of the model and effects of excluded instruments on salary

	Nurses		Nursing auxiliaries	
	Coeff.	(σ)	Coeff.	(σ)
Individual characteristics				
Age < 35	*ref*	*ref*	*ref*	*ref*
Âge [35 ; 45[	0.094***	(0.007)	0.047***	(0.003)
Âge [45 ; 50[	0.140***	(0.008)	0.074***	(0.004)
Âge [50 ; 55[	0.155***	(0.007)	0.084***	(0.005)
Âge ≥ 55	0.169***	(0.008)	0.099***	(0.006)
Homme	0.032***	(0.009)	0.021***	(0.005)
Distance < 5	*ref*	*ref*	*ref*	*ref*
Distance [5 ; 10[	ns		ns	
Distance [10 ; 20[	ns		ns	
Distance ≥ 20	0.015**	(0.007)	ns	
Characteristics of the job and of the facility				
Nuit	0.017*	(0.010)	ns	
N/N*	- 0.118**	(0.060)	ns	
$(N/N^*)^2$	ns		- 0.014***	(0.003)
Statut = non-profit private	*ref*	*ref*	*ref*	*ref*
Statut = for-profit private	ns	ns	- 0.056***	0.004
N_Lits	0.001***	(0.0002)	0.001***	(0.0001)
N_Lits^2 (coeff. by 10^{-6} and σ by 10^{-7})	- 2.38***	(8.13)	- 1.74***	(4.04)
%GIR1	*ref*	*ref*	*ref*	*ref*
%GIR2	ns		ns	
%GIR3	ns		ns	
%GIR4	- 0.114***	(0.036)	- 0.054***	(0.019)
%GIR5	ns		ns	
%GIR6	ns		ns	
Directeur > 2 ans	0.014**	(0.006)	0.008**	(0.003)
Environment				
Hôpital (coeff. de Huff)	ns		ns	
‰Inf_libéraux_bv/pop	0.008*	(0.005)	-	-
HHI_{EHPA}_bv (indice H-H)	ns		ns	
‰Inf_résid_bv/pop	ns		-	-
‰AS_résid_bv/pop	-	-	ns	-
Paris	0.164***	(0.050)	0.048*	(0.027)
Île-de-France	0.085***	(0.011)	0.039***	(0.006)
Instruments excluded				
EHPAD non régulé	ns		ns	
Taux d'occupation moyen_bv	ns		0.088***	(0.031)
Tarif dépendance moyen_dpt	ns		ns	
Groupe < 5 EHPAD	*ref*	*ref*	*ref*	*ref*
Groupe [5 ; 20 EHPAD[	- 0.018**	(0.007)	- 0.020***	(0.004)
Groupe ≥ 20 EHPAD	- 0.029***	(0.009)	- 0.009**	(0.004)
δ	10.086***	(0.095)	9.616***	(0.039)
Tests				
Fisher's Test				
H0: weak instruments				
Test statistics	F(5.5446) = 3.25		F(5.13413) = 7.49	
p-value	0.0062		0.0000	
Amemiya-Lee-Newey Test				
H0: exogenous instruments				
Test statistics	$Chi^2(4)$ = 5.101		$Chi^2(4)$ = 0.907	
p-value	0.2771		0.9235	
Wald Test				
H0: exogenous Log_Salaire				
Test statistics	$Chi^2(1)$ = 1.18		$Chi^2(1)$ = 28.35	
p-value	0.2772		0.0000	

****: significant at 1%; **: significant at 5%; *: significant at 10%; ns: not significant.*

Note: the table shows the parameter estimates for the instrumentation equation used to adjust the Log_Salaire *variable for endogeneity. The coefficients were estimated by maximising likelihood functions (see above). Tests for exogeneity and validity of the instruments are presented in the lower part of the table.*
Coverage: 5,478 nurses and 13,444 nursing auxiliaries working under open-ended contracts in private EHPADs in France.
Sources: Insee, DADS 2008*; Drees, enquête* EHPA 2007*; Insee, base permanente des équipements (BPE, permanent facilities database) 2007; Drees, répertoire Finess 2007; authors' calculations.*

the higher the turnover of nursing auxiliaries. The size of the EHPAD probably influences the relations between the management team and the staff. In small facilities, the director can be closer to the employees, and more in touch with their wishes in terms of work organisation and hours. Turnover of nurses is also higher in for-profit private EHPADs, but status does not have any impact on turnover of nursing auxiliaries. Finally, the presence of a director for more than two years at the facility does not have any direct impact on employee retention, but it

Table 4
Marginal effects on the probability of nurses and nursing auxiliaries leaving (*probit* model with adjustment for salary endogeneity)

	Nurses		Nursing auxiliaries	
	Coeff.	(σ)	Coeff.	(σ)
Individual characteristics				
Âge < 35	*ref*	*ref*	*ref*	*ref*
Âge [35 ; 45[	ns		ns	
Âge [45 ; 50[	ns		0.044*	(0.026)
Âge [50 ; 55[	ns		ns	
Âge ≥ 55	ns		ns	
Homme	0.072***	(0.023)	0.073***	(0.012)
Distance < 5	*ref*	*ref*	*ref*	*ref*
Distance [5 ; 10[	ns		0.021**	(0.009)
Distance [10 ; 20[	ns		0.026***	(0.009)
Distance ≥ 20	0.080***	(0.017)	0.095***	(0.015)
Characteristics of the job and of the facility				
Log_Salaire	ns		- 1.215***	(0.246)
Nuit	ns		ns	
N/N*	- 0.417***	(0.125)	ns	
$(N/N^*)^2$	0.200***	(0.073)	- 0.026***	(0.008)
Statut = privé associatif	*ref*	*ref*	*ref*	*ref*
Statut = privé lucratif	0.095***	(0.016)	ns	
N_Lits	ns		0.001**	(0.0003)
N_Lits^2 (by 10^{-6})	ns		- 2.72**	(1.12)
%GIR1	*ref*	*ref*	*ref*	*ref*
%GIR2	0.172*	(0.088)	0.084*	(0.050)
%GIR3	0.278***	(0.095)	ns	
%GIR4	ns		ns	
%GIR5	ns		ns	
%GIR6	0.254***	(0.095)	ns	
Directeur > 2 ans	ns		ns	
Environment				
Hôpital (Huff coefficient)	0.008*	(0.004)	0.008*	(0.004)
‰Inf_libéraux_bv/pop	0.029***	(0.010)	-	-
HHI_{Ehpa} _bv (indice H-H)	- 0.038*	(0.023)	- 0.024*	(0.014)
‰Inf_résid_bv/pop	ns		-	-
‰AS_résid_bv/pop	-	-	- 0.007***	(0.002)
Paris	- 0.154***	(0.060)	ns	
Île-de-France	0.117**	(0.050)	0.059***	(0.014)

****: significant at 1%; **: significant at 5%; *: significant at 10%; ns: not significant.*

Note: the table presents the mean of the marginal effects of the variables on the probability of nurses and nursing auxiliaries leaving within the year. For example, living in Paris reduces the probability of a nurse leaving by from 15% to 16% on average, with a degree of significance of 1%. Endogeneity of the variable Log_Salaire *is corrected by instrumentation.*
Coverage: 5,478 nurses and 13,444 nursing auxiliaries working under open-ended contracts in private EHPADs in France.
Sources: Insee, DADS 2008*; Drees, enquête* EHPA *2007; Insee, base permanente des équipements (BPE, permanent facilities database) 2007; Drees, répertoire Finess 2007; authors' calculations.*

may have an indirect impact through the wage (cf. Table 3).

Finally, as regards the impact of the local environment, closeness of a hospital has a positive effect on nurses and nursing auxiliaries leaving. They are then more encouraged to change mode of practice of their profession and turn towards the hospital sector, which can offer more interesting career prospects and a greater diversity of positions and sectors. For nurses, the presence of self-employed nurses working in their local area of residence also had a positive and significant effect on their probability to leave. This is another opportunity for changing mode of practice. There is high regional inequality in terms of density of self-employed nurses. In areas where this density is high, self-employed nurses perform relatively fewer nurse medical treatment acts (AMIs) and more nursing care acts (AISs) (Barlet & Cavillon, 2011). In regions under-endowed with self-employed nurses, such nursing care and support is provided by home care services. This substitution of acts of different types enables self-employed nurses to maintain an acceptable level of activity even when supply is large, and this can attract salaried nurses who live in such areas[8]. The concentration variable has a significant negative effect: the more the market is concentrated in terms of nursing staff positions, the less staff are encouraged to leave their facilities. We also observe that the better their local area of residence is endowed with nursing auxiliaries relative to the size of the local population, the less the nursing auxiliaries left their jobs. The reasons might be twofold. Firstly, nursing auxiliaries stay in their jobs because job opportunities are rare in view of the high number of nursing auxiliaries on the local labour market. Secondly, they probably work in a local area that is relatively attractive, and therefore do not seek to work in another locality. Finally, staff are more mobile in terms of changing jobs in Ile-de-France, possibly because of the public transport network, that is better than in other regions of France. Nurses living in Paris have a lower propensity to leave their jobs. Such nurses have probably chosen to pay more for their accommodation in order to reduce their commuting time, and are therefore less willing to change facilities if that would affect their distance from home to work.

8. Since 2011, social security approvals for self-employed nurses in "over-endowed" zones can no longer be granted except for replacing a nurse who is leaving (amendment No. 3 to the national agreement for self-employed nurses). This effect is therefore probably strongly attenuated.

* *
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We have highlighted the existence of ocal difficulties for retaining nursing staff at private EHPADs: closeness of a hospital, density of self-employed nurses, overall shortage of nursing auxiliaries, and increased pressure from competition between nursing homes for elderly people can encourage nurses and nursing auxiliaries to leave the facilities where they work.

The wage levels also have an effect on he behaviour of nursing auxiliaries. The higher they are, the lower the probability of leaving. Wage compensation could be a means of reducing the effect of regional disparities on turnover among this category of staff. However, their pay is not currently set according to such local difficulties because it is limited by the prices of the EHPADs. The nursing dependency care and support prices that, in theory, cover the costs of the nursing staff, are set administratively by the *Département* Councils and by the Regional Health Authorities (*Agences régionales de santé*, ARSs) The accommodation prices can sometimes compensate for the insufficient pay; however, even when such prices are not regulated, they can be constrained by price competition that we can observe in certain local areas. The wage does not have any impact on the probability of nurses leaving their jobs. Their labour supply thus seems inelastic to prices and to be determined by other factors, such as quality measured by staffing levels, or by the degree of dependency of the residents that influence the nature of the work to be done.

Nursing homes directors then have few levers available for reducing turnover of their nursing staff. Presence of a director for more than two years and night work do not have any impact on retention of such staff. Only a pay rise and reinforcement in staffing level would seem to reduce the probability of the employees leaving. However, such measures require an increase in the wage costs, and that then needs to be passed on to the nursing dependency care and support prices of the EHPADs. Since those prices are covered respectively by the French state health insurance scheme (*Assurance Maladie*) and by the *Département* Councils through payment of the personal independence allowance (*Allocation Personnalisée d'Autonomie - APA*), these measures would induce an extra cost for the public finances. However, they seem essential in view of the impact that a reduction in

turnover among the nursing staff can have on the quality of care of the residents.

This econometric study is the first to analyse the reasons for nursing staff leaving EHPADs in France. It could be interesting, in further studies, to analyse in more detail the impact of certain variables, in particular care quality, on decisions by nursing staff to resign. Unfortunately, we only have information on the staffing level, which naturally does not make it possible to approach all of the multi-dimensionality of care quality. Also in this study, we lack data on the socio-demographic characteristics of the nurses and of the nursing auxiliaries, and on the organisational culture and the managerial policy of facilities directors. Various authors have shown that the involvement of the nursing staff in managing timetables or in administrative decisions can have a non-negligible impact on job satisfaction, and thus on the choice of staying at the facility (Donoghue & Castle, 2007). Finally, here we only have cross-sectional data that, unlike panel data, do not make it possible to adjust for endogeneity related to unobserved heterogeneity. And yet, those employees who decide to leave their facility may have particular characteristics that are not all taken into account by the explanatory variables of the model. □

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