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VARIA

THEMATIC SECTION: HEALTH ECONOMICS

ARTICLES

Introduction to the Thematic Section on Health Economics

Carine Franc*

Over the past decade, the journal *Économie et Statistique* has devoted two special issues to health economics. After the special issues published in 2013 and 2016, this Thematic Section brings together a selection of articles from the 41st *Journées des économistes de la santé français* (JESF, Annual congress of French health economists) held at the University of Poitiers in December 2019. This yearly event gives rise to the publication of a selection of articles in a peer-reviewed generalist journal every other year. Thus, after the *Revue Économique* in 2009, *Économie Publique* in 2010 and 2012, then *Économie et Statistique*, the *Revue Française d'Économie* in 2017, then the *Revue d'Économie Politique* in 2019, it is *Economie et Statistique / Economics and Statistics* that welcomes this new edition. These publications illustrate the commitment of the *Collège des économistes de la santé* (Health Economists College), the organiser of this event, to widely disseminate the results of work carried out in this field.

In 2015, the title of the introduction was indicative of an already tense situation: "A sector that is always under pressure". What can we say today, in 2021? How can we describe the current situation in the health sector? In the first few sentences, we underlined a difficult economic environment and a particularly constrained budgetary context for public decision-making. But what about the constraints on policy makers today? The Covid-19 pandemic has shaken up our economy as well as our lives and continues to destabilise a fragile health system that has been under pressure for several years.

Regarding the first few months of this unsettling year of the Covid-19 pandemic, the *Cour des comptes* (a public body that assesses public expenditure) has estimated, as of autumn 2020, that the exceptional fall in the revenues of Social Security compared to those forecast in the financing law adopted at the end of 2019 is almost €27.3 billion (Cour des comptes, 2020). At the same time, they estimated the increase in expenditure to be nearly €11.5 billion, mainly due to the staggering rise in health insurance expenditure. Thus, at the end of September 2020, the Social Security financing bill forecast a deficit of more than €44 billion before it was revised upwards in the financing law passed at the end of the year to €49 billion (including the 'old age solidarity' scheme). As expected, the contribution of the health insurance branch deficit is huge, with an estimated deficit for 2020 of €33.7 billion, almost 70% of the expected cumulative deficit (LFSS for 2021, 2020). However, the trade-offs of the last few years, highly regulated by the *Objectifs nationaux des dépenses d'assurance maladie* (ONDAM – a set of objectives for National health insurance expenditure), had made it possible to contain of the health insurance' deficits, despite the continuous rise in health expenditure. ONDAM is a tool for regulating health insurance expenditure: its scope corresponds to the proportion of consumption of medical care and goods financed by Social Security (including special schemes), as well as certain items falling within the broader scope of current health expenditure. Each year, the Parliament sets maximum expenditure targets for outpatient and hospital care when it votes on the Social Security Financing Law. Between 2000 and 2019, expenditure within the scope of the ONDAM almost doubled from €103 billion to €200 billion (an increase

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of 94%) (LFSS for 2021, 2020). This increase was largely explained by the increase in health spending rather than by changes in scope. For example, between 2006 and 2019, consumption of medical care and goods increased in value by over 35% (Marc *et al*., 2020).

For 2020, of course, the figures deviate entirely from the trends observed in previous years and the overrun for 2020 reached €13 billion for an ONDAM estimated at over €219 billion (LFSS for 2021, 2020). Even if the amounts are not stabilised, the exceptional gross additional cost could reach €18 billion. This expenditure, incurred in response to the health crisis, essentially corresponds to the purchase of medical equipment and masks, the provision of diagnostic tests, financial assistance, allocated on an emergency basis, to hospitals and residential care homes for the reorganisation of care, the recruitment of staff and payment of bonuses to carers and the financing of work stoppages during the lockdowns, etc. This crisis has exacerbated tensions among health professionals and, in particular, among hospital staff, tensions that had been simmering for a long time. In order to cope with this unprecedented economic, social and health situation, the government proposed a plan known as the '*Ségur de la Santé*' (named after avenue de Ségur, where the Ministry of health is located). This plan includes salary increases for all staff in healthcare establishments and care homes for senior citizens (EHPAD), totalling €1 billion in 2020 and €6 billion more in 2021. However, the upheavals are far from confined to hospitals: the number of office and home visits, and in particular the number of GP visits, fell sharply in the first five months of 2020: -12% compared to the same period in 2019, with a particular drop in reimbursements of 14% in March and 28% in April (PLFSS, 2021, Annex 1). In order to ensure that this reduced use does not lead to a deterioration in the health situation of 'non-Covid' patients, in addition to simplifying access to teleconsultations, tariff incentives were introduced to encourage GPs to offer 'long' consultations to their frail patients who had missed out on check-ups during lockdown. However, despite this massive expenditure to counter the epidemic and to limit its consequences, the first evaluations carried out in July 2020 highlighted the social and regional inequalities present during the health crisis (Dubost *et al*., 2020). In the first few months of the crisis, social inequalities were already apparent at all levels, in exposure to the virus, in vulnerability to the virus with, as we know, a significant social disparity in aggravating factors and co-morbidities, and in management and access to care. More specific to this health crisis, inequalities also became very apparent during lockdown with, for example, a lack of continuity of care for 'other' patients, and obviously significant disparities in housing conditions and isolation as well as in material security. Although for several years now, numerous studies have shown the significant increase in social inequalities and in particular social inequalities in health in our western societies, the health crisis has perhaps, for a time, made them less 'bearable'. Even the US Federal Reserve (Fed), not known for taking into account the redistributive effects of its monetary policy, stated, through its chair Jerome Powell, that African-Americans and Hispanics have been the most affected by the rise in the unemployment rate as a result of this crisis - as in previous crises (Powell, 2020). To make its activities more effective, the Fed should specifically take into account these disparities in its monetary policy adjustments.
A revolution in thinking?

Beyond the macro-financial framework data which, in the current economic context, take on 'non-standard' dimensions, the health sector is a remarkable field of research for economists. It concentrates almost all possible market failures, which can sometimes be considerable in scale. These failures, far from being merely theoretical distortions to a hypothetical balance, justify the intervention of public authorities in many forms and in many aspects. These include public interventions in the form of barriers to competition (patents, *numerus clausus*, etc.) or strict price regulations in the sector specifically to overcome problems related to information asymmetries (prices of medicines, tests and screening, medical care, introduction of deductibles, etc.). Another failure today that perfectly illustrates the particularities of the 'health good' and the indispensable regulation of public authorities is the public response to issues related to externalities. In the context of the Covid-19 pandemic, it seems obvious that it is in the interest of everyone's health that everyone should have access to screening as soon as they are in any doubt and to a vaccine as soon as it is put on the market. The question of sufficient use of the vaccine in order to achieve

the necessary collective immunity is just as essential. Indeed, since individual decisions do not take into account the general interest, the youngest, the least 'at risk' or the most risk-averse (adverse effects) could be less inclined to be vaccinated, despite the fact that the vaccine is available free of charge. Additional incentives, whether financial (a bonus) or in kind (a voucher for a beer, a ticket to a sports event) may convince a few more candidates. Public authorities can also introduce barriers to entry for the consumption of certain goods (restaurants, concerts, travel, etc.) through the introduction of a 'market entry permit' or a '*Pass sanitaire*'. There is therefore a quite large range of incentives available to induce an optimal level of consumption of a product with strong positive consumption externalities. There is also compulsory vaccination as a regulatory tool. A real textbook case for the economist!

Thus, it is clear that, above all, health is not a good like any other, and if this is obvious at the individual level, for each of us, it is also an established fact in the economic field. Therefore, apart from obviously important altruistic considerations, it would be a major mistake to consider health expenditure only as a weight in the economy. Yet, as confirmed by the expert panel to the High Commission on Health, Employment and Economic Growth (Horton *et al*., 2016), employment in the health sector is generally seen as "a cost burden on the economy, one that is often thought to be inefficient and resistant to gains in productivity". According to this Commission, health employment should, on the contrary, be seen as an extremely attractive investment, not only in terms of fairness of access to health but also to strengthen and stabilize inclusive economic growth. James (2017) argues that health systems are essential to the efficient functioning of a country's economy as healthy adults are more productive and healthy children do better in school. This strengthens economic performance and makes growth more sustainable and inclusive. The health care sector is also a major source of employment. On average, health and social work activities accounted for about 11% of total employment in OECD countries in 2014 (James, 2017). More broadly, and from an endogenous growth perspective, both health and education are essential components of human capital that justify mainly public funding (Barnay *et al*., 2019). Finally, as Cornilleau (2012) points out, although the evolution of health expenditure constitutes a real challenge for growth, precisely because it is often publicly-funded expenditure, it contributes to the increase in well-being in a proportion that, even though difficult to measure, is certainly significant.

The few contributions presented at the JESF in December 2019 published in this issue all fall within the scope of recurring themes and make it possible to address a certain number of analyses that are enlightening for public decision-making.

While the current economic climate has exacerbated tensions among health professionals, issues related to their remuneration are clearly not a new topic. **Brigitte Dormont, Aimée Kingsada and Anne-Laure Samson** look back at the first pay-for-performance system offered in France to doctors in 2009 *via* the *Contrat d'Amélioration des Pratiques Individuelles* (CAPI, an incentive to change in practices). They consider the effect of this system, mainly intended for general practitioners, on their care provision behaviour, in terms of the level of their activity per patient as well as their involvement in the rise of the primary care physician system. The authors also show that the effects of CAPI are not neutral from the point of view of doctors' fees per patient, with consequences on the dynamics of fees in the expenditure in outpatient healthcare for Social Security.

The regulation of doctors' fees in GP practices has a long history, in search of a balance between the attractiveness of private practice for professionals and accessibility for patients. **Brigitte Dormont and Cécile Gayet** study the consequences for private doctors and dentists of the ban on charging additional fees above the base rate for patients covered by the CMU-C (a scheme to help low-income families cover health expenses). In particular, they examine the extent to which this ban creates a financial constraint for sector 2 doctors (who are allowed to charge fees above the base rate) and private dentists, which could lead them to exclude these patients, even though the idea is to promote their access to care. The results show that while the average additional fee tends to decrease when professionals

receive CMU-C patients, there does not seem to be a negative impact on total fees due to an increase in their activity at the same time.

Of course, inequality in access to and use of healthcare is not only the result of the behaviour of health care providers. While it is well known that the demand for care depends on age, through the change in care needs, the link between this demand and the characteristics of the professional activity is less established. **Estelle Augé and Nicolas Sirven** propose an analysis of this based on the use of health care by the self-employed compared to employees. The authors show that the self-employed tend to consume less outpatient care during their working life ('must-trade' effect), whereas their consumption then increases to gradually catch up with the levels observed among employees after retirement ('catch-up' effect), suggesting that their health therefore declines more rapidly over the life cycle.

In addition to the opportunity costs that can explain the choice of care, preferences obviously play a key role in individual economic trade-offs. Having individuals reveal their preferences is therefore essential to understanding their individual decisions. In a discrete choice study, **Christine Peyron, Aurore Pélissier and Nicolas Krucien** analyse the preferences of the French population with regard to the methods and content of genetic information that is potentially accessible thanks to genomic medicine. The authors highlight a desire to access the most comprehensive genetic results possible, with a desire for autonomy on the part of individuals as regards choosing the information communicated, and a certain value placed on making a contribution to research through the provision of their genetic data.

In a final article, **Louis Arnault and Jérôme Wittwer** study the effect of the 2015 reform of the home care APA (*Aide personnalisée à l'autonomie*), an autonomy allowance, on the benefits actually received by beneficiaries according to their level of dependence. The authors show that while the average amount of benefits offered to the least autonomous beneficiaries increased significantly between 2011 and 2017, the average amount offered to the least dependent beneficiaries decreased, when applying consistent criteria. Within each GIR defining the level of autonomy, in 2017, the amounts granted are more widely distributed, in 'both directions', which suggests that constraints on departmental council budgets have led to cutting allowances for people with relatively more autonomy so as to provide more funding for the most severely dependent people.

In the current context, more than ever, economic analysis must contribute to policy-making by promoting efficient spending. Indeed, if the popular adage says 'health is priceless', it has rarely cost so much! Of course, the financial shocks are massive in the health sector, but they are also massive in many other sectors of the economy and far beyond. The pandemic has shaken up our way of life, and continues to affect our social and even family interactions and our freedoms. The shock is such that it is impossible for this pandemic not to leave its mark on the history of our people and the economic history of our time. It is still difficult, if not impossible, to take stock of the upheavals caused by this crisis. Thus, we can hope that, contrary to the concerns of Chantal Cases and Brigitte Dormont in the preface to the special issue published in 2013, economic analysis can play a key role in decisions affecting the health system. Indeed, in this unprecedented period of pandemic, it has become obvious, let us hope, to a large number of people, that the tools of the economist will be able to help and support public decision-making. What is more, in view of the challenges of economic recovery, the trade-offs that will have to be made with their inevitable consequences on the organisation of the health system, on the functioning of the various stakeholders, and on the model(s) for its financing will ultimately reflect societal choices. □

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The Introduction of Pay-for-Performance : What Impact on General Practitioners' Activity in France?

Brigitte Dormont*, Aimée Kingsada and Anne-Laure Samson*****

Abstract – In 2009, a system of pay-for-performance (P4P) was offered to physicians in France *via* the *Contrat d'Amélioration des Pratiques Individuelles* (CAPI). This study assesses the causal impact of CAPI on their behaviour in terms of care provision. Based on a panel of general practitioners in private practice observed before (2005 and 2008) and after (2011) its introduction, we use an instrumental variables approach, applied to a model in first-differences in order to correct the endogeneity biases linked to the fact that signing up to CAPI is a choice. We show that, unlike other practitioners, those who have signed up to CAPI have not reduced their number of consultations per patient or the amount of prescriptions per patient. They have also increased, to a greater extent than others, the proportion of their patients who they treat as the primary care doctor (i.e. the *"médecin traitant"*). Moreover, CAPI has enabled them to increase their fees per patient with, as a consequence, a higher treatment cost for the Social Security system.

JEL classification: I18, J22, C23, C26
Keywords: pay-for-performance, CAPI, care provision, general practitioners

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The way in which physicians are paid influences their behaviour in terms of care provision and the efficiency of the health system. The choice between capitation, a salary or fee-for-service, or a combination of these payment methods, influences the volume and the quality of care offered, access to care of the population and the efficiency of health expenditure (Grignon *et al.*, 2002).

In France, fee-for-service remains the dominant method. This type of payment encourages physicians to respond to demand and to meet patients' needs (Albouy & Déprez, 2009). However, there are numerous undesirable effects associated with it. In Sector 1, where rates are fixed, physicians' income mainly depends on the volume of their activity. Fee-for-service may therefore encourage the multiplication of procedures which reduces the efficiency of the health system (Delattre & Dormont, 2003). It also encourages curative care to the detriment of preventive care because it does not reward the long-term benefits of prevention (Franc & Lesur, 2004).

It is in this context that, in 2009, the *Caisse Nationale d'Assurance Maladie* (CNAM, the National health insurance) introduced a pay-for-performance (P4P) scheme, the *Contrat d'amélioration des pratiques individuelles* (CAPI, a contract between physicians and the Social Security).[1] This contract introduced a new element of remuneration for physicians associated with the achievement of targets in terms of quality and based not on the number of procedures carried out, but on the number of patients treated as the primary care doctor (the *médecin traitant*). On a voluntary basis, CAPI provided for a flat-rate remuneration to be added to fee-for-service, the amount depending on the rate of achievement of the targets set (see below).

Pay-for-performance has emerged in several OECD countries (the United States, Australia, Germany, etc.) following the example of the United Kingdom which pioneered it in 2004 with its 'Quality and Outcomes Framework' programme. With its generalisation, a large number of empirical studies have been carried out to assess its impact. All of them analyse the effect of financial incentives on achievement of the targets set under the programmes, the various incentives often being assessed separately. They conclude that pay-for-performance has a mixed effect. In France, the assessments currently available suggest a zero or limited effect. We address this question here from a different perspective, examining whether the financial incentives under CAPI, which increase the proportion of physicians' pay that is associated with the patient rather than the procedure, alter physicians' practices and the structure of their activity. This angle of analysis has not yet been adopted in France (or, as far as we are aware, in the international literature) to assess pay-for-performance.

We use a balanced panel of general practitioners (GPs) observed before (2005 and 2008) and after (2011) the introduction of CAPI. Balancing is required for our method of assessment. It means working on the basis of physicians who have been practising continually in private practice over the period from 2005 to 2011. The latter represent 84% of the procedures carried out and 82% of the patients for whom care was provided over that period. Using an instrumental variables estimation applied to a model in first-differences, we assess the causal impact of CAPI on the behaviour, in terms of care provision, of GPs who are "treated" by CAPI.

The period studied is characterised by strong growth in potential demand addressed to each physician due to changes in the medical demography, the preferences of young generations of physicians and a rise in chronic illnesses. The physicians in our sample have seen a considerable increase in patient numbers (+14.7%) which goes hand in hand with an equally large reduction in the number of consultations per patient (-14.1%). In this context, CAPI introduces a significant counterbalance to these changes: contrary to their colleagues, those physicians who opted for CAPI have not taken on more patients or reduced the number of consultations per patient; nor have they reduced the amount of prescriptions per patient. They have also increased, to a far greater extent than their colleagues, the proportion of their patients who they treat as the *médecin traitant*. By generating additional income per patient irrespective of the number of procedures carried out, CAPI has allowed physicians to increase the amount of time devoted to each patient and, as a consequence, their fees per patient. This significant effect of CAPI on physicians' practices, which may translate to an improvement in the quality of patient treatment, goes hand in hand, as far as the Social Security system is concerned, with a significant increase in the cost of care for each patient concerned.

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*1. The National Medical Council (*Conseil national de l'Ordre des médecins*) was opposed to it, seeing this contract as an attack on the independence of doctors and harming the relationship of trust between the doctor and their patient (Dormont, 2013).*

The article is structured as follows. Section 1 offers an overview of the literature on the effects of pay-for-performance, so as to put our contribution into context. Section 2 returns to the functioning of CAPI and presents the data used, the construction of the sample and some descriptive statistics. The empirical strategy is described in Section 3, the results are set out in Section 4, then we conclude.

1. Literature Review

Since the 2000s, many OECD countries have introduced a pay-for-performance system aimed at improving the quality of care provided (through better care treatment for chronic illnesses, early detection of cancers, etc.) and the efficiency of health expenditure. The emergence of this new system has given rise to a large number of studies seeking to assess its cost and its efficiency (see Cashin *et al.*, 2014 for a summary). Almost all of the studies assess the effects of these incentives on the achievement of each of the targets directly aimed at by the financial incentives (Van Herck *et al*., 2010; Flodgren *et al*., 2011; Scott *et al*., 2011; Gillam *et al.,* 2012; Eijkenaar *et al.,* 2013). These works obtain varying quality effects because, as indicated by Kantaveric *et al.* (2013), results are directly dependent on the methodology used in the assessments and on the structure of the system, and more specifically on the substance of the incentives (size of bonuses, number of targets and measure of their achievement). They are also highly dependent on the organisation of the health system in the country concerned (particularly the initial payment system, whether it is an individual or group practice). Pay-for-performance may also have an impact on the physician's other activities, those not covered by the financial incentives, but in that case too, the estimated effects are conflicting according to the studies, even where they relate to the same countries: for example in Britain, Doran *et al*. (2011) conclude that there is a deterioration in the quality of care for procedures not covered by the incentives whereas, previously, Sutton *et al*. (2010) reached the opposite conclusion.

Unlike in other countries, few econometric studies assess the effects of pay-for-performance in France. Like the international literature, these studies mainly seek to quantify the impact thereof in terms of achievement of the targets aimed at by the financial incentives, or the quality of care. Saint-Lary & Sicsic (2015) thus assess the effect of CAPI on the length of consultations, used as a proxy for the quality of care, and show that consultations by physicians who have signed up to CAPI are not significantly longer than those by others. Sicsic & Franc (2017) analyse the effect of CAPI on the number of mammographies prescribed for women between the ages of 50 and 74 but do not find any significant difference between those prescribed by physicians who have signed up to CAPI and those who have not. According to them, the amount allocated to this indicator does not generate enough of an incentive to significantly improve practices for the prevention of breast cancer. In these studies, although the authors highlight a selection of physicians in the system, the econometric specifications used do not enable this endogeneity to be controlled. On the other hand, Michel-Lepage & Ventelou (2016) consider a probit model with instrumental variables to assess the effect of CAPI on achievement of the target to reduce prescriptions of benzodiazepines in patients aged 65 or over. Their results suggest that CAPI has a significant but minor impact on the achievement of this target. However, the exogeneity of the instrument used (the number of consultations by physicians over the period studied) is disputable. Moreover, their period of study (June 2011 to December 2012) includes the period in which ROSP[2] was introduced: the control group (physicians who have not signed up to CAPI) therefore also had financial incentives to achieve this target. Rat *et al*. (2014), who look at the same indicator but in the context of ROSP and without instrumenting the amount of payments received *via* ROSP, do not observe any effect of performance-related pay.

Compared to these inconclusive results regarding the efficiency of the pay-for-performance system, our contribution to the literature is two-fold. Firstly, we examine whether CAPI, which modifies the form of payments received by physicians by giving less weight to fee-for-service, has an impact on behaviour in terms of the provision of care by physicians. Although our data do not contain any details on the pharmaceutical prescriptions (generic or original), or the tests and blood dosages prescribed, they do, on the other hand, provide a set of variables relating to behaviour in terms of the provision of care: number of consultations, procedures, number and proportion of patients treated as the *médecin traitant*, number of beneficiaries of complementary universal health insurance (CMU-C), patients in long-term illness (ALD), structure of patients by age and sex,

2. Rémunération sur Objectifs de Santé Publique, *which extended pay-for-performance to all physicians in 2012.*

prescriptions, and components of the doctor's income. As far as we are aware, no assessment of pay-for-performance from this perspective of the impact on the structure of the provision of care has yet been carried out either in the French or the international literature.

Moreover, our empirical strategy assesses the impact of these incentives taking the endogeneity of having signed up to the CAPI system into account. Our first-difference specification using an instrumental variable method allows the assessment of a local effect, measured on compliers alone, based on a balanced panel of physicians who have worked continuously in private practice from 2005 to 2011. Our results therefore have to be interpreted with caution. In any case, our approach allows for correcting biases associated with the endogeneity of having signed up to CAPI, which is not usually the case – or imperfectly – in French studies.

2. The CAPI System, Data and Descriptive Statistics

In March 2009, the UNCAM (National Union of health insurance funds) introduced pay-for-performance in France *via* CAPI (Journal officiel, 2009). The aim of the system is to encourage physicians to follow the good practice recommendations issued by the *Haute Autorité de Santé* – the National Health Authority – (more prevention, support for patients suffering chronic illnesses), whilst limiting the growth in health expenditure. The contract reduces the proportion of fee-for-service, which is known to encourage them to offer more procedures and more curative than preventive care, in physicians' pay. Any *médecin traitant* on agreement with the Social Security in private practice and having the minimum number of patients and the minimum volume of prescriptions could sign, on a voluntary basis, a three-year contract with the CNAM. Physicians were then free to leave the system if they wanted to. By signing up to CAPI, a physician undertakes to meet the targets set under public health law in return for a financial reward (see Box).

Nearly 16,000 *médecins traitants* in private practice signed up to CAPI over the period covered by this system, that is to say more than one in three eligible physicians (CCSS, 2011). The growth in the total number of signatories has been gradual: from 5,000 in June 2009, 13,000 in December 2009, 14,000 in June 2010 and 15,500 in December 2010. Most therefore signed up in 2009. In its communication, the CNAM highlighted the success of CAPI since its first year (CNAM, 2010), with objective achievement rates among those signing up to CAPI which have increased to a greater extent than among those who have not. On the other hand, achievement rates among those signing up to CAPI were initially (before they signed up) higher than the rates of those who have not.

2.1. The Data: An Exhaustive Panel of French General Practitioners in Private Practice

The study uses data from a matching process produced by INSEE on behalf of DREES from two exhaustive administrative sources relating to physicians working in private practice in France. The first, supplied by CNAM, contains information on the doctor's sociodemographic characteristics, the structure of their activity, their patients and their fees. It is matched with data from the Directorate-General of Public Finances (*Direction Générale des Finances Publiques*, DGFiP) which provide details of physicians' tax returns (personal tax returns) and detailed information on the various sources of their remuneration and the characteristics of the taxable household. The matching also contains information on the municipality in which the doctor is practising.

Box – **The CAPI System**

CAPI consists of two parts: the first relates to targets for prevention and the treating of chronic pathologies and the second, referred to as the prescription optimisation target, encourages the prescribing of generic drugs (see Appendix 1). In total, sixteen public health target indicators have been established.

When calculating whether targets have been achieved, account is taken of the physician's initial achievement rate, but also their progression. If he or she achieves at least 25% of the targets in each of the two parts of the contract, they get a bonus which is calculated as follows:

$$Bonus = Achievement\ rate \times number\ of\ patients\ as\ médecin\ traitant \times €7$$

The bonus received is an increasing function of the number of patients treated as the *médecin traitant* and the rate of achievement of the targets. To give an idea of size, a doctor who treats 800 patients as the *médecin traitant* may hope for a bonus of up to €5,600 if they achieve all of their targets.

Five years are available (2005, 2008, 2011, 2014 and 2017) but only 2005, 2008 and 2011 have been retained for analysis. This is because, in 2012, CAPI was replaced by ROSP, which extended pay-for-performance to all physicians, which may have altered their activity. The period from 2008 to 2011, which saw no reforms in outpatient care that may have had any specific effect on certain physicians, can therefore be used to identify the effect of CAPI itself.

2.2. Sample Used for the Analysis

CAPI has been offered to all physicians under agreement with the National Health Insurance working in private practice. Our data show that 99.97% of physicians who received a CAPI bonus in 2011 are GPs. For this reason, our study concentrates on the latter.

We restrict coverage to GPs working exclusively in private practice (i.e. they have no hospital work in addition to their private practice work).[3] We also disregard physicians who draw a pension over the period. Moreover, we concentrate uniquely on physicians practicing in Sector 1 (that is, who apply fees agreed with the Social Security) and thus exclude those who either are not under agreement or practice in Sector 2. These physicians have very different characteristics to those in Sector 1 and, in 2011, represent only 10.4% of GPs and only 4.4% of those who signed up to CAPI and received a bonus. The sample then consists of 50,233 GPs in private practice observed at least once in 2005, 2008 and 2011.

Our econometric strategy (see below) requires physicians to be observed before (2005 and 2008) and after (2011) CAPI was introduced. Our sample is therefore restricted solely to physicians present in these 3 years. The construction of this balanced sample reduces the initial sample by 15,980 physicians (31%) to leave 34,253 physicians.

Using a balanced sample raises the question of a selection bias. It results in excluding that three types of physicians: *(i)* physicians who left private practice in 2008 or 2011 (40% of those ruled out); *(ii)* physicians observed for the first time in 2008 or in 2011 (40%); *(iii)* physicians who have a career break and disappear from the data for one or two years (20%).[4] We do not know the reasons for any temporary or permanent departure from and return to the data. However, their characteristics (see Appendix 2) and data from the *Ordre des Médecins* – the National Medical Council – (see Le Breton-Lerouvillois & Romestaing, 2013) show that type *(i)* are physicians who left private practice for retirement reasons, for a temporary break in their careers or for a change of medical specialty and that type *(ii)* physicians started their practice that year. The remaining 20% stopped working in private practice for one or two years (sick leave, maternity or temporary departure from private practice in favour of another form of practice). They have substantially reduced their activity during the year(s) of observation, probably reflecting a departure from private practice (and therefore from the sample) during the course of the year.

Overall, the working sample is made up uniquely of physicians in a "permanent structure", that is to say physicians who have already built up their client base (so not new physicians), who are not at the end of their careers either and who have chosen to work full-time in private practice. They represent 70% of the original sample but carry out 84% of total procedures, earn 84% of total fees and treat 82% of patients. This balancing, which is needed for our econometric approach, therefore leads us to examine the main care providers.

Finally, we also excluded from this balanced sample of 34,253 physicians all of those for whom the variables of interest in 2008 or 2011, the instruments in 2005 and the control variables in 2005, 2008 or 2011 have atypical values. Our final sample then consists of 32,171 physicians from Sector 1 observed over three years, 2005, 2008 and 2011, that is to say 96,513 observations.

Of these GPs in private practice, 23.1% (7,429 physicians) received a CAPI bonus in 2011. This does not mean that 23.1% of GPs signed up to CAPI. The reason is that some physicians signed up but did not achieve the targets required for them to earn any bonus (according to CNAM, this accounts for about 25% of signatories, cf. Ulmann, 2011). In the data, we can only observe the amount paid in bonuses and not the doctor's status in terms of signing up. It is therefore impossible for us to distinguish, among the physicians not having received any CAPI bonus, those who signed up to CAPI without achieving the targets from those who did not sign up to CAPI. In this article, we are therefore seeking to measure the effect of CAPI in relation to physicians who sufficiently altered their practices to get a bonus.

3. This restriction is needed in so far as our data only provide information on work carried out in a private practice. The activity carried out in a hospital structure, a retirement home or any other structure in which the doctor would be employed is not accounted for in our data and the measurement of their activity is therefore incomplete.

4. To identify them, we also use data from 2014: if the doctor is present in 2005 but absent in 2008 and/or 2011, but present again in 2014, they have had a temporary career break.

2.3 Variables of Interest

Our analysis seeks to estimate the causal impact of CAPI, and therefore the impact of the modification of remuneration associated with each patient, on the structure of physicians' activity. Even if the bonus is a relatively small amount, it is not negligible (Figure I), and the literature on incentives shows, in many areas, a significant response by individuals to small monetary incentives. The behaviour of physicians in terms of care provision may be summarised using the following variables:

- Variables relating to overall annual activity: the number of consultations, the total number of procedures and the volume of care provided (i.e. the sum of the various procedures, valued by the standard price for these procedures). The volume of care thus valued despite being a monetary variable, allows the composition of the activity and their technicality to be measured.[5]

- Variables relating to the structure of the doctor's patients: the number of different patients seen during the year and the proportion of patients treated as the *médecin traitant* since calculating the CAPI bonus depends on the number of patients treated as the *médecin traitant* (cf. Box).

- Variables relating to the structure of the doctor's activity, measured per patient: the number of consultations, the total prescription amounts and the pharmaceutical prescription amounts. One might expect that CAPI would have a positive effect on the amount of time devoted to each patient, i.e. on the number of consultations given to each patient. The effect of the system on the amount of prescriptions is more ambiguous since the achievement of certain targets is inextricably linked to an increase in prescriptions (such as of mammographies, of dilated fundus examinations or of glycated haemoglobin tests), or in pharmaceutical prescriptions in particular (such as antihypertensives), whilst the achievement of other targets is linked to a reduction in the amount of pharmaceutical prescriptions (such as an increase in the proportion of prescribed drugs in the directory of generic medicines) (see Appendix 1).

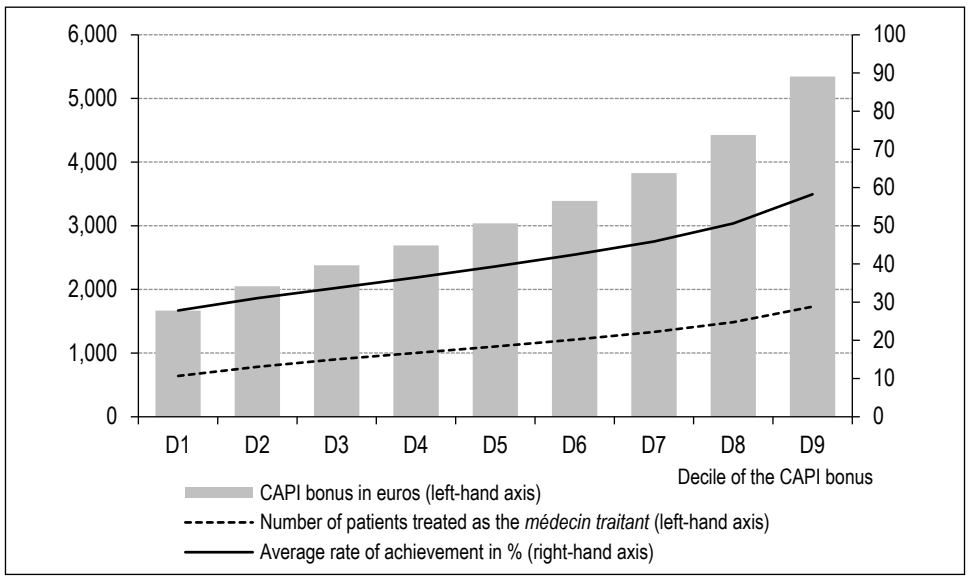
- Remuneration and cost variables: the amount of total fees and fees per patient, but also the full cost of reimbursable expenditures per patient. The latter includes physicians' fees and the value of prescriptions.

2.4. Descriptive Statistics

Our data show that, in 2011, physicians who signed up to the system received an average bonus of €3,332. This average conceals large disparities (Figure I): 10% of physicians who signed up to CAPI received a bonus of less than €1,667 and 10% received a bonus of more than

5. Indeed, where total numbers of procedures are completely identical, a physician who only gives consultations will have a lower volume of care than one who combines "conventional" consultations with technical procedures for which charges are higher (such as electrocardiograms).

Figure I – **Rate of achievement of targets, amount received in bonuses and number of patients treated by general practitioners who signed up to CAPI as the *médecin traitant* in 2011**



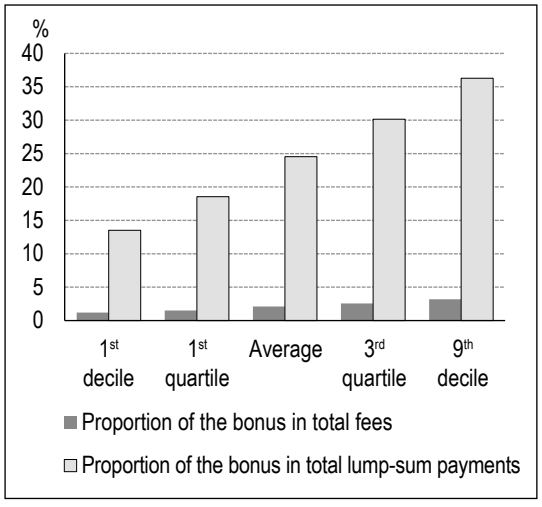
Notes: The decile of the CAPI bonus and the average number of patients treated as a *médecin traitant* are both read on the left-hand axis. The average rate of achievement is shown on the right-hand axis. The average rate of achievement is calculated by the authors.
Reading Note: In 2011, 10% of doctors who signed up to CAPI treat fewer than 641 patients as a *médecin traitant*, have a target achievement rate of less than 27.8% and receive a bonus of less than 1,667 euros.
Sources and Coverage: CNAM-DGFiP-DREES matched data, wave 2011. Metropolitan France. General practitioners in Sector 1 and working exclusively in private practice who signed up to CAPI.

€5,342. A quick calculation shows that 59% of the variance in these bonuses between physicians is due to the variability of the number of patients treated as the *médecin traitant* and 25% is due to the variability of the rate of achievement (the remaining variability corresponding to the correlation between these two variables). The 10% of physicians receiving the lowest bonuses combine a low rate of achievement (less than 27%) and a limited number of patients treated as the *médecin traitant* (fewer than 641 patients). Conversely, the 10% of physicians receiving the highest bonuses have an average rate of achievement of more than 58% and treat more than 1,729 patients as the *médecin traitant*.

This bonus represents an average of 24.5% of the total lump-sum payments received by GPs in addition to their fee-for-service. However, this is still only a small proportion of the physicians' pay: on average, less than 2.11% of fees, a little more than 3% for the 10% of physicians earning the highest bonuses (Figure II). The extension of CAPI to ROSP, in 2012, through an increase in the number of targets giving rise to bonuses, led to an increase in the proportion of lump-sum payments in physicians' pay in subsequent years.

Table 1 shows a comparison of the characteristics (in 2008, before the introduction of CAPI) of physicians who received a CAPI bonus with those who did not receive one. Those who received a bonus have very different characteristics to other physicians: they tend to be men, to be younger and to live in a couple in a household with dependent children. They tend to practise in municipalities less densely populated with GPs, specialists and other private health professionals (dental surgeons, nurses, midwives and physiotherapists). The demand for care directed at them is therefore generally higher.

Figure II – **Proportion of the CAPI bonus in total fees and lump-sum payments of general practitioners in 2011**



Reading Note: On average, the CAPI bonus represents 24.5% of the total lump-sum payments and only 2.11% of the total fees of general practitioners in 2011.
Sources and Coverage: see Figure I. Authors' calculations.

Table 2 shows the average of the different variables of interest in 2008 and 2011. The statistics highlight a significant difference between CAPI and non-CAPI physicians in respect of all variables. Before signing up to CAPI, in 2008, physicians who are signatories carried out more procedures in total and had a significantly higher volume of activity. They treated more patients, and in a greater proportion as the *médecin traitant*, and received higher total fees. These differences grow in 2011, with the impact of CAPI and other factors of change in physicians' activity.

These statistics clearly show that physicians who signed up to CAPI are different to their colleagues. It is therefore essential to take account of the potential endogeneity of signing up to CAPI in the econometric analysis of its impact.

3. Empirical Strategy

Physicians have been able to sign up to CAPI since 2009 and we can observe, from the data for 2011, the impact of receiving a bonus on the characteristics of the doctor's overall activity. Noting $log(Y_{it})$ the logarithm of one of these characteristics, we consider a model of the form:

$$log(Y_{it}) = \alpha + \beta \text{CAPI}_{it} + X_{it}^{'}\gamma + \delta t + \theta_i + \epsilon_{it} \quad (1)$$

where t=2008 or 2011, i=1...N

CAPI_{it} is a dichotomous variable equal to 1 if the doctor has signed up to CAPI and received a bonus in 2011 and 0 if not. In the remainder of the article, we will simplify matters by saying that this variable measures the effect of "signing up to CAPI"; in fact, it measures the effect of signing up to CAPI and achieving the targets enabling the doctor to receive a bonus.

θ_i represents the individual specific effect of doctor i. This term incorporates elements of unobserved heterogeneity specific to the doctor and assumed to be constant over time: their style of practice, their ethics and the importance they give to leisure in the work and leisure trade-off.

ϵ_{it} represents the idiosyncratic error term which affect the behaviour of doctor i in terms of their care provision in year t, such as an epidemic, a variation in the demand for care, a need by the doctor to increase their income, their state of health or any other temporary shock.

Table 1 – **Sociodemographic characteristics of general practitioners in 2008, before CAPI was introcuced, according to whether or not they chose to sign up to CAPI**

	NON-CAPI % in column	CAPI % in column	p-value
Number of doctors	24,742	7,429	
Gender			
Men	73.7	77.8	
Women	26.3	22.2	***
Age			
Aged < 49	35.8	40.3	***
Aged 49-55	35.7	35.6	ns
Aged ≥ 56	28.5	24.1	***
Marital status			
Single	11.1	8.4	***
Divorced	10.5	10.1	ns
Married	76.7	79.7	***
Civil partnership	1.1	1.2	ns
Widow(er)	0.6	0.6	ns
Dependent children			
No	32.8	27.5	
Yes	67.2	72.5	***
Dependent persons in the family home			
0	32.3	26.9	***
1	21.0	19.7	**
2	26.3	28.3	***
3 or +	20.4	25.1	***
Density of GPs in private practice in the municipality where they are practising for 1,000 inhabitants			
Average (standard deviation)	1.39 (0.80)	1.36 (0.84)	***
Density of specialist doctors in private practice and other medical professions in private practice in the municipality where they are practising for 1,000 inhabitants			
Average (standard deviation)	3.68 (2.11)	3.56 (2.06)	***

Notes: The *p-value* corresponds to the test of equality of means between CAPI and non-CAPI doctors. ns stands for not significant: $p \geq 0.10$; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Reading Note: In 2008, 26.3% of doctors who have not signed up to CAPI are women whilst they represent 22.2% of doctors who have signed up to CAPI. This difference is significant at the 1% threshold.
Sources and Coverage: CNAM-DGFiP-DREES matched data, wave 2008. Metropolitan France. General practitioners in Sector 1 and working exclusively in private practice.

The variable t is a linear trend symbolising the progression between 2008 and 2011 in respect of all of the variables for the provision of care by physicians.

X'_{it} corresponds to a set of variables which explain physicians' activity. Many of them are constant between 2008 and 2011 and disappear in first differences, as well as the age of the doctor, which is collinear with the trend. On the other hand, variables relating to the number of people in the doctor's household (partner and number of children), to the density of GPs in private practice and to the density of specialists and other health professionals in private practice in the municipality where they work, are retained in the first-difference specification.

The endogeneity of the decision to sign up to CAPI partly translates to a correlation between the individual specific effect θ_i and the variable CAPI_{it}. This specific effect is eliminated by transforming the initial model through first differences. This gives:

$$\Delta log\left(Y_{it}\right) = \beta \Delta \text{CAPI}_{it} + \Delta X'_{it}\gamma + \delta + \Delta\epsilon_{it}$$

More precisely, as we will be studying the changes between 2008 and 2011, the model is expressed as follows:

$$\Delta Y_{i0811} = \beta \Delta \text{CAPI}_{i0811} + \Delta X'_{i0811}\gamma + \delta + \Delta\epsilon_{i0811} \quad (2)$$

In this context, the effect of receiving a CAPI bonus on the rate of growth of different variables is being studied: $\Delta Y_{i0811} = \left(log\, Y_{i11} - log Y_{i08}\right)$.[6]

Even if first differences allow the specific effect on the doctor to be eliminated, it is possible that

6. When this variable is a proportion (this is the case for the share of patients followed as a médecin traitant), ΔY_{i0811} corresponds only to the variation of this proportion between 2008 and 2011. For the other variables, we approximate the growth rate by the first difference of the logarithms. The choice to measure the explained variables in logarithms comes from the distribution of these variables. The values of Skewness and Kurtosis lead to a log normal distribution for the different explained variables.

Table 2 – **Comparison of variables for care provision by general practitioners, between doctors who signed up to CAPI and other doctors**

	2008			2011		
	NON-CAPI Average (standard deviation)	CAPI Average (standard deviation)	p-value	NON-CAPI Average (standard deviation)	CAPI Average (standard deviation)	p-value
Number of doctors	25,922	7,433		25,922	7,433	
Overall activities						
Number of consultations	4,696 (2,056)	5,057 (1,917)	***	4,767 (2,129)	5,134 (2,010)	***
Total number of procedures	5,413 (2,311)	5,784 (2,091)	***	5,423 (2,363)	5,806 (2,177)	***
Volume of care (1)	120,053 (51,233)	128,040 (46,453)	***	126,020 (54,844)	134,629 (50,757)	***
Patients						
Number of patients	1,538 (622)	1,643 (585)	***	1,791 (748)	1,907 (705)	***
Proportion of patients treated as the *médecin traitant*	46 (17)	51 (11)	***	56 (19)	62 (12)	***
Structure of activity per patient						
Number of consultations per patient	3.1 (0.9)	3.1 (0.7)	ns	2.7 (0.8)	2.7 (0.7)	***
Prescriptions per patient (1)	495 (244)	497 (194)	ns	434 (194)	435 (166)	ns
Pharmaceutical prescriptions per patient (1)	247 (109)	249 (94)	ns	201 (88)	201 (77)	ns
Remuneration and cost (1)						
Fees	149,806 (63,112)	159,857 (56,908)	***	150,180 (64,528)	163,784 (60,138)	***
Fees per patient	101 (34)	101 (29)	ns	87 (29)	89 (26)	***
Basis for reimbursement of the full cost per patient	597 (295)	598 (214)	ns	521 (211)	524 (183)	ns

(1) In constant euros based on 2015.
Notes: ns stands for not significant: $p \geq 0.10$; * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Reading Note: In 2008, doctors who have not signed up to CAPI carried out an average of 4,696 consultations whilst doctors who have signed up to CAPI carried out 5,057. This difference is significant at the 1% threshold.
Sources and Coverage: CNAM-DGFiP-DREES matched data, waves 2005, 2008 and 2011. Metropolitan France. General practitioners in Sector 1 and working exclusively in private practice.

temporary shocks included in $\Delta\epsilon_{i0811}$ are correlated to the adoption of CAPI. A sudden variation in demand associated, for example, with a flu or gastroenteritis epidemic may result in an increase in the doctor's activity ($\Delta Y_{i0811} > 0$) and may also lead them to sign up to CAPI if they anticipate that this increase in activity may lead patients to choose them as the *médecin traitant*. A change in family circumstances (such as a birth) may also have a negative impact on the doctor's activity ($\Delta Y_{i0811} < 0$) and at the same time encourage them to sign up to CAPI (in order to earn a bonus enabling them to offset the negative effect of less work on their income). The variables of density of GPs and family composition contained in variables X enable some of these temporary shocks to supply or demand to be controlled, but this does not catch all of the shocks. Other elements may be present in $\Delta\epsilon_{i0811}$. For example, it may be a shock in terms of the doctor's preference for the quality of care, in terms of a distaste for the multiplication of procedures, arising following the loss of patients, that is to say a shock in terms of information on the doctor's own performance. $\Delta\epsilon_{i0811}$ may also reflect the sensitivity of the doctor to the various campaigns run by the National Health insurance to promote the quality of care.

It is therefore not possible that temporary shocks figuring in the disturbance of the model influence participation in treatment, which would imply that the estimation of the model in first-differences through the ordinary least squares is not consistent. To obtain a consistent estimation, we use an instrumental variables estimator, the first stage of which being defined by:

$$\Delta \mathrm{CAPI}_{i0811} = a + bZ_{i05} + \Delta X'_{i0811} c + \Delta u_{i0811} \quad (3),$$

where $\Delta \text{CAPI}_{i0811}$ corresponds to the decision to sign up to CAPI. The instrument used, Z_{i05}, is the logarithm of the density of GPs observed in 2005 in the municipality where the doctor is practising. Its influence on ΔY_{i0811} should only be reflected in its impact on signing up to CAPI: it should be closely correlated to the probability of signing up to CAPI and not correlated to $\Delta\epsilon_{i0811}$. There are several reasons supporting the idea that this instrument observed at the level of the physician's municipality is exogenous. Firstly, this variable is observed in 2005; it is therefore implausible for it to be correlated to $\Delta\epsilon_{i0811}$ which represents temporary shocks affecting the doctor between 3 and 6 years later. It is true that this instrument may be correlated to the individual effect specific to the doctor θ_i because the latter is probably linked to their choice of location. However, θ_i is eliminated from our first-difference specification.

The correlation of the density of GPs in 2005 to signing up to CAPI may result from quality competition mechanisms or from the effects of physicians' excessive workloads. If the density of physicians is high, they may be in competition to attract patients and, in that case, improving quality may be an advantage that CAPI has conveniently been rewarding since 2009. Choosing CAPI should therefore be associated with a high density of physicians. However, there is no published information on the quality of care delivered by physicians, which limits the effect of quality on demand: if CAPI has an effect on the quality of care, this should rather occur directly through the incentive associated with pay-for-performance.

Another rationale leads to an opposite prediction: if the density of physicians is low, the doctor receives many patients and provides many procedures because the demand for their services is high. In this context, they may want to reduce their workload in favour of improving quality (see fewer patients, treat them better and, in particular, treat them as the *médecin traitant*) and earn a CAPI bonus which may offset the loss of earnings associated with the fact that they have carried out fewer procedures. In this case, choosing CAPI would be associated with a low density of physicians. It is this second interpretation which is supported by our results.

4. Estimation of the Impact of CAPI

4.1. The Context: Changes in the Practices of General Practitioners between 2008 and 2011

To understand the effect of CAPI, it is important to understand contextual elements which have affected changes in the practices of all physicians over its application period.

The period from 2008 to 2011 is characterised by the generalisation of the gatekeeping (*médecin traitant*) system, set up in 2004 and by a reduction in the numbers of GPs, which started in 2007. For the physicians in our sample, the density of GPs fell by an average of 7.4% between 2008 and 2011 and nearly 80% of them saw a reduction in density in the municipality where they practised, mainly owing to retirements. Another important change is the increase in the proportion of women in the profession, as is clearly apparent from the unbalanced data, where 47% of physicians who are established in 2008 are women whilst, that same year, 78% of the physicians who retire are men (cf. Appendix 2). This increase in the proportion of women has an impact because numerous studies have shown that female physicians in private practice work less than their male counterparts.[7] Among men, the young generations are also less active at a given age than older generations.

These changes, together with an increase in chronic illnesses, lead to changes in potential demand for the services of physicians in our sample. Since the sample is balanced, we do not observe an increase in the proportion of women who have signed up over the period from 2008 to 2011. However, these established physicians (who account for the vast majority of care provision with 84% of procedures), face movements in potential demand owing to medical demographics and the preferences of young generations. This context leads to the changes shown in Table 3.

As can be seen, there is considerable growth in the number of patients per doctor (+14.7%) and even more marked growth in the number of patients for whom the doctor is the *médecin traitant* (+34%). This reflects the increased burden on the system, which translates to a 9.7 percentage points increase in the proportion of patients treated as the *médecin traitant*. But if these physicians therefore have many more patients, they carry out virtually no more consultations: just +0.6% between 2008 and 2011. This goes hand in hand with a marked drop in the number of consultations per patient (-14.1%) and the number of prescriptions per patient (-12.8%).

7. *The difference is estimated at 35% by Dormont & Samson (2008) ; see also Dumontet & Chevillard (2020) for a summary of the results.*

Table 3 – **Changes in the different variables of interest between 2008 and 2011 over the whole sample**

Variables	Growth rate 2008-2011 (%)	Of which growth between 2008 and 2011 due to changes in density (%)
Number of consultations	0.6	0.4
Number of patients	14.7	0.4
Number of patients treated as the *médecin traitant*	34.0	0.2
Proportion of patients treated as the *médecin traitant*[1]	9.7	0.1
Number of consultations per patient	-14.1	0.0
Prescriptions per patient [2]	-12.8	0.1
Fees [2]	0.3	-0.2

[1] For this variable, it is the variation of the proportion in percentage points and not the rate of growth. [2] In constant euros basis 2015.
Notes: These average rates of growth are the average of the individual rates of growth observed between 2008 and 2011 for all doctors in the sample.
Sources and Coverage: See Table 2.

The physicians in our sample therefore provided care for far more patients over the period without carrying out far more procedures. One can see therein one effect of the *médecin traitant* system which gives an additional fee of €40, a sort of capitation, for the treatment of each patient suffering a long-term illness (*affection longue durée*, ALD), but also of the increase in potential demand. This may also be the result of changes in the density of physicians, the reduction therein necessarily implying an increase in the number of patients per doctor. However, the growth rates, which represent growth due to changes in density show that changes relating to the activity of the GPs in our sample are correlated to those relating to the density of physicians only to a very limited extent.[8] It is in this context that the CAPI system was introduced as a counterbalance, a new element of remuneration which is itself also based on patients treated as the *médecin traitant* but is associated with indicators of quality which may limit the tendency to do as little as possible per patient.

4.2. First Step: Signing Up to CAPI

The results presented in Table 4 show that the density of GPs in private practice in the municipality where they are practising in 2005 is negatively correlated to the earning of a CAPI bonus. Actually, this variable is, amongst other things, a predictor of the number of patients treated as the *médecin traitant*, a number which has a positive influence on the return on signing up to CAPI *via* the value of the bonus. In this context, a high density translating to an abundance of care provision has to have a negative impact on this number and, consequently, on the propensity to sign up to CAPI. The Fisher statistic, which corresponds to the test of significance of the instrument in the first-stage regression where there are other control variables, has a value of 14.89 which indicates that our instrument is well correlated to the CAPI bonus, in other words that the instrument is not weak.

4.3. Impact of CAPI on the Practices of General Practitioners

The results of second-stage estimations (equation (2)) are presented in Tables 5 and 6; we report the coefficients estimated in respect of the different variables ΔY_{i0811}, the name thereof being specified at the start of each line. In Table 5, the results of ordinary least squares estimations are reported in the OLS columns and those of instrumental variables estimations are reported in IV columns. Two coefficients are reported each time: the estimation of β, the effect of the treatment associated with CAPI, and that of δ,

8. Within the growth in the number of patients of 14.7%, only 0.4% is attributable to a reduction in density. The same applies to all of the variables considered apart from the number of consultations, whose growth is very slight (0.6%), but is due to a variation in density in two thirds of cases (0.4%).

Table 4 – **First-step estimation (equation (3))**

	Y = signed up to CAPI
Z = log of the density of general practitioners in the municipality where they are practising in 2005	-0.021*** (0.005)
Fisher statistic from Kleibergen-Paap	14.89
N	32,171

Notes: *** p < 0.01. The standard errors clustered at the GP level are in parenthesis. This estimation includes the control variables presented in section 3. The Fisher statistic from Kleibergen & Paap (2006) is a generalisation of the statistic from Cragg & Donald (1993) in the case where errors are not i.i.d.
Sources and Coverage: CNAM-DGFiP-DREES matched data, waves 2005, 2008 and 2011. Metropolitan France. General practitioners in Sector 1 and working exclusively in private practice.

the change common to the two groups over the period, other things equal, in particular in terms of the densities of physicians in the department. δ is not a gross change in the variable of interest, but its change once changes in density have been taken into account. For example, for total fees, the IV estimation of δ is -6%: this does not mean that the fees have fallen by 6% over the period in our sample (they have increased, slightly, by 0.3%, cf. Table 3). All the following comments as regards trends have to be understood in terms of "all other things being equal in relation to changes in control variables" (to simplify things, the coefficients of the control variables are not reported in the table).

The column headed "Hausman test" gives, for each estimation, the alpha risk associated with the Hausman test of exogeneity. The tests lead to a rejection of the hypothesis of exogeneity of CAPI in respect of almost all of the variables explained, apart from the number of consultations and the total number of procedures, for which it may be considered that the ordinary least squares are consistent and efficient. The comments which follow are based on IV estimations except in the case where the OLSs are validated by the Hausman test.[9]

Table 6 summarises the main results. For physicians who signed up to CAPI, it gives an estimation of the sum of the coefficients $\beta + \delta$ (with a confidence range of 95%) and for other physicians the value of the coefficient δ. These values give the changes in the variable of interest over the period, other things equal, for each category of physicians. The third column gives an estimation of the impact β of CAPI in respect of each variable considered.

The estimations show that CAPI completely halted the current trends in the changes in the practices of GPs over the period (Table 6). Whilst GPs generally see more patients (+20.2%), with fewer consultations and fewer prescriptions for each of them (-17.5% and -21.5%), the impact of CAPI on those who signed up to it is such that these physicians are not taking on any more patients (the change is not significant) and are not significantly increasing the number of consultations they give or the value of their prescriptions per patient. Another impact of CAPI is a much greater increase in the proportion of patients treated as the *médecin traitant*: it increases by 23.7 percentage points for physicians who signed up to CAPI compared to just +5.9 points for the others. Finally, whilst total fees and fees per patient fall significantly between 2008 and 2011 for GPs (-6.3% and -26.5%), it is the opposite for those who signed up to CAPI, the effect thereof being so great that it is reversing the trend: their total fees and their fees per patient have increased by 20.8% and 25.8% respectively.

It therefore appears that CAPI has had a significant impact on physicians' practices: in the context of a considerable increase in the number of patients which translated to a consequent reduction in the number of consultations per patient, CAPI has put the brakes on a strong tendency to do little with each patient whilst giving substance to this upturn in terms of the quality of care. Although the data do not enable us to observe directly whether the targets set by the CAPI indicators have been achieved, these results show an impact that is compatible with efforts to achieve them.

For example, our estimations show that, unlike other physicians, those who have signed up to CAPI have not reduced the number of consultations per patient. It is logical that "patient time" has not been reduced thanks to CAPI because achievement of the targets may require a higher number of procedures or preventive measures per patient. For example, as diabetic patients are recommended to have 3 or 4 tests of glycated haemoglobin per year, these patients will be required to see their doctor 3 or 4 additional times per year to read the test results, whilst these consultations may have been neglected in the absence of performance indicators.

Whilst the trend over the period is for pharmaceutical prescriptions to fall, maintaining the number of meetings per patient among physicians who signed up to CAPI goes hand in hand with maintaining expenditure on prescriptions per patient. This effect was not apparent beforehand because the incentives offered by CAPI imply effects with reversed signs in relation to prescriptions: on the one hand, increasing prescriptions of preventive measures (such as mammographies or glycated haemoglobin tests),

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9. In cases where the Hausman test validates the instrumental variables estimations, it is possible to calculate, by comparison, the bias associated with the OLS estimation. The latter is positive for the majority of the variables in terms of level (volume of care, number of patients), but negative for the majority of those which are measured in terms of a ratio, per patient (consultations per patient, prescriptions per patient, cost per patient). As we explained in the section devoted to the empirical strategy, the first-difference specification means that only temporary shocks can create a bias here, personality traits or the style of practice of the doctor being eliminated by difference. The positive bias found may be explained as follows: if the physician faces a positive shock in terms of demand, associated with a flu epidemic for example (an element present in the disturbance), their activity, the number of patients they have and their prescriptions increase. At the same time, this same shock may be the time to recruit patients treated as the médecin traitant, *a factor strongly influencing decisions to sign up to CAPI. The biases observed on variables measured in terms of ratios are the result of biases on variables in terms of level at the numerator and the denominator of the variable explained.*

Table 5 – **Effects of signing up to CAPI on the provision of care by general practitioners. First-difference specifications, estimations by ordinary least squares (OLS Column) and by the instrumental variables method (IV Column)**

	OLS		IV		Hausman test
	CAPI=1	Trend	CAPI=1	Trend	
	β (standard error)	δ (standard error)	β (standard error)	δ (standard error)	p-value
Overall activity					
Number of consultations	0.001 (0.002)	0.005*** (0.001)	-0.093 (0.088)	0.027 (0.020)	H: 0.270
Total number of procedures	0.002 (0.002)	-0.006*** (0.001)	0.041 (0.081)	-0.015 (0.019)	H: 0.624
Volume of care (1)	0.002 (0.002)	0.040*** (0.001)	-0.475*** (0.147)	0.150*** (0.034)	H: 0.000
Patients					
Number of patients	-0.003* (0.002)	0.144*** (0.001)	-0.253** (0.101)	0.202*** (0.023)	H: 0.001
Proportion of patients treated as the *médecin traitant* (2)	0.326*** (0.079)	9.965*** (0.043)	17.764*** (5.726)	5.932*** (1.324)	H: 0.000
Structure of activity per patient					
Number of consultations per patient	0.004*** (0.001)	-0.139*** (0.001)	0.160** (0.077)	-0.175*** (0.018)	H: 0.016
Number of procedures per patient	0.005*** (0.001)	-0.151*** (0.001)	0.294*** (0.099)	-0.217*** (0.023)	H: 0.000
Volume of care per patient (1)	0.005*** (0.001)	-0.104*** (0.001)	-0.222** (0.086)	-0.052*** (0.020)	H: 0.000
Prescriptions per patient (1)	-0.005** (0.002)	-0.126*** (0.001)	0.377*** (0.138)	-0.215*** (0.032)	H: 0.000
Pharmaceutical prescriptions per patient (1)	-0.010*** (0.002)	-0.204*** (0.001)	0.373*** (0.132)	-0.292*** (0.031)	H: 0.000
Remuneration and cost (1)					
Fees	0.023*** (0.002)	-0.005*** (0.001)	0.271*** (0.102)	-0.063*** (0.024)	H: 0.005
Fees per patient	0.026*** (0.001)	-0.149*** (0.001)	0.523*** (0.145)	-0.265*** (0.034)	H: 0.000
Basis for reimbursement of the full cost per patient	0.000 (0.002)	-0.130*** (0.001)	0.379*** (0.129)	-0.218*** (0.030)	H: 0.000
Number of observations	32,171				

(1) In constant euros 2015. (2) This variable is not measured as the difference in the logarithms of this proportion between 2008 and 2011, but as the difference in level between 2008 and 2011.
Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The standard errors clustered at the GP level are in parenthesis. The last column shows the p-value of the Hausman test of exogeneity of the variable "receive a CAPI bonus", where the instrument is the logarithm of the density of doctors who are general practitioners at municipality level in 2005. The estimations include the control variables presented in section 3.
Sources and Coverage: See Table 4.

or certain pharmaceutical prescriptions (such as antihypertensives) to achieve certain targets. On the other hand, an increase in the proportion of generic medicines in prescriptions is encouraged (see Appendix 1). Our estimations suggest that these two effects offset one another.

In a context where fee-for-service predominates, the pay-for-performance mechanism introduced by CAPI generates additional income per patient irrespective of the number of procedures carried out. As we are unable, with our data, to observe any effect on the length of a consultation or the quality of care, our estimations show that the CAPI bonus has allowed an increase in fees per patient for physicians who have signed up.

Finally, it is interesting to look at the impact of CAPI on the cost of treatment for each patient by the Social Security system. To this aim, we refer to the basic reimbursable amount, adding the fees and prescription expenditure per patient (second last line in Table 6). It can be observed that the cost of treatment per patient has fallen by 21.8% for physicians who have not signed up to CAPI (owing to the reduction in fees and pharmaceutical prescriptions). Conversely, the cumulative increase in total prescriptions and fees (payment for procedures + CAPI bonus)

Table 6 – **Changes in the practices of doctors who signed up or did not sign up to CAPI from 2008 to 2011. Calculations based on the estimations in Table 5**[(i)]

	NON-CAPI	CAPI	Difference = Impact of CAPI
	δ [$IC_{95\%}$]	$\beta + \delta$ [$IC_{95\%}$]	β [$IC_{95\%}$]
Overall activity			
Number of consultations	0.005*** [0.003, 0.007]	0.006*** [0.003, 0.009]	0.001 [-0.002, 0.004]
Total number of procedures	-0.006*** [-0.008, -0.004]	-0.004*** [-0.007, -0.001]	0.002 [-0.001, 0.005]
Volume of care (1)	0.150*** [0.084,0.217]	-0.324*** [-0.545, -0.103]	-0.475*** [-0.762, -0.187]
Patients			
Number of patients	0.202*** [0.156, 0.247]	-0.050 [0.202, 0.100]	-0.253** [-0.450, -0.056]
Proportion of patients treated as the *médecin traitant* (2)	5.932*** [3.337, 8.528]	23.69*** [15.06, 32.320]	17.764*** [6.541, 28.986]
Structure of activity per patient			
Number of consultations per patient	-0.175*** [-0.210, -0.140]	-0.014 [-0.131, 0.101]	0.160** [0.008, 0.312]
Number of procedures per patient	-0.217*** [-0.262, -0.173]	0.076 [-0.071, 0.225]	0.294*** [0.101, 0.487]
Volume of care per patient (1)	-0.052*** [-0.091, -0.012]	-0.273*** [-0.403, -0.143]	-0.222** [-0.391, -0.053]
Prescriptions per patient (1)	-0.215*** [-0.277, -0.152]	0.162 [-0.045, 0.370]	0.377*** [0.106, 0.648]
Pharmaceutical prescriptions per patient (1)	-0.292*** [-0.352, -0.232]	0.081 [-0.118, 0.280]	0.373*** [0.114, 0.632]
Remuneration and cost (1)			
Fees	-0.063*** [-0.109, -0.016]	0.208*** [0.053, 0.362]	0.271*** [0.070, 0.472]
Fees per patient	-0.265*** [-0.330, -0.199]	0.258** [0.040, 0.477]	0.523*** [0.239, 0.808]
Basis for reimbursement of the full cost per patient	-0.218*** [-0.276, -0.159]	0.161 [-0.033, 0.356]	0.379*** [0.126, 0.633]
Number of observations		32,171	

(i) According to the Hausman test result, use is made of the estimations by OLS ("number of consultations" and "total number of procedures" variables) or instrumental variables estimations.
(1) In constant euros 2015. (2) This variable is not measured as the difference in the logarithms of this proportion between 2008 and 2011, but as the difference in level between 2008 and 2011.
Notes: * p < 0.10, ** p < 0.05, *** p < 0.01. The standard errors clustered at the GP level are in parenthesis. The estimations include the control variables presented in section 3.
Sources and Coverage: See Table 4.

counterbalances this bias in the cost of treatment of patients for physicians who have signed up. This system is therefore expensive for the National Health Insurance.

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Based on a balanced panel of GPs in private practice observed before and after its introduction, we have assessed the impact of CAPI on the behaviour of GPs in terms of their provision of care. Our angle of approach differs from that of other empirical studies of the influence of pay-for-performance which are centred on the effect of financial incentives on the achievement of targets set by the programmes. Our approach involves examining whether the new element of remuneration introduced by CAPI – which generates additional income per patient irrespective of the number of procedures carried out – has led to a change in the structure of physicians' activity. Our analysis is based on a panel of 32,171 French GPs in Sector 1 who have been working continuously in private practice over the course of 2005, 2008 and 2011. These physicians have carried out 84% of the procedures carried out over the period. Our method of estimation uses an instrumental variables

approach on a first-difference model in order to take account of the fact that the decision to sign up to CAPI, an optional system, is an individual decision made by the physician that is probably non-exogenous to the behaviour studied.

French studies on the impact of CAPI on quality indicators have not found any positive effect on the quality of care or found only a very slight effect (Saint-Lary & Sicsic, 2015; Michel-Lepage & Ventelou, 2016; Sicsic & Franc, 2017). However, our results show that CAPI has significantly influenced the practices of physicians who signed up to it in a way that is compatible with an improvement in the quality of care: contrary to their colleagues who have not signed up, physicians who have signed up to CAPI have not reduced "patient time" (number of consultations per patient) or the amount of prescriptions per patient. They have also increased, to a far greater extent than other physicians, the proportion of their patients who they treat as the *médecin traitant*.

Our study thus produces a different result than other studies on CAPI. It is not necessarily contradictory because we do not focus on the efficiency of the pay-for-performance mechanism as such, but examine whether the modification of the payment system implied by CAPI, which alters the proportion of fee-for-service, changes something in the structure of a physician's activity. The answer is yes. However, if CAPI has favoured improvement in the quality of care, it is not because of premiums associated to quality targets, but rather on account of a mitigation of the role of pay-for-performance in a physician's remuneration. Referring to the theoretical literature on health economics, the mechanism that would have played would be an increase in the role of capitation rather than a mechanism of financial incentive to achieve quantitative targets that are indicative of the quality of care.

Our results cannot be extrapolated without caution to the potential impact of ROSP, which extended pay-for-performance to include all physicians in 2012, because our instrumental variables estimation only enables us to identify a local effect of the treatment on the treated. This effect is obtained only on compliers, who are the physicians whose decision to sign up to CAPI was influenced by the variation of the instrument. Moreover, the database used is a balanced panel of physicians present over the period from 2005 to 2011. The external validity of the results may therefore be questioned and their generalisation to include the entire population of physicians to whom ROSP now relates has to be carried out with caution.

Our data do not allow to go further in the analysis by studying changes in the time physicians spend at work and the length of their consultations. However, CAPI has also resulted in an increase in fees per patient. As a consequence, and whilst the average cost to the Social Security system for the treatment of a patient falls over the period for all physicians, this decrease is not observed for the patients of physicians who have signed up to CAPI. This system is therefore expensive for the National Health Insurance. As a result, it is crucial to highlight its beneficial effects in the form of a better quality of care for patients or in the form of greater efficiency in care pathways which would reduce avoidable hospitalisations. In any case, we find that CAPI has a significant impact on physicians' practices, which is compatible with an improvement in the quality of care which remains to be confirmed. □

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APPENDIX 1

OBJECTIVES OF CAPI

Indicators [1]	Inter-mediate target (%)	Final target (%)
"Detection and prevention - Treating chronic pathologies"		
Patients over the age of 65 who have had the flu vaccine	71	≥ 75
Patients aged between 50 and 74 who have had a mammography within the last 2 years	73	≥ 80
Patients over the age of 65 treated using vasodilatators	9	≤ 7
Patients over the age of 65 treated using benzodiazepines with a long half-life	9	≤ 5
Diabetic patients who have 3 or 4 doses of HbA1c per year	54	≥ 65
Diabetic patients who have had one dilated fundus examination per year	52	≥ 65
Diabetic patients (men +50 years of age, women +60 years of age) treated using antihypertensives and statins	65	≥ 75
Diabetic patients (men +50 years of age, women +60 years of age) treated using antihypertensives and statins and low-dose aspirin (LDA)	52	≥ 65
Patients treated using antihypertensives who have normalised their blood pressure levels (declarative indicator)	40	≥ 50
"Optimisation of prescriptions"		
Antibiotics [2]	84	≥ 90
Proton pump inhibitors (PPI) [2]	70	≥ 80
Statins [2]	58	≥ 70
Antihypertensives [2]	55	≥ 65
Antidepressants [2]	70	≥ 80
Proportion of prescriptions of conversion enzyme inhibitors (CEI) out of CEI and sartan prescriptions	55	≥ 65
Number of patients treated using LDA / Number of patients treated using platelet inhibitors [1]	84	≥ 85

[1] Proportion of patients treated as the *médecin traitant*.
[2] Proportion of prescribed drugs in the directory of generic medicines (boxes).
Sources: Journal Officiel (2009).

APPENDIX 2

SOCIODEMOGRAPHIC CHARACTERISTICS OF PHYSICIANS REMOVED FROM THE INITIAL SAMPLE AND OF PHYSICIANS IN THE WORKING SAMPLE

	Leaving in 2005	Leaving in 2008	Joining in 2008	Joining in 2011	Other physicians	Analysis sample
Observed	Until 2005	Until 2008	From 2008 onwards	From 2011 onwards	With a career break	In 2005, 2008 and 2011
Number of doctors	3,057	3,493	3,376	2,999	2,755	32,171
Composition (% in column)						
Gender						
Men	77.2	78.4	52.9	52.5	59.3	77.8
Women	22.8	21.6	47.1	47.6	40.7	22.2
Age						
Aged < 49	34.8	24.2	75.6	74	44.4	40.3
Aged 49-55	22.5	19.9	15.4	15.5	27.1	35.6
Aged ≥ 56	42.7	56	9	10.4	28.5	24.1
Marital status						
Single	11.7	8.8	18.9	19.4	15.3	8.4
Divorced	14	13	9.8	9.9	14.6	10.1
Married	73	76.6	66.4	59.8	65.5	79.7
Civil partnership	0.6	0.5	4.6	10.5	3.3	1.2
Widow(er)	0.7	1.2	0.3	0.3	1.3	0.6
Dependent children						
No	50.3	55.3	26.5	29.4	37.6	27.5
Yes	49.7	44.8	73.5	70.6	62.5	72.5
Dependent persons in the family home						
0	49.8	54.8	25.3	28.6	37.9	26.9
1	18.4	18	20.2	20.2	19.8	19.7
2	17.8	15.4	32.5	31.1	24.2	28.3
3 or +	14	11.8	8	20.1	18.1	25.2

Sources and Coverage: CNAM-DGFiP-DREES matched data, waves 2005, 2008 and 2011. Metropolitan France. General practitioners in Sector 1 and working exclusively in private practice.

The Ban on Extra-Fees for Beneficiaries of the CMU-C Health Cover: What Consequences for Physicians and Dentists in Private Practice?

Brigitte Dormont* and Cécile Gayet*

Abstract – Whilst it is forbidden to charge patients with CMU-C health cover fees in excess of the reimbursable regulated fee (or extra-fees), so as to make their access to care easier, field experiment studies report discrimination against the latter by physicians. This issue is approached here from the angle of healthcare supply, using four waves of longitudinal administrative data on physicians in private practice between 2005 and 2014. We examine whether this ban on excess fees for CMU-C beneficiaries, i.e. charging them fees in excess of the standard social security-negotiated fees agreed under the public health insurance scheme, generates a real financial constraint for Sector 2 physicians (those who charge extra-fees) and dentists in private practice. Estimates show a significant drop in the average extra-fees per procedure when physicians accept more CMU-C patients in their practice. Even if costs are transferred (cost-shifting), with other patients being charged higher extra-fees, this is not enough to offset the financial impact. However, this restriction does not have a negative impact on total fees for Sector 2 specialists, general practitioners and dentists, as they increase their volume of activity at the same time.

JEL Classification: I11, I13, I18, C23
Keywords: physicians in private practice, dentists, Supplementary Universal Health Cover (CMU-C), extra-fees, panel data

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The CMU-C supplementary universal health cover plan (*Couverture maladie universelle complémentaire*) was introduced on 1 January 2000 to offer free supplementary health cover for individuals whose income is below a set level. Individuals eligible for this health cover, like all people at the bottom of the income scale, tend to be in poorer health than the rest of the population of the same age (Tuppin *et al.*, 2011 and CNAM, 2017). In order to remove the financial barriers to accessing healthcare, the regulator has banned physicians from charging CMU-C health cover beneficiaries fees in excess of the reimbursement rates and has limited the prices dentists can charge for prosthetic procedures. In 2019, the last year in which this scheme was in operation, 5.9 million people in France, or 8.8% of the total population, had CMU-C cover.[1] On 1 November 2019, CMU-C merged with the complementary health insurance voucher scheme known as *Aide à la Complémentaire Santé*[2] (ACS) to become the *Complémentaire Santé Solidaire* (CSS), which continues to restrict prices.

Does CMU-C really improve its beneficiaries' access to healthcare? The available studies offer contrasting results. Two studies show that it limits out-of-pocket expenses and the incidence of giving up treatment for financial reasons (Desprès *et al*., 2011 ; Ricci, 2011). Two econometric cross-sectional data analyses also show that, other things equal, beneficiaries of the CMU-C cover have as much recourse to health care from GPs, specialists and dentists as individuals with private complementary health insurance (Raynaud, 2003 ; Jess, 2015). On the other hand, a regression discontinuity analysis does not show that individuals eligible for CMU-C have better access to healthcare than those whose income is just above the eligibility threshold[3] (Guthmuller & Wittwer, 2017).

Actual access to treatment for people with CMU-C health cover raises the question of their acceptance by health professionals. There is an unequal distribution of CMU-C patients between physicians, with concentration effects that cannot be explained solely by the location of the people eligible for this cover across the regions (Boisguérin & Pichetti, 2008 ; Cases *et al.*, 2008). Moreover, a field experiment conducted in Val-de-Marne in 2005 reported a rate of refusal to treat individuals with CMU-C cover of 4.8% among GPs, 41% among specialists and 39% among dentists (Desprès, 2010). These difficulties in accessing treatment are confirmed by a more recent nationwide controlled experiment conducted in 2019, where 9% of requests for appointments with dentists, 11% with gynaecologists and 15% with psychiatrists resulted in a refusal to see patients with CMU-C health cover and ACS vouchers (Chareyron *et al*., 2019). These studies show that there is a greater incidence of refusal to treat among physicians who are free to charge unregulated fees (i.e. those in Sector 2), and an analysis of their comments reveals that the ban on extra-fees is a motive for them refusing to treat (Desprès & Lombrail, 2017). Discrimination against CMU-C patients can also, all else being equal, have more qualitative consequences, as with shorter consultations (Breuil-Genier & Goffette, 2006).

Taking that finding of discrimination as its starting point, this paper tackles the issue from the perspective of healthcare supply. The objective is to examine whether the ban on charging extra-fees for CMU-C patients puts a significant financial constraint on physicians and dentists in private practice.[4] Does treating CMU-C patients entail a drop in their fees? Or do they manage to maintain their overall fees through increased volume of activity or through cost-shifting, that is, by charging other patients higher extra-fees? These adjustment mechanisms lead to different conclusions in a public policy perspective. A rise in extra-fees through cost-shifting would involve an increase in out-of-pocket expenses for the patients concerned. If a compensatory increase in the level of activity was not in response to the increased care needs of certain patients, it would equate to induced demand behaviour, which is costly to the social security. In order to guide policies for combating refusal to treat, questions should therefore be asked about the current remuneration of physicians and dentists in private practice for treating patients with CMU-C health cover. The value of assessing these mechanisms is heightened by the fact that rate restrictions have been extended to holders of ACS vouchers in 2012 for extra-fees and in 2017 for prosthetic treatment rates, and subsequently maintained under the CSS plan which now encompasses CMU-C and ACS.

We use data form a matching of two administrative sources: one from the *Caisse Nationale*

1. The income eligibility threshold for CMU-C at that time was €746 a month for a single person living in Metropolitan France., i.e. 74% of the poverty threshold.

2. The ACS was a voucher scheme to subsidise the purchase of complementary health cover for slightly less poor people, whose income was up to 35% higher than the CMU-C ceiling. A total of 1.7 million individuals benefited from this in 2019.

3. This result is different for the sub-sample of individuals aged under 30, among whom those eligible for CMU-C have better access to specialists.

4. See Box later in article on the regulation of fees in excess of the agreed reimbursable rates in France.

Box – **Regulation of Extra-Fees in France**

In France, medical agreements set the prices for medical procedures, known as the statutory rates, which are used as the basis for the health cover provided by French Social Security. Physicians and dentists in private practice are paid a set fee per procedure, based on this rate.[a] The 1980 agreement established two practice sectors: in Sector 1, physicians must charge the statutory rates[b] whereas in Sector 2, referred to in French as *à honoraires libres*, physicians are free to set their own rates at a higher level than the statutory rate but with "tact and moderation"[c], and the corresponding difference is known as extra-fees (sometimes referred to as the "balance bill"). In return for abandoning the practice of charging extra-fees, Sector 1 physicians benefit from part payment of their social security and pension contributions. There is no sector distinction for dentists, who can charge unregulated rates, equating to the freedom to charge extra-fees, but only on prosthetic procedures. Patients are covered by Health Insurance for 70% of the statutory rates for outpatient treatment. Out-of-pocket expenses ("beneficiary co-payments", lump-sum contributions and extra-fees) may be partly or entirely covered by supplementary health insurance. In 2013, 95% of French people had supplementary health insurance, only 60% of whose policies provided even partial cover for extra-fees (Batto *et al*., 2016). CMU-C is designed to prohibit extra-fees for Sector 2 physicians. With regard to prosthetic treatment, CMU-C imposes price caps, which are higher than the statutory rates and covered in full, on dentists.

Authorisation of extra-fees allows physicians to increase their income without any direct impact on Social Security expenditure. By assessing their patients' social situation during their first consultation, Sector 2 physicians and dentists are in a position to apply discriminatory rates, adjusting them according to their patients' willingness to pay (Johar *et al.,* 2014; 2017). But because they are not covered by Social Security, extra-fees may limit access to healthcare in departments of France where there are few Sector 1 physicians (Dormont & Péron, 2016). To contain their expansion in the context of primary healthcare, entry to Sector 2 was virtually frozen for GPs in 1990.[d]

[a] A small proportion of physicians' and dentists' fees comes from lump-sum payments. In our sample, they represent 6.3%, 1.1% and 0.2% respectively of remuneration for GPs, specialists and dentists.
[b] Sector 1 physicians can charge extra-fees in certain special cases: classed as an extraordinary excess (a particular patient requirement) or authorised excess (if the patient has not followed the officially approved care pathway).
[c] Article R.4127-53 of the French Code of Medical Ethics.
[d] In practical terms, entry to Sector 2 was reserved for former clinical directors, which effectively excluded GPs. More recently, the Contrat d'Accès aux Soins *(CAS) and* Option Pratique Tarifaire Maîtrisée *(Controlled rates option) were introduced (in 2014 and 2017 respectively) to encourage Sector 2 physicians, primarily specialists, to limit their extra-fees and increase the proportion of their practice that is subject to statutory rates.*

d'Assurance Maladie (CNAM, the national health insurance fund) on the activity of health professionals in private practice, and the other from the *Direction Générale des Finances Publiques* (DGFiP, the French tax authority). These longitudinal data consist of four waves (2005, 2008, 2011 and 2014) and are exhaustive in their coverage of French health professionals in private practice who are subject to agreements with the state. The empirical strategy consists in estimating the impact of a variation in the proportion of their CMU-C patients on the fee components and activity of physicians and dentists. Each estimation takes into account the characteristics of the local population and medical density in the physician's geographical area by using INSEE census data. The sample is broken down according to the classification of specialist areas of medical training: general practitioners, medical specialists, radiologists, surgical specialists, paediatricians, psychiatrists, gynaecologists, anaesthetists and dentists. In total, the data include 389,776 observations relating to 142,877 physicians and dentists working full time in private practice, observed in 2005, 2008, 2011 and 2014.[5]

These longitudinal data allow us to specify fixed effect models to take account of unobserved characteristics relating to the physician, which remain constant over time and which might be correlated with their behaviour as regards accepting CMU-C patients (ethical code, style of practice, etc.). In this context, estimations using the ordinary least squares method in a fixed effect model are convergent if the temporal variations in the proportion of the physician's CMU-C patients are exogenous, in other words if they correspond to fluctuations in the CMU-C demand made of the physician.

Conversely, if variations in the proportion of CMU-C patients are dependent on the physician's behaviour, it is necessary to implement an instrumental variable method to obtain a convergent estimation. Due to statistical power considerations, such an estimation was only possible for a less detailed categorisation of physicians, into just three groups, namely: GPs, specialists and dentists. The instrument used is the proportion of individuals with CMU-C cover in the department of France where the physician is based.[6] While there may be a correlation with a specific physician effect connected with their choice of location when setting up in practice, the inclusion of fixed effects eliminates this source of bias. Our instrumental variable estimations allow us to reinforce the key results for the three main groups of physicians, obtained by fixed-effect

5. Dentists were observed only as from the 2008 wave.
6. These data have been provided by the CMU-C fund.

ordinary least squares using a more detailed categorisation of medical specialisations.

Our estimations show that the ban on extra-fees for CMU-C patients is associated with a significant drop in the average value of extra-fees per procedure when physicians see more CMU-C patients. The possibility of cost-shifting (i.e. charging other patients higher extra-fees) is therefore limited. However, this rate restriction does not lead to a significant reduction in total fees for GPs, dentists or any specialists except surgical specialists.[7] It is noted that dentists and physicians able to charge unregulated fees increase their volume of activity when the proportion of their CMU-C patients increases. Using Sector 1 physicians (who cannot charge any extra-fees, see Box) as counterfactual to measure the potentially greater healthcare needs of CMU-C patients, the rise in volume of activity is suggestive of induced demand behaviour by Sector 2 specialists and GPs. This assumption is verified for GPs but not for specialists after we allow for the fact that the effect of work time constraints on physicians' ability to increase the number of procedures might differ by sector. For GPs and specialists as a whole as well as dentists, the instrumental variable estimates confirm the fall in extra-fees per procedure when the proportion of CMU-C patients increases, as well as the increase in number of procedures per patient and the absence of any impact on total fees.[8]

The rest of this paper firstly summarises the economic literature on analysing healthcare supply behaviour (Section 1), before presenting the data used and statistics describing the activity, fees and patient base of physicians and dentists in private practice (Section 2). Sections 3 and 4 present the empirical strategy and the results obtained, before providing conclusions in the final section.

1. Economic Analysis of Healthcare Supply and Pricing

The economic literature on the questions with which we are dealing relates to three main themes: the quality of healthcare offered when the physician is free to set their own prices; the impact of regulatory price constraints on the physician's decisions and lastly, the effect of price restrictions just for a certain proportion of patients, which directly corresponds to the issue of treating CMU-C patients.

Theoretical analysis of healthcare supply generally regards prices as being unregulated and assumes physicians to be practising in monopolistic competition, with differentiating elements related to their individual location and reputation. They determines the price, quantity and quality of the healthcare they offer, by maximising their utility under the constraint of the demand addressed to them. In order to get the consumers surplus, they may play with prices and care quality, for example by adjusting consultation length (Glazer & McGuire, 1993; Clerc *et al*., 2012). On the assumption that an improvement in care quality benefits all patients, price discrimination in the form of extra-fees may increase social well-being: the gains generated by the rise in care quality for all outweigh the surplus losses caused by the rise in prices for patients paying extra-fees (Kifmann & Scheuer, 2011).

Empirical studies do not contradict these theoretical predictions. French physicians practising in Sector 2 have longer consultations than their counterparts in Sector 1 (Breuil-Genier & Goffette 2006 ; Clerc *et al*., 2012) and a study of Australian data shows no difference in the quality of care offered by a single GP to patients charged different rates (Johar *et al.,* 2014). But situation complexity does not permit any general theoretical prediction: there is probably heterogeneity of price-quality elasticity in the supply and demand functions regarding the healthcare provided by different physicians, and there is nothing to preclude discrimination between patients in terms of quality.

The subject of the consequences of differences between patients in terms of regulated rates was developed in the USA with the introduction of the Medicare and Medicaid public health insurance programmes for the over 65s and low-income households, respectively. Medicaid is also granted on a means-tested basis to individuals with Medicare health cover; its role is highly comparable to that of CMU-C in providing free supplementary cover for beneficiary co-payments, which are significant in Medicare, just as they are for Social Security in France (Dormont, 2019). In order to curb the cost of these public health cover programmes, the rates set for a Medicaid patient are lower than for a Medicare patient, which are in turn lower than for a patient with private insurance. Many studies show that these differences encourage inequality in terms of access to healthcare, finding that

7. The result regarding surgical specialists is not robust to the use of a first difference specification or to the inclusion or exclusion of 2014.
8. For dentists, a significant rise in total fees and average revenue per patient is obtained when the proportion of their patients with CMU-C health cover increases, but these results are not always robust.

an increase in Medicaid rates improves all aspects of treatment of individuals covered by Medicaid, including the length of consultation and similarly, that a fall in Medicaid rates leads to a deterioration in their treatment (Sloan *et al.*, 1978 ; Adams, 1994 ; Decker, 2007 ; Buchmueller *et al.*, 2015 ; Polsky *et al.*, 2015 ; Candon *et al.*, 2018 ; Alexander & Schnell, 2019). Conversely, the restrictions imposed in the 1980s on "balance billing" (the equivalent of extra-fees) for people with Medicare cover did not affect their use of healthcare services nor the quality of care (McKnight, 2007).

The incentive to refuse to treat patients affected by a reduced rate might be neutralised if physicians could compensate for this constraint by charging their other patients higher rates. In the literature, this strategy is termed cost-shifting. It is only optimal for the physician under certain conditions relating to the form of the demand function for their services, notably relatively low price-elasticity in regard to patients who are subject to extra-fees (Ginsburg, 2003). There are few empirical studies that examine this issue for physicians in private practice: we only found Showalter's (1997) paper on American data, which shows no significant impact from a cut in Medicaid rates on the rates that local GPs charge patients with private insurance. In general, the impact of an increase in the number of patients subject to the reduced rate should lead the physician to a new optimisation calculation (according to the *homo economicus* model) which may lead them to alter the quantity of treatment offered, the amount of extra-fees (or balance bill), and the length of consultation (which determines their working time for a given level of activity). Their decisions in this respect will be dependent on their preferences in terms of work-leisure trade-off and their ethical code as a health professional.

Papers analysing physicians' reactions to regulated-price shocks show adjustments where the income effect outweighs the substitution effect in terms of the trade-off between work and leisure. Coudin *et al.* (2015) study the impact of the Sector 2 freeze on GPs' practices in France by means of a regression discontinuity method of analysis. They find that the volume of activity for physicians restricted by this freeze is 50% higher than for their peers in previous generations, who were not subject to consultation rate restrictions (for GPs affected by the reform, there was an average drop of 42%). A contingent valuation survey conducted by Chanel *et al*. (2017) among French GPs also shows that many of them claim an increase in the rates charged for treatment would lead them to reduce their working time. In another context, Chen (2014) finds that a rise in Medicaid rates significantly reduced the total number of hours worked by American physicians. A rise in the level of activity of physicians must be interpreted with caution: it may correspond to a new economic balance if prices are unregulated and the rise in activity is in keeping with price elasticity of demand. It may also correspond to induced demand, that is to say an increase in the number of procedures per patient if the variation in practice activity is greater than would be predicted by price elasticity of demand or, in a fixed-price context, if demand for healthcare was previously being met (Delattre & Dormont, 2000).

2. Data on Physicians Covering All Areas of Specialisation and Sectors

2.1. Near-Exhaustive Data

Our data result from the matching of two administrative sources, namely the National health insurance fund (CNAM) and the Tax authority (DGFiP), which provide information for 2005, 2008, 2011 and 2014 on the activity of health professionals in private practice and their declared income. The matched data provide exhaustive coverage of physicians in private practice in Metropolitan France who are subject to agreements with the social security; all medical specialisations are observed, as well as dentists from 2008 onwards. The data are organised into an unbalanced panel, i.e. not all the physicians are present in all four waves, depending on when they set up in practice and when they retired.

The CNAM data concern the total fees received by the physician and distinguish between those derived from statutory rates and additional charges, extra-fees and lump-sum payments, as well as the volume of treatment provided by the physician, the number of clinical and technical procedures and prescriptions. The data also provide information about the physicians (age and gender, year of setting up in private practice, area of specialisation and practice sector) and about their total patient file (number of different patients seen in the year, practice structure by patient age and gender, proportion of patients with chronic conditions (ALD for *affection longue durée*) and patients with CMU-C health cover). In addition, we had access to information about the municipality in which the physician's practice is based, enabling us to use INSEE census data to take into account the characteristics of the local population and medical density

in the physician's geographical area.[9] The geographical level used is the "pseudo-canton"[10], as municipalities are too small to include all movements of individuals and departments are too large to take into account the mixed picture in terms of supply and demand.

The study's coverage is limited to physicians and dentists subject to agreements with the social security, working full time in private practice in Sector 1 or 2 within Metropolitan France and aged 65 or less. Partially salaried physicians, who account for 16.6% of private practice physicians and dentists within this scope, for whom we have no information about their practice structure, are not taken into account. For the purposes of empirical analysis, we also excluded those physicians who changed sector or specialisation, and some atypical observations.[11] The final database consists of 389,776 observations corresponding to 142,877 physicians or dentists, which represent 93.5% of private practice physicians and dentists within the scope.

Specialisations are grouped together by specialist qualifications in the different areas of medical training: general medicine, paediatrics, psychiatry, medical specialisation, surgical specialisation, anaesthetics, gynaecology and radiology.[12] For dentists, the sub-group of those specialising in dentofacial orthopaedics, which accounts for 5.5% of dentists, is not included.

Working on the details of areas of specialisation, as we do, is rare, if not unique in econometrics applied to health data. Up until recently, French data on physicians stemmed from a survey of 1 in 10, without a sufficiently large sample size for each area of specialisation. Here, we study the details of the specialist areas, with a few exceptions.[13] Our database is close to being exhaustive, consisting of: 62,398 general practitioners, 11,921 medical specialists, 5,595 radiologists, 10,106 surgical specialists, 4,077 psychiatrists, 3,739 gynaecologists, 2,028 paediatricians, 3,858 anaesthetists and 39,155 dentists.

The information available is nevertheless limited: we do not observe the physicians' practice at patient level or by patient category. The empirical approach therefore consists in assessing the average impact for each physician of a change in the annual proportion of their patients with CMU-C health cover in regard to their annual fees, extra-fees and practice volume, without being able to identify within these variables the proportions corresponding to CMU-C patients versus other patients.

2.2. Practice Volume and Total Patient File of Dentists and Physicians by Specialisation and Sector

An initial descriptive approach highlights quite marked differences by sector and area of specialisation (Table 1). Concerning the breakdown by sector, only 9.4% of GPs practise in Sector 2 because of greatly restricted access to this sector since 1990. This proportion is much higher but variable for specialists, from 68.2% for surgical specialists down to just 9.8% for radiologists. The number of patients also varies greatly from one type of practitioner to another: for example, GPs and paediatricians see about 1,500 different patients, for whom they carry out about 3 clinical procedures a year whereas psychiatrists have quite a low number of patients (about 400) whom they see 10 times a year and, conversely, gynaecologists, anaesthetists, and medical and surgical specialists have several thousand patients for whom they carry out about 1 clinical procedure and 1 technical procedure a year. Radiologists are a case apart: they see over 6,000 different patients in a year, for whom they carry out 2 technical procedures. Dentists see an average of 829 different patients for whom they carry out nearly 4 procedures a year, including 0.5 prosthetic procedures.

The proportion of patients with chronic conditions (ALD) is also characteristic of the medical specialists' practices: it is close to the national average (14.4% in 2011) for GPs but lower for paediatricians and gynaecologists (1.6% and 7.4% respectively for those in Sector 1), a proportion of whose patients do not necessarily have serious health issues (preventive monitoring or contraception). However, individuals with chronic conditions account for a much higher proportion of the patient base of medical specialists, surgical specialists, radiologists

9. As census data is unavailable for the 2005 wave, we use 2006 data instead.

10. A "pseudo-canton" is a grouping of one or more entire municipalities. There are 3,785 of them in Metropolitan France, made up of over 36,000 municipalities.

11. Sector 2 physicians and dentists with average excess fees per procedure of more than €100,000 or less than €1; physicians for whom the number of procedures carried out is smaller than the number of patients seen by them in the year, and observations for which at least one of the variables of interest has a negative or null value, or involving at least one missing variable in a given year. Stomatologists (0.7% of physicians subject to agreements with the state) who are surgical specialists have also been excluded from the analysis because the excess fees they charge their patients are high, even in Sector 1.

12. Although radiology forms part of the "medical specialisation" category, we assess radiologists separately because of the specific characteristics of their practice (see Table 1). The medical specialisation group primarily includes cardiology, dermatology, gastroenterology, rheumatology and pulmonology. Surgical specialist areas include ophthalmology, surgery and oto-rhino-laryngology.

13. Laboratory physicians, stomatologists and dentists specialising in dentofacial orthopaedics.

Table 1 – **Patient base and practice structure – Averages per physician/year**

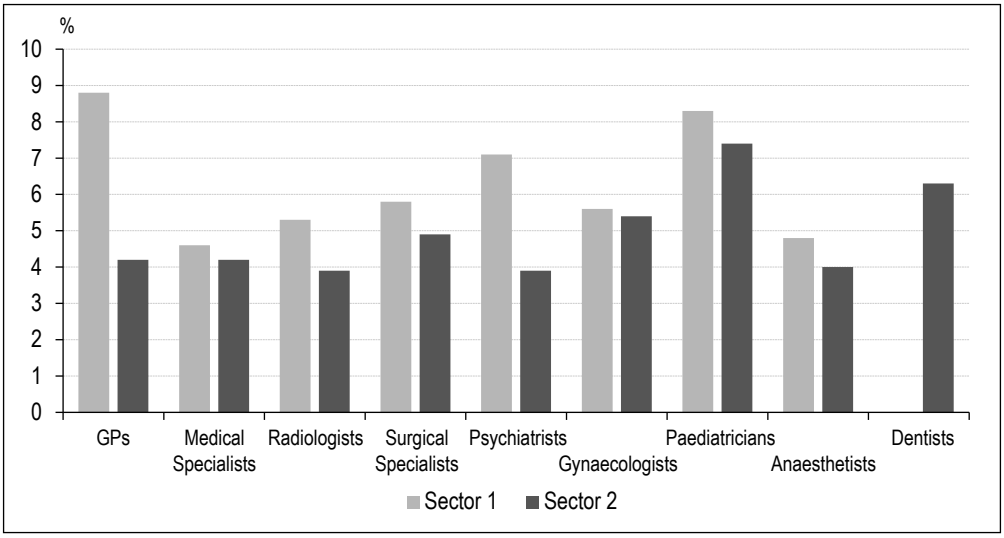
	General Practitioners		Medical Specialists		Radiologists		Surgical Specialists		Psychiatrists		Gynaecologists		Paediatricians		Anaesthetists		Dentists
N. observations	189,631		34,208		14,307		26,409		10,971		10,347		5,447		9,437		89,019
N. physicians	62,398		11,921		5,595		10,106		4,077		3,739		2,028		3,858		39,155
% Sector 2	9.4		27.2		9.8		68.2		24.5		53.4		29.1		36.2		-
Sector	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
N. patients	1713 (78)	1349 (78)	2620 (2923)	2250 (3076)	6619 (2950)	6969 (3462)	3614 (2302)	2514 (2217)	417 (315)	334 (258)	2396 (893)	2108 (887)	1571 (773)	1581 (710)	2686 (1042)	2541 (1006)	829 (408)
Statistics per patient																	
Procedures	3.2 (1.2)	3.1 (1.8)	2.6 (3.1)	2.1 (1.2)	2.4 (1.9)	2.0 (1.2)	1.9 (0.8)	2.0 (0.6)	9.9 (6.5)	9.4 (5.6)	1.8 (0.5)	1.8 (0.5)	2.7 (0.7)	2.5 (0.7)	1.6 (0.6)	1.6 (0.4)	3.9 (1.3)
Clinical	3.2 (1.2)	2.7 (1.6)	1.1 (1.4)	1.2 (0.7)	0.1 (0.3)	0.1 (0.3)	0.8 (0.5)	1.1 (0.5)	9.8 (6.5)	9.4 (5.6)	1.2 (0.4)	1.3 (0.4)	2.6 (0.8)	2.4 (0.7)	0.6 (0.2)	0.6 (0.2)	-
Technical	0.1 (0.5)	0.3 (1.1)	1.5 (2.6)	0.9 (1.1)	2.3 (1.7)	2.0 (1.0)	1.0 (0.9)	0.9 (0.6)	0.0 (0.1)	0.0 (0.1)	0.5 (0.5)	0.5 (0.5)	0.1 (0.2)	0.1 (0.2)	1.0 (0.6)	1.0 (0.3)	0.5* (0.4)
% Chronic condition	16.0 (6.4)	14.6 (6.7)	30.8 (18.6)	24.7 (13.9)	23.7 (18.3)	22.0 (14.7)	19.2 (9.0)	21.4 (11.3)	26.6 (14.5)	20.5 (11.1)	7.4 (3.1)	8.4 (7.7)	1.6 (2.0)	1.8 (2.0)	17.4 (10.3)	16.7 (8.1)	11.3 (4.0)
% CMU-C	8.8 (8.6)	4.2 (4.3)	4.6 (4.0)	4.2 (3.3)	5.3 (4.1)	3.9 (2.6)	5.8 (5.0)	4.9 (3.7)	7.1 (5.4)	3.9 (3.6)	5.6 (5.1)	5.4 (4.8)	8.3 (7.0)	7.4 (6.7)	4.8 (3.2)	4.0 (2.6)	6.3 (7.1)
%Zéro CMU-C	0.2	1.2	0.3	0.4	0.2	0.6	0.2	0.3	2.3	9.0	0.1	0.2	0.2	0.1	0.3	0.4	1.2

* Prosthetic procedures in the case of dentists.
Notes: Standard deviations are shown in brackets.
Reading Note: Sector 1 GPs have an average of 1,713 different patients in a given year.
Sources and Coverage: CNAM-DGFiP matching, 2005-2008-2011-2014 waves. Metropolitan France. Physicians and dentists subject to agreements with the social security, aged 65 or less, and who work full time in private practice.

and psychiatrists compared with the national average.

Figure I illustrates physicians' treatment of patients with CMU-C health cover (detailed percentages in Table 1). The breakdown of patients with this cover by medical specialisation can be explained primarily by their specific needs. CMU-C patients are mainly children and young women, more often affected by psychiatrical problems than the other patients, which means that for GPs, psychiatrists and paediatricians, the proportion of those patients is higher than the national average for Metropolitan France (7.1% in 2014). Conversely, this proportion is lower for the other areas of specialisation. Above all, it is always lower in Sector 2 than in Sector 1. Without ruling out the hypothesis of more marked levels of refusal to treat in Sector 2, the geographical distribution

Figure I – **Proportion of patients with CMU-C health cover – Averages per physician/year**



Sources and Coverage: CNAM-DGFiP matching, 2005-2008-2011-2014 waves. Metropolitan France. Physicians and dentists subject to agreements with the social security, aged 65 or less, and who work full time in private practice.

of Sector 2 physicians and CMU-C patients in the region may explain these differences.

Very few physicians see no CMU-C patients at all, except for psychiatrists (9.0% in Sector 2 and 2.3% in Sector 1).[14] Not treating any CMU-C patients may be the result of practice location.

In the period studied, the proportion of patients with CMU-C health cover first fell between 2005 and 2008, going from 6.3% to 5.8%, before then growing to 6.1% in 2011 and 7.1% in 2014. The significant increase between 2011 and 2014 can be explained by the 8.3% rise in the eligibility threshold for CMU-C in 2013 and by the effects of the 2008 financial crisis. In the sample, over half of physicians and dentists (61.6% of GPs, 60.5% of specialists and 50.6% of dentists) experience a reduction in the proportion of their CMU-C patients from one wave to the next. Compared with overall variations, this indicates a concentration of CMU-C activity (see Online Appendices, Table C1 – link at the end of the paper). Our specifications include a physician fixed effect, so it is the within standard deviation for this variable that measures the average significance of fluctuations in the proportion of known CMU-C patients for each physician: it appears to be fairly moderate, at about 1.5 points, and in excess of 2 points only in the case of Sector 1 psychiatrists.

2.3. Fees, Rates and Extra-fees for Dentists and Physicians by Specialisation and Sector

Sector 2 specialists charge higher fees than their Sector 1 counterparts (Table 2), whereas they have a lower volume of activity (see Table 1). In Sector 1, annual fees vary between €137,000 and €170,000 for GPs, paediatricians, psychiatrists and gynaecologists and are higher for other types of specialists, rising to €590,000 for radiologists. In Sector 2, extra-fees represent larger shares of total fees, ranging from 22.2% of fees for radiologists to 38.8% for psychiatrists. This suggests that Sector 2 physicians are dealing with a demand that is a decreasing function of extra-fees and that they charge higher rates, even if it means completing fewer procedures than their colleagues in Sector 1. In Sector 2, extra-fees per procedure vary between an average of €14 for GPs and radiologists to €42 for anaesthetists. Dentists, for whom unregulated pricing only applies to prosthetic procedures, charge average extra-fees of €309 per prosthetic procedure.[15] These figures illustrate the effect of unregulated pricing: Dentists derive 48% of their total fees from extra-fees.

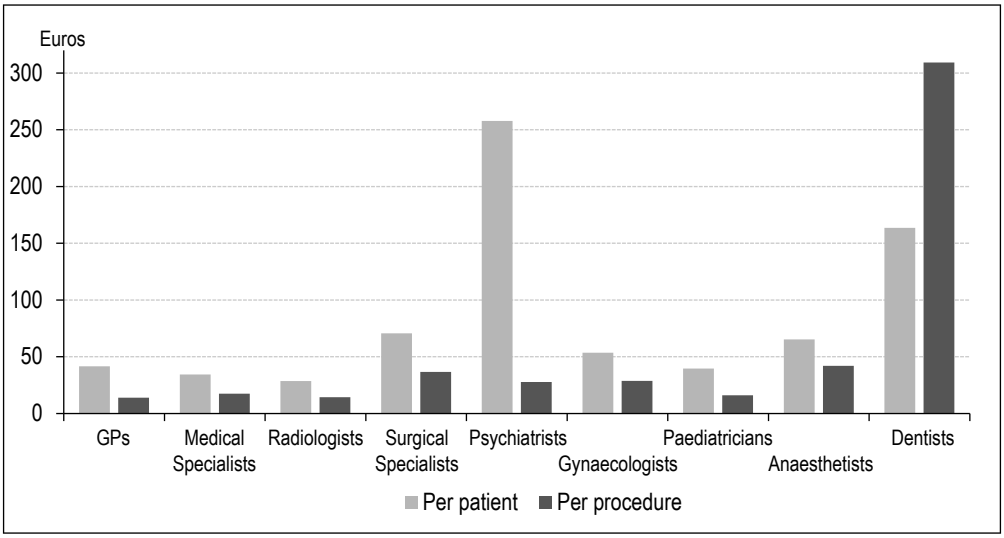
14. Physicians and dentists who do not see any CMU-C patients are distinctive: their fees are lower and they see fewer patients, for whom they carry out a higher number of very expensive procedures (see Online Appendices, Tables C11 and C12).
15. 99.4% of observations of dentists in our sample carry out a positive number of prosthetic procedures a year.

Table 2 – **Fees and extra-fees – Averages per physician/year**

	General Practitioners		Medical Specialists		Radiologists		Surgical Specialists		Psychiatrists		Gynaecologists		Paediatricians		Anaesthetists		Dentists
N. observations	189,631		34,208		14,307		26,409		10,971		10,347		5,447		9,437		89,019
N. physicians	62,398		11,921		5,595		10,106		4,077		3,739		2,028		3,858		39,155
% Sector 2	9.4		27.2		9.8		6.8		24.5		53.4		29.1		36.2		-
Sector	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
Fees																	
Annual (in €'000)	148	144	223	221	590	696	245	362	137	157	170	267	137	179	296	412	240
	(66)	(98)	(147)	(169)	(347)	(384)	(140)	(209)	(86)	(94)	(105)	(145)	(69)	(83)	(1096)	(147)	(135)
Per patient (in €)	926	123	121	122	138	132	99	207	409	619	72	137	90	117	126	180	3171
	(78)	(88)	(126)	(80)	(244)	(196)	(125)	(153)	(243)	(416)	(38)	(81)	(25)	(35)	(231)	(88)	(217)
Per procedure (in €)	29	42	49	60	51	59	51	104	43	66	39	72	34	47	80	116	415[b]
	(71)	(27)	(29)	(29)	(47)	(30)	(68)	(75)	(6)	(17)	(13)	(31)	(7)	(10)	(213)	(50)	(125)
Extra-fees[a]																	
Per patient (in €)	0.6	42	1	34	1	29	5	70.6	10	258	2.5	54	1	40	6.5	65	164
	(4)	(62)	(5)	(30)	(21)	(42)	(54)	(86)	(36)	(239)	(7)	(50)	(5)	(24.5)	(27)	(65)	(169)
Per procedure (in €)	0.2	14	0.5	18	0.4	14	3	37	1	28	1	29	0.5	16	4	42	309[c]
	(1)	(26)	(2)	(15)	(6)	(14)	(36)	(47)	(3)	(17)	(3)	(22)	(1.8)	(10)	(17)	(40)	(122)
Per Fees (%)	0.6	30	1	29	0.7	22	2	31	2	39	3	38	1	32	4	32	48
	(3)	(15)	(3)	(14.5)	(3)	(13)	(6.5)	(14)	(5)	(13.9)	(6)	(13)	(4)	(12)	(9)	(15)	(11)

[a] for dentists, this is more about freedom to charge unregulated rates for prosthetic procedures. [b] fees per prosthetic procedure. [c] excess fees per prosthetic procedure.
Reading Note: Total fees for Sector 1 GPs amount to an average of €148,000 in a given year.
Sources and Coverage: See Table 1.

Figure II – **Total extra-fees per patient and per procedure (€) – Averages per physician/year**



Notes: For dentists, this is more about freedom to charge unregulated rates, with the term "excess fees" being used in our study as the common term for both physicians and dentists. Excess fees per procedure equate to excess fees per prosthetic procedure for dentists.
Sources and Coverage: CNAM-DGFiP matching, 2005-2008-2011-2014 waves. Metropolitan France. Physicians in Sector 2 and dentists subject to agreements with the social security, aged 65 or less, and who work full time in private practice.

Average annual extra-fees per patient give an idea of the financial impact for a Sector 2 physician or dentist of treating a patient with CMU-C health cover: extra-fees range from €29 per patient for a radiologist to €258 for a psychiatrist (see Table 2 and Figure II). The opportunity cost is particularly high for a Sector 2 psychiatrist, owing to the large number of consultations held in a year for a single patient. This sheds light in particular on the results of the recently conducted field experiment mentioned earlier, which show a high incidence of discrimination among psychiatrists (Chareyron *et al.*, 2019).

3. Empirical Strategy

Empirical analysis of the impact of the rate restriction on the income and volume of activity for Sector 2 physicians and dentists is focused on three questions: Does an increase in the proportion of CMU-C patients lead to a reduction in the average extra-fees per procedure? Does it have a significant impact on the total fees received? Does it have a significant impact on the number of procedures provided per patient?

We adopt a reduced-form approach, estimating the impact of variation in the proportion of CMU-C patients on different variables of interest. Firstly, we assess whether Sector 2 physicians and dentists can completely absorb the rates shock associated with the ban on charging CMU-C patients extra-fees by compensating for the loss of earnings through higher extra-fees for their other patients. In principle, physicians should not have much latitude for such a strategy, as they are constrained by the demand and can only increase extra-fees at the risk of losing patients. We then analyse the change in annual fees and volume of activity, broken down by number of patients and number of procedures per patient when the proportion of patients with CMU-C health cover increases.

The chosen specification is a fixed effect model in the following form:

$$y_{itc} = \%CMUC_{itc}\beta + X'_{itc}\delta + D'_{tc}\gamma + \lambda_t + \varphi_i + e_{itc} \quad (1)$$

$i = 1\ldots N$; $t = 2005, 2008, 2011, 2014$;
$c = 1,\ldots,3785$

where y_{itc} represents the explained variable for physician i in pseudo-canton c in wave t: the logarithm for fees, average extra-fees per patient, average extra-fees per procedure, average number of procedures per patient and number of patients. The variable $\%CMUC_{itc}$ corresponds to the proportion of their CMU-C patients, expressed in percentage points (0-100). Vector X'_{itc} includes the total patient file variables (proportion of patients with chronic conditions and the age structure of their patient file) which influence the physician's practice behaviour and prices. Vector D'_{tc} contains variables regarding the physician's competitive context and local demand (in the pseudo-canton where they are established): population structure by age and gender, unemployment rate, and density of dentists or physicians for the area of specialisation under consideration.[16]

16. Medical density equates to the number of dentists or specialised physicians in private practice in Sector 1 or 2 per 100,000 inhabitants in the pseudo-canton concerned.

Time dummies λ_t take account of time impacts affecting all physicians identically in year t (technological advances, ageing of the population, economic climate, epidemics, etc.). The specific effect φ_i formalises the heterogeneity due to unobserved characteristics of the physician, which are assumed to remain constant, such as their ethical code, practice style and the preferences that steered them in their choice of location. Effects φ_i are assumed to be fixed and non-random, as this heterogeneity is probably correlated with the variables characterising the local context as regards medical density and demand for healthcare.[17] Lastly, e_{ict} is the idiosyncratic error term. Models are always estimated by allowing clusters to take account of possible correlations between disturbances for a single physician.

Estimating (1) by ordinary least squares leads to a convergent estimate if there is no correlation between the explanatory variables and the error term e_{itc}. This assumption is perhaps not verified as regards the proportion of CMU-C patients. Introducing fixed effects helps to eliminate bias related to a level of discrimination that remains constant over time, but not a one-off refusal to treat in a given year when faced with a new request for a consultation from an individual with CMU-C health cover. Assuming variable $\%CMUC_{itc}$ to be exogenous amounts to assuming that fluctuations in said variable reflect fluctuations in the demand addressed to physicians by individuals with said cover, with one of the possible modalities being that all physicians accept all CMU-C patients who apply to them. The estimates obtained in this context must be regarded as descriptive, as the assumed exogeneity of $\%CMUC_{itc}$ does not allow any causal interpretation.

To confirm the interpretations of the results obtained within this context, we use an instrumental variable to correct for the bias that may result from a possible correlation between e_{itc} and $\%CMUC_{itc}$. The instrument used is the proportion of individuals with CMU-C cover in the department of France where the physician is based. While there may be a correlation with a specific physician effect connected with their choice of location when setting up in practice, the fixed effects eliminate this source of bias. Due to statistical power considerations, the instrumental variable estimate could only be applied to a broader categorisation of physicians by area of specialisation, namely distinguishing only between GPs, specialists and dentists. Hausman tests are conducted to test the exogeneity of variable $\%CMUC_{itc}$.

Regardless of the explained variable, coefficient β measures the impact on this variable of the variation in the proportion of CMU-C patients. With regard to extra-fees per procedure, it should be noted that we cannot differentiate procedures or extra-fees between patient category, whether CMU-C or not, and that our variable measures average extra-fees per procedure, as calculated for the entire patient base. In this context, we can only test whether the physicians manage to compensate in full for the financial loss related to the ban on extra-fees for CMU-C patients by charging their other patients higher rates: the assumption tested is $\beta = 0$.

As people with CMU-C health cover may have greater healthcare needs than other patients, it is hard to identify whether extra activity by a physician with a higher proportion of CMU-C patients is due to a strategic reaction to the ban on charging extra-fees or simply in response to a higher demand for healthcare. To examine this point, our empirical approach consists of identifying the healthcare needs of the CMU-C population based on the results for Sector 1 physicians, who in theory are confronted with these needs in the same way as Sector 2 physicians, and then pinpointing the consequences of the financial constraint based on the contrast between the Sector 1 and Sector 2 assessments, all else being equal. This approach, which uses Sector 1 physicians as a counterfactual, is based on the assumption that individuals with CMU-C cover who consult Sector 1 physicians have identical healthcare needs to those who consult Sector 2 physicians.

We then consider specifications similar to (1), except that physicians from Sectors 1 and 2 are now pooled and we assume that all of the model's parameters may differ depending on the sector to which a physician belongs:

$$y_{itc} = \%CMUC_{itc}\beta_s + X_{itc}^{'}\delta_s + D_{tc}^{'}\gamma_s + \lambda_{t,s} + \varphi_i + e_{itc} \quad (2)$$

$i = 1 \ldots N$; t = 2005, 2008, 2011, 2014;
c = 1,…,3785; s=1,2

where s = 1 or 2 depending on the sector in which the physician practises.

The existence of contrasts between the reactions of physicians from the two sectors to a variation in the proportion of CMU-C patients will be tested using the null hypothesis test $H_0 : \beta_1 = \beta_2$.

17. *For each explained variable, Hausman tests confirmed the rejection of the assumption of a lack of correlation of explanatory variables with specific physician effect with first-order risk p < 1%.*

If treating CMU-C patients is associated with a reduction in average extra-fees per procedure for Sector 2 physicians, we should get $\beta_2 < 0$. On the other hand, average fees per procedure for Sector 1 physicians should not be affected by a variation in the proportion of patients with CMU-C cover, as these physicians are not allowed to charge extra-fees. Examining whether $\beta_1 = 0$ therefore constitutes a placebo test to validate the empirical approach.

The effects on the number of procedures per patient and on the number of patients allow us to analyse whether there is a link between treating patients with CMU-C health cover and effects on volume of activity. These volume effects may lead to increases in fees for Sector 1 physicians and compensate for potential price-related losses for those in Sector 2. If individuals with CMU-C cover have identical healthcare needs, regardless of the practice sector of the physician whom they consult, then a significantly higher increase in the number of procedures per patient among Sector 2 physicians compared with those in Sector 1 ($\beta_2 > \beta_1$) may signal induced demand behaviour by Sector 2 physicians to compensate for the loss suffered in terms of fees per procedure stemming from treatment of CMU-C patients.

4. Results

Firstly, the results show that an increase in the proportion of CMU-C patients does not lead to significantly lower total fees for physicians and dentists, except for surgical specialists.[18] But behind this non-significant impact, our estimates reveal considerable price and volume effects.

4.1. Do Sector 2 Physicians and Dentists Compensate for the Absence of Extra-fees for CMU-C Patients by Charging Other Patients Higher Rates?

The assumption that the financial impact is eliminated by means of cost-shifting is rejected. It can, indeed, be observed that, all else being equal, an increase in the proportion of CMU-C patients leads to a significant reduction in the average extra-fee per procedure for all physicians and dentists (Table 3, column 3). The scale of the effects varies by area of specialisation: when the proportion of CMU-C patients rises by 1 percentage point,[19] extra-fees per procedure

18. The result with regard to surgical specialists is not robust (see below for details of robustness testing).
19. It should be noted that the within standard deviation for the proportion of patients with CMU-C health cover is about 1.5 points for most areas of specialisation in Sector 2.

Table 3 – **Impact of a variation in the proportion of patients with CMU-C health cover for Sector 2 physicians and dentists in private practice – Physician fixed effect models**

Explained Variable	Ln(Fees) (1)	Ln(Extra-fees[a] per Patient) (2)	Ln(Extra-fees[a] per Procedure) (3)	Ln(Procedures per Patient) (4)	Ln(Patients) (5)	N. obs
General practioners	-0.0031 (0.0019)	-0.0124*** (0.0020)	-0.0154*** (0.0019)	0.0030** (0.0013)	-0.0017 (0.0017)	18,089
All specialists	-0.0039 (0.0029)	-0.0179*** (0.0022)	-0.0212*** (0.0022)	0.0032*** (0.0011)	-0.0004 (0.0026)	39,051
Medical specialists	-0.0086 (0.0060)	-0.0182*** (0.0033)	-0.0246*** (0.0036)	0.0063*** (0.0016)	-0.0091* (0.0055)	8,648
Radiologists	0.0645 (0.0440)	-0.0532** (0.0220)	-0.0605** (0.0261)	0.0072 (0.0082)	0.0775 (0.0493)	1,170
Surgical specialists	-0.0082** (0.0038)	-0.0132*** (0.0034)	-0.0149*** (0.0037)	0.0017 (0.0015)	-0.0047 (0.0034)	17,225
Psychiatrists	0.0087 (0.0102)	-0.0218*** (0.0078)	-0.0256*** (0.0069)	0.0038 (0.0053)	0.0132 (0.0088)	2,322
Gynaecologists	-0.0106 (0.0081)	-0.0180*** (0.0037)	-0.0187*** (0.0036)	0.0006 (0.0018)	-0.0090 (0.0072)	5,080
Paediatricians	-0.0079 (0.0088)	-0.0202*** (0.0056)	-0.0181*** (0.0049)	-0.0021 (0.0031)	-0.0040 (0.0077)	1,430
Anaesthetists	0.0186 (0.0144)	-0.0328*** (0.0099)	-0.0376*** (0.0095)	0.0048 (0.0047)	0.0286** (0.0133)	3,176
Dentists	-0.0006 (0.0013)	-0.0065*** (0.0009)	-0.0085*** [b] (0.0004)	0.0044*** (0.0004)	0.0005 (0.0010)	89,019

[a] for dentists, this is more about freedom to charge unregulated rates for prosthetic procedures. [b] excess fees per prosthetic procedure logarithm.
Notes: p < 0.1 *; p < 0.05 **; p < 0.01 ***. Estimations include physicians fixed effects and are made controlling: year of observation; age structure of the patient base; proportion of patients with chronic conditions; physician density for the category in question in the pseudo-canton; age and gender structure of the population in the pseudo-canton, and unemployment rate in the pseudo-canton. Standard deviations in brackets allow clusters at physician level.
Reading Note: A rise by 1 percentage point in the proportion of patients with CMU-C health cover significantly reduces the average excess fees per procedure for Sector 2 GPs by 1.5% (with a first-order risk of 1%).
Sources and Coverage: See Table 1.

are observed to fall by about 2% for GPs and most specialists, 4% for anaesthetists and 6% for radiologists. For dentists, there is a 0.9% fall in extra-fees per prosthetic procedure.

These results show that Sector 2 physicians and dentists cannot fully compensate for the restriction on extra-fees by increasing their rates for other patients. The results are similar to those obtained by Showalter (1997), who did not find cost-shifting when analysing American data. Our results are compatible with a strategy of increasing extra-fees for non-CMU-C patients, but one that would only achieve partial compensation; they may also mean that physicians reduce their extra-fees to attract more patients and make up for their loss of earnings by increasing the number of procedures carried out.

The results also indicate that a rise in the proportion of CMU-C patients entails a rise in the number of procedures per patient (Table 3, column 4), an effect that is significant for GPs (+0.3%), medical specialists (+0.6%) and dentists (+0.4%). This rise in the number of procedures per patient does not allow any area of specialisation to avoid a fall in extra-fees per patient (Table 3, column 2). Lastly, it can be observed that the fall in extra-fees per procedure is not compensated for by a rise in the number of patients (except for anaesthetists), as this remains constant for almost all areas of specialisation (column 5). The variation in the proportion of CMU-C patients is a substitution with patient numbers remaining constant.[20]

4.2. Impact of Limiting Extra-fees: Volume Effects

Table 4 shows the estimates from the model (2): the β_1 coefficients estimated for Sector 1 physicians (S1), β_2 estimated for Sector 2 physicians (S2) and the significance level for the contrast between the two sectors (S1 = S2).

The results confirm the previous interpretations for GPs and medical specialists: significant negative effects can be observed on Sector 2 physicians but not on those in Sector 1;[21] it is indeed the ban on extra-fees for CMU-C patients that leads to the reduction in fees per procedure.

As we saw above, maintaining the total amount of fees despite the restriction related to the ban on extra-fees is accompanied by an increased volume of activity for Sector 2 physicians, as is shown by the significant positive effects on the number of procedures per patient or number of patients (Table 4, columns 3 and 4). For Sector 2 GPs and medical specialists, it clearly appears that when the proportion of CMU-C patients increases, the fees per procedure fall, the number of procedures per patient increases and the overall total amount of fees is not affected.

Are these volume effects connected with CMU-C patients' greater healthcare needs or with induced demand behaviour on the part of the Sector 2 physicians to compensate for price-related losses? Assuming that needs are fully accounted for through the estimated impacts in Sector 1, we examine the significance level for the contrast $\beta_1 - \beta_2$ in the number of procedures per patient between physicians in Sector 1 and Sector 2 (Table 4, column 3, line S1=S2). We find a significant contrast for GPs and specialists as a whole. For example, when GPs experience a 1 percentage point rise in the proportion of their patients with CMU-C cover, the number of procedures per patient in Sector 2 increases by 0.3%, whereas it falls by 0.1% in Sector 1.

Before interpreting this contrast as the expression of induced demand behaviour, it is necessary to verify that there is no constraint due to saturation point being reached as regards working hours, which might affect GPs and specialists differently depending on their practice sector. To examine this point, we carry out the same estimations for areas of specialisation suspected of induced demand but only retain in the sample those physicians who, in theory, are not already at saturation point as their level of activity is low or moderate, that is to say within the first three quartiles of the distribution of total number of procedures, regardless of sector. The results confirm the induced demand hypothesis for GPs but not for specialists as a whole (see Online Appendix, Table C2).

These results do not allow any causal relations to be established as they are based on the assumption that variations in the proportion of a physician's CMU-C patients are exogenous. We therefore estimate the fixed effect model using, as an instrument, the proportion of individuals with CMU-C health cover in the department

20. Additional analyses, not shown here, indicate that an increase in the proportion of patients with CMU-C health cover is accompanied by a fall in the proportion of fees accounted for by lump-sum payments for Sector 2 GPs and that there is no correlation with the proportion of fees represented by lump-sum payments for Sector 2 specialists and dentists.

21. This is not the case for psychiatrists and anaesthetists in Sector 1, who also suffer a reduction in their fees per procedure. This effect may be explained by the approved excess fees that Sector 1 physicians are entitled to charge if the patient does not follow the officially approved care pathway, but not for CMU-C patients. Table 2 shows that among Sector 1 physicians, psychiatrists and anaesthetists charge higher excess fees per patient than other specialists.

Table 4 – **Impact of a variation in the proportion of patients with CMU-C health cover for physicians in private practice – Physician fixed effect models**

Explained variables		Ln(Fees) (1)	Ln(Fees / procedure) (2)	Ln(Procedures / patient) (3)	Ln(Patients) (4)	N Obs.
General practioners	S1	0.0030*** (0.0009)	0.0003 (0.0002)	-0.0013*** (0.0004)	0.0041*** (0.0008)	189,631
	S2	-0.0031 (0.0019)	-0.0044*** (0.0006)	0.0030** (0.0013)	-0.0017 (0.0017)	
	S1 = S2	***	***	***	***	
All specialists	S1	0.0052* (0.0027)	0.0003 (0.0005)	-0.0003 (0.0008)	0.0052** (0.0025)	111,126
	S2	-0.0038 (0.0029)	-0.0066*** (0.0009)	0.0032*** (0.0011)	-0.0004 (0.0026)	
	S1 = S2	**	***	**	ns	
Medical specialists	S1	-0.0001 (0.0051)	-0.0006 (0.0007)	0.0045*** (0.0013)	-0.0040 (0.0048)	34,208
	S2	-0.0086 (0.0060)	-0.0058*** (0.0012)	0.0063*** (0.0016)	-0.0091* (0.0055)	
	S1 = S2	ns	***	ns	ns	
Radiologists	S1	0.0182* (0.0102)	0.0037** (0.0017)	-0.0015 (0.0022)	0.0160* (0.0095)	14,307
	S2	0.0645 (0.0438)	-0.0203* (0.0123)	0.0072 (0.0082)	0.0775 (0.0491)	
	S1 = S2	ns	*	ns	ns	
Surgical specialists	S1	-0.0056 (0.0096)	0.0070*** (0.0019)	-0.0025 (0.0021)	-0.0102 (0.0082)	26,409
	S2	-0.0081** (0.0038)	-0.0051*** (0.0017)	0.0017 (0.0015)	-0.0047 (0.0034)	
	S1 = S2	ns	***	ns	ns	
Psychiatrists	S1	0.0031 (0.0034)	-0.0025*** (0.0004)	0.0001 (0.0019)	0.0056** (0.0025)	10,971
	S2	0.0086 (0.0101)	-0.0083*** (0.0020)	0.0038 (0.0053)	0.0132 (0.0087)	
	S1 = S2	ns	***	ns	ns	
Gynaecologists	S1	-0.0052 (0.0039)	-0.0003 (0.0013)	0.0041*** (0.0015)	-0.0090*** (0.0032)	10,347
	S2	-0.0106 (0.0080)	-0.0021 (0.0017)	0.0006 (0.0018)	-0.0090 (0.0072)	
	S1 = S2	ns	ns	ns	ns	
Pediatricians	S1	0.0087 (0.0057)	0.0002 (0.0006)	0.0032 (0.0019)	0.0052 (0.0045)	5,447
	S2	-0.0079 (0.0087)	-0.0018 (0.0012)	-0.0021 (0.0031)	-0.0040 (0.0077)	
	S1 = S2	ns	ns	ns	ns	
Anaesthetists	S1	0.0077 (0.0238)	-0.0072* (0.0040)	-0.0045** (0.0020)	0.0194 (0.0250)	9,437
	S2	0.0186 (0.0144)	-0.0149*** (0.0056)	0.0048 (0.0047)	0.0286** (0.0133)	
	S1 = S2	ns	ns	*	ns	

Notes: ns for non-significant; p < 0.1 *; p < 0.05 **; p < 0.01 ***. Estimations include physicians fixed effects and are made controlling the same variables as indicated in the Notes for Table 3 and allowing their heterogeneous effects for physicians in Sector 1 and Sector 2. Standard deviations in brackets allow clusters at physician level.
Reading Note: A rise by 1 percentage point in the proportion of patients with CMU-C health cover significantly increases Sector 1 GPs' total fees by 0.3% (with a first-order risk of 1%). This effect is significantly different for GPs from Sector 1 versus those practising in Sector 2, with a first-order risk of 1%.
Sources and Coverage: See Table 1.

where the physician practices; as indicated above, due to statistical power considerations, this can only be done using a broader categorisation, which groups together all specialists. The results are shown in Table 5. The Fisher test (column 2) shows the instrument correlates well with $\%CMUC_{itc}$. Adopting a null hypothesis rejection threshold of 5% regarding the exogeneity of the variable $\%CMUC_{itc}$, our conclusions remain unchanged for the three broad categories:

Table 5 – **Impact of a variation in the proportion of patients with CMU-C health cover for Sector 2 physicians and dentists in private practice – Physician fixed effect instrumental variable models**

Explained Variable	Stage One		Stage Two					No. of obs
	% Patients CMU-C (1)	Fisher (2)	Ln (Fees) (3)	Ln(Excess Fees[a]) per Patient) (4)	Ln(Excess Fees[a]) per Procedure) (5)	Ln(Procedures) Per Patient) (6)	Ln(Patients) (7)	
General Practitioners	0.499*** (0.042)	139	-0.0099 (0.0110)	-0.0491*** (0.0132)	-0.0588*** (0.0122)	0.0097 (0.0069)	-0.0068 (0.0106)	18 089
p-value			0.5269	0.0044	0.0002	0.3277	0.6258	
Specialists	0.488*** (0.027)	308	-0.0109 (0.0100)	-0.0495*** (0.0107)	-0.0587*** (0.0111)	0.0092 (0.0058)	0.0058 (0.0097)	39 051
p-value			0.4916	0.0025	0.0006	0.3031	0.5193	
Dentists	0.405*** (0.029)	190	0.0188** (0.0085)	0.0375*** (0.0085)	-0.0178***[b] (0.0042)	0.0185*** (0.0041)	-0.0130* (0.0071)	89 019
p-value			0.0230	0.0000	0.0281	0.0005	0.0597	

[a] for dentists, this is more about freedom to charge unregulated rates for prosthetic procedures. [b] excess fees per prosthetic procedure logarithm.
Notes: p < 0.1 *; p < 0.05 **; p < 0.01 ***. The proportion of patients with CMU-C health cover is instrumented with the proportion of individuals with CMU-C cover in the department of France where the physician's practice is based. Estimations include physicians fixed effects and are made controlling the same variables as indicated in the Notes for Table 3. The p-value of the Hausman test indicates whether the variable for the proportion of patients with CMU-C cover can be treated as exogenous. Column 2 indicates the Fisher statistic for the instrument excluded in stage one.
Reading Note: Column 1 shows that a rise by 1 percentage point in the proportion of individuals within the department with CMU-C health cover increases the proportion of Sector 2 GPs' patients who have CMU-C cover by 0.5 percentage points (with a first-order risk of 1%). Column 5 shows that a rise by 1 percentage point in the proportion of patients with CMU-C health cover significantly reduces the average excess fees per procedure for Sector 2 GPs by 5.9% (with a first-order risk of 1%).
Sources and Coverage: See Table 1.

varying the proportion of CMU-C patients leads to a reduction in the average excess fee per procedure and per patient, with no overall impact on the total value of fees.

The instrumental variable estimates give an important result for dentists: an increase in the proportion of their CMU-C patients by 1 percentage point leads to a 3.8% rise in their extra-fees per patient[22] (Table 5). This result must be confirmed, as it is not obtained in our robustness tests (first differences estimation). If it were to be confirmed, one might conclude that the 30% price rise for prosthetic procedures applicable to CMU-C patients in 2006 was precisely calibrated to avoid a negative impact on average revenue per patient for dentists in private practice treating CMU-C patients.[23]

4.3. Robustness of Results

With first difference estimations, we obtain the same results, except for the estimated impact with the instrumental variable estimator regarding the rise in fees and extra-fees per patient for dentists (see Online Appendix, Tables C3 to C6).

Our results could be sensitive to various types of shocks. In particular, the impacts of public policies between 2012 and 2014, potentially affecting physicians differently, would not be controlled by time dummies. In 2012, the ban on extra-fees was extended to patients eligible for the ACS supplementary health insurance subsidy scheme, a rule that does not seem to have been entirely respected by physicians up to 2015, according to Jusot *et al*. (2019). Moreover, in 2013, the raising of the CMU-C eligibility threshold led to a significant increase in the number of beneficiaries (+18%). Lastly, in 2014, physicians who signed the *Contrat d'Accès aux Soins* (an agreement between physicians and the social security to limit extra-fees) undertook to limit their average extra-fees rate to 100% of the statutory rate and to maintain their volume of activity carried out at the statutory rate. We ran our models excluding the 2014 wave in order to assess whether these three public policy-related impacts have a significant effect on the estimates. This proved not to be the case: apart from a few exceptions already mentioned above, our results are identical over the 2005-2011 period (see Online Appendix, Tables C7 to C10). Our results might then be sensitive to the impact of the physician's household composition: those whose family circumstances have changed might be inclined to refuse to treat CMU-C patients in a given year. We find the results withstand the inclusion in the regression of variables characterising the household (marital status and number of dependent children). Lastly, there might be local impacts on income, potentially leading to an increase in the rate of individuals entitled to CMU-C cover owing to a general fall in income in a particular department of

22. For dentists, this is rather freedom to charge unregulated rates, with the term "excess fees" being used in our study as the common term for both physicians and dentists.
23. The results in Table 5 also show for dentists that an increase in the proportion of their patients with CMU-C health cover by 1 percentage point leads to a 1.9 % rise in their total fees. This result is not robust for any of the robustness tests in the following section.

France, without this being captured by the "pseudo-canton" unemployment rate control variable. Such a correlation would entail a variation in physicians' fees or in their volume of activity, unconnected with variations in the proportion of people entitled to CMU-C cover within the department. However, this seems unlikely, as our results are robust when we control for median income at the department level (median income is not available at pseudo-canton level).

* *
*

Sector 2 physicians and dentists do not manage to compensate for the ban on extra-fees for CMU-C patients by charging other patients higher rates, but this fall in rates does not entail a drop in total fees as physicians simultaneously increase their volume of activity. The rise in volume of activity may stem from induced demand behaviour or greater healthcare needs for CMU-C patients. By using Sector 1 physicians as counterfactual, we identify induced demand for Sector 2 specialists and GPs. However, the relevance of reference to Sector 1 may be questioned, based on the argument that some Sector 1 physicians may already have no capacity for more work. Eliminating physicians with a high level of activity results in the induced demand hypothesis being confirmed for Sector 2 GPs but no longer for Sector 2 specialists. As dentists do not belong to an officially agreed sector, there is no reference group to help interpret the rise in their activity in terms of induced demand. The instrumental variable estimations confirm our results. They can only be calculated using a broader categorisation of medical specialisations, but allow to account for the non-exogeneity of physicians' behaviour as regards treating CMU-C patients. For dentists, they also show that an increase in the proportion of CMU-C patients leads to a significant rise in the dentists' revenue per patient, but this result must be confirmed as it is not always robust but may be connected with the price hike decided on in 2006 for prosthetic procedures applicable to patients with CMU-C health cover.

Our results suggest that the ban on extra-fees is not neutral for Sector 2 physicians and dentists, as treating patients with CMU-C health cover leads to a drop in the average price per procedure and an increase in the volume of activity. That might explain, more generally, incidences of refusal to treat for all physicians and, in particular, psychiatrists (who have an average of 10 consultations per patient a year). Interpreting our results in terms of the trade-off between work and leisure, they suggest that physicians' preferences are such that the income effect outweighs the substitution effect: when procedure-related income falls, they react by carrying out more procedures, which is a result that tallies with those obtained by Coudin *et al*. (2015) and Chanel *et al*. (2017). However, since we are not able to observe the length of consultations, we cannot tell whether the rise in volume of activity involves increased working time.

From the perspective of public decision-making, the evident fall in average remuneration per procedure for Sector 2 physicians and dentists suggests that the ban on extra-fees might be a source of inefficiency on two counts: it may foster discrimination against patients with CMU-C health cover, and it may encourage induced demand behaviour. Some thought must inevitably be given to the current regulations, as the obligation to charge statutory rates has been extended to individuals eligible for ACS vouchers and subsequently maintained in the setting up of the new *Complémentaire Santé Solidaire* system in 2019. □

Link to Online Appendices: https://www.insee.fr/en/statistiques/5396132/ES-524-525_Dormont-Gayet_Online_appendix.pdf

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‘Must-Trade and Catch-Up’ – Do the Self-Employed Under-Invest in Their Health?

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Abstract – This study analyses the healthcare consumption of self-employed workers (SEW) versus employees, at different ages in France. It is based on 2012 cross-sectional data from the French Health, Healthcare and Insurance Survey (ESPS) matched with National Health Insurance data. We decompose healthcare demand (ambulatory and inpatient care) at different ages and by gender using a two-step model. The results show that, *ceteris paribus,* SEW (especially men) tend to consume less ambulatory care in the early stages of their working life, as their job is more demanding (‘must-trade’ effect), while their consumption gradually increases with age, reaching the levels of other categories of workers after retirement (‘catch-up’ effect). These results, in line with economic theory, suggest that SEW’s health declines faster over the life cycle. From a public policy perspective, they challenge, on the grounds of public health, the EU2020 strategy advocating the development of SEW in Europe.

JEL Codes: I12, C31
Keywords: healthcare demand, healthcare expenditure, occupational status

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The EU2020 employment strategy recognizes entrepreneurship and self-employment (SEW)[1] as a key to foster economic growth and to create new jobs (European Commission, 2017). Many European countries have implemented national public policies to promote SEW partly based on the alleged benefits of various economic and health outcomes (Goetz *et al*., 2012; Koellinger & Thurik, 2012; Carree & Thurik, 2010). Although Schumpeter (1911) advocated the case for 'the wild spirit' for economic performance a century ago, the arguments in favour of health are fairly recent. The literature widely acknowledges that self-employed workers (SEW) are generally healthier (Sewdas *et al*., 2018; Algava *et al*., 2013; Stephan & Roesler, 2010), with lower mortality rate (Lallo & Raitano, 2018; Toivanen *et al*., 2016; Algava *et al.,* 2011), and lower demand for healthcare than other categories of workers (Riphahn *et al*., 2003; Gruber & Kiesel, 2010). SEW's lower level of demand for healthcare seems to be explained by lower healthcare needs.

The usual explanation refers to the 'active job' assumption. According to Karasek & Theorell's job strain model (1990), SEW jobs are characterized by high but balanced levels of 'demand' and 'control'. Although their jobs require more hours of work (OECD, 2015), induce more stress (Lewin-Epstein & Yuchtman-Yaar, 1991), emotional fatigue (Jamal, 2007), and are associated with specific health problems (Park *et al*., 2019), self-employed workers' leeway or autonomy in organising their work would limit the deleterious effects of professional activity on health (Stephan & Roesler, 2010; Hessels *et al*., 2017). However, a major contribution from Rietveld *et al*. (2015) established that SEW are healthier mainly because of a selection effect i.e. a better initial health status.[2] Herber *et al*. (2020) most recently provided similar findings, and Garrouste *et al*. (2020) found that SEW's physical health deteriorates more severely than other categories of workers. In addition, SEW systematically appear healthier and exhibit lower mortality rates than employees. The selection effect highlighted by Rietveld *et al*. (2015) could explain this apparent paradox: health losses suffered by self-employed workers would go relatively unnoticed because of their better initial health status. This is an important public health and economic issue that is generally not recognised. Finally, the job strain approach appears flawed since the balance between 'demand' and 'control' should not have deleterious consequences on health. Other studies suggest that, with identical healthcare needs, self-employed workers demand less healthcare during their working life (Pfeifer, 2013) and more than employees after they retire (Boaz & Muller, 1989; Bíró, 2016).

This article develops an alternative framework to better describe and understand the specificity of changes in self-employed workers' healthcare behaviour over the life course. We refer to Grossman's (1972) seminal model of demand for health capital over the life course. In this model, the demand for healthcare is derived from the demand for health. The individual maximizes health and consumption over life, subject to a budget constraint and a time constraint (total time being broken down in healthy days for work, sick days, leisure). The individual's optimal health stock is at the equilibrium when the rate of return on health capital equals the cost of health capital. This cost consists of the depreciation rate plus the opportunity cost of investing in something else. Since the marginal benefit of investment in health is decreasing (because of decreasing returns on health production), the demand for health falls when the depreciation rate rises. However, the demand for healthcare rises with age as the time available in good health diminishes with the depreciation rate, and the individual substitutes medical care for prevention.

We calibrate the health capital model with the following three stylised facts. The literature establishes that SEW exhibit *(i)* a higher level of health capital at baseline (Herber *et al.,* 2020; Rietveld *et al.,* 2015), *(ii)* a higher rate of depreciation due to harder work conditions (as suggested by Rietveld *et al.,* 2015; see also above on the 'demand' aspects of the 'demand-control' model),[3] and *(iii)* higher working time (Janssen, 1992; Boaz & Muller, 1989).[4] The combination of these stylised facts in the health capital model leads to two theoretical effects: first, for SEW, a higher rate of depreciation (due to harder work conditions) inflates the cost and reduces the demand for health capital, and higher health stock in the

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1. For the sake of simplicity SEW will refer to the self-employed workers or self-employment, depending on the context.

2. Poor health reduces the ability to carry out professional activities, limits access to financing (which is essential for starting a business), and reduces the likelihood of being insured, especially when moving from employee to SEW (Rietveld et al., *2015).*

3. Rietveld et al. *(2015) displayed "tentative evidence that, if anything, engaging in self-employment is bad for one's health".*

4. "Although the self-employed have more control over their work time than employees, they may be more affected than employees by the loss of output and earnings associated with absence from the workplace" (Boaz & Muller, 1989). We shall see thereafter that this assumption is especially relevant in the French context (cf. section 2).

early stages of SEW's career favours prevention as a health investment strategy (more healthy days available for leisure). We call this the 'must-trade' effect[5] when SEW have a lower healthcare demand than employees at baseline. The second effect, or the 'catch-up' effect, is when SEW's demand for healthcare increases faster than employees; it follows from SEW's higher depreciation rate. Although the demand for health falls when the depreciation rate rises, if the leisure time dedicated to prevention falls (due to SEW's higher workload), the demand for healthcare may increase because optimizing individuals substitute medical care for their own efforts. This effect is reinforced at retirement since a low health stock at older ages does not favour prevention, despite the fact that SEW get relatively more working time back for leisure than employees when they retire, so that their medical consumption should rise (Bíró, 2016; Lucifora & Vigani, 2018).

This article is aimed to analyse the differences in healthcare behaviour between employees and SEW from an age-related perspective. Using 2012 cross-sectional data from the *Enquête sur la santé et la protection sociale* (a French survey on health and healthcare insurance, ESPS hereafter) matched with National Health Insurance data, we find that SEW (especially men) tend to consume less ambulatory care in the early stages of their working life, while their consumption gradually increases with age and eventually reaches the levels of other categories of workers after retirement. We analyse the effect of the current or last occupational status (self-employed workers *vs.* employees) on the consumption of ambulatory and inpatient care (in terms of amount and volume). Healthcare expenditures (HCE) are decomposed using a two-step model. The first equation estimates the probability of access to ambulatory and inpatient care (extensive margin) using probit models, and the second estimates the amount (in euros) and the volume (number of visits) of ambulatory and hospital care (intensive margin) with log-linear models. Finally, as self-employed workers' healthcare behaviours are heterogeneous over the life-course, we developed an age-specific approach, before and after the exit from the labour market. We also explore differences by gender and between the various professions in the status.

This paper is structured as follows. Materials and methods are presented in section 1. Section 2 examines SEW's health expenditure. Section 3 investigates the heterogeneity of SEW's healthcare behaviours, then we conclude.

1. Materials and Method

1.1. Context, Data and Sample

The French healthcare system is based on a social insurance model. It provides people with publicly financed healthcare over their entire life span, without age restrictions. The public insurance system covers almost 100% of hospital care expenditures and 70% of expenditures for ambulatory care prescriptions (including drugs) listed in the publicly financed benefits package. Complementary private health insurance covers the remaining 30% as statutory cost sharing for 95% of the population in 2012. Although there is no difference between SEW and other categories in access to healthcare and compulsory health insurance (as in all EU countries), some benefits remain limited for SEW such as unemployment, maternity or paternity leave, invalidity, work-related accidents, etc. (Spasova *et al*., 2017) and are received later after a disease (see Torp *et al.,* 2018 in the case of cancer) compared to other workers. Primary care is mostly delivered in the ambulatory care sector by self-employed professionals. Patients can consult for ambulatory care without limitation, and the nature and level of care (including drugs) depends on physicians' prescriptions. Specialist consultations mostly take place in ambulatory care and not within hospitals. Although choices of any general practitioner (GP) or specialist care are free, patients who visit the gatekeeper GP benefit from a lower rate of co-payment. Surgical and obstetric care is provided by public and private hospitals, while highly specialised medical care is mainly provided by public hospitals. Since 2004, the hospital funding scheme evolved from global budget (public hospitals only) to activity-based financing. For a detailed overview of the French health system and past and recent reforms, see Chevreul *et al*. (2015).

As already mentioned, our data consist of the matching of the 2012 ESPS and data from the *Caisse nationale d'assurance maladie* (CNAM, the French public health insurance). The ESPS, coordinated by the Institute for Research and Information in Health Economics (IRDES) since 1988, is designed to be representative of the French population; it provides data on health status, access to healthcare services, health insurance and information on the economic and social status of individuals aged 18 years and above. Survey responses are merged with health expenditure data from the *Échantillon*

5. In reference to the assumption that SEW professional activity requires more working time.

Généraliste des Bénéficiaires (EGB), a permanent representative sample of the population covered by the French public health insurance, whether they have received healthcare reimbursements or not. The EGB contains exhaustive anonymous information (paper and electronic treatment forms, hospital invoices) on all the ambulatory and hospital medical procedures and prescriptions through expenditures presented for reimbursement to the CNAM. For more details on the dataset, see Célant *et al*. (2014).

The initial sample consists of 599,544 individuals in 2012 drawn from the EGB. The main sampling frame is representative of 95% of the French population in 2012. A random subsample is drawn from the EGB; the individuals in this subsample and their household members are eligible for the ESPS survey. A total of 8,413 households representing 23,047 French residents were surveyed in 2012, of which 17,598 aged 18 or more. The observations are then merged with the EGB's data, resulting in 9,231 observations (52.5% match; the remaining unmatched individuals correspond to household members whose public health insurance is independent from the reference individual's health insurance known in the EGB). We excluded 690 observations, corresponding to individuals who had never worked. Some 75.5% out of the 8,541 respondents in the sample at this stage answered the health questionnaire, and only 6 additional observations were dropped because of missing values. The final working sample consists of 6,445 observations (28% of the initial respondents).

1.2. Variables

Dependent variables. Among the variables from the EGB, the main variables of interest are the total amount of healthcare expenditures in ambulatory care[6] and inpatient (or hospital) care, in euros. We also use variables on the volume of care: the number of visits to a general practitioner (GP), or to a specialist (SP) and the number of nights spent in a hospital. For each of these variables, we take into account both access to care (a binary variable indicating whether the respondent consumed the type of care) and the total associated amount (in euros or volume). In addition, we use the responses to a question in the ESPS 2012 asking whether the respondent had foregone care over the last 12 months. This allows to account for unmet needs, as was used as a complementary indicator of healthcare access by Allin & Masseria (2009).

Identifying self-employed workers. We want to analyse the long-term effects of the occupational status on health and healthcare, i.e. including when people are not anymore economically active. For this, we distinguish self-employed workers from other workers on the basis of their current occupational status as reported by those economically active at the time of survey, or the last occupational status reported by the others – if they ever worked – to avoid the selection effect at the exit from the labour market that occurs, in particular, when individuals are in poor health. The resulting variable indicates whether the respondent is or was a self-employed worker (taking the value 1) or an employee – the reference[7] (taking the value 0). Self-employment is well known to be quite heterogeneous, so it is broken down into five categories: farmers, craftsmen, merchants, small business owners, and liberal professions.

Other determinants of healthcare expenditures. Our choice of covariates is in line with the factors identified by the literature as determining individuals' healthcare expenditures. From the demand side perspective, it relates to needs, means, and individual characteristics, including occupational status. *(i)* The need for care is approximated by several self-reported health measures: self-rated health, with five levels from 'Good' to 'Poor'; whether the respondent felt (severely) limited in his/her usual activities; the number of chronic diseases from a 12-item list; the number of Activities of Daily Living (ADL) or Instrumental Activities of Daily Living (IADL) limitations; and self-reported measures of depressive symptoms and cognitive impairments. For the sake of parsimony, a single continuous measure of 'Poor health' was computed from a multiple correspondence analysis of these six variables (as in Sirven & Rapp, 2017). The loading factors on the main axis (above 80% of the total inertia) were rescaled to values between 0 and 1 (respectively the best and the worst health status in the sample). In addition, we use the information from administrative data to add a dummy variable indicating whether the respondent died within two years

6. Ambulatory expenditures can be broken down into various types of care whether expenditures refer to physicians (general practitioner, specialist, dentist, midwife), paramedics (nurse, physiotherapist, etc.), biology, other medical goods and services (drugs, medical devices, etc.), and expenditures for emergency visits without hospitalisation. For the sake of clarity and concision, we focus on aggregated values of ambulatory expenditures in multivariate analyses. See Table A1 in the Appendix 1 for a disaggregated bivariate analysis of self-employed workers (SEW) and non-SEW ambulatory expenditures.

7. The reference will hereafter be defined as 'non-SEW', as the emergence of bogus self-employment makes it impractical to use 'dependent' for other forms of (past) employment.

following the survey. The other determinants of the demand for healthcare taken into account are: *(ii)* having a complementary health insurance; *(iii)* the household income *per capita* (using a standard equivalence scale) in quintiles, and a dummy for those who did not report an income; *(iv)* whether the respondent was working at the time of the survey; *(v)* a measure of the Karasek & Theorell (1990) demand-control ratio of working conditions for the working population (see Appendix 1 for a brief presentation and details on the computation of demand-control ratio); *(vi)* socio-demographic variables: age, sex, and education level; *(vii)* and household size. From a supply side perspective, we retain the density of physicians in the area, which is considered as the usual determinant of access to care in the literature. It is measured here as the (log) density of physicians/100,000 inhabitants in the *département* (the level of government below the region and above the municipality).

1.3. Identification Strategy

We aim to measure the effect of the occupational status (self-employed workers *vs.* employees) on the consumption of ambulatory and inpatient care. A two-step model is a standard choice for modelling healthcare expenditures (HCE) at the extensive and intensive margins. The extensive margin represents access to care, i.e. whether a person consumed the type of care, and the intensive margin is the total amount of healthcare associated (in amount or volume). The first step estimates the probability of access to ambulatory and hospital care (extensive margin, $\Pr\left(y>0\middle|X\right)$) by a probit model, and the second estimates the amount (in euros) and volume (number of visits) of ambulatory and hospital care (intensive margin, $E\left[\ln\left(y\right)\middle|y>0,X\right]$).[8] An OLS estimator is used on the natural logarithm of the amount of care. Formally:

$$y_i^k = \alpha + \beta SEW_i + \delta x_i + \varepsilon_i$$

where y_i^k represents the access to care (k=1; $y_i^k = \{0,1\}$) and the amount and volume of care consumed (k=2; $y_i^k > 0$) of individuals. SEW_i is a binary variable taking the value of 1 if the individual is a self-employed worker and 0 if the individual is an employee; x_i is the matrix of the control variables, and ε_i is an error term.

For the specification of the second step, we follow Manning & Mullahy's (2001) recommendations so as to compare GLM and log-transformed OLS.[9] In our case, the log-scale residuals from the OLS models for the amount of care (euros and volume) are symmetric (the coefficients of skewness are close to 0), and/or the variances are large (≥1); while log-scale residuals from GLM with log-link and gamma variance are heavy-tailed (coefficients of Kurtosis > 3). Both sets of tests thus suggest that log-transformed OLS was appropriate here. However, residuals from the log-transformed models are strongly heteroskedastic (essentially due to health status and age) so that a lognormal heteroscedastic re-transformation into euros by a scale factor (Duan's smearing factor) was implemented.[10] This procedure guarantees that the log-transformed OLS not only yields consistent estimates, it also is a more precise alternative than GLM (Manning & Mullahy, 2001).

In addition, we investigate the heterogeneity of the effect of self-employment on HCE. One approach relies on the breakdown of the occupational status into its categories (farmers, merchants, craftsmans, small business owners, liberal professionals). Another more standard approach is based on the stratification of the sample by age and sex – two exogenous factors. In this last case, a model of HCE with interaction terms (self-employment × age × sex) is tested.

2. Do the Self-Employed Spend Less in Healthcare?

2.1. A Specific and Multifaceted Population

There are 11.1% of self-employed workers in our sample (Table 1), a proportion that is similar to the macroeconomic rate of self-employment of 11.4% in OECD data for the same year. Self-employment is composed of 34.5% of farmers, 28.4% of craftsmen, 23.4% of merchants, 3.8% of small business owners and 9.9% of liberal professions. In terms of demographic characteristics, a large majority of self-employed workers are men, and they are older than other categories of workers.

Table 2 displays descriptive statistics broken down by work status. SEW appear in poorer health that other workers; this is unlike what is usually found in literature, and probably due to the much higher share of older workers that

8. From a theoretical perspective, the two equations are independent since the patient initiate the consultation, and the physician decides about the type and amount of care that is necessary. The 'two-persons analogy' illustrates the idea that unobservable characteristics from each agent (i.e. error terms from both equations) have no reason to be correlated. Since two different generating processes are at play, no correction for sample selection is required.

9. Extended estimating equations provided semi-parametric estimates of the link and variance functions parameters required to fit a GLM. Results suggested that the data generating process was best described with a log link function and a gamma distribution for the variance, as it is often the case with healthcare expenditure data.

10. The variance function was estimated for subgroups of age class, since age roughly seize elements of health, the other source of heteroskedasticity here.

Table 1 – **Sample Description**

	Overall		Sex		Age group			
	Obs.	Percent	Men	Women	18-39	40-54	55-64	65+
Employees (Non-SEW)	5,728	88.9	45.7	54.3	26.6	31.2	19.3	22.9
Self-employed workers (SEW)	717	11.1	64.6	35.4	11.4	25.8	17.2	45.6
SEW by professional category								
Farmers	247	34.5	59.1	40.9	7.7	15.8	10.9	65.6
Craftsmen	204	28.4	79.9	20.1	13.2	31.9	18.1	36.8
Merchants	168	23.4	52.4	47.6	11.3	31.0	20.2	37.5
Small business owners	27	3.8	77.8	22.2	14.8	25.9	18.5	40.7
Liberal profession	71	9.9	63.4	36.6	18.3	31.0	28.2	22.6
Total	6,445	100	47.8	52.2	24.9	30.6	19.0	25.5

Sources: ESPS (2012).

Table 2 – **Descriptive statistics of features of the self-employed (SEW)**

Variables	Overall	SEW	Non-SEW	Difference
Age (in years)	52.4	60.4	51.4	9.01***
Woman (%)	52.2	35.4	54.3	-18.92***
Household size (number of members)	2.7	2.6	2.7	-0.14***
Living alone (%)	18.3	15.9	18.6	-2.75*
Education (%)				
No diploma	13.7	12.7	13.8	-1.15
High school	44.4	47.8	43.9	3.90**
Baccalauréat (A-levels)	15.2	14.2	15.3	-1.05
University	25.4	23.3	25.6	-2.35
Income (%)				
Q1	15.3	17.7	15.0	2.72*
Q2	17.3	20.2	17.0	3.24**
Q3	17.0	12.3	17.6	-5.34***
Q4	18.2	13.7	18.8	-5.15***
Q5	18.7	17.4	18.8	-1.37
Missing	13.4	18.7	12.8	5.91***
Working (%)	53.4	46.6	54.2	-7.66***
Ratio Demand-Control	0.1	0.1	0.1	-0.02***
Ratio Demand-Control missing	0.5	0.6	0.5	0.07***
Has complementary health insurance (%)	88.5	92.3	88.0	4.32***
Poor health (%)	0.2	0.2	0.2	0.02***
Deceased within 2 years (%)	0.6	0.7	0.6	0.12
Log density of physicians/100,000	5.1	5.1	5.1	0.00
Observations	6,445	717	5,728	

Notes: Mean difference tests, with * p<0.1, ** p<0.05, *** p<0.01.

among non-SEW. The differences between SEW and other workers, in almost all the socioeconomic and demographic characteristics, are often pronounced, indicating a specific population. One of them is of particular interest from the perspective of job strain and results in a lower demand-control ratio than for other workers – already pointed out in the literature; this reflects that SEW have more demanding working conditions but more control over their work than other categories of the working population.

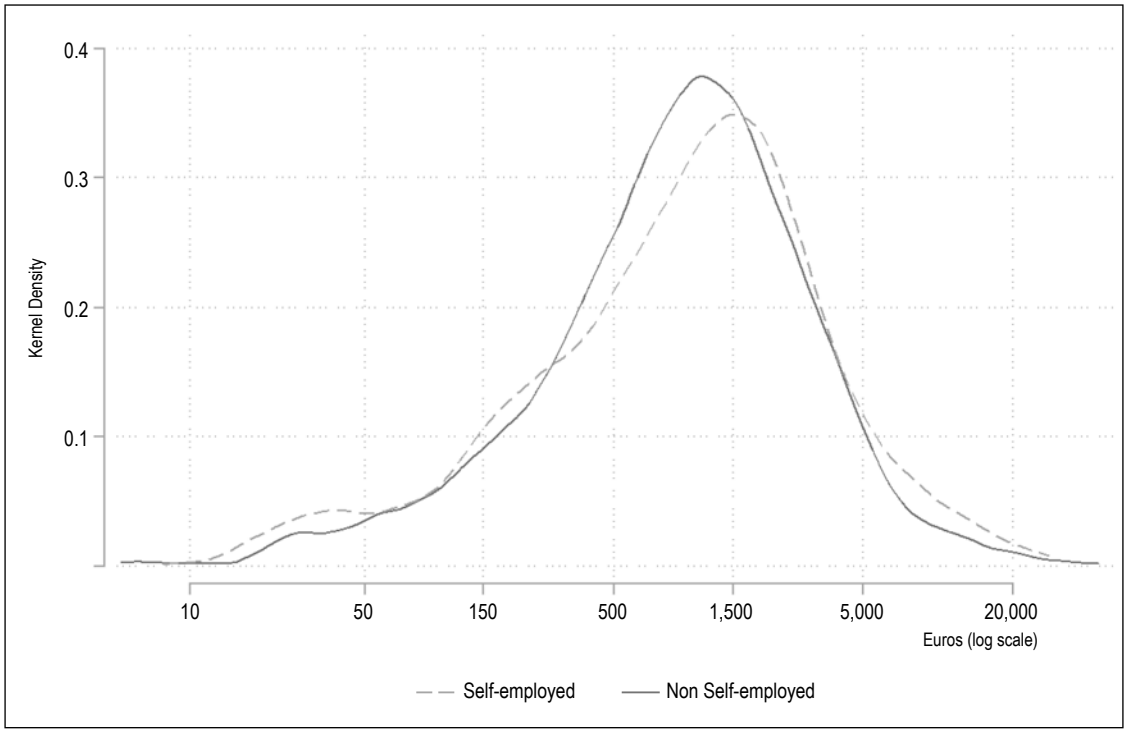
2.2. Bivariate and Multivariate Analysis

In terms of ambulatory healthcare consumption, Figure I shows that the self-employed also appear to have a lower density of healthcare (dotted curve) than employees (solid curve).

More in detail,[11] considering amounts (in euros), first in terms of extensive margin, SEW appear to have less access to physicians (GP, SP, dentist and midwife); and to medical goods and services (e.g. drugs, optics, other medical devices); on the contrary, they have more access to paramedics such as nurses and to transport, for example for care and examinations or to

11. As reminder, healthcare expenditures, both in terms of amount (euros) or volume (number of visits), were broken down in terms of access to care (or extensive margin) i.e. whether the respondent consumed the type of care, and in terms of total amount consumed (intensive margin).

Figure I – **Ambulatory HCE in France 2012 – by (current or last) occupational status**



Sources: ESPS (2012).

return back home after hospitalisation (Table 3; details by item of expenditure are provided in Appendix 2). Secondly, in terms of intensive margin, they consume less specialist care and more nursing care and other medical goods and services. Considering the volume (number of visits), i.e. in terms of extensive margin, they have less access to ambulatory care such as the general practitioner and specialist, and more use of inpatient care (unplanned hospitalisation and rehospitalisation). Regarding the intensive margin, the only significant difference between SEW and non-SEW is the number of visits to a specialist, with fewer visits by the self-employed.

At this point, it would then seem that self-employed workers have less access to healthcare. However, assuming that the most important reason for healthcare consumption is healthcare needs, this could only reflect differences in health status, or in socioeconomic status; for example, once needs are controlled for, high socioeconomic groups tend to consume more specialists (Doorslaer *et al.*, 2004; Van der Heyden *et al.*, 2003).

Table 3 – **Healthcare expenditures by occupational status**

	Overall	SEW	Non-SEW	Difference
Access to care (extensive margin)				
Ambulatory care	96.3	94.7	96.5	-1.77**
Inpatient care	18.9	20.9	18.7	2.24
Visits to GP	87.3	81.9	88.0	-6.09***
Visits to specialists	75.9	71.4	76.4	-5.02***
Night spent in hospital	12.0	13.4	11.8	1.55
Forgone care	20.1	14.9	20.8	-5.87***
Amount of care (intensive margin)				
Log ambulatory HCE	6.8	6.8	6.8	0.02
Log inpatient HCE	7.6	7.7	7.6	0.07
Log number of GP visits	1.4	1.4	1.4	-0.00
Log number of specialist visits	1.2	1.1	1.2	-0.11***
Log number of nights in hospital	1.4	1.4	1.4	0.07
Observations	6,445	717	5,728	

Notes: Mean difference tests of HCE observed over the past 12 months. All mean differences for access to care were done when they were observed. ** p<0.05, *** p<0.01.

Actually, once health and socioeconomic characteristics are controlled for, we find no differences in the probability of access to ambulatory and inpatient care (Table 4). But there is an effect on the intensive margin: in particular SEW consume less ambulatory care (on average, about 304 euros less than employees), and they make fewer visits to general or specialist practitionners. There is no difference in inpatient care, certainly due to the difficulty of reducing hospital care, which generally involve different procedures than ambulatory care. The results also show that, other things equal, SEW report less forgone care. Since forgone care is healthcare that an individual has identified as being needed but that was not satisfied, this could mean that SEW face unmet care needs less often. One possibility would be that their assessment of their needs is different from that of employees, or they are more likely to misreport how much care they have forgone (as indicated on the ongoing research of Garrouste *et al.,* 2020).

3. Is there a Pattern of Healthcare Consumption by the Self-Employed?

The self-employed spend less in healthcare; however, the literature indicates that their healthcare behaviours change over the life-course. We develop now an approach by age and gender, before and after the exit from the labour market, to identify and describe these changes.

3.1. Differences by Age and Gender

Figure II displays the marginal effects of self-employment on healthcare expenditure, other things equal (health, income, etc.), and broken down by age and sex (i.e. two exogenous factors). The results suggest that during working life, and especially at the beginning of their career, SEW consume less care, i.e. the 'must-trade effect'. Their consumption gradually increases with age and finally reaches the level of the non-SEW around retirement, the 'catch-up' effect. The reduction of this consumption gap would seem to support our hypothesis of higher depreciation rate of health. This twofold effect, particularly marked for men, is not significant for women. This result for women may be induced by factors of different nature: an insufficient sample size (self-employed women represent only 35.4% of the 717 self-employed workers of our sample); healthier behaviours than men (Dean, 1989; Wardle *et al.,* 2004); and the carrying out of professional activities that do not expose them to the same strains as men – for example, they are more present in personal services, health and

Table 4 – **Determinants of HCE**

A – Extensive margin

Independent variables/Type of care	Ambulatory (p.p.)		Inpatient (p.p.)		Forgone (p.p.)	
Self-employed (SEW)	-0.013	(0.008)	0.012	(0.017)	-0.030**	(0.015)
Poor health	0.073***	(0.014)	0.325***	(0.023)	0.315***	(0.026)
Ratio Demand/Control	0.012	(0.024)	-0.043	(0.070)	0.207***	(0.055)
Ratio Demand/Control (missing)	0.003	(0.012)	0.047	(0.032)	0.038	(0.032)
Deceased within 2 years	-		0.287***	(0.090)	-0.015	(0.059)
Complementary health insurance	0.024**	(0.010)	0.039**	(0.016)	-0.054**	(0.021)
Income (*Ref. Q1*)						
Q2	0.002	(0.005)	0.025	(0.019)	-0.005	(0.018)
Q3	0.011**	(0.005)	0.040*	(0.023)	-0.030	(0.019)
Q4	0.009*	(0.005)	0.025	(0.022)	-0.046**	(0.018)
Q5	0.006	(0.005)	0.034*	(0.020)	-0.111***	(0.017)
Missing	0.010**	(0.005)	0.026	(0.022)	-0.064***	(0.017)
Age (years)	0.000*	(0.000)	0.000	(0.000)	-0.002***	(0.000)
Woman	0.037***	(0.004)	0.029***	(0.009)	0.065***	(0.011)
Household size	-0.002	(0.002)	-0.008	(0.006)	-0.011**	(0.005)
Living alone	-0.019**	(0.009)	-0.001	(0.017)	0.046***	(0.016)
Working	-0.008	(0.011)	0.020	(0.031)	0.035	(0.032)
Education (*Ref. No diploma*)						
High school	0.007	(0.005)	-0.014	(0.014)	0.025*	(0.013)
Baccalauréat	0.006	(0.005)	-0.027	(0.017)	0.016	(0.018)
University	0.015***	(0.005)	0.004	(0.019)	0.034*	(0.018)
Log density of physicians/100,000	-0.006	(0.007)	0.022	(0.015)	0.045**	(0.021)
Observations	6,445		6,445		6,445	
Correctly classified % / Adjusted R2	96.3		81.2		80.2	

➔

Table 4 – (*contd.*)
B – Intensive margin

Independent variables/Type of care	Amounts (€)		Volume (number of visits and nights in hospital)		
	Ambulatory	Inpatient	GP visits	Spec. visits	Nights in hospital
Self-employed (SEW)	-304.1***	-9.2	-0.420**	-0.530**	0.073
	(99.9)	(291.3)	(0.195)	(0.221)	(0.766)
Poor health (MCA)	4,135.0***	2,740.4***	7.305***	5.360***	6.097***
	(196.8)	(594.4)	(0.475)	(0.358)	(1.141)
Ratio Demand/Control	-694.0*	284.4	-1.114	0.332	-0.702
	(385.5)	(1051.4)	(0.862)	(0.773)	(2.828)
Ratio Demand/Control (missing)	347.1*	1,323.9***	0.250	1.343***	0.498
	(200.0)	(511.3)	(0.485)	(0.489)	(1.188)
Deceased within 2 years	1,879.7***	3,389.4***	1.879***	1.408**	6.120***
	(230.3)	(752.9)	(0.634)	(0.641)	(1.728)
Complementary health insurance	498.0***	871.1***	-0.086	0.870***	1.071
	(94.8)	(294.4)	(0.278)	(0.247)	(0.681)
Income (*Ref. Q1*)					
Q2	1.5	222.4	0.102	0.044	0.320
	(104.8)	(329.1)	(0.187)	(0.216)	(0.821)
Q3	67.9	271.1	-0.228	0.157	0.725
	(111.4)	(344.7)	(0.245)	(0.242)	(0.807)
Q4	123.0	372.7	-0.204	0.350*	0.955
	(106.4)	(389.4)	(0.240)	(0.192)	(0.915)
Q5	205.1*	-275.0	-0.467*	0.785***	0.131
	(120.4)	(367.2)	(0.270)	(0.249)	(0.886)
Missing	162.5	455.8	-0.397	0.301	0.645
	(118.6)	(391.4)	(0.277)	(0.235)	(0.965)
Age (years)	28.5***	7.4	0.020***	0.007	0.004
	(2.4)	(7.3)	(0.005)	(0.007)	(0.019)
Woman	525.0***	-86.9	1.053***	1.516***	-0.214
	(62.9)	(212.5)	(0.124)	(0.141)	(0.474)
Household size	-112.4***	-97.3	-0.158**	-0.161**	-0.130
	(30.8)	(81.7)	(0.078)	(0.067)	(0.193)
Living alone	-247.0***	-81.0	-0.130	-0.418**	-0.355
	(79.8)	(247.4)	(0.214)	(0.184)	(0.739)
Working	189.8	991.7*	0.006	1.115**	-0.173
	(198.6)	(539.9)	(0.468)	(0.500)	(1.177)
Education (*Ref. No diploma*)					
High school	78.2	-334.4	-0.093	0.332*	-1.352**
	(73.4)	(212.8)	(0.169)	(0.176)	(0.617)
Baccalauréat	55.1	321.8	-0.601**	0.371	-0.003
	(108.0)	(321.1)	(0.240)	(0.247)	(0.845)
University	94.7	572.7*	-0.944***	0.835***	0.817
	(98.1)	(294.2)	(0.221)	(0.259)	(0.833)
Log density of physicians/100,000	409.1***	-630.5**	0.281	1.254***	-1.923***
	(105.3)	(291.6)	(0.467)	(0.266)	(0.743)
Observations	6,205	1,220	5,625	4,890	774
Correctly classified % / Adjusted R2	0.288	0.104	0.192	0.111	0.113

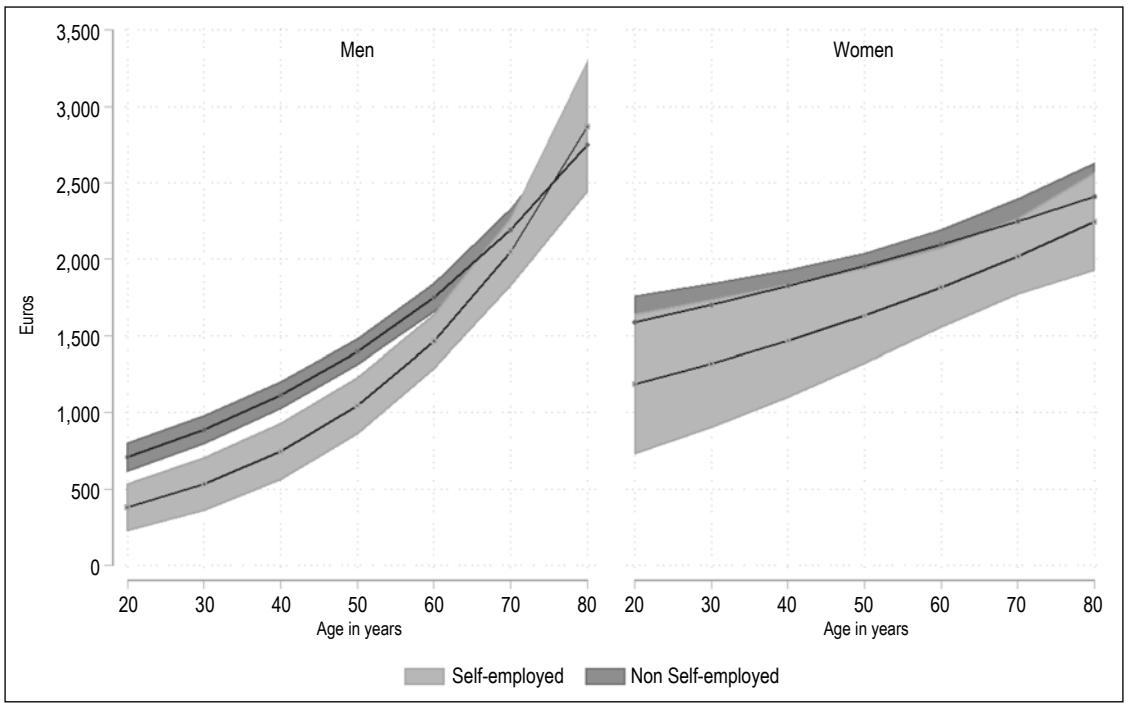
Notes: Extensive margin displays marginal effects from Probit models. Intensive margin displays lognormal retransformed OLS coefficients into euros by a scale factor. Standard errors in parenthesis. * p<0.1, ** p<0.05, *** p<0.01.

social work and less in agricultural occupations or construction (Salembier & Théron, 2020).

These results are conforted when SEW and other categories are compared at the intensive and extensive margins (Table 5). There is no difference in access to healthcare between SEW and employees. The main differences appear at the intensive margin, and before the age of 60: SEW consume 427 euros less of ambulatory care and make fewer visits to the GP compared to other professional categories; the differences are not significant after 60.

Beyond these general results, differences between SEW and non-SEW are more or less

Figure II – **Ambulatory HCE by age, sex, and (last) occupational status**



Sources: ESPS (2012).

pronounced depending on the self-employed's profession, confirming the heterogeneity within the status. For instance, merchants exhibit almost no difference in healthcare behaviour with non-SEW, whereas farmers report less forgone care and less visits to a specialist (see Appendix 2, Table A2-2). Small business owners also report less forgone care, while they display the same levels of healthcare consumption in amounts and volume as non-SEW. Liberal professionals visit less GP but they spend more nights in hospital.

3.2. On Potential Limits

The results indicate that, other things equal, especially with identical health status, self-employed workers' healthcare consumption is lower than that of other workers in the early years of working life (the 'must-trade' effect) and increases more rapidly with age to eventually catch-up with the level of employees (the 'catch-up' effect). This is consistent with the assumption that SEW experience a higher depreciation rate of their health capital over time. However, the interpretation of these results is not straightforward, because, through the age effect, which allows us to highlight the higher depreciation of health, other factors may be hidden.

A first source of bias could come from difficulties in measurement of the multifaceted aspects of health status, even though the ESPS survey provides an extensive amount of health measures. In this case, the 'catch-up' effect could be caused by higher SEW's health needs at older ages. However, SEW exhibit lower mortality rates than employees (Lallo & Raitano, 2018; Toivanen *et al*., 2016; Algava *et al.,* 2011) which suggests that, in a given age group, SEW have lower healthcare needs. Another bias may

Table 5 – **Determinants of HCE – Stratified regressions by age class and sex (summary)**

A – Extensive margin

Independent variables/Type of care	Ambulatory (p.p.)		Inpatient (p.p.)		Forgone (p.p.)	
Overall	-0.013	(0.008)	0.012	(0.017)	-0.030**	(0.015)
Age < 60	-0.032*	(0.016)	0.008	(0.024)	-0.021	(0.025)
Age ≥ 60	0.002	(0.004)	0.011	(0.026)	-0.015	(0.022)
Men	-0.019	(0.014)	0.006	(0.019)	-0.011	(0.018)
Women	-0.011	(0.011)	0.019	(0.029)	-0.057**	(0.026)
Men & Age <60	-0.041	(0.027)	-0.001	(0.024)	-0.013	(0.028)
Men & Age ≥ 60	-0.002	(0.007)	0.016	(0.029)	-0.002	(0.025)
Women & Age <60	-0.037	(0.024)	0.018	(0.047)	-0.030	(0.037)
Women & Age ≥ 60	-		0.005	(0.041)	-0.033	(0.034)

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Table 5 – (*contd.*)
B – Intensive margin

Independent variables/Type of care	Amounts (euros)		Volume (quantities)		
	Ambulatory	Inpatient	GP visits	Spec. visits	Nights in hospital
Overall	-304.1***	-9.2	-0.420**	-0.530**	0.073
	(99.9)	(291.3)	(0.195)	(0.221)	(0.766)
Age < 60	-427.3***	-231.9	-0.908***	-0.318	-0.592
	(116.8)	(333.3)	(0.276)	(0.306)	(0.945)
Age ≥ 60	-29.1	101.0	0.050	-0.634*	0.562
	(147.8)	(490.2)	(0.263)	(0.325)	(1.245)
Men	-358.7***	4.6	-0.598**	-0.297	0.145
	(131.6)	(481.2)	(0.239)	(0.206)	(1.129)
Women	-246.9*	-116.4	-0.112	-0.938**	0.105
	(130.1)	(407.6)	(0.291)	(0.428)	(0.988)
Men & Age <60	-521.3***	-14.7	-0.890**	-0.349	-0.558
	(155.5)	(533.3)	(0.365)	(0.291)	(1.257)
Men & Age ≥ 60	81.8	66.0	-0.204	-0.204	1.112
	(205.4)	(780.1)	(0.343)	(0.352)	(1.728)
Women & Age <60	-292.8	-587.8*	-0.909**	-0.274	-0.698
	(186.5)	(356.4)	(0.453)	(0.601)	(1.068)
Women & Age ≥ 60	-168.7	42.9	0.463	-1.263**	0.040
	(220.5)	(687.4)	(0.400)	(0.569)	(1.930)

Notes: We report only the coefficient of the variable of interest – self-employed worker. Extensive margin displays marginal effects from probit models. Intensive margin displays lognormal retransformed OLS coefficients into euros by a scale factor. Standard errors in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

come from a generational effect interpreted as an age effect. In this case, the 'catch-up' effect would merely reflect similar attitudes towards care among SEW and employees amongst older generations, while the 'must-trade' effect would imply that SEW behave differently from employees in younger generations. The recent years have seen the 'uberization' of society with the development of 'bogus self-employment', change that may place younger generations of SEW in a more precarious economic situation than their elders. However, the theoretical reason why SEW spend less in healthcare at younger ages would remain the same: a higher relative cost of health capital that reduces the demand for health and favours prevention over medical care.

* *
*

This study proposed an analysis of self-employed workers healthcare consumption through an age-specific approach, during and after their working life. Using 2012 cross-sectional data from the ESPS survey matched with National Health Insurance data, we find that self-employed workers (especially men) tend to consume less ambulatory care in the early stages of their working life, while their consumption gradually increases with age to eventually catch-up with the levels of other categories of workers after retirement. This supports the assumption that self-employed workers' health is deteriorating faster over the life cycle.

These results are in line with the predictions of Grossman's model for health demand. The self-employed seem to follow a two-period strategy resulting from the combination of higher initial health capital, higher depreciation rate of said capital over time and higher working time. In the early stages of their career, self-employed workers's optimal demand for health is low because the cost of health capital is high due to a higher depreciation rate of health (induced by harder working conditions). As they are ageing, their demand for healthcare rises since leisure time shrinks (because of a reduction in healthy days and the important amount of working time required in their economic activity) so that they have to substitute care to prevention. These two effects, referred to in the article as 'must-trade' and 'catch-up', provide an alternative to the 'demand-control' model for understanding SEW's healthcare behaviour, much in line with economic theory.

Further research could consider explaining the specific healthcare pattern of self-employed workers using an alternative version of Grossman's health capital model. For instance, since the self-employed exhibit specific preferences, a different approach could rely on behavioural models, such as lower risk aversion (Ekelund *et al*., 2005); a shift in preferences over time could explain the overall pattern of

care consumption over the life course. Although promising, this path requires adapting the standard economic model of demand for health where preferences are fixed over time (Grossman, 1972). Research could also aim to address the surprising and paradoxical finding that self-employed workers tend to report lower rates of postponed care. Whether this effect is a reporting bias, or another mechanism at play, is still unknown.

Finally, our study establishes a potential health loss for the self-employed workers. In the perspective of public policy, it suggests that without adequate mechanisms to compensate for a higher rate of depreciation of their health capital, the EU2020 strategy which advocates for the development of SEW in Europe is difficult to reconcile with public health objectives. □

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APPENDIX 1

THE MEASUREMENT OF WORKING CONDITIONS

Karasek & Theorell (1990) job strain model is based on the balance between demand and control. The demand represents work intensity (physical demand and time pressure due to workload), and the control refers to autonomy in the tasks performed at work and the possibility of developing new skills. This model identifies four specific situations: low demand and low control (passive job); low demand and high control (low-strain job); high demand and low control (high-strain job); and, high demand and high control (active job). This latter situation should represent those of the SEW and should lead to positive health effects. We used eight questions of the 2012 ESPS survey to calculate the demand-control ratio.

Table A1 – **Working conditions variables used to compute the demand-control ratio**

Working conditions	Response (Score)			
	Always	Often	Sometimes	Never
Q1: "I have to hurry up to do my job"	4	3	2	1
Q2: "I'm exposed to carrying heavy loads when handling"	4	3	2	1
Q3: "I'm exposed to painful or tiring postures in the long run: prolonged standing, bending, arms in the air, twisting, forced posture"	4	3	2	1
Q4: "I'm exposed to harmful or toxic products (or substances): dust, smoke, microbes, chemicals"	4	3	2	1
Q5: "I do repetitive work under time constraints or line work"	4	3	2	1
Q6: "My job requires me not to sleep between midnight and 5 a.m."	4	3	2	1
Q7: "My work allows me to learn new things"	4	3	2	1
Q8: "In my job I have little freedom to decide how to do my job"	1	2	3	4

The demand-control ratio is computed from these eight variables in the following way:

Indicator	Calculation
Demand	Score (Q1) + Score (Q2) + Score (Q3) + Score (Q4) + Score (Q5) + Score (Q6)
Control	Score (Q7) + Score (Q8)
Ratio Demand-control	(2/6) * [(Score (Q1) + Score (Q2) + Score (Q3) + Score (Q4) + Score (Q5) + Score (Q6)) / (Score (Q7) + Score (Q8))]

APPENDIX 2

HCE AND ITS DETERMINANTS AT THE EXTENSIVE AND INTENSIVE MARGINS

Table A2-1 – **Self-employed workers' HCE at the extensive and intensive margin**

1 – Intensive margin

Type of healthcare	SEW	Non-SEW	Difference	Wilcoxon	p-value
			Amounts (€)		
Inpatient care	4,393.2	3,437.5	955.7	-0.463	0.644
Ambulatory care	1,900.5	1,697.3	203.2	-1.077	0.282
Physicians	553.5	556.1	-2.6	2.334	0.020
GP	157.1	156.7	0.4	-0.627	0.531
Specialist	282.1	282.4	-0.3	1.970	0.049
Dentist	448.4	372.5	76.0	-0.764	0.445
Midwife	584.0	221.6	362.4	-0.234	0.815
Paramedics	513.8	361.9	151.9	-1.451	0.147
Nurse	454.6	253.6	201.1	-4.397	0.000
Physiotherapist	393.7	373.4	20.3	-0.231	0.817
Other health professional	41.4	172.4	-131.0	2.604	0.009
Biology	147.9	136.5	11.4	-1.605	0.108
Other medical goods and services	1,047.6	908.4	139.2	-3.281	0.001
Drugs	679.8	587.0	92.8	-4.413	0.000
Medical devices	374.4	346.4	28.0	-2.600	0.009
Optics	491.6	440.1	51.5	-1.770	0.077
Prosthesis	294.1	214.4	79.7	-1.540	0.124
Transports	658.4	666.5	-8.1	-0.458	0.647
ER without hospitalisation	128.0	129.1	-1.1	-0.176	0.860
			Volume (number of visits)		
Ambulatory care					
Visits to GP	5.7	5.9	-0.2	-0.237	0.813
Visits to Specialist	4.6	5.1	-0.5	2.912	0.004
ER without hospitalisation	1.3	1.3	0.0	-0.243	0.808
Inpatient care					
Hospitalisation	1.7	1.5	0.2	-1.483	0.138
Hospitalisation - unplanned	1.3	1.2	0.1	-1.101	0.271
Nights in hospital	8.7	6.2	2.5	-0.282	0.778
Rehospitalisation	1.5	1.7	-0.1	-0.145	0.885

2 – Extensive margin

Type of healthcare	SEW	Non-SEW	p-value
		Amounts (€)	
Inpatient care	20.9	18.7	0.149
Ambulatory care	94.7	96.5	0.018
Physicians	91.4	95.0	0.000
GP	81.9	88.0	0.000
Specialist	71.3	76.4	0.002
Dentist	38.4	45.5	0.000
Midwife	0.7	2.4	0.004
Paramedics	48.4	44.9	0.075
Nurse	38.6	33.9	0.012
Physiotherapist	18.3	19.0	0.641
Other health professional	2.6	3.2	0.403
Biology	63.3	62.9	0.813
Other medical goods and services	89.8	92.9	0.003
Drugs	88.1	91.3	0.005
Medical devices	27.5	26.2	0.448

➔

Table A2-1 – (*contd.*)

Type of healthcare	SEW	Non-SEW	p-value
Optics	19.5	26.2	0.000
Prosthesis	20.8	19.9	0.579
Transports	12.4	9.0	0.003
ER without hospitalisation	8.1	11.9	0.003
	Volume (number of visits)		
Ambulatory care			
Visits to GP	81.9	88.0	0.000
Visits to Specialist	71.4	76.4	0.003
ER without hospitalisation	8.2	11.9	0.004
Inpatient care			
Hospitalisation	20.9	18.7	0.149
Hospitalisation - unplanned	6.6	4.6	0.025
Nights in hospital	13.4	11.8	0.228
Rehospitalisation	3.3	2.1	0.030
Foregone care	14.9	20.8	0.000

Notes: Mean difference tests of healthcare expenditures observed over the past 12 months.

Table A2-2 – **Determinants of HCE – Extensive and Intensive Margins, by SEW categories**

A2-2.1 – Extensive margin

Independent variables/Type of care	Ambulatory (p.p.)	Inpatient (p.p.)	Forgone (p.p.)
Farmers	-0.001	0.030	-0.055**
Craftsmen	-0.008	0.008	-0.002
Merchants	-0.021	0.003	-0.004
Small business owners	-0.066	0.005	-0.131**
Liberal professionals	-0.031	-0.021	-0.054
Determinants of HCE	Yes	Yes	Yes
Observations	6,445	6,445	6,445
Correctly classified % / Adjusted R2	96.3	81.2	80.2

A2-2.2 – Intensive margin

Independent variables/Type of care	Amounts (euros)		Volume (quantities)		
	Ambulatory	Inpatient	GP visits	Specialists. visits	Nights in hospital
Farmers	-164.3	-113.8	-0.376	-0.628**	-0.495
Craftsmen	-326.9**	59.5	-0.361	-0.565*	-1.049
Merchants	-255.2*	-95.3	-0.396	-0.248	1.199
Small business owners	-8.5	-547.8	1.338	-0.338	0.438
Liberal professionals	-357.2	925.5	-1.556***	-0.606	8.769***
Determinants of HCE	Yes	Yes	Yes	Yes	Yes
Observations	6,205	1,220	5,625	4,890	774
Correctly classified % / Adjusted R2	0.288	0.102	0.192	0.110	0.121

Notes: Extensive margin displays marginal effects from probit models. Intensive margin displays lognormal retransformed OLS coefficients into euros by a scale factor. Legend: * p<0.1, ** p<0.05, *** p<0.01.

Preferences of the French Population Regarding Access to Genetic Information: A Discrete Choice Experiment

Christine Peyron *, Aurore Pélissier * and Nicolas Krucien **

Abstract – This study analyses the preferences of the French population with regard to the genetic information that is potentially accessible thanks to genomic medicine. More specifically, it is a question of knowing whether or not the French population *(i)* is in favour of knowing all possible results with regard to genetic predispositions; *(ii)* has preferences with regard to the person or the method that would decide upon the list of accessible results; *(iii)* is in favour of researchers having access to patients' genetic data. This study makes use of the discrete choice method, with an online survey, conducted in France with a representative sample of 2,501 respondents. The choice data were analyzed in a mixed logit model, to explore the variability of preferences. The results show a preference for autonomy in choosing the information disclosed, to access the most comprehensive genetic results possible and for a contribution to research through the provision of genetic data.

JEL Classification: C25, I1, O33.
Keywords: genomic medicine, access to information, stated preferences, discrete choice experiment

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Genomic medicine is based on the use of information contained within the entire genome of individuals for the purposes of diagnosis or making therapeutic decisions. The development of genomic medicine is accelerating in OECD countries healthcare systems thanks to a fall in the price of sequencing combined with public policies supporting the dissemination of this innovation. Large-scale projects are being set up in many countries; some examples of these are the Precision Medicine Initiative (Reardon, 2015) in the USA, the Melbourne Genomics Health Alliance (Stark *et al*., 2019) in Australia, the 100,000 Genomes Project by the National Health Service (Turnbull *et al.*, 2018) in the United Kingdom and the China Precision Medicine Initiative in China (Liu *et al.*, 2019). The aim of these projects is to integrate genome sequencing into routine clinical practice, with a particular focus on care pathways linked to cancer and rare diseases for the time being. The regulatory bodies hope to use genomic medicine to improve the effectiveness and efficiency of healthcare. In France, the *Plan France Médecine Génomique* 2025 (the French initiative for genomic medicine, hereafter PFMG), was launched in 2016 (Aviesan, 2016), shares similar the same objectives: to rapidly develop access to high-throughput sequencing on the national territory and to improve the international competitiveness of France in this industrial sector. Two sequencing platforms were installed in 2017 in the cities of Paris and Lyon with the aim of establishing this development and accessibility.

The present study analyses the preferences of the French population with regard to genetic information. More specifically, it is a question of knowing whether or not the French population *(i)* is in favour of accessing all possible results; *(ii)* has preferences with regard to the person or the method that would define the list of accessible results; *(iii)* is in favour of researchers having access to personal genetic data. In order to answer these questions, we use a stated preferences method, known as the discrete choice experiment (DCE), which to our knowledge has seldom been used to study the preferences of the French population with regard to genomic medicine.

The remaining of this article is divided into four sections. Section 1 consists in a review of the problems and challenges surrounding access to genetic information. Section 2 describes the designing of the discrete choice experiment and the recruitment method. The results are presented in Section 3. The implications of the study results are discussed in Section 4 before addressing the limitations of this study, together with the opportunities that it presents.

1. Issues and Challenges for the Population of Access to Genetic Information

Genomic medicine raises numerous questions, which link back to the usual problems associated with genetic information, as well as specific questions regarding new-generation tests, since these tests make it technically and financially possible to sequence all of an individual's genes and therefore to broaden the range of possible results.

1.1. Complex Information

The genetic dimension of a diagnosis is difficult for a non-specialist to understand, and then the main difficulty lies in the limited patients' knowledge of genetics. Indeed, some results determine the genetic origin of a pathology with certainty, whereas others, where the results are uncertain, only provide a risk. Some results may relate to a pathology for which clinical symptoms are present, whereas others indicate a predisposition for a future, as yet asymptomatic disease. The consequences of all of these results may then extend to relatives, ascendants, descendants or unborn children. Genetic information has an personal and familial dimension, it faces concepts of fate or destiny and for that reason can be sought out by some individuals and feared by others. Genomic medicine will be faced with even greater difficulties with the development of its accessibility (Clayes & Vialatte, 2014).

1.2. Specific Informational Challenges Associated with the Sequencing of Genomes

Genomic medicine also faces specific problems relating, to the results that can be accessed *via* genome sequencing and, to the use of the genomic data (Berg *et al*., 2011; INSERM, 2008; Joly & Knoppers, 2014). Whilst "traditional" genetic tests only target a small number of genes, *a priori* linked to the diagnosis being sought, WGS generates much more genomic information not necessarily related to the pathology for which the test has been prescribed. This wealth of information makes it difficult to determine the information that will be transmitted and that will require greater attention when it comes to patient support (Ormond *et al.*, 2010; INSERM, 2016).

With next-generation whole genome sequencing, additional information may become available

(Houdayer *et al.,* 2019). This additional information, which is unrelated to the pathology for which the sequencing was carried out, is referred to as "incidental data" where it is discovered fortuitously during the reading of the sequences, or as "secondary data" where it is sought out voluntarily. Such data make it possible to assess the degree to which the patient is predisposed to other pathologies that may or may not arise in the future, not just for them, but also for their relatives and their unborn children. Such pathologies may be curable or incurable and they may or may not be able to be managed by means of preventive behaviour. For example, without having explicitly sought the information out, the results will indicate with certainty the future occurrence of a pathology such as Huntington's disease or will show an increased risk of cardiovascular disease, diabetes or certain cancers (Green *et al.*, 2013). Additional data may also concern pharmacogenetics and could therefore specify the patient's response to drug treatments. For this reason, genetic medicine is classified as predictive and preventive medicine (Hood & Friend, 2011). At present, secondary data are only observed in a relatively small proportion of diagnostic procedures involving high-throughput sequencing. This is currently estimated to involve 2% of these procedures. However, this figure could increase as technology and knowledge develops. Such data still raise significant questions for practitioners (Parker, 2008; Héron & Gargiulo, 2009; van El *et al.*, 2013). They force a re-examination of the already tricky issue of patient access to genetic test results (Nzale *et al.*, 2020; Plan National Maladies Rares 3, 2018 [the French national plan for rare diseases]). The fact that the technology exists, that it is becoming increasingly efficient and financially viable, and that it provides the geneticist with a promising range of information, does not necessarily mean that all possible results are communicated to the patient, nor does it mean that the patient wants that.

A second problem, that is more specific to genomic medicine, concerns the use of biological samples and patients' genetic data for research purposes. Advances in genomics require the use of very large databases, which are constantly being fed with new individual data, and the creation of biobanks. The PFMG, for example, expects to be producing several tens of petabytes of data per year by 2021 (Aviesan, 2016). These databases must be compliant with confidentiality rules, since the genomic sequence of an individual, which is often supplemented with phenotypic and clinical data, can be identifying. These biobanks will only be able to generate knowledge if they are widely shared, thereby increasing the possibility of interpreting rare genetic events. These data will be accessible, not only for current research projects but also for future projects that are not yet precisely defined.

1.3. National Recommendations and Regulations

Whether it concerns the dissemination of results or the use of genetic data, each country has developed its own set of rules and procedures to define patient consent and its scope. Since 2013, the American College of Medical Genetics and Genomics (ACMG) has been recommending that all genome sequencing should look for pathogenic variations contained in a predetermined list of genes, unless the patient objects to this (Green *et al*., 2013). Fifty-nine genes that are not directly related to the original indication are now being examined (Kalia *et al.*, 2017); they are considered to be medically "actionable", in other words, their pathogenic variations lead to an increased risk of a disease, but one that can be prevented or treated.

In France, practices for disclosing additional results remain heterogeneous. The Law of 27 May 2013 defines the best-practice guidelines applicable to the examination of a person's genetic characteristics for medical purposes (see Appendix 1). In terms of the results that are to be communicated by the geneticist, the patient may express their wish to not receive the diagnosis and, as regards the additional data. The legislation is not favourable for the transmission of any information other than that initially sought and for which the patient has consented to the examination being carried out. Recently, a working group at the *Agence de la Biomédecine* (the Biomedicine Agency) spoke out against the systematic analysis of secondary data from a pre-determined list of genes unrelated to the initial indication (Isidor *et al.*, 2019) and recommended that the communication of incidental data be judged in a diagnostic multidisciplinary consultation meeting, with clinical utility as a criterion. From an operational point of view, the legislation stands, the two high or very high speed sequencing platforms already installed will not transmit incidental or secondary data during the initial phase of their implementation.

In France, researchers must obtain consent from patients in order to use their data for defined

research projects and must check that they do not object to such in the event that there is a change to the project. The latter provision relaxes the obligations incumbent on researchers who use biobanks. However, having been informed of the projects to which their data are contributing, patients are free to withdraw from a research project at any time and without having to provide any reason for this (Noiville, 2019). Conversely, in UK, consent to the use of genomic data is given once and for all.

Looking at the health, scientific and economic objectives of the PFMG, the current legal rules, and the heterogeneity of practices in perspective, it is not surprising that the public authorities are searching for possibilities to develop the genomic medicine while preserving the public interest and protecting individual rights. The complexity of the challenges posed by genomics should not be left out of the public debate: the development of this "new" branch of medicine should remain in line with the values favoured by the population.

1.4. Better Understanding the Expectations of Potential Users

Summaries of published studies and future research (Berger & Olson, 2013; Rogowski *et al*., 2015) identify avenues that economists should pursue to better contribute to the evaluation of genomic medicine and to the issues it raises for its beneficiaries, promoters and regulators. One of these avenues is to assess the preferences and expectations of patients/citizens. Having a greater understanding of their preferences with regard to the results that they are expecting, or knowing whether they are willing to contribute to the establishment of vital biobanks would allow us to better measure the specific contribution made by development strategies such as the PFMG and the possibility of advancing knowledge through the provision of patients' genetic data.

Some economists have already looked into patients' preferences when it comes to genetic test results. Their research is either qualitative (interviews, focus groups) or quantitative (questionnaire-based surveys, revealed preference methods). They provide mean values regarding attitudes towards genetic testing among the general population (Henneman *et al.*, 2013), or for certain types of patient: pregnant women (Ormond *et al.*, 2009), patients with different levels of risk (Bränström *et al.*, 2012), parents awaiting a diagnosis for their child (Townsend *et al.*, 2012). The findings of this research point to a generally favourable attitude towards genetic testing, positive expectations of results and the desire to be fully involved in choices regarding access to tests or results. In research that looks more specifically at genomic testing, the focus is often on the decision as to whether or not to access unsolicited data. The results very consistently show a clear majority in favour of the dissemination of unsolicited data, and a slightly smaller but persistent majority where the unsolicited data concern incurable pathologies (Shahmirzadi *et al*., 2014; Fernandez *et al*., 2014; Gray *et al.*, 2016).

While most of these studies addressed the preferences of patients already undergoing genetic treatment, some studies have looked into the preferences of the general population (Henneman *et al.*, 2013; Marshall *et al.*, 2016; Facio *et al.*, 2016; Regier *et al.*, 2019). The characteristics of national health systems, values and societal preferences mean that the acceptability of genomics and its implications are not necessarily the same in all countries. Nevertheless, the preferences of French population for genomic medicine remain largely unknown: the first economic evaluations of genomic care are starting to be published (Marino *et al.*, 2018) or are currently under way, but there are no studies that address the issue of demand and preferences among the French population with regard to the genetic information that can potentially be accessed. There are a few publications that focus on the preferences of French patients already receiving genomics-based care (e.g. Peyron *et al.*, 2018), but these do not allow for a broader reflection on the expectations and acceptability of this information among the general population.

2. Discrete Choices to Reveal Preferences Regarding Access to Genetic Information

The preferences of the French population regarding access to genetic information are explored here within the scope of an online survey, conducted with a polling institute (CSA) among a representative sample.

The survey asks a series of questions on a range of the respondent's characteristics and a part corresponding to a discrete choice experiment. This experiment is conducted within the context of medical care: the respondents are asked to imagine that they are undergoing medical treatment, part of which involves a genetic test to diagnose the pathology that they are suffering from; however, there are several different tests

available and they must choose which would be the most suitable for them.

The discrete choice method (Box 1) is widely used in health economics in order to study individual preferences (Clark *et al.*, 2014), but, to the best of our knowledge, has not yet been used to study the preferences of the French population with regard to genomic medicine. In order to construct this discrete choice experiment, define the attributes of the proposed tests and their value, establish scenarios and decide upon the design of the experiment, we followed current methodological recommendations (Bridges *et al*., 2011; Johnson *et al*., 2013; Kløjgaard *et al*., 2012; Louvière & Lancsar, 2009).

2.1. Selection of Attributes and Their Levels

Although there are not really any clear rules regarding the selection of the number of attributes and their levels, this step is recognised as being crucial to the validity of the experiment (Kløjgaard *et al.*, 2012). According to the multi-attribute utility theory, each attribute must be of importance to the respondents to enable them to make compensatory trade-offs between the value of the various attributes (Lancsar & Louviere, 2008). The attributes should cover all relevant dimensions of what is being proposed, but they should remain limited in number: indeed, the choice experiment can be complex from a cognitive point of view, and this complexity increases with the number of attributes.[1] Appropriate levels must then be determined for each attribute. They must correspond to relevant values and must present differences that are large enough to allow choices to be made, but not so large that one level would be *a priori* dominant (Lancsar & Louviere, 2008). Finally, the wording or explanations of the attributes must ensure that the respondents have a clear and unambiguous understanding of their content. This is a general constraint for any self-completed questionnaire, but one that is much more important here: indeed, the values proposed in a discrete choice experiment (or the context for the choices) are hypothetical and not necessarily related to the respondent's knowledge or experience.

Recent recommendations emphasise the need for a qualitative approach, as well as for pre-testing to confirm the choice of attributes and their values (Coast *et al.*, 2012; Drummond *et al.,* 2015). With this in mind, we started by identifying the possible attributes, together with their various possible levels, based on a comprehensive review of the literature concerning current issues in genetics, the ethical and legal questions currently being raised, questions raised by professionals regarding the dissemination of results and the perception of genetic information by patients and the general public. The attributes and their levels were then examined and discussed by a group of experts in the field of genomics, made up of two geneticists, one biologist, one public health physician and one health sociologist. They were also submitted to the respondents during the pre-test phase of the survey and were detailed in the section describing the questionnaire and its structure.

Four attributes were selected (Table 1):

- *Decision* (the person who will be able to decide upon the results that could be communicated): the identity of the person who decides refers back to

1. Marshall et al. *(2010) estimate that 70% of discrete choice experiments include between 3 and 7 attributes, most commonly between 4 and 6 attributes.*

Box 1 – **The Discrete Choice Experiment**

The Discrete Choice Experiment (DCE) is a method used to reveal preferences based on the concept of hypothetical choices. It was developed during the 1970s through the work of Daniel McFadden (McFadden, 1974). In particular, McFadden applied a mathematical formulation to the random utility maximisation (RUM) model (Manski, 1977). RUM is a behavioural model describing how agents are supposed to make choices from among a finite and countable number of options (discrete choices). It is based on three theories: *(1)* The random utility theory, according to which the utility an agent derives from the consumption of a good cannot be fully observed (Böckenholt, 2006); *(2)* the multi-attribute utility theory, according to which the utility is derived from the characteristics of the good rather than the quantity of the good itself (Lancaster, 1966); *(3)* the revealed preference theory, according to which the agents choose the option that provides them with the greatest level of utility (Samuelson, 1938; 1948).

The DCE consists of presenting chosen hypothetical situations from among several options that combine a number of characteristics (or attributes), from which participants indicate which one they prefer. For example, the decision to consult a doctor could be influenced by the waiting time for an appointment, the amount of time spent in the waiting room or the cost of the consultation. Different values or levels are assigned to each of these characteristics. Using the experimental design methodology, these various values are combined to form choice tasks. The first test could be made up of an option A for a consultation in 3 days' time that costs 20 euros with a 45 minute waiting time and an option B for a same-day consultation that costs 30 euros and has a 60-minute waiting time. Since the options differ in their composition, the participants have to make trade-offs between time, cost and waiting time during the successive tests. These trade-offs provide the information needed to model preferences (i.e., utility gained from marginal changes in the attributes).

the debate in genomics as to the patient's capacity to make decisions and whether such decisions should be transferred to the expert, i.e. the geneticist (with behaviours that can range from shared decision-making to *a priori* benevolent paternalism), as well as the possible existence of collective rules that would be imposed, identically or not, on all patients. We have chosen four possibilities that illustrate this debate: the doctor makes the decision alone following a discussion with the patient; the patient makes the decision alone following a discussion with the doctor; collective rules, which are enshrined in law, define the results to be delivered; local and specific decisions for each patient determine what he or she will receive.

- *Results* (the scope of these results): as we have already mentioned above, genetic information is complex and high-speed sequencing can reveal genetic mutations that cause or will cause pathologies other than those for which the test has been prescribed and that are currently asymptomatic. We have deliberately limited the choice by concentrating on the option of whether or not the patient wants to know their predispositions with regard to actionable or non-actionable pathologies (we have therefore removed the wording that states that the results may also concern relatives and that there could be a greater or lesser degree of certainty regarding the link between mutation and pathology given the current state of knowledge).

- *RAC* (for *reste à charge*, the cost for the patient): the amount that the patient must pay allows for an understanding of the sensitive nature of a hypothetical payment. This attribute is necessary to allow for the subsequent calculation of the willingness to pay. The upper limit is an approximation of the cost of the test, currently borne by genetic centres but not invoiced to the patients. The lower limit is almost free of charge, reflecting the current situation associated with a prescription in a hospital genetics department.

- *Sample* (the way in which the biological sample taken for the test is used): the management of the sample provides for its destruction; its subsequent re-analysis, but only for the purposes of the patient's care; its being made available solely to researchers; or its simultaneous reuse for both the patient and for research.

2.2. Designing of the Discrete Choice Experiment

The discrete choice method also requires the experimental designing of choice tasks, or in other words, alternative options that combine the possible levels of the attributes, which will be submitted to the respondent in pairs. In order to achieve this, an orthogonal main effects plan design was obtained with the Ngene software (ChoiceMetrics Pty Ltd, New South Wales, Australia), which resulted in 16 pairs of scenarios.

Table 1 – **The attributes and their levels**

Attributes	Levels of the attributes	Abbreviation
Decision "Who should decide upon the results received?"		
	A. My doctor decides, having discussed this with me	'My doctor'
	B. I decide, having discussed this with my doctor	'Me'
	C. The law decides and the same rules are applied to everybody	'The law'
	D. A local ethics committee (made up of doctors, lawyers, philosophers, patient representatives, etc.) decides after examining my results	'Committee'
Results "What results should I receive?"		
	A. Only the results that concern my current disease	'Disease'
	B. The results that concern my current disease + my predisposition to all treatable or preventable diseases	'Actionable'
	C. The results that concern my current disease + my predisposition to certain treatable or preventable diseases included on a list that has been determined nationally by geneticists	'List'
	D. The results that concern my current disease + my predisposition to all treatable or preventable diseases + my predisposition to diseases that are currently untreatable	'All
RAC (out of pocket cost) "How much should I have to pay?" (in euros)		
	1, 40, 90, 160	
Sample "What will happen to my blood sample?"		
	A. My sample will be reanalysed for me (new results may be possible following developments in knowledge) and used anonymously for medical research	'For me and research'
	B. My sample will be used anonymously for medical research	'For research'
	C. My sample will be reanalysed for me (new results may be possible following developments in knowledge)	'For me'
	D. No use after my test, my sample is not stored	'None

Notes: The levels marked as A are the reference values for the choices associated with qualitative variables. Costs for patients are a continuous variable.

In order to limit the number of tasks given to each respondent, these 16 scenarios were randomly split into two different versions of the questionnaire (each therefore containing eight tasks). Choices needed to be made between two non-labelled options referred to as "Test A" and "Test B".[2] An example of a choice task is shown in Figure I.

For the online questionnaire, the formatting and wording of the choice tasks aimed to provide adequate information regarding the genetic tests and what is at stake for a potential beneficiary and to facilitate the cognitive challenge presented by a discrete choice experiment. It should be noted that the questionnaire underwent two rounds of pre-testing in the form of semi-structured interviews, which were held once the questionnaire had been filled in independently under survey conditions (Box 2).

2. We did not offer an opt-out option for this experiment. On the one hand, the hypothetical context that we are asking the respondents to place themselves in is that of medical care during which they are required to undergo a genetic test, and their choice relates only to the characteristics of that test. It can therefore be assumed that the implication if they do not choose these characteristics is that the decision will be left to someone else, which corresponds to the options proposed. On the other hand, in a discrete choice experiment, giving respondents the option to not make a choice only brings about small differences in the estimates (Fiebig et al.*, 2005), while forcing them to make a choice can result in better thought out responses and better quality data (Veldwijk* et al.*, 2014).*

Figure I – **Example of the choice tasks**

	Test A	Test B
Who should decide upon the results received?	**My doctor** decides, having discussed this with me	A **local ethics committee** (of doctors, lawyers, philosophers, patient representatives, etc.) decides after examining my results
What results should I receive?	The results that concern my current disease + **my predisposition to all treatable or preventable diseases**	**Only the results that concern my current disease**
How much should I have to pay?	**1 €**	**40 €**
What will happen to my blood sample?	My sample will be **used anonymously for medical research**	My sample will be **reanalysed for me** (new results may be possible following developments in knowledge) **and used anonymously for medical research**
I prefer test Click the corresponding box	☐	☐

Box 2 – **The Questionnaire and its Structure**

The questionnaire is made up of four parts:

- The first relates to the individual characteristics that allowed the sample to be stratified according to six criteria: gender, age group, socio-professional category, region of residence, size of urban area and size of household;

- The second part introduces the subject of genetics with questions that allow the respondent to be provided with information about genetics, the concept of predisposition and possible outcomes of a genetic test;

- The third part of the questionnaire (the results of which are presented in the remainder of this article) corresponds to the discrete choice experiment. Having asked the respondent to imagine being in a healthcare setting where they had to undergo a genetic test, but were able to choose the test, they are offered eight successive choice tests, each between two different configurations of the test;

- The fourth and final part of the questionnaire deals with the respondent's experience of the discrete choice experiment that they have just completed (interest, difficulty, preferred item), their general attitude towards healthcare and therapeutic innovations and their knowledge of genetics.

The questionnaire was pre-tested among 21 people for the first pre-test and 14 for the second. The sample of pre-testers was an empirical sample recruited in order to cover the 18-49 and 50-70 age groups, as well as education levels ranging from no qualification to higher education. During these two pre-tests that we carried out ourselves, the respondents completed the survey online and then the completion thereof was discussed in an interview grid. We looked in particular at the amount of time taken to complete the questionnaire, the overall acceptability of the survey, the ease of completing the online questionnaire, the comprehension of the questions and the provision of explanations regarding genetics and the attributes and choices being requested, which could be accessed by clicking on the links in the questionnaire. The first pre-test led in particular to us rewording the questionnaire, both to explain the context in which the hypothetical choices were to be made by the respondents (*i.e.*, within the scope of a test that was to be carried out for the purposes of medical treatment), to ensure that the attributes are clearly differentiated from one another and to ensure that the links were actually helpful. The second pre-test allowed us to verify that the rewordings resulting from the first pre-test did not raise any further issues.

2.3. Preference Modelling

The analysis of the data from the discrete choice experiment is based on the *random utility maximisation* model. According to the random utility hypothesis, the utility U that an individual n derives from the option j comprises an observable component V and an unobservable component ε. According to the multi-attribute utility hypothesis, the observable component is a function of the characteristics of the option X_{jk} in the individual preferences for these characteristics β_{nk}. Due to the unobservable component, the modelling focuses on the probability P of the option being chosen, $P_{nj} = exp\left(V_{nj}\right) / \sum_{nj} exp\left(V_{nj}\right)$. In practice, V is frequently assumed to be additive in terms of its arguments and linear in terms of its parameters ($V_{nj} = \sum_k \beta_{nk} X_{njk}$) and ε is assumed to be distributed independently and identically as a type I extreme value ($\varepsilon_{nj} \sim iid\ EV1$). This specification therefore leads to a multinomial logistic regression model (Train, 2009). The interest in this econometric modelling lies in its ability to analyse the variability of the impact of attributes and their values within the sample. This objective responds to an assumption of heterogeneity of preferences with respect to the values of the attributes.

The inter-individual variability of the preference parameters is captured with a normal distribution (see Hauber *et al.*, 2016) whose mean μ and variance σ² are to be estimated. The model includes a constant, β_0, which is associated with the scenario presented on the left in the choice tasks. This is to measure systematic bias in decision making.

2.3.1. Estimation of the Preferences

In our experiment, the deterministic component V is assumed to be linear in terms of its parameters and additive in terms of its arguments. The formula is as follows:

$$\begin{aligned} V_n = {} & \beta_0 + \beta_{n1} * Results\_\text{Actionable} \\ & + \beta_{n2} * Results\_\text{List} + \beta_{n3} * Results\_\text{All} \\ & + \beta_{n4} * Decision\_\text{Me} + \beta_{n5} * Decision\_\text{The law} \\ & + \beta_{n6} * Decision\_\text{Committee} \\ & + \beta_{n7} * Sample\_\text{For research} \\ & + \beta_{n8} * Sample\_\text{For me} \\ & + \beta_{n9} * Sample\_\text{None} + \beta_{n10} * RAC \end{aligned}$$

With the exception of the monetary attribute *RAC*, which is included as a continuous variable, all of the variables were dummy coded (and the reference level is excluded from the model). The reference values, are therefore: *Results*-None, *Decision*-My doctor, *Sample*-For me and for research.

The preference parameters (β_{n1}, …, β_{n9}) are assumed to be distributed normally with a diagonal variance-covariance matrix ($\beta_{nk} \sim N(\mu_k, \sigma_k)$). The cost preferences are assumed to follow a log-normal distribution in order to force all individuals to have non-positive preferences for a cost increase.

The log-likelihood (LL) function of the model is as follows:

$$\text{SLL} = \sum_n \sum_j d_{nj} \ln\left(\frac{1}{R}\sum_r P_{nj|\beta_n^r}\right)$$

where $d_{nj} = 1$ where individual n chooses option j and 0 otherwise. This LL function needs to be simulated (hence simulated log-likelihood, SLL). For the purposes of this study, 1,000 Halton draws were used (R = 1,000), and the optimisation process was initiated with 20 different sets of starting values to test the robustness of the results.

2.3.2. Calculation of the Willingness to Pay

The inclusion of a monetary attribute (*RAC*) in our utility function allows us to calculate willingness to pay (WTP) for changes in the other attributes. In the case of an additive linear utility function, the WTP for attribute k is obtained as a ratio of preference parameters.

$$\text{WTP}_\text{k} = \frac{\partial V / \partial X_k}{\partial V / \partial RAC} = \frac{\beta_{nk}}{\beta_{n10}}$$

The ratio between a parameter and the attribute *RAC*'s coefficient can therefore be interpreted as a marginal willingness to pay, i.e. as the maximum amount that individuals would be prepared to pay in order to improve an attribute by one unit.

The estimated parameters are interpreted as the change in utility associated with moving from the reference value of an attribute to the considered value of that same attribute. The preferences will be heterogeneous with respect to a level of an attribute where the standard error of the coefficient associated with that value differs significantly from zero.

Once the parameters for the distribution of preferences have been estimated, it is possible to provide a visual representation of the heterogeneity of preferences by simulating the distribution of preferences (in this case, the number of samples was equivalent to the number of respondents) and to represent the distribution using Kernel density curves.

3. The Choices Collected and Estimation of Preferences

3.1. The Sample and its Perception of the Discrete Choice Experiment

The survey was sent out (between 28 September and 13 October 2017) in the form of a web link to a CSA panel. The recruitment of respondents needed to result in a representative sample of the French population, stratified by gender, age, socio-professional category, household size and location. 4,380 individuals clicked on this web link. 1,011 of them were not included in the sample as they were out of quota, and 868 individuals did not complete the questionnaire; the majority (61%) of them stopped at the beginning of the questionnaire, and then a further 28% stopped at the start of the section devoted to the discrete choice experiment. The final sample comprises 2,501 individuals aged between 18 and 70 and is representative of the French population (their characteristics are given in Appendix 2, Table A2-1).

Regarding the discrete choice tasks, 60.8% of the respondents find the choices they had to make always or mostly difficult. However, when asked to apply a qualifier to the choice of the hypothetical situation, the respondents found this: "surprising" (15.2%), "complicated" (24.2%), but "interesting" (44.4%). They also largely responded to the logic involved in the discrete choice method, which requires that all the attributes can be subject of a trade-off by the respondent. If an attribute or a value dominates all of the others, the multi-attribute utility function is itself meaningless, 66% of respondents stated that none of the four attributes determined their choice alone. For the others, the attribute that was dominant was only systematically so for 24.5% of them, and that dominant attribute differed depending on the individual (*Decision* for 38.2%, *Results* for 28.8% and *RAC* for 24.9%). Where the respondents stated that they had ignored an attribute in order to make their choices, this was "rare" for 58.8% of them and "always" for 41.2%. The attributes that apparently had the least influence over choices were the *RAC* (47%) and the use of the *Sample* (25.5%), followed by the identity of the *Decision*-maker (15.5%) and the *Results* (11.9%). These results are detailed in Appendix 2 (Table A2-2).

3.2. Preferences that are Sometimes Heterogeneous, but in Favour of Access to Genetic Information

The results obtained by estimating the utility function are presented in Table 2.

All of the mean effects are significant at the 1% level, which indicates that the four test attributes were taken into account by the participants when they chose their preferred test. For each qualitative attribute, moving from the reference value to another option always changes the utility.

The coefficients associated with the different levels of the qualitative attributes are not all random. The assumption of heterogeneity in preferences was rejected for the following effects: *Results* attribute, 'Committee' level of the *Decision* attribute, 'For me' level of the *Sample* attribute. However, for the other attribute levels (the 'Me' and 'The law' levels of the *Decision* attribute, and all levels of the *Sample* and *RAC* attributes), it is preferable to assume the heterogeneity of preferences. A visual representation of the dispersion of each of the random coefficients within the sample is provided by means of density curves (Figure II).

For the *Results* attribute, the coefficients are positive and significant for all three levels: accessing results other than those that are specifically related to the initial pathology systematically increases the utility of the genetic test. However, the scope of the additional results reported has an impact on the increase in utility. As a result, the greatest increase occurs when all of the predispositions are communicated, whether actionable or not. Where the additional data are only available regarding pathologies that are actionable or on the predefined list, the utility also increases for all respondents, but to a slightly lesser degree.

For the *Decision* attribute, the shift from a decision made by the doctor (after discussion with the patient) to a decision made by the patient (after discussion with the doctor) increases the well-being of the individual. Conversely, the shift to a delimitation of results that is the same for everyone and enshrined in law, or the shift to a specific delimitation for each patient, but which is delegated to an ethics committee, results in a decrease in satisfaction. The impacts on utility of a decision that would be made by the patient (after discussion with the doctor) or that would be delimited by the law also vary within the sample and, unlike the previous attribute, the impact is not always the same for all respondents. On average, the shift to a patient-led decision is viewed positively; however, for 13.5% of respondents, this would bring about disutility when compared with the final decision being made by a doctor. Having a law that defines the results that are accessible is viewed negatively on average; however, 30.3% of respondents saw this as a positive. A decision

Table 2 – **Results of estimations (mixed Logit)**

	Parameters for the distribution of preferences			Willingness to pay (in euros)		
	μ (SE)	σ (SE)	% respondents with a negative preference	Mean	95% confidence interval	
Constant	0.235*** (0.021)					
Results - Only concerning my current disease (*Ref.*)						
Ref. + my predisposition to actionable diseases	0.812*** (0.043)	0.000 (0.093)	0	26.24	22.85	29.63
Ref. + my predisposition to a fixed list of diseases	0.759*** (0.045)	0.012 (0.124)	0	24.52	23.13	27.91
Ref. + all my predispositions	0.881*** (0.040)	0.154 (0.208)	0	28.47	25.05	31.88
Decision - My doctor *(Ref.)*						
Me	0.547*** (0.040)	0.497*** (0.094)	13.5	17.67	14.14	21.20
The law	-0.509*** (0.046)	0.988*** (0.058)	69.7	-16.44	-20.35	-12.54
An ethics committee	-0.770*** (0.041)	0.261 (0.182)	100	-24.87	-28.31	-21.43
Sample - For me and research (*Ref.*)						
For research	-0.479*** (0.041)	0.791*** (0.062)	72.7	-15.47	-19.21	-11.75
For me	-0.279*** (0.045)	-0.030 (0.087)	100	-9.020	-12.41	-5.63
None	-0.655*** (0.045)	1.014*** (0.055)	74.1	-21.17	-25.1	-17.23
RAC	-5.319*** (0.080)	1.920*** (0.089)	100			
Observations	20,008	Log-likelihood (model): -11106				
Respondents	2,501	Bayesian Information Criterion (BIC): 22420				
Parameters	20					

*** significant at 1%. μ stands for mean, σ for standard error and SE for error type.
Notes: The willingness to pay (WTP) is given as a mean value and with a 95% confidence interval. A plus symbol next to the willingness to pay indicates that respondents would be willing to pay that amount in order to benefit from the level of that attribute and to preserve the same level of utility, and a minus symbol indicates the amount that they would need to be paid to persuade them to tolerate that level of the attribute without lowering the utility. The confidence intervals for the WTP were calculated using the Delta method following the procedure explained in Bliemer & Rose (2013).

made by a local ethics committee having reviewed the patient's record had the greatest negative impact on utility for all respondents.

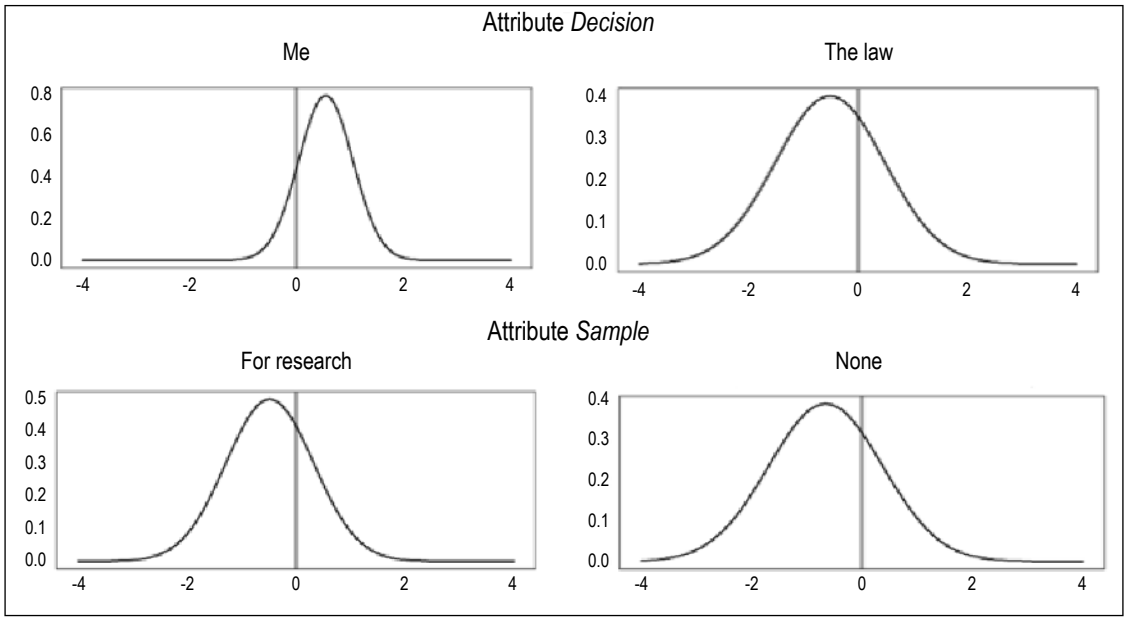
As regards the *Sample* attribute, the coefficients associated with all levels of this attribute are negative and significant. By way of a reminder, the reference level is a reanalysis of the sample for the patient and making the sample available for research. Shifting from this option to no other use, i.e. no reanalysis for me or for research, is the change that, on average, brought about the greatest degree of disutility. However, 25.9% of respondents would prefer that their sample be for immediate use only. Moving from the reference option to use for research only would, on average, bring about a greater decrease in utility than subsequent use for the patient only. However, the impact of limiting use to research remains positive for 27.3% of respondents. Finally, shifting from use for me and for research to purely personal use is also negative, but can be considered as a constant within the sample.

Finally, the coefficient associated with the attribute *RAC* is significant, negative and of variable magnitude. All else being equal, and not surprisingly, the increase in the cost to be borne by the patient reduces the utility associated with the test.

3.3. Willingness to Pay to Change the Options for Accessing Genetic Information

The results regarding the willingness to pay (cf. Table 2) demonstrate that the respondents are prepared to pay, on average, between 24.52 and 28.47 euros to gain access to additional results. They are willing to pay 17.67 euros to be able to choose for themselves which results

Figure II – **Random coefficient density curves from the mixed logit estimation**



Notes: On the vertical axis, density. On the horizontal axis, the coefficients resulting from the mixed logit estimation.

they will be able to access rather than letting their doctor decide what they can be told about. In order for it to be acceptable for the delimitation of the results to be determined by the law or an ethics committee, they would need to be paid a compensatory amount of 16.44 or 24.87 euros, respectively. Finally, in order to waive any further use of their sample, whether it be for themselves or for research, they would need to be paid 21.17 euros, and 9.02 euros if the subsequent use excludes research while maintaining the benefit of reuse for themselves.

4. Initial Results and Prospects for Research on Genomics in France

Our results show, that the French population has a preference for tests that would allow to look beyond the results targeting the pathology for which the test was prescribed, with that preference increasing in line with the scope of that additional data. The desire to have information, all of the information possible when it is presented as being potentially available, may seem like it has not been properly thought out when linked to a hypothetical situation. However, the same results have previously been obtained by other studies, in other countries and among specific populations (Gray *et al.*, 2016, among colorectal and lung cancer patients in the UK; Peyron *et al.*, 2018, among French families with a child suffering from a rare developmental disorder with no known aetiological diagnosis), or among the general public (Daack-Hirsh *et al.*, 2013 in the USA; Facio *et al.*, 2013 in the USA; Fernandez *et al.*, 2015 in Canada; Hishiyama *et al*., 2019 in Japan; Marshall *et al.*, 2016 in the USA). The fact that the patient may experience disappointment or anxiety when faced with the results of sequencing or additional data (Chassagne *et al*., 2019) must not result in this initial positive attitude towards the additional information being discounted. For professionals and public authorities alike, it is therefore a question of knowing how to support this strong demand, or to find a way to justify and explain why such access, while technically possible, is not yet authorised in France. It is also possible that the announcements made in the PFMG 2025 and the dissemination of information on the opportunities associated with genomic medicine will further increase these expectations over time.

Our respondents value access to all predispositions even more than they value access to just those pathologies that are actionable; this result differs from that found by Marshall *et al.* (2016) in the USA. Furthermore, in our study, the utility of expanding the results beyond those concerning the current pathology is identical for all individuals, whereas other research has shown heterogeneity in this preference for more results: Marshall *et al.* (2016) show that in the USA, some of the respondents have no interest in genetic information in general; Regier *et al.* (2015) show heterogeneity in the utility of genetic information (however, they did specify the severity of the diseases in the choice of results to be accessible, which we have not done here). The heterogeneity in the utility attributed to the additional data may depend on

the provisions of a more explicit presentation of the risks associated with the pathologies within the attributes. The different attitudes to risk would then be reflected in varying preferences.

In line with this first analysis, and also in accordance with the literature (Daack-Hirsh *et al.*, 2013; Regier *et al.*, 2015; Marshall *et al.*, 2016), our respondents prefer a decision with upstream support from a doctor, but that is ultimately made by themselves (Moumjid *et al*. 2017). In addition to this desire for autonomy, there is real opposition to decisions that would be made in reference to a list of accessible results set out in the law, and in particular to decisions that would be made by a local ethics committee, with none of the respondents wanting that option. The respondents want decisions that are personalised within the scope of their individual relationship with their doctor; general regulation by law would not guarantee that degree of personalisation. While it could be more attentive to individual situations, a local ethics committee that would make a decision after examining the medical records appears to be perceived as being both restrictive in terms of the autonomy of the patient outside a chosen relationship of trust and, unlike the law, offers little guarantee of equality.

Not being able to reanalyse one's own sample for the purposes of one's own treatment is indeed seen as a disadvantage; respondents appear to have taken on board the rapid development of genetic knowledge and the opportunity to benefit from it. Our results regarding the use of samples are also of interest for assessing the acceptability in France of the construction of genomic biobanks and databases. The disutility associated with samples that will no longer be available for research clearly shows, albeit indirectly, that contributing to biobanks is valued in itself by individuals. The research appears positive here, and the obstacles that could be raised by questions regarding management, ownership and anonymity are not highlighted here.

The heterogeneity of preferences, as reflected in the random distribution of certain parameters, particularly those linked to the nature of the decision-maker, demonstrate that the importance attached to the different characteristics of the test is not always the same for each individual. Beyond the average level of preferences, it is therefore possible to highlight characteristics that are either seen as unanimously positive, such as access to all results, or unanimously negative, such as the role of a local ethics committee in accessing results. These convergences or variabilities in preferences can present a source of reflection for a public decision-maker.

From a methodological point of view, the relevance of a discrete choice survey lies in its ability to look beyond the points of view that could be gathered by means of a traditional questionnaire. The results prove this interest. By way of an example, although 47% of respondents reported that cost had little influence over their decisions, estimates show that this characteristic is clearly significant for the level of utility, even if the importance of cost varies within the sample.

* *
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Our results allow us to characterise the methods of access to genetic information that are most in line with the *a priori* expectations of the French population, and to compare them with current practices or debates on the dissemination of genomic tests. However, our study was not without its limitations. The first is inherent in any discrete choice experiment that places the respondent in a hypothetical situation, in this case that of having a disease and needing to undergo genetic testing and having to choose a test that most closely matches their preferences. There is no guarantee that the trade-offs and wishes would result in the same choices in the real world. The second possible limitation is that the complexity of the concepts and the range of issues associated with accessing a genomic test and the additional data may have made the choices made here "superficial". Nevertheless, the responses that we received from the survey with regard to its difficulty, as well as its interest, and the fact that none of the attributes were spontaneously declared dominant by a majority of the respondents, tend to support the use of this method. The qualitative approach undertaken in order to establish our choice experiment resulted in elements of choice that all appear significant in the estimates. This is also a reassuring sign, although it does not rule out the possibility that some decisive elements may be missing.

In order to build our choice scenarios, we made use of an orthogonal design that assumes that all parameters carry the same weight. An alternative strategy, which is currently quite widespread, is to use an efficient configuration, which takes account of the *a priori* information on the preferences to be estimated and which would increase the accuracy of the estimates. Looking beyond the debates on the comparative contribution of

these approaches (Olsen & Meyerhoff, 2017; Yao *et al.*, 2015), we decided that it would be preferable to not integrate results from studies carried out within populations other than the French population (which could have provided us with *a priori* distributions of preferences within our field of study), especially since the relatively large size of our sample is able to counterbalance any possible loss of precision in our estimates. However, our results can be used in efficient configurations for other discrete choice surveys concerning genetic information and the French population.

Indeed, we believe it is necessary to continue developing research on access to tests and genomic medicine. At present, access to genomic medicine in France remains limited and primarily concerns the fields of cancer and rare diseases, to which the high-speed sequencing platforms are currently dedicated. As regards the possibility of accessing additional results, this is not widespread and is the subject of heated debate among health professionals (Delanne *et al.*, 2019). However, the Société Française de Médecine Prédictive et Personnalisée [French society for predictive and personalised medicine] recommends that a list of 36 medically actionable genes associated with cancer be communicated to patients (Pujol *et al.*, 2018). Specific studies, which are still ongoing, should allow for a better understanding of the demand for additional results in France. The FIND study, for example, which was financed by the Ministry of Health and Social Affairs (awarded the PREPS 2016 funding) and conducted within the Dijon, Lyon and La Pitié-Salpêtrière APHP university hospitals, explored the demand for additional results among the families of children suffering from rare developmental abnormalities offered genomic testing, as well as the repercussions that the communication of these data would have on their quality of life and their behaviours in terms of seeking treatment. It is essential that these issues are investigated within a context where access to genomic medicine is likely to increase and be rolled out more widely to more medical indications – in line with the ambitions set out in the PFMG 2025.

By focusing on the ways in which information is accessed when access to genomic medicine is supposedly already effective, we have examined the expectations or the intensity of the demand that the French population might have for these new treatments and associated tests. This decision was motivated by the current situation in France: access to this new medicine can only be provided within the scope of specific medical care, which, as we have highlighted, already raises many questions for patients, practitioners and the regulator. Nevertheless, with the spread of this field of medicine, it is reasonable to assume that, in the medium to long term, the question regarding the level of demand for genomic testing within the population will be more pressing: do French people want to undergo such testing? Would this be on prescription from a health professional (GP, specialist, geneticist) or freely available on the market? If this demand were to increase, this would require even greater attention to be paid to the nature of the results communicated and the use of the samples, particularly when it comes to uses outside of the medical sphere.

As we can see, there are many questions and avenues of research in the field of genomic medicine. We have been able to produce an initial assessment of the expectations of French people when it comes to the ways in which genetic tests are accessed. These initial results should already be able to fuel the debate among the professionals who would need to guide patients towards truly informed consent and, beyond that, towards informed decision-making for those who wish to access the results and, on the other hand, among public policy decision-makers, to ensure that these technologies are rolled out in a way that is respectful of societal preferences and at the very least with a constructive discussion regarding citizens' preferences. □

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APPENDIX 1

EXTRACTS FROM THE DECREE OF 27 MAY 2013 DEFINING THE BEST-PRACTICE GUIDELINES APPLICABLE TO THE EXAMINATION OF A PERSON'S GENETIC CHARACTERISTICS FOR MEDICAL PURPOSES

The genetic characteristics of a person may only be examined for medical or scientific research purposes. The express written consent of the person involved must be obtained prior to the examination taking place and after he or she has been duly informed of its nature and purpose. The consent shall state the purpose of the examination. It may be withdrawn at any time and without formalities.

The results of a genetic examination should not be communicated directly to the patient by the medical biology laboratory, but by the prescriber [...]. The methods by which these results are communicated must be defined in advance, in particular during the consultation giving rise to the prescription. The person shall be free to express, in writing, their wish to not be informed of a diagnosis.

The question as to whether the results are to be returned to the patient arises when the genetic examination leads to the incidental discovery of information other than that being sought. In order to protect the patient from information that is not of use, that is likely to cause concern or that he or she does not wish to know, the applicable law (Article 16-10 of the French Civil Code and Article R. 1131-4 of the French Public Health Code) is not favourable for the transmission of any information other than that initially sought and for which the patient has consented to the examination being carried out.

Under these conditions, it is up to the doctor to determine the appropriate course of action on a case-by-case basis and in the context of the individual consultation with their patient. He or she is advised to contact a doctor working within a multidisciplinary team, bringing together clinical and genetic competences, as mentioned in Article R. 1131-5 of the French Public Health Code.

Original Text of the Decree

L'examen des caractéristiques génétiques d'une personne ne peut être entrepris qu'à des fins médicales ou de recherche scientifique. Le consentement exprès de la personne doit être recueilli par écrit préalablement à la réalisation de l'examen, après qu'elle a été dûment informée de sa nature et de sa finalité. Le consentement mentionne la finalité de l'examen. Il est révocable sans forme et à tout moment.

Le résultat d'un examen génétique ne doit pas être directement communiqué au patient par le laboratoire de biologie médicale mais par le prescripteur (…). Les modalités de communication de ce résultat doivent être préalablement définies, notamment au cours de la consultation qui a donné lieu à la prescription. La personne peut exprimer, par écrit, sa volonté d'être tenue dans l'ignorance d'un diagnostic.

La question du rendu des résultats au patient se pose lorsque l'examen génétique conduit à révéler fortuitement d'autres informations que celles recherchées. Le droit en vigueur (art. 16-10 du code civil et art. R. 1131-4 du code de la santé publique), pour protéger le patient d'informations inutiles, angoissantes ou dont la révélation n'est pas désirée, n'est pas en faveur de la transmission d'informations autres que celle initialement recherchée et pour laquelle le patient a consenti à la réalisation de l'examen.

Dans ces conditions, il appartient au médecin de déterminer au cas par cas et dans le cadre du colloque singulier avec son patient la conduite à tenir. Il lui est conseillé de prendre l'attache d'un médecin œuvrant au sein d'une équipe pluridisciplinaire rassemblant des compétences cliniques et génétiques telle que mentionnée à l'article R. 1131-5 du code de la santé publique.

APPENDIX 2

Table A2-1 – **Characteristics in the sample and in the general population (in %)**

	Sample	General population
Gender		
Male	48.4	48.8
Female	51.6	51.1
Age		
18-24	11.0	12.3
25-34	19.3	18.6
35-49	30.9	30.7
50-59	20.4	20.0
60-70	18.4	18.4
Profession		
Farmers, farm workers	1.2	1.1
Craftspeople, traders, company managers	4.0	4.3
Managers, senior intellectual workers	11.2	11.4
Intermediate professions	18.8	17.7
Employees	22.0	20.4
Labourers	13.2	15.9
Retired	16.6	16.0
Other, no professional activity	13.0	13.2
CSP		
CSP+	35.2	34.5
CSP-	35.2	36.3
Unemployed	29.6	29.2
Distribution by region		
Paris region	18.8	19.3
North	6.3	6.4
East	8.9	8.6
East Paris Basin	7.6	7.7
West Paris Basin	8.8	9.1
West	13.9	13.4
South-West	11.0	11.0
South-East	13.1	12.2
Mediterranean	11.7	12.5
Number of persons within the household		
1 person	17.6	16.8
2 people	35.0	33.5
3 people	21.1	20.6
4 people	18.5	18.6
5 or more people	7.7	10.6
Size of urban area		
Fewer than 2,000 inhabitants	21.2	22.7
From 2,000 to fewer than 20,000 inhabitants	16.6	16.9
From 20,000 to fewer than 100,000 inhabitants	13.8	13.1
More than 100,000 inhabitants	31.5	30.1
Paris region	17.0	17.2

Table A2-2 – **Perception of the survey (number of observations and percentages)**

We placed you in a hypothetical situation. Did you find this:		
Complicated	605	24.2 %
Surprising	380	15.2 %
Boring	128	5.1 %
Pleasant	131	5.2 %
Unpleasant	147	5.9 %
Interesting	1,110	44.4 %
Total	2,501	100.0 %
The choices that you just made were:		
Always difficult	163	6.5 %
Mostly difficult	1,359	54.3 %
Mostly easy	919	36.7 %
Always easy	60	2.4 %
Total	2,501	100.0 %
Did you base your choices on only one of these four characteristics?		
Yes	850	34.0 %
No	1,651	66.0 %
Total	2,501	100.0 %
Which one?		
Who will decide what results are returned to you?	325	38.2 %
What results in addition to those concerning your current disease?	245	28.8 %
How much should you have to pay for this test?	212	24.9 %
What will happen to your blood sample once the test is complete?	68	8.0 %
Total	850	100.0 %
Would you say that this characteristic influenced your choices:		
Most of the time	642	75.5 %
All of the time	208	24.5 %
Total	850	100.0 %
Did you disregard one of the four characteristics when making your choices?		
Yes	1,319	52.7 %
No	1,182	47.3 %
Total	2,501	100.0 %
Which one?		
Who will decide what results are returned to you?	205	15.5 %
What results in addition to those concerning your current disease?	157	11.9 %
How much should you have to pay for this test?	620	47.0 %
What will happen to your blood sample once the test is complete?	337	25.5 %
Total	1,319	100.0 %
To what extent would you say that this characteristic influenced your choices?		
Not at all	543	41.2 %
Very little	776	58.8 %
Total	1,319	100.0 %

The Effect of the 2015 Reform of the Personalized Autonomy Allowance on the Care Plans Notified to Beneficiaries

Louis Arnault* and Jérôme Wittwer**

Abstract – The law on the adaptation of society to ageing, which reformed the home care allowance APA, entered into force on 1 March 2016. This article aims to study the effect of this on the amounts proposed in plans by the medical and welfare teams (EMS), first theoretically and then empirically, on more than 300,000 beneficiaries in 2011 and 2017. The analysis is based on individual data from the statistical services of the Ministry of Health and Social Affairs (DREES). The average amount offered to beneficiaries assessed as belonging to the iso-resource group of dependence (GIR) 3, 2 or 1 saw a respective increase of €16, €49 and €57 between 2011 and 2017. The amount offered to most beneficiaries allocated to GIR 4 decreased, other things being equal. Within each GIR, in 2017, the amounts granted are more widely distributed, in both directions, which suggests that constraints on *départements*' council budgets have led EMS to cut allowances for people with relatively more autonomy so as to provide more funding for the most severely dependent people.

JEL Classification: H75, J14, J18
Keywords: loss of autonomy, public assistance, reform, censored quantile regressions

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The Personalized Autonomy Allowance (APA) has been the main form of aid granted to address the loss of autonomy among France's elderly population since 2002. At the end of 2017, nearly 769,000 homebound senior citizens were receiving the allowance and it accounted for nearly 98% of all home care benefits paid by the *départements*' councils to people aged 60 and above (Abdouni, 2018). The APA is a form of aid in kind that is managed at the *département* level (the administrative level between the region and the municipality, hereafter department) and mainly serves to compensate carers for their time spent providing assistance (Couvert, 2017): housework, shopping, meal preparation, or personal care. Each home care APA beneficiary is notified of a personal care plan. The full amount is capped by law and this limit increases in value in proportion to the beneficiary's loss of autonomy. The "beneficiary co-payment" is a means tested part of the costs under the care plan that is paid by the beneficiary and which takes the amount under the plan into account, while the remaining part is paid by the department's council.

On 1 March 2016, the reform of the home care APA enacted by the *Loi d'adaptation de la société au vieillissement* (a law aimed at the adaptation of society to ageing, hereafter ASV Law) entered into force, reforming the allowance scheme so as to reduce the excess required from senior citizens with the lowest level of independence. All of the statutory limits – or ceilings – for benefits under the notified care plans were raised – particularly the limits for the most dependent beneficiaries. The scale used to calculate the "beneficiary co-payment" was also revised to lower the excess due from beneficiaries requiring a significant amount of assistance. The change to how the beneficiary co-payment was calculated, which applied to all home care APA beneficiaries, potentially lowered their out-of-pocket expenditures (Arnault, 2019; Latourelle, 2019). A number of authors study the way in which lower marginal hourly costs, such as those brought about by the revised law, could result in beneficiaries receiving more care. These authors analyse the elasticity between the demand for professional care for APA beneficiaries and their out-of-pocket expenditures (Bourreau-Dubois *et al*., 2014; Roquebert & Tenand, 2017) and observe that they are particularly responsive to it. On average, beneficiaries should therefore have upwardly revised the volume of care they received in response to their lower contribution rates brought about by the change to the scale used to calculate beneficiary co-payments.

However, it is not just beneficiaries whose behavioural responses are liable to influence the effects of the reform. Medical and welfare teams (EMS) also play a key role, given that they prepare the care plan offered to each beneficiary. The way in which they do this differs (Fondation Médéric Alzheimer, 2019), including on the basis of their initial training (Gramain *et al*., 2015) or the organisational structure in which these departments council officers work (Gramain *et al*., 2012). Other than a DREES study highlighting the fact that EMS seem to offer the cheapest care services whenever the care plan amount approaches the limit (Couvert, 2017), little is known about how EMS cope with the statutory constraints placed on their practices.

The scale of the knock-on effects resulting from the higher ceilings for all GIR (an administrative grouping of beneficiaries by level of lost autonomy) is therefore contingent on the behavioural response of the EMS (Tenand & Gramain, 2019). At first glance, the general expectation might be that the higher ceilings affected only those beneficiaries whose allowances would have been restricted by the ceilings before the law was reformed. Therefore, more than three quarters of beneficiaries – senior citizens notified of amounts strictly below the ceiling before the reform – would have been unaffected and the effects of the increased limits on department council spending would be moderate (Fontaine & Gramain, 2017). However, it cannot be ruled out that the overall distribution of the notified amounts included in the plans changes as a result of the increased ceilings. This is because, first, the ceilings can act as implicit benchmark standards for the EMS and lead them to shift the entire distribution of notified amounts to the right, i.e. upwards. The second reason is the budgetary constraints placed on the departments that could be highly restrictive and influence EMS practices. While the regulations on APA operation are set at national level, it is the department councils that implement and manage the allowance scheme. Although these councils have been receiving additional funds from the *Caisse Nationale de Solidarité pour l'Autonomie* (CNSA, a dedicated national fund) following the reform, they still contribute 60% of all expenditure and therefore still bear most of the costs associated with decisions taken by the EMS when preparing the plans.

This article aims to evaluate the effect of the reform on the amounts of assistance notified to home care APA beneficiaries. It offers new insight into how the departments' councils and teams determine the amounts notified under the

plans while incorporating legislative amendments. The rest of the paper is organised as follows: the first section recalls the functioning of the APA home care. Section 2 presents the theoretical model constructed for the study, the empirical specification is detailed in section 3 and the data are presented in section 4. Section 5 presents the results; then we conclude.

1. The Personalized Autonomy Allowance

1.1. How the Home Care APA Works

When a senior citizen applies for home care APA, a medical and welfare team (EMS) visits the person at home and evaluate their level of dependence based on a national assessment grid (*Autonomie, gérontologie, groupes iso-ressources*, AGGIR). The grid includes six "iso-resources groups" (GIR) that classify the various levels of lost autonomy, whereby senior citizens in GIR 6 are the most independent and those in GIR 1 are the most severely dependent. To be eligible for APA, applicants must be aged 60 or above and belong to GIR 1 to 4, i.e. they must find it difficult to carry out certain daily activities such as washing or feeding themselves without any assistance. If the applicant is eligible, they will be notified of a personal care plan. The amount indicated in the plan (in euros) corresponds to the value of the technical and human assistance it will grant technical and human assistance. Human assistance will be recorded as a monthly volume of subsidised care, valued in accordance with a rate set by the department. Ultimately, the total care plan amount notified may not exceed a statutory ceiling, in euros, the value of which increases in proportion to the beneficiary's loss of autonomy. For example, in 2015, the pre-reform monthly ceiling was €562.57 for GIR 4 beneficiaries and €1,312.67 for GIR 1 beneficiaries.

The notified plan corresponds to the maximum subsidised care allowance. It does not always equal the amount of care consumed by the beneficiary, who may choose not to use some subsidised hours. Some of the amount (the "beneficiary co-payment") is paid by the beneficiary, depending on the beneficiary's income.[1] The beneficiary's contribution rate is defined as the ratio between the sum of the beneficiary co-payment and the total care plan amount. Up until 2016 when the ASV Law was implemented, contribution rates increased linearly with the beneficiary's means where their (personal) monthly income fell between €740 and €2,945. The contribution rate was zero if the beneficiary's monthly income was below €740, and 90%, the maximum rate permissible, if their monthly income exceeded €2,945. In 2015, GIR 4 beneficiaries were paying 22.3% of the full amount of their care plan on average, compared to 21.1% of GIR 1 beneficiaries (Arnault, 2019).

1.2. The Measures of the ASV Law

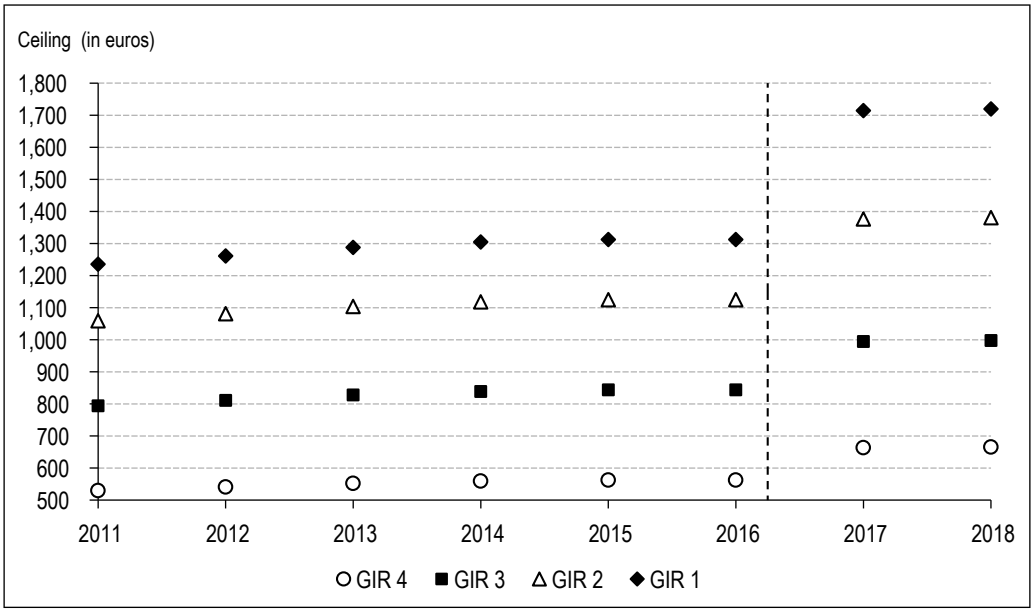
Five years after the national debate held on elderly dependency in 2010-2011, France adopted the ASV Law (loi 2015-1776 of 28 December 2015). The section of the Law that reformed the home care APA entered into force on 1 March 2016.

Under that section, the minimum threshold for beneficiary contributions was raised from €740 to €800 (monthly) so that individuals receiving the solidarity allowance for the elderly (ASPA, or minimum old-age pension) can be exempt from paying any contributions whatsoever. Prior to 2016, the APA scheme also provided benefits that many deemed insufficient to cover the cost of home care support, particularly for the most severely dependent beneficiaries (those in GIR 1 or 2). Before the reform, they were much more likely to be notified of a "saturated" care plan with a value restricted by the ceiling in force (Arnault, 2020; Bérardier, 2012; Fizzala, 2016). Therefore, it was likely that certain hours of required care went unsubsidised, which meant that those hours may have been more costly for the beneficiaries. The reform introduced higher statutory plan amount limits for each GIR, with an increase of 31% for GIR 1 beneficiaries, 22% for GIR 2 beneficiaries, and 18% for GIR 3 and 4 beneficiaries[2] (Figure I). As the average contribution rate of the middle classes was higher than that of lower or higher income beneficiaries before the reform, they were also deemed to be put at a disadvantage by policy addressing the loss of autonomy in France (Fizzala, 2016). The scale used to calculate the beneficiary co-payment was therefore also revised: the financial contribution of the beneficiaries in the mid-level income bracket, with monthly income of between €800 and €2,945, now takes the full value of their plan into account as opposed to being based exclusively on the beneficiary's

1. Three categories of resources are considered for calculating the beneficiary's financial contribution: declared income, income subject to withholding tax, and inactive assets. Joint resources are considered for couples, where applicable. To derive personal income, joint resources are divided by 1.7 for co-habiting couples and by 2 for couples who do not live together.

*2. Prior to the reform, the value of the ceiling was obtained by multiplying the constant attendance allowance (*Majoration pour Tierce Personne*, MTP) by a factor of 0.51 for GIR 4, 0.765 for GIR 3, 1.02 for GIR 2, and 1.19 for GIR 1, respectively. The MTP is re-evaluated each year by decree, in line with inflation. The revaluation of the ceilings involved increasing the value of the multiplying factors applied to the MTP, for each GIR. The new, post-reform factors are 0.601 for GIR 4 (+18%), 0.901 for GIR 3 (+18%), 1.247 for GIR 2 (+22%), and 1.553 for GIR 1 (+31%).*

Figure I – **Change in the amount of the statutory ceiling in force on 1 January by GIR**



Notes: The vertical dotted line corresponds to 1 March 2016, the date on which the part of the ASV Law reforming home care APA entered into force.
Reading Note: On 1 January 2011, the applicable ceiling was €530 for a GIR 4 beneficiary, €794 for a GIR 3 beneficiary, €1,059 for a GIR 2 beneficiary, and €1,236 for a GIR 1 beneficiary.
Sources: CNAV (*Caisse Nationale d'Assurance Vieillesse*) circulars for the amounts of the constant attendance allowance (MTP) on 1 January.

level of income. This provides them with an additional allowance for care hours received in excess of the amounts in the plans equal to €350 and €550, respectively. Lastly, until it was reformed, the home care APA intrinsically failed to account for family caregivers providing care to senior citizens requiring support.

2. Theoretical Model

A theoretical model has been developed to predict the effect of higher ceilings on the amounts included in the plans that EMS are offering to home care APA beneficiaries. This model is based on another, developed to study the effect of financial incentives on general practitioner practices and patient expectations of them (Jelovac & Polomé, 2017). To simplify the analysis, let us assume that the EMS visits two senior citizens ($i = \{1,2\}$) eligible for the home care APA who the EMS assesses as belonging to the same GIR.[3] The EMS must therefore prepare a subsidised care plan, in euros, based on the requirements of each person *i*. The amount M_i under the care plan proposed to the senior citizen *i* corresponds to a particular volume of care, with the department valuing each care unit at a rate *t* based on its nature and the type of provider. To simplify matters, we will assume that the care plans consist only of human assistance. In practice, this accounts for 87% of the totals notified for the home care APA (Arnault & Roy, 2020). Let us also assume that the EMS offers an amount M_i to a senior citizen and we disregard the way in which this amount breaks down in terms of the volume of care and the hourly rate.[4] Three simplifying assumptions are made:

- A1: the professional care received by a beneficiary is through the APA only. This hypothesis may seem strong, given the relatively high proportions of beneficiaries already notified of the maximum subsidised care plan amounts, equal to the ceilings, and whose care needs may therefore go unfulfilled. 25% of the 1,616 APA beneficiaries included in a study conducted using "customer" data from a home care service also received professional care not covered by the APA. Nevertheless, non-subsidised hours are negligible for the most part because they account for 2.6% of the total hours of care received by beneficiaries, on average (Tenand, 2018).

- A2: the volume of informal care received by a beneficiary is exogenous.

- A3: the contribution rate of a beneficiary increases linearly with their income and does not depend on the full amount of the care

3. The process of determining APA eligibility has already been completed by the EMS at the homes of both senior citizens. The only thing the two beneficiaries have in common is their GIR, and not necessarily any specific disability. Beneficiaries in a given GIR might actually suffer from different disabilities, which would result in different care arrangements.

4. For human assistance, by way of example, the EMS can make a trade-off between the number of hours and the associated hourly rate, which is mainly based on the type of provider selected. This allows it to choose to notify the beneficiary of either few hours, albeit at a high rate (for example, weekend hours provided by a care service provider), or many hours at a low rate (for example, over-the-counter hours provided by a professional caregiver during weekdays).

plan, as was the case before the ASV Law was implemented.[5]

We assume that the EMS already visited beneficiary 2 and offered them an amount equal to the limit $\bar{M}$, even if the EMS had intended to provide them with more than this amount. This would be the case if beneficiary 2 was severely disabled or if they received very little informal care. As a result, the EMS now seeks the amount M_1^* to be offered to beneficiary 1, which maximises its utility, considering that M_1 cannot exceed $\bar{M}$. The EMS' utility function is assumed to depend on the utility V_1 of beneficiary 1, as perceived by the EMS (the EMS is assumed to be altruistic), and the utility W of the department's council, as assimilated by the EMS:

$$\max_{M_1} \beta V_1(M_1,\ IC_1, A_1, Z_1) + (1-\beta) W(D_1)$$

where:

β is the level of altruism of the EMS ($\beta \in [0;1]$);

$V_1(.)$ is the utility of beneficiary 1, as perceived by the EMS;

M_1 is the amount offered to beneficiary 1 by the EMS under the care plan as part of the home care APA;

IC_1 is the amount of informal care received by beneficiary 1, which is assumed to be at no cost;

A_1 is the level of autonomy of beneficiary 1;

Z_1 is the care received by beneficiary 1 (cost = unit) after their needs related to loss of autonomy have been met;

I_1 is the disposable income of beneficiary 1 (before the deduction of home care costs).

a_1 is the contribution rate of beneficiary 1 with respect to paying for one hour of subsidised care. This rate falls between 0 and 0.9 and is assumed to increase linearly with I_1: $a_1 = a_1(I_1) = cI_1, \quad c > 0$

$$Z_1 = I_1 - a_1 M_1.$$

$W(.)$ is the utility of the department's council, as assimilated by the EMS;

D_1 is expenditure covered by the department's council for the plan notified to beneficiary 1:

$$D_1 = (1-a_1) M_1$$

where $W(D)$ is assumed to be concave and to decrease strictly with the department's council spending:

$W_D < 0;\ W_{DD} < 0.$

The utility of beneficiary 1, as perceived by the EMS (V_1), is assumed to be separable:

$V_1(M,\ IC, A, Z) = v_1(M, IC, A) + u_1(Z),$

where $v_1(.)$ is the utility of beneficiary 1 in terms of their needs related to loss of autonomy being met; v_1 is strictly increasing and concave in each of its arguments:

$$\frac{\partial v_1}{\partial M} = v_{1,M} > 0; \quad \frac{\partial v_1}{\partial IC} = v_{1,IC} > 0;$$

$$\frac{\partial v_1}{\partial A} = v_{1,A} > 0;\ v_{1,MM} < 0;\ v_{1,ICIC} < 0;\ v_{1,AA} < 0.$$

$u_1(.)$ is the beneficiary's utility resulting from receiving the composite good. u_1 is strictly increasing and concave in terms of the quantity of composite good received: $u_{1,Z} > 0;\ u_{1,ZZ} < 0.$

The amount actually offered to beneficiary 1 by the EMS cannot exceed the statutory limit $\bar{M}$: $M_1 \leq \bar{M}$.

It is also assumed that the notified plans must comply with budgetary constraints and not exceed a certain budget B[6]:

$D_1(M_1) + D_2(\bar{M}) \leq B$, where D_i is expenditure covered by the department's council for the plan notified to beneficiary i:

$$D_i(M_i) = (1-a_i) M_i$$

and B is the department's council budget for home care APA expenditure.

The maximisation programme *(P)* of the EMS can therefore be reformulated as follows:

$$\begin{cases} \max_{M_1} \beta\left[v_1(M_1, IC_1, A_1) + u_1(Z_1)\right] + (1-\beta)\left[W(D_1)\right] \\ s.t. \begin{cases} M_1 \leq \bar{M} & (statutory\ constraints) \\ M_1 \leq \dfrac{B-(1-a_2)\bar{M}}{(1-a_1)} (budgetary\ constraints) \end{cases} \end{cases} \quad (P)$$

Two scenarios are considered, depending on whether the budgetary constraints placed on the department give the EMS free rein

5. Following the implementation of the ASV Law, there is no longer a linear relationship between contribution rate growth and beneficiary income and the rate is now also dependent on the full plan amount. Nevertheless, the function that links the contribution rate to the amount included in the care plan is discontinuous and complex. In this theoretical model, we therefore implicitly assume that the reduced hourly contribution rate for high plan amounts, which results from the reform, has zero effect on the selection of the plan amount that the EMS offers to the beneficiary.

6. One of the potential channels through which the department's budgetary constraints could influence the practices of the EMS is touched on in the CNSA report (2015), which states that, despite the strong trend towards greater decentralisation of medical and welfare teams at infra-departmental level (territorialisation), the departments are actively working towards "harmonising" the assessment practices of those teams. The aim would be to limit the number of appeals and conflicts involving beneficiaries, which are very time-consuming, and to offer them equal treatment throughout France. But it would also serve to "avoid discrepancies" in the notified care plans, i.e. to contain them: "the watchword was more or less identical from one department to another: better control of the care plans allocated". Departmental council budgetary constraints weigh all the more heavily as the EMS do not have the final decision on the notification of the plan: they only propose a plan notified to the departmental council, which makes the final decision.

("flexible budgetary constraints") or restrict it ("strict budgetary constraints").

In Scenario 1, it is assumed that the constraints placed on the departmental budget are flexible. The EMS acts as though the departmental budget B were high enough. In this case, the legal constraints on the limit are the most restrictive and the EMS internalise the budgetary constraints only through the disutility of the expenditure $W(D_1)$. If the EMS are not constrained by budget, the notified plans are set only on the basis of the marginal utility of the care and the disutility of the expenditure according to the EMS: they are therefore independent of the ceiling if the optimal notified care plan is below the ceiling.

Scenario 2 corresponds to the case where the EMS has internalised the need to comply with strict budgetary constraints. The departmental budgetary constraints are more restrictive than the legal constraints on the limit. An increased ceiling $\bar{M}$ (with the budget being maintained) would lead the EMS to lower the amount that it offers to a beneficiary 1, even more if this beneficiary 1 has a high contribution rate. The EMS therefore intends to bring beneficiary 2 more in line with the optimal situation that was not possible previously due to the initial ceiling, while respecting the budgetary constraints. Since the marginal utility of the assistance offered to beneficiary 2 is strictly positive, the EMS makes it more satisfactory by offering less to beneficiary 1 so as to provide more to beneficiary 2, with the budget being maintained.

The formalised EMS programme for each scenario is presented in the Box below.

Box – **The EMS programme with a flexible or a strict budgetary constraint**

Scenario 1: Flexible Budgetary Constraints

The EMS programme can be reformulated as follows:

$$\begin{cases} \max\limits_{M_1} \beta\left[v_1(M_1, IC_1, A_1) + u_1(Z_1)\right] + (1-\beta)\left[W(D_1)\right] \\ \qquad s.t. \quad M_1 \leq \bar{M} \end{cases} \qquad (P')$$

The following Lagrangian equation applies:

$$L = \beta\left[v_1(M_1, IC_1, A_1) + u_1(Z_1)\right] + (1-\beta)\left[W(D_1)\right] + \lambda\left(\bar{M} - M_1\right)$$

If the EMS wishes to offer beneficiary 1 an amount strictly below the ceiling ($\lambda = 0$), then it can be shown, using the primary conditions and by applying the implicit function theorem, that for beneficiary 1:

$$\left.\frac{\partial M_1}{\partial IC_1}\right|_{M_1^*} = -\left.\frac{\partial F / \partial IC_1}{\partial F / \partial M_1}\right|_{M_1^*} = -\frac{v_{1,MIC}\left(M_1^*, IC_1, A_1\right)}{v_{1,MM}\left(M_1^*, IC_1, A_1\right) + a_1^2 u_{1,ZZ}\left(Z_1\left(M_1^*\right)\right) + \left(\frac{1-\beta}{\beta}\right)(1-a_1)^2 W_{DD}\left(D_1\left(M_1^*\right)\right)}$$

The amount offered by the EMS under the care plan will decrease with the amount of informal care received by the beneficiary if the marginal utility of formal care decreases with the amount of informal care ($v_{1,MIC} < 0$), i.e. if formal care and informal care are substitutes or considered to be substitutes by the EMS. The fact that care plans are means tested with respect to informal care is a hot topic because the law is not entirely clear on this matter. We will be able to empirically verify the behaviour that the EMS seems to have adopted.

On the other hand, if marginal utility of formal care decreases with the level of autonomy ($v_{1,MA} < 0$), the amount offered by the EMS under the plan will increase, in the manner expected, with the level of dependence of the beneficiary (therefore decreasing with A).

$$\left.\frac{\partial M_1}{\partial A_1}\right|_{M_1^*} = -\left.\frac{\partial F / \partial A_1}{\partial F / \partial M_1}\right|_{M_1^*} = -\frac{v_{1,MA}\left(M_1^*, IC_1, A_1\right)}{v_{1,MM}\left(M_1^*, IC_1, A_1\right) + a_1^2 u_{1,ZZ}\left(Z_1\left(M_1^*\right)\right) + \left(\frac{1-\beta}{\beta}\right)(1-a_1)^2 W_{DD}\left(D_1\left(M_1^*\right)\right)} < 0$$

As for the effect of $\bar{M}$, a higher ceiling has no impact on the notified amounts unrestricted by the previous ceiling: there is thus no effect on beneficiaries initially "under the ceiling".

If $M_1^* < \bar{M}$: $\left.\frac{\partial M_1}{\partial \bar{M}}\right|_{M_1^*} = 0$

Scenario 2: Strict Budgetary Constraints

The programme can be reformulated as follows[a]:

$$\begin{cases} \max\limits_{M_1} \beta\left[v_1(M_1, IC_1, A_1) + u_1(Z_1)\right] + (1-\beta)\left[W(D_1)\right] \\ \qquad s.t. \quad M_1 \leq \bar{B}\,(< \bar{M}) \end{cases} \qquad (P'')$$

➔

Box *(contd.)*

where $\bar{B} = \frac{B-(1-a_2)\ \bar{M}}{(1-a_1)}$

Optimally, if the budgetary constraints are strict, the EMS will always offer beneficiary 1 an amount strictly below the ceiling ($M_1^* < \bar{M}$) and less than or equal to $\bar{B}$. Let us assume that the EMS is restricted by the departmental budget, i.e. the team would have intended to offer more to beneficiary 1:

$$M_1^* = \frac{B-(1-a_2)\bar{M}}{(1-a_1)}$$

When budgetary constraints are strict, we now see the following for certain types of beneficiaries who are "below the ceiling"[b]:

$$\frac{\partial M_1}{\partial \bar{M}} = \frac{-(1-a_2)}{(1-a_1)} < 0$$

$$\frac{\partial^2 M_1}{\partial \bar{M} \partial a_1} = \frac{-(1-a_2)}{(1-a_1)^2} < 0$$

An increased ceiling $\bar{M}$ (with the budget being maintained) would lead the EMS to lower the amount of the plan offered to beneficiary 1 ($\frac{\partial M_1}{\partial \bar{M}} < 0$), even more if beneficiary 1 has a high contribution rate ($\frac{\partial^2 M_1}{\partial \bar{M} \partial a_1} < 0$).

[a] *However, it is assumed that* $B > (1-a_2)\bar{M}$*, such that the département's budget remains strictly positive after the EMS offers the amount* $\bar{M}$ *to beneficiary 2. It is also assumed that the budget is insufficient to fund both plans at the ceiling.*

[b] *With this simplified model, we make the implicit assumption that the cover for beneficiary 2 still remains at the level of the ceiling, even after the increase of* $\bar{M}$*. Similar results could be shown without having to make this assumption.*

3. Empirical Specifications

If we take *i* to be a home care APA beneficiary whose GIR is known, living in department *j* during year *t*, whereby M_{ijt} is the amount that the EMS offers to the beneficiary under the care plan, which cannot exceed the ceiling $\overline{M_t}$ in force during year *t*. The notified plan amount is equal to the limit for almost 25% of the beneficiaries included in the 2011 sample: 18.4% of GIR 4 beneficiaries, 31.6% of GIR 3 beneficiaries, 35.2% of GIR 2 beneficiaries, and 51.6% of GIR 1 beneficiaries. In this instance of using censored data, the ordinary least squares estimate is biased. We must therefore find a suitable method to process the censored data to correctly estimate the change in the amount under the plan between 2011 and 2017, all other things being equal. The censored regression model, or Tobit model (Tobin, 1958), is therefore initially estimated:

$$M_{ijt} = \begin{cases} M_{ijt}^* & if\ M_{ijt}^* < \overline{M_t} \\ \overline{M_t} & if\ M_{ijt}^* \geq \overline{M_t} \end{cases}$$

where $M_{ijt}^* = X_{ijt}^{'}\beta + \delta j + \gamma t + \epsilon_{ijt}$ with $\epsilon_{ijt} \sim N(0, \sigma^2)$; where M_{ijt}^* corresponds to the latent amount selected by the EMS under the care plan, which cannot be seen beyond the ceiling, and the vector X_{ijt} includes age bracket, gender, and relationship status variables, including income brackets, with *j* being the beneficiary's home department and *t* being the year. This Tobit model is estimated on the basis of four sub-samples – one for each GIR. However, the Tobit model is restricted to estimating an average effect of the year on the amount proposed by the EMS. As predicted by the theoretical model, the changes in the amounts proposed between 2011 and 2017 can be expected to differ according to the size of the plans (small or large). In a second step, we therefore estimate multiple censored quantile regressions (Fack & Landais, 2009; 2010). Unlike the Tobit models, censored quantile regressions have the advantage that they do not rely on any parametric assumptions concerning error term distribution. Quantile regression estimates conditional quantiles rather than the conditional expectation of the dependent variable. In our example, the τ^e conditional quantile for the distribution of the amount M can therefore be formulated as:

$$Q_{M|Z}(\tau) = X_{ijt}'\beta(\tau) + \delta(\tau)\, j + \gamma(\tau) t,$$

where $Z = \{X; j; t\}$ represents the set of explanatory factors that can be seen from the quantiles relating to the distribution of the amounts.

Censoring has no impact on the conditional quantiles if they are strictly below the ceiling. The censored quantile regression estimator used here (see Online Appendix C1 – link at the end of the article) is a three-step estimator (Chernozhukov & Hong, 2002; Fack & Landais, 2009). This estimator makes it possible to obtain unbiased estimators with minimal variance for each value considered of τ. This enables to estimate the change in the

amounts offered to beneficiaries receiving small plans (lower quantiles) between 2011 and 2017 and the change in the amounts offered to beneficiaries receiving large plans (upper quantiles), the value of which is close to the ceiling, over the same period.

In order to analyse the role of the departmental budgetary constraints on EMS decision-making in greater detail, the Tobit models and censored quantile regressions are re-estimated on the basis of two sub-samples of different departments which have been created based on the proportion of beneficiaries in GIR 1 or 2 among all home care APA beneficiaries during 2015. The departments with the highest proportion of highly dependent beneficiaries targeted by the reform are those with the sharpest potential increase in the department's spending as a result of the Law's implementation, and therefore those which are likely to be subjected to the most heavily tightened budgetary constraints.

Lastly, the Tobit models and three[7] of the four censored quantile regressions are re-estimated on the sub-sample of beneficiaries whose monthly income is strictly below €739.80: this figure, expressed in euros as at 2017, is the level below which the beneficiary's contribution rate is zero in both 2011 and 2017. The ASV Law therefore does not result in any change to the contribution rate for these beneficiaries. In principle, the effects observed for this sub-sample can therefore be directly attributable to the ceilings being raised between 2011 and 2017.

4. Data

4.1. Sample

Individual APA-ASH reporting data are administrative data relating to everybody who receives the APA and the *Aide Sociale à l'Hébergement* (the ASH, housing benefits). These data cover the years 2007, 2011 and 2017 and are gathered from the departments' councils by the *Direction de la recherche, des études, de l'évaluation et des statistiques* (DREES) of the Ministry of Health and Social Affairs. The 2007 data are not included in this study because their coverage is restricted to just 34 departments. These data provide information on the main criteria of home care APA beneficiaries (age, gender, relationship status, income, GIR), their APA history (changes in dependency level or change of place of residence), and details of the care plans of which they have been notified (amounts, volumes, and types of care and providers). It is not a panel survey in the sense that beneficiaries included in the 2011 data cannot be re-identified in 2017.[8]

The data initially consist of 1,590,014 observations concerning home care APA beneficiaries in 102 departments. 967,625 observations correspond to beneficiaries in 2017 (60.9% of the sample) and 622,389 correspond to beneficiaries in 2011 (39.1% of the sample). As individual reporting was mandatory in 2017 but voluntary in 2011, the number of observations is much lower in 2011 because around one third of the departments did not respond. Several steps for selecting individuals and departments are implemented to create the final sample of beneficiaries included in the study (see Appendix). In particular, the sample only includes beneficiaries joining the scheme for the first time, i.e. those eligible to receive the APA from 1 June of year *N*-1. The aim is to ensure that the beneficiaries in 2017 benefited from the ceilings that entered into force after the ASV Law was implemented on 1 March 2016 while creating a sample of beneficiaries in 2011 that is comparable to the 2017 sample. The final sample includes information on 304,506 beneficiaries from the 56 departments that responded to the two waves of surveys, which includes two overseas departments (Guadeloupe and Martinique): 155,389 observations concerning beneficiaries in 2011 and 149,117 concerning those in 2017.

4.2. Descriptive Statistics

The average age of GIR 4 and 3 beneficiaries is higher in 2017 than in 2011, while there is no difference for GIR 2 beneficiaries, and GIR 1 beneficiaries are younger in 2017 (83.5 years on average in 2017 compared to 84.5 years in 2011, see Table 1). The proportion of female beneficiaries is lower in 2017 than in 2011, across all GIR. This difference is in line with the gap between male and female life expectancy contracting by more than 9 months between 2011 and 2017 while male life expectancy without disability fell further behind female life expectancy without disability (Deroyon, 2019). The proportion of beneficiaries in a partnership also tended to increase, from 38.5% in 2011 to 42.4% in 2017.

7. The sub-sample of GIR 1 beneficiaries whose income is strictly below €739.80 includes only 666 observations: the estimators of the quantile regression parameters cannot be estimated in a convergent manner.

8. The average length of time in receipt of the APA is three years and seven months and does not exceed six years for around 8 out of 10 beneficiaries (Boneschi & Zakri, 2018). Considering that these periods include any time spent in care homes, most beneficiaries of home care APA in 2011 are no longer receiving the allowance in 2017, in any case.

Table 1 – **Average characteristics of beneficiaries in the sample by GIR, in 2011 and 2017**

Variables	All GIR		GIR 4		GIR 3		GIR 2		GIR 1	
	2011	2017	2011	2017	2011	2017	2011	2017	2011	2017
Number of observations	155,389	149,117	92,797	94,068	33,303	30,683	26,125	22,363	3,164	2,003
Age	82.4	82.7	81.9	82.4	83.3	83.7	83.0	83.0	84.5	83.5
% women	0.675	0.648	0.708	0.682	0.643	0.607	0.604	0.572	0.619	0.562
APA resources (€/month)(1)	1,373	1,443	1,322	1,418	1,418	1,450	1,483	1,541	1,510	1,441
Contribution rate	0.239	0.251	0.227	0.254	0.249	0.244	0.264	0.252	0.262	0.216
In a couple	0.385	0.424	0.357	0.392	0.376	0.432	0.482	0.532	0.488	0.592
GIR 4 proportion	0.597	0.631								
GIR 3 proportion	0.214	0.206								
GIR 2 proportion	0.168	0.150								
GIR 1 proportion	0.020	0.013								
Ceiling (statutory ceiling)(1)	732	853	563	664	839	995	1,126	1,377	1,314	1,715
Proportion of 'saturated' plans (at the ceiling)	0.248	0.129	0.184	0.089	0.316	0.183	0.353	0.210	0.516	0.264
Plan amount(1)	507	495	367	358	604	616	811	852	1,070	1,129

(1) In euros (2017).
Notes: Unweighted values.
Reading Note: In 2011, the average age of GIR 4 beneficiaries in the sample is 81.9 years, compared to 82.4 in 2017.
Sources and Coverage: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017; home care APA beneficiaries in Metropolitan France and French overseas departments and territories (excluding Mayotte) in 2011 and 2017 who are eligible after 1 June of the year *N*-1 and reside in one of the 56 departments that took part in the individual reporting surveys in 2011 and 2017.

The average monthly income of beneficiaries increased from €1,373 to €1,443 (in constant euros[9]), mainly due to the trend of pensions improving for those generations affected by the APA. In line with expectations, the average rate of beneficiary contributions to care plan funding therefore increased by slightly more than one percentage point (from 23.9% in 2011 to 25.1% in 2017). Nevertheless, we see that the increased contribution rate is restricted to GIR 4 beneficiaries: GIR 3 beneficiaries were unaffected, and the rate even fell for those beneficiaries allocated to GIR 2 and GIR 1. The new calculation scale introduced via the ASV Law causes the rate to fall when the amount under the plan exceeds certain thresholds that are met more frequently by the most heavily dependent beneficiaries. The distribution of beneficiaries joining the scheme, by GIR, also shifted slightly in the sample between 2011 and 2017, with the proportion of beneficiaries allocated to GIR 4 increasing from 59.7% in 2011 to 63.1% in 2017. The ceilings, in constant euros, increased between 2011 and 2017 (18% for GIR 4 beneficiaries, 19% for GIR 3 beneficiaries, 22% for GIR 2 beneficiaries, and 31% for GIR 1 beneficiaries).

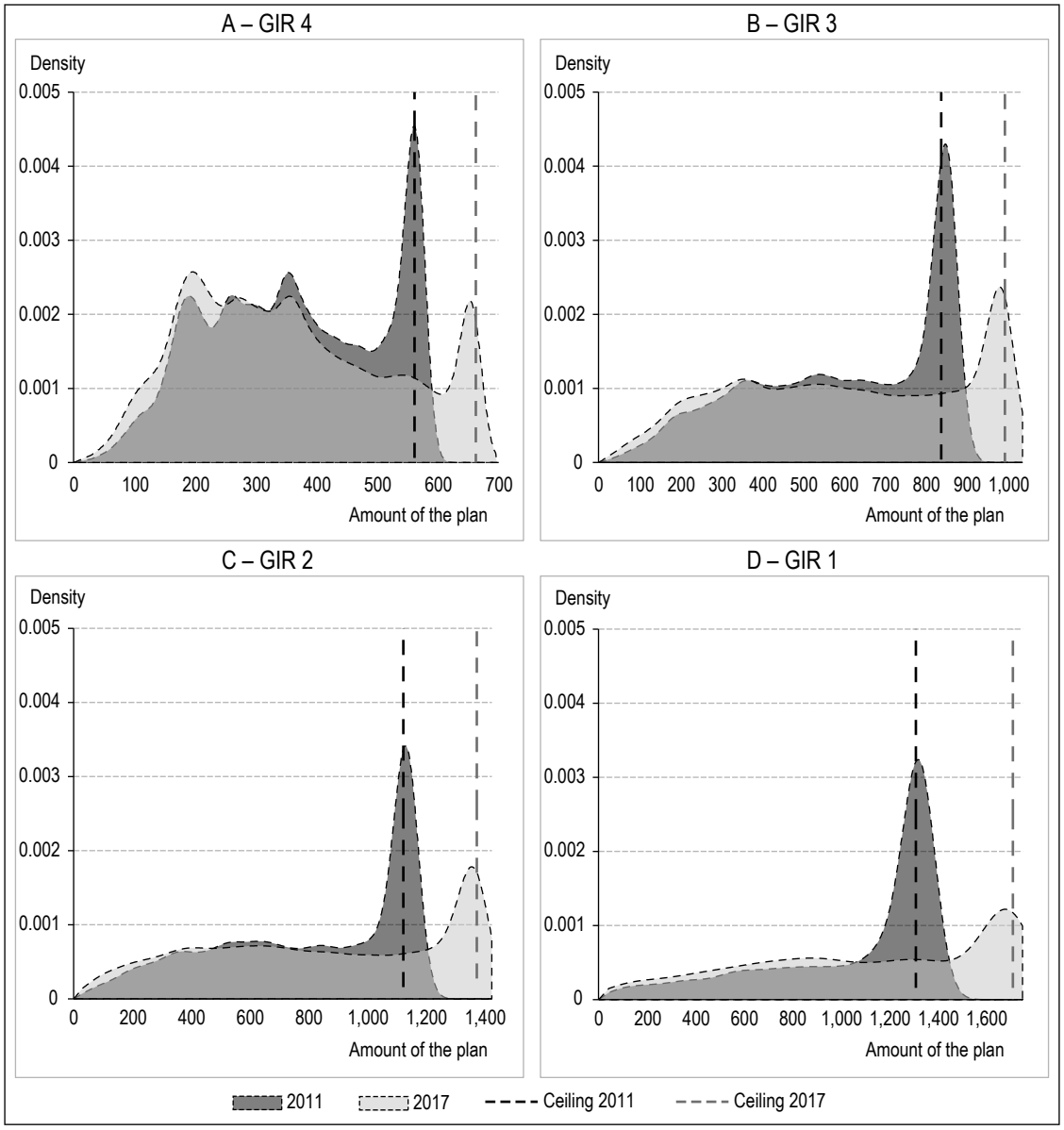
Looking at the distribution of plan amounts, by GIR in 2011 and 2017 (figure II), the probability that a beneficiary receives a plan amount equal to the ceiling falls considerably for each GIR between 2011 and 2017. The increased ceilings resulting from the ASV Law have therefore resulted in fewer instances of the ceiling restricting selections made by the EMS. For almost 50% of GIR 4 beneficiaries in 2017, the amount included in the plan is between €200 and €375 and therefore well below the ceiling (€664). The beneficiaries' disability profiles or the amounts proposed by the EMS for a given type of disability would be more variable among beneficiaries allocated to GIR 4 than those in other GIR. Regardless of the GIR, the distribution of plan amounts furthest from the ceiling shifts to the left: GIR 4 beneficiaries are more likely to be notified of an amount below €250 in 2017 than in 2011. Similarly, beneficiaries are more likely to be notified of a plan below €350 (GIR 3), €500 (GIR 2) or €1,000 (GIR 1) in 2017 compared to in 2011.

5. Results

The results of the Tobit models, by GIR, are shown in Table 2. These models include departments' fixed effects, introduced to eliminate constant departmental characteristics over time that would influence the average amount proposed by the EMS. First, the constant, which represents the order of magnitude of the average plan amount proposed by the EMS, increases strongly with the beneficiary's level of dependence. For a given GIR, the average

9. Income, amounts and ceilings for 2011 are corrected to reflect the growth rate of the constant attendance allowance (MTP) between 1 January 2011 and 1 January 2017 (6.4%), which itself follows the price index. This percentage change is slightly lower than that observed in the sample for the median hourly rate for human assistance. The median hourly rate is calculated as the quotient of the costs for human assistance notified in the plan over the number of notified hours of human assistance, and increases here by 9.2% (rising from €18.40 in 2011 to €20.10 in 2017).

Figure II – **Distribution of the plan amounts by GIR, in 2011 and 2017, in constant €**



Notes: Unweighted values. Amounts in euros (2017). The ceilings are represented by vertical dotted lines.
Reading Note: In 2017, the probability that the amount notified to a GIR 3 beneficiary falls between €500 and €750 is approximately equal to 0.001*(750-500)=0.25 (dark grey area under the curved line between the points 500 and 750 on the x-axis).
Sources: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017.

plan amount proposed also increases with the age of the beneficiary: for a GIR 4 beneficiary, it varies by around €30 depending on whether the beneficiary is under 75 or between 85 and 90. The increase between these two age groups is €68 for a GIR 3 beneficiary. The difference rises to €76 for a GIR 2 beneficiary and €105 for a GIR 1 beneficiary.

The EMS offers a higher notified plan amount to women in a partnership than to men in a partnership. This is even more the case if the beneficiary is severely dependent. With all other characteristics remaining fixed, the EMS offers an extra €15 to a female GIR 4 beneficiary living in a partnership compared to a male equivalent. Among beneficiaries in a partnership, the difference between genders is clearly more pronounced among GIR 1, 2 and 3 beneficiaries (+€81 for female GIR 2 and 3 beneficiaries and +€91 for female GIR 1 beneficiaries). These differences between genders could partly be explained by the different types of tasks for which men and women say that they need care, for a given GIR (Soullier & Weber, 2011). Nevertheless, the difference between men and women living alone is clearly less pronounced, regardless of the GIR. Other things equal, the amount under the plan that the EMS offers to a beneficiary living alone is higher than that for a beneficiary co-habiting with a partner. The average difference is around

Table 2 – **Results of the Tobit models on the care plan amount by GIR**

	GIR 4		GIR 3		GIR 2		GIR 1	
Constant	325.6***	(4.4)	456.0***	(16.3)	673.6***	(30.7)	1,039.8***	(120.2)
Age (*Ref. [60 ; 75[)*								
[75 ; 80[	7.9***	(1.3)	25.8***	(4.4)	21.6**	(7.2)	-0.2	(31.0)
Age : [80 ; 85[	17.1***	(1.2)	46.4***	(3.9)	53.1***	(6.4)	83.1**	(28.9)
Age : [85 ; 90[	29.6***	(1.2)	67.5***	(3.8)	76.0***	(6.3)	104.6***	(28.2)
Age : 90 or +	45.2***	(1.3)	70.8***	(4.0)	72.1***	(6.7)	42.3	(29.4)
Gender and couple status (*Ref. Man in a partnership)*								
Woman in a parternship	15.1***	(1.2)	81.0***	(3.7)	80.7***	(5.6)	91.0***	(22.9)
Man single	72.5***	(1.4)	189.1***	(4.0)	266.4***	(7.4)	177.7***	(34.0)
Woman single	69.1***	(1.0)	198.8***	(2.9)	278.6***	(5.0)	205.3***	(21.5)
Income in euros / month *(Ref. [0 ; 739.8[)*								
[739.8 ; 1 000[	-9.0***	(1.5)	-9.8**	(4.5)	-1.1	(7.9)	46.8	(30.1)
[1 000 ; 1 250[	-20.3***	(1.4)	-29.8***	(4.4)	-19.6**	(7.6)	-25.9	(29.5)
[1 250 ; 1 500[	-29.8***	(1.4)	-33.9***	(4.5)	-48.1***	(7.9)	-19.9	(31.1)
[1 500 ; 2 000[	-31.3***	(1.4)	-44.4***	(4.4)	-64.0***	(7.6)	-49.3	(30.3)
[2 000 ; 2 500[	-26.5***	(1.7)	-36.0***	(5.2)	-77.0***	(8.8)	-102.6**	(35.4)
2 500 or +	13.7***	(2.1)	-5.3	(5.6)	-11.3	(9.1)	-26.9	(36.1)
Departmental fixed effect	Yes		Yes		Yes		Yes	
Year 2017 *(Ref. 2011)*	-9.1***	(0.8)	15.3***	(2.4)	48.8***	(4.1)	55.8**	(18.0)
σ	159.2***	(0.3)	280.3***	(1.0)	414.9***	(1.7)	540.2***	(7.5)
N	186,865		63,986		48,488		5,167	

Notes: Unweighted values. Amounts in euros (2017). The standard errors are shown in brackets. * p < 0.10 ; ** p < 0.05 ; *** p < 0.001.
Reading Note: On average, the EMS offer a notified plan amount that is €29.60 higher to a GIR 4 beneficiary aged between 85 and 90 than to a GIR 4 beneficiary under the age of 75, all other things being equal.
Sources: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017.

€70 for a GIR 4 beneficiary, €190 for a GIR 3 beneficiary, and close to €270 for a GIR 2 beneficiary. The smaller difference observed for a GIR 1 beneficiary (close to €180) than for a GIR 2 beneficiary (around €270) is discussed below. These gender effects among beneficiaries in partnerships, and relationship status effects (men and women combined), therefore also seem to reflect the role of informal care potentially or actually provided by spouses, and specifically wives, on the amounts of assistance offered. Among beneficiaries in partnerships, either women cannot rely on receiving the same level of informal care as men, or the EMS make this assumption when preparing the care plan. Informal care is assigned to women more often than men in society, even today (Weber, 2010). At a given age, women are also in better health than their husbands on average and are therefore potentially more capable of providing care. The effect of living in a partnership tends to decrease among GIR 1 beneficiaries compared to GIR 2 beneficiaries, for both men and women. Beneficiaries in this category require so much care that the need to be notified of a large plan depends less directly on the amount of informal care received than for GIR 2 beneficiaries.

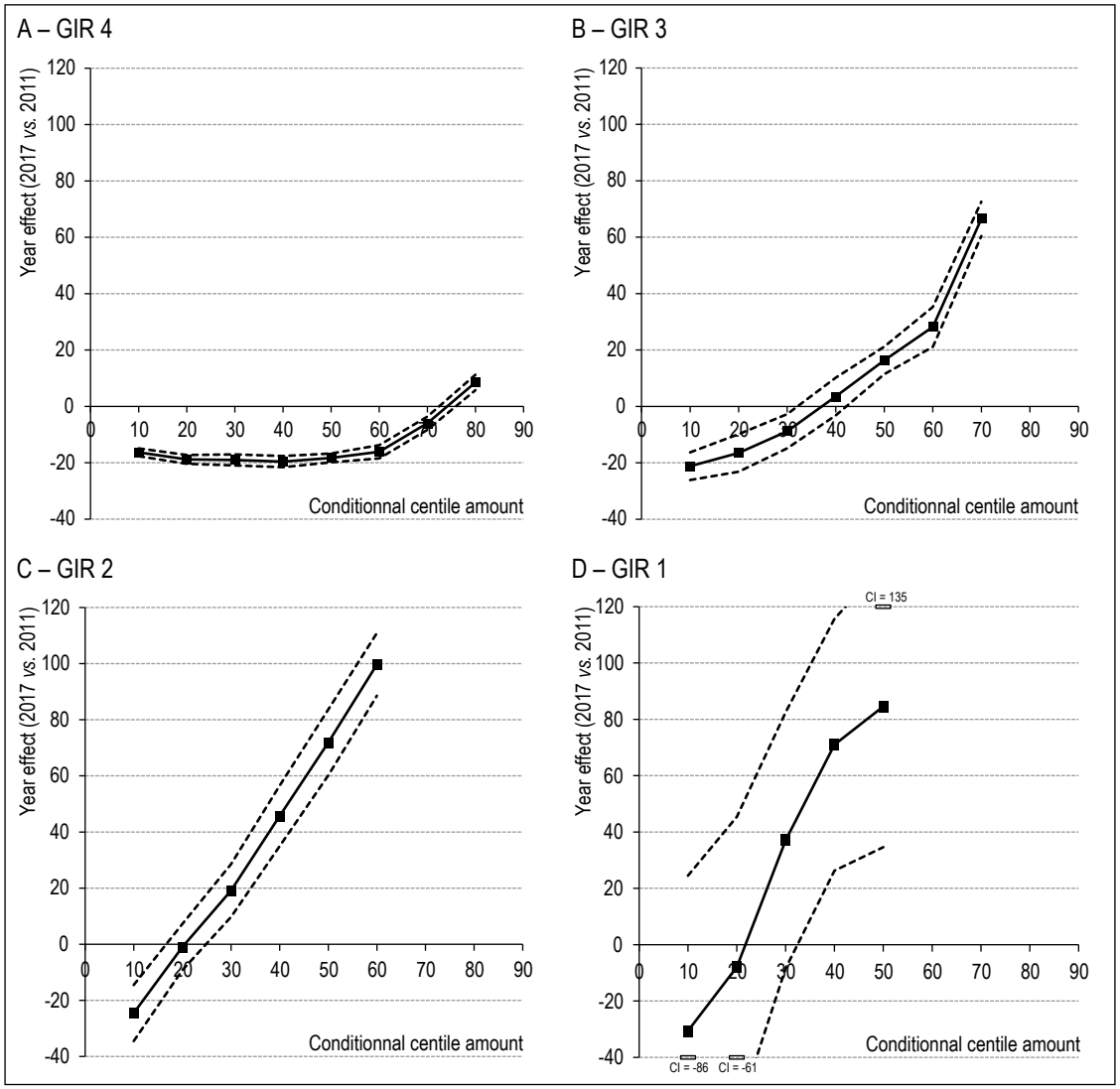
Regardless of the GIR, the amount that the EMS proposes under the plan is considerably higher for beneficiaries with income strictly below €1,000. Among GIR 4 beneficiaries, the amount proposed is also considerably higher for beneficiaries with income strictly above €2,500. These two groups of beneficiaries (low income and high income) are those for which the contribution rates before the reform are either very low or very high. Returning to the theoretical model presented earlier, this result could reflect the fact that the respective weights given by the EMS to the beneficiary's utility and to the department's spending in its own utility function (i.e., the coefficients β and 1- β in the theoretical model) depend on the beneficiary's level of income. When faced with low-income beneficiaries, the EMS would place greater importance on their utility than on departmental spending. The team would therefore offer a higher average amount to beneficiaries in the lowest income bracket because the marginal cost of care for these beneficiaries is low (or even nil), even though the marginal cost for the department is high. As a result, the amount offered to these low-income beneficiaries would be a decreasing function of their contribution rate. Conversely, when faced with higher-income beneficiaries, the EMS would give more weight to minimising the department's spending in its utility function. The team would therefore offer a higher average amount to beneficiaries in the highest income bracket because the marginal cost of care for

the department is low. As a result, the amount offered to these high-income beneficiaries would instead be an increasing function of their contribution rate.

Other things equal, the average amount offered by the EMS to a GIR 4 beneficiary fell by around €9 between 2011 and 2017 even though the ceiling was raised. The sign of this average effect seems to validate the second scenario under the theoretical model: to be able to compensate for the additional cost of the ASV Law's implementation for the department, and thus comply with the budgetary constraints, the EMS would have therefore reduced the amount proposed to certain GIR 4 beneficiaries. On the other hand, the average amount that the EMS propose to beneficiaries assessed as belonging to GIR 3, 2 and 1 saw a considerable respective increase of €16, €49 and €57 between 2011 and 2017.

The changes in the amounts proposed by the EMS for the different quantiles in the non-censored part of the distribution are derived from quantile regressions for each GIR (Figure III). Regardless of the GIR, the changes in the plans proposed to beneficiaries receiving low amounts differ from the changes in the plans proposed to beneficiaries receiving amounts that are close to the ceiling, as could be seen in the unconditional descriptive statistics (cf. Figure II). For GIR 4 beneficiaries, the EMS lowered the amount proposed to a very large proportion of beneficiaries below the initial ceiling (from -€15 to -€20 on average between the 10th and 60th percentiles; -€6 for the 70th percentile).

Figure III – **Changes in the amounts proposed by the EMS between 2011 and 2017, other things equal, by conditional percentile (by GIR)**



Reading Note: The solid curves represents the results of the censored quantile regressions (effect of the year 2017 compared to 2011) for each GIR. The dotted curves represent the 95% confidence interval calculated by bootstrap (50 replications). The amount offered by the EMS to GIR 4 beneficiaries falls by €16 between 2011 and 2017 at the conditional 10th percentile.
Sources: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017.

For individuals in GIR 3 and GIR 2, the effect increases strictly with the quantile, and the proportion of beneficiaries affected by a decrease in the plan amount proposed between 2011 and 2017 is smaller than among GIR 4 beneficiaries. The decrease in the amount can only be seen for the 10th, 20th and 30th percentiles among GIR 3 beneficiaries, and only for the 10th percentile among GIR 2 beneficiaries. By contrast, the increase in the proposed amount affects a larger proportion of beneficiaries below the initial ceiling: the increase is significant for the 50th, 60th, and 70th percentiles among GIR 3 beneficiaries (+€16, +€28, and +€67, respectively). Among those in GIR 2, the increase is significant starting from the 30th percentile (from +€20 for the 30th percentile to +€100 for the 60th percentile). No significant decrease in the amount can be seen between 2011 and 2017 among those in GIR 1. The effect of the year continues to grow and reaches +€85 for the 50th percentile. Nevertheless, the effects are not accurately estimated due to the small GIR 1 beneficiary sample sizes.

In order to analyse in greater detail the role played by the departmental budgetary constraints on the changes observed, the Tobit models and censored quantile regressions are re-estimated on the basis of two sub-samples of departments which have been created based on the proportion of beneficiaries in GIR 1 or 2 among all home care APA beneficiaries during 2015 (see Online Appendix C2, Table C2-1). The departments where the proportion of GIR 1 and 2 beneficiaries is higher than the average are those with the sharpest potential increase in spending as a result of the Law's implementation, and therefore those which are likely to be subjected to the most heavily tightened budgetary constraints. The reduction in the amount offered to GIR 4 beneficiaries between 2011 and 2017 is greater in these departments (from -€21 to -€28 between the 10th and 60th percentiles) than in those with a lower proportion of GIR 1 or 2 beneficiaries (from -€3 to -€10 between the 10th and 60th percentiles). Similarly, among GIR 3 beneficiaries, the amount notified decreases significantly up to the 30th percentile, at the 1% threshold, and up to the 40th percentile (at the 10% threshold) in departments where the proportion of GIR 1 or 2 beneficiaries is higher than the average. On the other hand, a significant decrease in the amount notified between 2011 and 2017 can only be seen for the 10th percentile in departments where the proportion of highly dependent beneficiaries is below the average.

Up to now, the models have been estimated on the basis of all home care APA beneficiaries. The effects of the year 2017 are re-estimated on the basis of the sub-sample of beneficiaries whose monthly income is strictly below €739.80 (see Online Appendix C3, Table C3-1). This is the income level below which their contribution rate remained constant and equal to zero between 2011 and 2017. Despite a number of variations for certain quantiles, the estimated effects derived from this sub-sample remain highly consistent with those seen using the full sample. This test rules out the possibility that the effect seen in the sample as a whole is due to the drop in the contribution rate for high plan amounts, and confirms the influence of the increased ceilings, following the ASV Law's implementation, on the amounts proposed by the EMS under plans.

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This article aimed to evaluate the effect of the 2015 home care APA reform on the amounts proposed by the EMS to beneficiaries as part of plans. A simplified theoretical model was presented in which two possible behavioural responses were considered, depending on the severity of the departmental budgetary constraints, and several censored regression models were then estimated from individual reporting data on home care APA beneficiaries in 2011 and 2017. One of the main objectives of the reform was to improve the level of coverage to meet the needs of the most heavily dependent beneficiaries, and this seems to have been achieved. Between 2011 and 2017, other things equal, we witness an increase in the average plan amounts notified to the most severely dependent beneficiaries, namely those in GIR 1 or 2. We also witness an upward shift (to the right) of the care plan distribution for beneficiaries requiring the most care, within each GIR. The empirical results also show that the reform did not result in a simple "spreading" of the upper distribution of notified amounts for a given GIR. In other words, the effect of the increased ceilings is not just reflected in results close to the ceilings, as a simplistic forecast might have predicted. Nor did the reform result in a shift in the overall distribution towards higher amounts for a given GIR. On the contrary, within each GIR, the amounts notified in 2017 are more widely distributed on the right and on the left. This spreading effect also impacts the lower distribution, which suggests that constraints on departmental council budgets have led EMS to cut allowances for people with relatively less dependency so as to provide more funding for people who are severely affected by a loss of autonomy. This trade-off can also be seen between GIR levels, because, all other things

being equal, the average amount offered by EMS to a GIR 4 beneficiary fell by around €9 between 2011 and 2017, while it increased for GIR 3 (+€16), 2 (+€49) and 1 (+€57), respectively. The analyses using department sub-samples also indicate that the trade-off is more pronounced within departments with an above-average proportion of highly dependent beneficiaries (those in GIR 1 or 2), i.e. in departments facing the highest potential additional costs due to the reform. The ASV Law has therefore produced the expected effects on the plan amounts notified to those most severely affected by a loss of autonomy (within a single GIR and between different GIRs) but it has also affected those same amounts for the least dependent beneficiaries. Due to the tighter budgetary constraints placed on the departments, the Law has led to APA resources being transferred from the least dependent senior citizens to the most heavily dependent senior citizens.

Several limitations to this work can be identified. First, data from 2011 and 2017 are used, while the ASV Law was adopted on 28 December 2015 with the part of the Law relating to home care APA being implemented on 1 March 2016. Events other than the Law, that took place between 2011 and 2017 and which cannot be seen in the data may have affected the amounts that the EMS offered to home care APA beneficiaries. In particular, it seems that there may have been a general tightening of departmental finances before the ASV Law was implemented, given the drop in the average amount, per beneficiary, of home care APA paid by departmental councils between 2013 and 2015 (Arnault, 2019). The changes observed must therefore be interpreted with some caution: part of the measured effects could also derive from changes in unobserved characteristics of the beneficiaries, such as their health status in a given GIR, or from changes in GIR allocation, for a particular health status or degree of lost autonomy. If the health and autonomy status of the less dependent beneficiaries among those in GIR 4 were to improve between 2011 and 2017 such that they required less subsidised care, this could lead to an overestimation of the trade-offs made between marginally dependent and heavily dependent beneficiaries due to the reform. On the other hand, these trade-offs could be underestimated if the needs of beneficiaries in a given GIR were to increase, i.e. if APA eligibility conditions were to become more restrictive, particularly for the most independent beneficiaries. These questions cannot be answered on the basis the administrative data used in this study because, GIR aside, they do not collect any detailed information about a beneficiary's health status or the nature of their care requirements. The exclusion of "previous" beneficiaries also means that re-evaluations of the care plans under new conditions, to which the beneficiaries may have been entitled, go unobserved. These re-evaluations may have had an impact on departmental budgetary constraints and, in turn, may have affected the average amounts notified to beneficiaries joining the scheme in 2017. Lastly, this work does not yet allow us to understand precisely whether the changes observed between 2011 and 2017 in the amounts notified by the EMS reflect "quantitative" variations in the volumes of care notified, "qualitative" changes in the types of care providers prescribed with constant volumes of care, or changes in the hourly rates of care set by the departments with the type of care provider remaining the same. The current analysis could be extended by studying the determining factors of notified volume of care or type of intervention rather than the amount notified. However, the information collected for these two factors, particularly in 2011, is of relatively poor quality as a substantial number of departments did not provide this data for all beneficiaries. Working on the basis of notified volumes of care rather than amounts would also make it more difficult to correctly censor the data due to the ceilings.

Few studies have been carried out on medical and welfare teams (EMS) up to now. However, this article provides a better understanding of their practices and their decisive role in the implementation of public policy concerning loss of autonomy. It shows that these teams have responded positively to the ASV Law by increasing the care plan amounts for the most heavily dependent beneficiaries. However, as they are working within a financially restrictive environment, this article also shows that they have reduced these same amounts for the most independent beneficiaries. With the focus having now shifted to preventing the loss of autonomy, questions may arise as to how these trade-offs made by the EMS may impact the likelihood of meeting this objective. The crucial role played by the EMS in the implementation of the Law is highlighted in this work, and we may also wonder to what extent their highly varying practices are a source of unequal treatment among beneficiaries throughout France. □

Link to the Online Appendix: https://www.insee.fr/en/statistiques/5396138/ES-524-525_Arnault-Wittwer_Online_appendix.pdf

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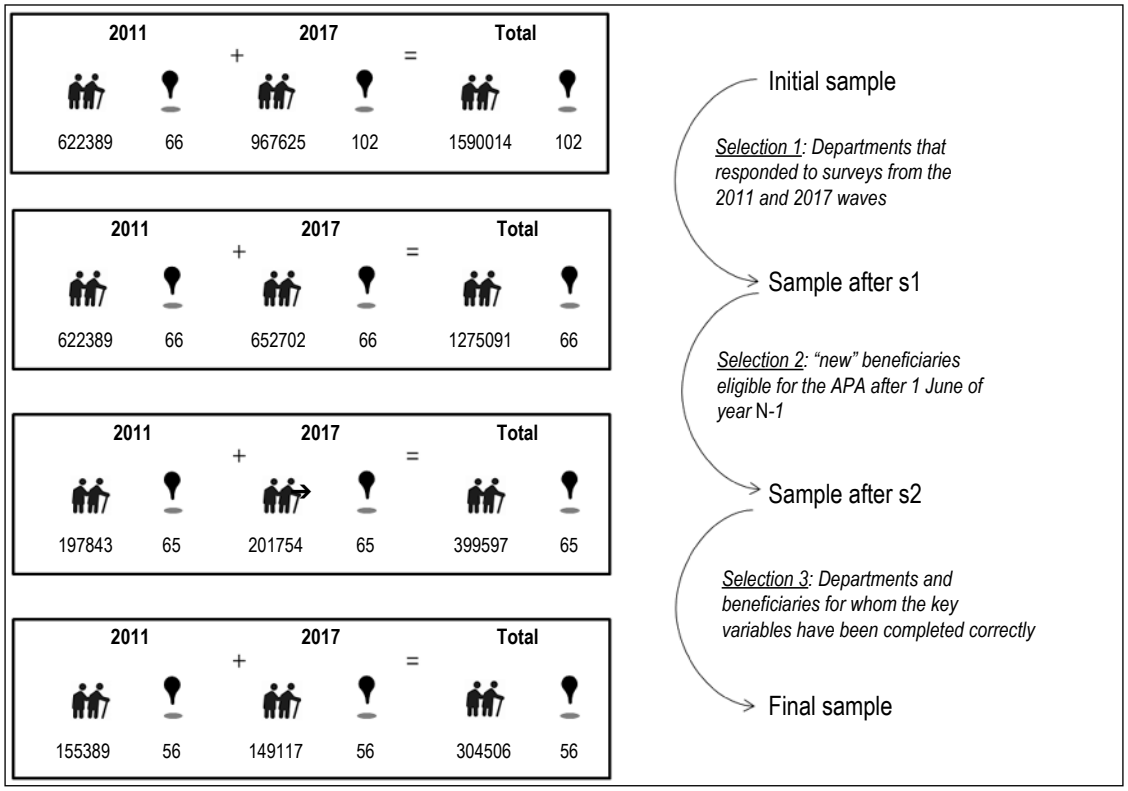
APPENDIX

SELECTION OF BENEFICIARIES FOR THE SAMPLE

After pooling the 2011 and 2017 data, they initially include 1,590,014 observations concerning home care APA beneficiaries in 102 departments. Several steps for selecting individuals and departments were required to create the final sample (Diagram). The first step involves selecting only beneficiaries from departments that took part in both data collection exercises, in 2011 and 2017. This leads to the exclusion of 314,923 lines corresponding to the beneficiaries in 2017 from departments that did not take part in 2011. The second step involves retaining only those beneficiaries joining the home care APA scheme for the first time – i.e., those eligible to receive the APA from 1 June of year *N*-1. These beneficiaries account for 33.6% of all home care APA beneficiaries entitled to the allowance in 2011 and 33.2% of those entitled to it in 2017. These beneficiaries are younger on average and more often tend to be men, with higher income, in a partnership, and less heavily dependent than "previous" beneficiaries, who are excluded from the sample (Table A1). The third selection step involves excluding departments for which most of the key variables (age, GIR, relationship status, income and plan amount) have been completed poorly, as well as individuals for whom at least one of these items of information is missing. The final sample includes information on 304,506 beneficiaries from the 56 departments that took part in both information collection exercises (see Map).

Diagram – **Selection of the final sample of home care APA beneficiaries in 2011 and 2017**



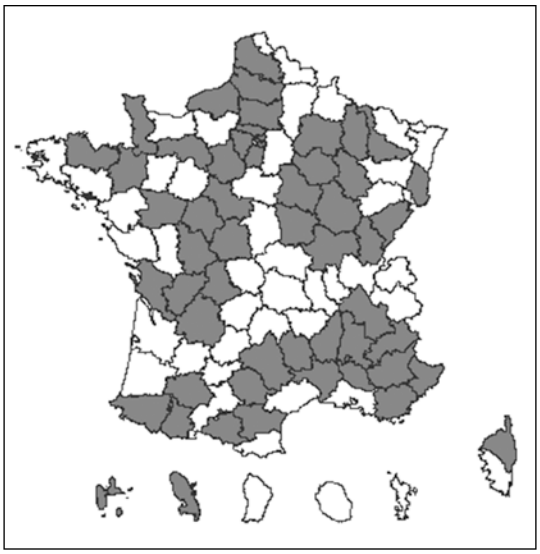
Notes: Unweighted values.
Reading Note: The initial sample consists of 1,590,014 home care APA beneficiaries living in 102 different departments, including 622,389 beneficiaries in 66 departments in 2011 and 967,625 beneficiaries in 102 departments in 2017.
Sources: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017.

Table A1 – **Average characteristics of home care APA beneficiaries in 2011 and 2017, according to their date of eligibility**

Variables	2011		2017	
	"Joining" beneficiaries (eligible after 1 June 2010)	"Previous" beneficiaries (eligible before 1 June 2010)	"Joining" beneficiaries (eligible after 1 June 2016)	"Previous" beneficiaries (eligible before 1 June 2016)
Number of observations	197,843	424,546	215,199	437,503
Age	82.3	83.6	82.7	84.7
Proportion of women	0.671	0.747	0.648	0.740
Income (€/month) (1)	1,398	1,207	1,510	1,350
Beneficiary's rate of contribution to care plan funding	0.234	0.182	0.248	0.198
In a couple	0.386	0.321	0.417	0.337
GIR 4 proportion	0.593	0.535	0.617	0.524
GIR 3 proportion	0.213	0.228	0.210	0.240
GIR 2 proportion	0.170	0.202	0.155	0.201
GIR 1 proportion	0.024	0.036	0.018	0.035

(1) in euros (2017).
Notes: Unweighted values.
Reading Note: In 2011, beneficiaries who became eligible for APA after 1 June 2010 have an average age of 82.3 compared to 83.6 for those who became eligible before this date.
Sources and Coverage: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017; home care APA beneficiaries in Metropolitan France and French overseas departments and territories (excluding Mayotte) eligible for APA in 2011 or 2017 and living in one of the 66 departments that responded to the surveys in 2011 and 2017.

Map – **Departments from which beneficiaries joining the home care APA scheme in 2011 and 2017 have been included in the final sample**



Notes: The departments from which beneficiaries are included in the final sample are shown in grey, while the departments from which beneficiaries are not included in the final sample are shown in white.
Reading Note: Beneficiaries from the department of Pas-de-Calais, shown in grey, are included in the final sample.
Sources: DREES, *enquêtes Remontées Individuelles*, APA-ASH individual data, 2011 and 2017.

Linking Migration Reasons and Origins to Labour Market Outcomes: Recent Evidence from Europe

Mehtap Akgüç* and Cécile Welter-Médée**

Abstract – This paper aims to understand how the labour market integration of migrants in Europe is affected, in an interrelated fashion, by their reason for migration and their region of origin. Using recent data from the European Labour Force Survey, we distinguish immigrants to Europe between four migration motives: economic, education, family reasons, or international protection. We compare labour market outcomes of these categories of immigrants through earnings, controlling for a variety of individual factors (including language skills and age at migration), and we also investigate the role of selection into employment. Our results suggest that an economic reason for migration together with already having a job upon arrival is positively associated with higher, while, other things equal, refugees and family migrants are more likely to end up with lower earnings. However, when estimating full interaction models, we find that these results are highly dependent on where migrants come from.

JEL Classification: C13, C25, F22, J61
Keywords: migration, migration motives, region of origin, labour market integration, earnings gap, cross-country study, Europe

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Immigration, that is, the arrival of foreign-born populations and their integration in a host country, has long been a topic of political debate in many countries. Part of the debate revolves around the economic and social integration of migrants. However, integration is a complex process that involves both the migrants' individual characteristics and the host countries' immigration and integration policies, reflected in the success of immigrants in the labour market of their host country. The literature on this subject has revealed important gaps between the labour market performance of migrants and that of native-born populations, and these gaps seem to persist across immigrants' generations (see Algan *et al.*, 2010, among others). However, immigrants are not a homogeneous population, in particular with regard to the reason for their migration and their country of origin – the two being possibly linked.

This paper analyses the labour market outcomes of migrants in the European Union (EU) in this perspective, by addressing the following research questions: Do different migration motives affect labour market outcomes and hence influence the economic integration of migrants in Europe? Controlling for other observable characteristics and region of origin, how is a migrant's earnings level affected by his/her reason for migrating? Does the impact of the reason for migration on earnings depend on where the migrant comes from? Finally, how much does selection into employment play a role in explaining the link between a migrant's earnings and reason for migration?

Using data from the European Labour Force Survey (EU-LFS hereafter), we address these research questions by considering possible heterogeneity among migrants beyond conventional observable characteristics. Furthermore, we use information on migration which is rarely available: the main motivation, or reason, for migration. The population of interest is the foreign-born population (first-generation migrants), broken down by reasons for migration, such as economic reasons (employment, distinguishing between those who arrived in the host country with a job already arranged and those who did not), family reasons (reunification), international protection, and education. Taking the migration motive into account provides further insights into the labour market and integration aspirations of different migrant groups and helps to avoid considering migrants as one homogenous group. The reason for migration is possibly also influenced by the migrant's country of origin.

Our results suggest that migrating for economic reasons and already having a job upon arrival is positively associated with higher earnings, after controlling for individual specific factors. However, our main findings highlight that the reason for migration should not be considered separately, as its impact seems to also be highly dependent on the migrant's country of origin. For example, *ceteris paribus*, refugees and family migrants are more likely than other types of migrants to end up with lower monthly earnings; however, this is the case for those from certain regions of origin only (e.g. non-EU European countries, the Middle East or Asia). We also find that an economic motive of migration does not immediately translate into better earnings. Actually, in some cases (for example, when they are from Africa, the Middle East or Asia), economic migrants seem to perform in the labour market similarly to individuals with other migration motives, such as family migrants and refugees. We also find evidence of the closeness of the earnings of economic migrants with a job upon arrival and student migrants.

The contribution of this paper is threefold. First, using a recent cross-country dataset – the EU-LFS –, we compare the labour market outcomes of various categories of immigrants in the EU, while most of the literature compares migrants to natives. Second, we incorporate the migration motive together with the region of origin to understand the differences in labour market outcomes (measured through the position in the earnings distribution). Third, our earnings model implements an econometric technique to control for selection into employment, while respecting the ordered nature of the outcome variable. This evaluation of the role of selection in explaining the differences in observed outcomes is almost never tackled in the literature.

The paper is structured as follows: Section 1 provides a brief overview of the literature on migrants' integration in the labour market; Section 2 describes the data, the main variables used, and provides a summary of the statistics; Section 3 presents the empirical strategy, and Section 4 the estimation results. Then we conclude.

1. Literature Review

While the literature on the labour market integration of migrants is vast, studies that consider this issue from the angle of the migration motive are rather scarce. It is rare to find information on reasons for migration together with information on the labour market in most existing data with

a sufficient sample size across Europe. Some surveys include the reason for migration as a separate question, while others ask about entry visa category or admission class. Visa category is clearly correlated with migration motive, but it does not necessarily coincide with the latter: for example, a migrant with work-related objectives might end up migrating as a family member or as an asylum seeker; or a migrant might arrive in the host country as a student if this status is easier to obtain than the family reunification visa.

Among the papers that do look at migration motivation is that of Rodrigues-Planas & Vegas (2011). They focus on family-based and labour-based migration from Morocco to Spain and conduct their analysis by gender. They find that family-based female migrants earn less than labour-based migrants and that selection into employment is key to explaining the differences. This is one of the only papers considering the selection issue in the earnings equation in this context, as we do in our paper. Boeri *et al*. (2015) distinguish between legal and illegal migrants to study labour market outcomes as well as residence location in Italy. They find that living in areas highly populated by (particularly illegal) migrants is associated with lower employment rates. Campbell (2014) considers the motives of migrants (work, study, family, and asylum) in the UK and finds that work- and study-migrants have successful outcomes in employment and wages, while family migrants perform less well, and refugees perform the worst. The latter finding is similar to our own, but neither of these papers considers the joint effects of migrant's motive and region of origin on outcomes, and hence misses further heterogeneity in integration that we capture.

Other papers consider migrants' labour market outcomes in the host country in relation to entry visa type. For example, using a longitudinal survey of immigrants in Canada, Aydemir (2011) distinguishes several visa categories (family, skilled worker, business, and refugee) to study short-term labour market outcomes such as employment and earnings. He finds that immigrants selected for their particular skills have a modest earning advantage, but not higher employment rates in the short term. Akgüç (2014) looks at visa types among migrants upon arrival in France. She shows that the composition of visa categories varies by origin and gender and finds that migrants with work or student visas have better employment and earnings, while family migrants and refugees perform similarly, but worse in the labour market. Bevelander & Pendakur (2014), meanwhile, compare entry categories of migrants (family, refugee and asylum seeker) in Canada and Sweden and find that the earnings and employment trajectories of non-economic migrants are similar in both countries. Cortes (2004) looks at refugees and economic migrants in the US in 1980 and 1990 and shows that the former group has better outcomes then the latter group over time. Finally, Hunt (2011) finds that immigrants with student visas have a large earnings advantage over native-born in the US. Many of these findings are in line with our results, but we try to go further by identifying specifically how the employment outcomes of different migrant groups compare according to motivation and origin.

Moreover, most of these studies focus on one or two countries at a time, or sometimes they look only at migrants from a specific region of origin. Analysis at the cross-country level is restricted due to general data limitations. To the best of our knowledge, only very few studies use cross-country European data (as in this paper) in studying integration patterns in relation to motivation for migration. In those studies, the authors mainly rely on an earlier dataset from 2008. One of these studies, by Cangiano (2015), shows that the immigration status on arrival has an impact on participation in the labour market, the probability of being unemployed, and access to jobs that correspond to the migrant's skills. While the participation of family migrants and refugees in the labour market is positively associated with their length of stay, according to this study, it also appears that they are at a significant disadvantage regarding unemployment in almost all European host countries. Cangiano's analysis also provides information on policy differences between host countries and their effect on different categories of migrants. This is an important aspect because immigration policies are likely to shape not only the composition of immigration flows, but also the labour market outcomes of different categories of migrants. This is where migration and integration policies intersect.

Dustmann *et al*. (2017) provide a comprehensive analysis of refugee migration (including policies and the functioning of asylum systems) in Europe in the aftermath of the recent refugee crisis. They also look at past refugee waves using the 2008 ad hoc module of the EU-LFS. They find significant employment gaps between refugees and other non-EU15 migrants, controlling separately for years since arrival, area of origin, and these two variables jointly.

Another study using the earlier 2008 ad hoc module of the EU-LFS is by Zwysen (2018), who analyses the determinants of differences in integration patterns by different categories of migration motivations. In particular, he shows that, on average, non-economic migrants experience faster growth in earnings. To do so, Zwysen (2018) focuses on the concept of "host country human capital", first developed by Duleep & Regets (1999), and measures it according to three indicators: the possibility of obtaining equivalent qualifications in the host country, language skills, and potential naturalisation.

Fasani *et al*. (2018) use the two ad hoc modules (2008 and 2014) of the EU-LFS to analyse the labour market integration of refugees in Europe. They argue that given the different (i.e. forced) nature of the migration process of refugees compared to, say, voluntary economic migration, it is not surprising to observe a persistent gap between the labour market outcomes of refugees and other migrants. They pool all other migrants together (only distinguishing between EU and non-EU migrants) and compare them to refugees by looking at employment status, unemployment, labour force participation, the probability of being in a highly skilled occupation, and the probability of being in the lowest decile of income distribution. Their findings confirm the gaps between refugees and other migrants as regards the aforementioned outcomes of interest.

Our study goes beyond these last three papers in several ways. First, we consider earnings as a labour market outcome. Second, we study all migration reasons and all regions of origin, without focusing on a specific group. Third, we investigate the interrelation between migration reasons and origins to understand their impact on the labour market performance of migrants. Last but not least, we evaluate the importance of selection into employment as part of our empirical methodology. Unlike others, we also take into account the ordered nature of the outcome variables and use non-linear estimation techniques (rather than linear probability models).

2. Data and Summary Statistics

2.1. The European Labour Force Survey and the Variables of the Analysis

The EU-LFS is a large household sample survey providing quarterly and yearly results on the labour market participation of people aged between 15 and 64 years old and living in private households, as well as those outside of the labour force. The EU-LFS is conducted by the national statistical institutes across the European Union, and the national contributions are centrally processed by Eurostat. The whole process leads to a harmonised and representative dataset at the European level. All empirical analyses in this paper are thus conducted by using the appropriate weights provided in the data.

In order to fill part of the knowledge gap surrounding the experience of different categories of migrants in European labour markets, an ad hoc module (AHM) of the EU-LFS on the situation of migrant workers and their direct descendants was first carried out in 2008 (AHM-2008) and a second time in 2014 (AHM-2014).[1,2] These two ad hoc modules have only a few variables in common. Given that most of the existing papers mainly relied on the AHM-2008 (e.g. Dustmann *et al*., 2017; Zwysen, 2018), and because it is not possible to track the evolution of all variables over the two periods, we choose to focus on the most recent data from 2014. It is important to note, however, that some major European countries (Germany, Denmark, the Netherlands and Ireland) do not make their data available in the AHM-2014.[3] Moreover, using the AHM-2014 for our empirical analysis implies that all countries in the sample are pooled. This gives an average estimate for the pooled set of countries in the data and provides a larger sample size to conduct estimations. We thus acknowledge that some of the results could differ if the analysis was done for a single country. To partly address this limitation, country fixed effects are included in all estimations to reflect country-specific characteristics (e.g. demography, but also national immigration policies).

2.1.1. Reasons for Migration

Motives for migration[4] are very informative, since they usually reflect the arrival conditions of migrants in the host country. These conditions, in turn, explain the opportunities for different types of migrant at the entry in host countries' labour markets. The variable describing the main reason for migrating to the

1. EU-LFS ad hoc modules do not provide information about illegal or irregular status (an issue which is not within the scope of the survey). Nevertheless, we acknowledge that illegal migrants may constitute a non-negligible share of migrants in some countries. For example, according to a survey conducted by Boeri et al. *(2015), almost 20% of migrants in Italy are illegal migrants.*

2. Eurostat foresees a third ad hoc module focusing on migrants in 2021.

3. For example, Germany participated in the 2014 ad hoc module, but the data are not made available to users for research purposes because of the German national legislation on data privacy.

4. It should be noted that in cases where migrants have migrated multiple times, 'migration motivation' variable only captures the main reason given for their latest move.

current country of residence is collected at the individual level.

The data allow, first of all, to distinguish economic migrants from migrants with non-economic motives. Moreover, among economic migrants, those who had found a job before migrating can also be distinguished from those who began looking for a job only once they arrived in the host country. As intuition would suggest, we posit that economic migrants have higher chances of a better integration in the destination labour market, as having or looking for a job is the main reason for migration. As regards economic migrants without a job upon arrival, our *a priori* expectation is mixed, since their individual (observed or unobserved) characteristics, as well as the labour market conditions of the host country, also play an important role in determining integration patterns. As regards non-economic migrants, one can distinguish between family migrants (mainly linked to reunification), migrants who move abroad for education purposes, and migrants seeking asylum or international protection (refugees). We believe that student migrants are also quite different from other categories, as they tend to be better educated. One could even consider them among the economic migrant group, since they may later compare to high-skilled migrants. Therefore, we expect that all non-economic migrants, with the exception of student migrants, are less likely to be integrated into labour markets, as participating in the labour market is not the main reason for their migration.

We also consider age at the time of migration, as it has been shown to play an important role in the social and economic integration of migrants (e.g. Aslund *et al*., 2009). Many empirical studies support the hypothesis that migrants who arrive in the host country at a younger age perform better at school (e.g. Cortes, 2006; Gonzalez, 2003). For example, Bleakley & Chin (2008) found that the older a migrant's age upon arrival, the less proficient they tend to be in English in adulthood, and this might have negative consequences on the educational performance of the second generation. In fact, migrants arrived before the age of 15 tend to have a similar profile to second-generation migrants, because they generally continue their education in the host country and gain a better knowledge of the language than older migrants. Because we are interested in the labour market outcomes of first-generation migrants (without modelling their educational choices), we retain only migrants arrived in a host country after the age of 15.[5]

2.1.2. Region of Origin

Country or region of origin is usually considered as a good proxy for culture, and evidence suggests that it plays an important role in the social and economic integration pattern (see, among others, Akgüç & Ferrer, 2015; Fernandez & Fogli, 2009). In this paper, we classify migrant countries of origin into aggregated regions, as provided in the data. This gives us nine groups: *(1)* EU15 and EFTA (the European Free Trade Association)[6] (this will be our reference category); *(2)* Other EU (the remaining EU countries); *(3)* Other Europe (e.g. Balkan countries); *(4)* North Africa; *(5)* Other Africa; *(6)* Middle East; *(7)* Asia; *(8)* North America, Australia and Oceania; and *(9)* Central and South America.

2.1.3. Measuring Labour Market Integration

Being integrated in the labour market indicates the extent to which migrants achieve similar labour market outcomes as native-born individuals. The commonly used measures of integration of a group in the labour market are the employment and activity rates. While they do not describe the employment conditions and quality, they are still good indicators for comparing situations between distinct groups on the extensive margin. For example, people who are unable to negotiate job conditions due to a precarious personal situation are often forced into degraded working conditions or part-time work, or they leave the labour market.

In this paper, we measure labour market integration in terms of earnings, which could be considered as part of the intensive margin. As regards earnings, the EU-LFS provides only the earnings deciles for workers in salaried employment (hence the earnings of self-employed workers are not reported). Most studies compare migrants' outcomes to those of a reference group, which is usually the native-born. Here, however, we compare different groups of migrants and retain economic migrants who already have a job on arrival as the reference group. This reference group is very particular and has likely as good (sometimes even better) labour market outcomes as natives (see descriptive analysis); therefore, our results should be interpreted with this basis group in mind. Overall, we interpret the higher (resp. lower) earnings of a particular migrant group (defined

5. Conventionally, individuals who arrive before the age of 15 with their parent(s) are not asked their reason for migration and are automatically classified under the 'family' category.

6. EFTA countries are Iceland, Liechtenstein, Norway, and Switzerland.

by migration motive and origin) as a sign of better (resp. worse) integration into the labour market compared to this reference group.[7]

2.2. Summary Statistics

In 2014, about 11% of the population in Europe accounted for in our sample was composed of foreign-born individuals, with different migration reasons (Figure I). More than half of the migrants in Europe (51.9%) in 2014 had family motives, followed by economic motives, which accounted for one third of migrants (31.7%). Among economic migrants, one third already had a job on arrival. Meanwhile, refugees constituted about 4.1% of total foreign-born populations and student migrants made up 7.1%. Given that AHM-2014 data include neither the four major destinations nor the last inflow of refugees to Europe since 2015, the proportions in this figure would correspond to a lower bound of the current numbers, especially as regards refugees.

Table 1 presents summary statistics of the main variables used in the analysis. We report the variables of interest across migrant grouped by reason for migration, together with figures on the native-born as another benchmark.[8]

Family migrants have the lowest employment rates of all migrant groups (53%). They mainly come from within the EU and have relatively advanced language skills. There are at least two possible reasons as to why this is the case: most European countries require a language test to be accepted for family reunification[9] and/or family migrants usually arrive at a younger age, which could mean more possibilities of learning the host country's language. The second largest group is that of economic migrants (either with a job on arrival and without). Their employment rate is unsurprisingly very high (82%) and they have relatively good language skills. Migrants arrived for educational reasons are significantly younger than the other groups, with employment rates lower than economic migrants, but higher than family migrants and refugees. This subgroup is the one with the highest share of highly skilled individuals. Their average duration of stay is generally similar to or slightly longer than that of economic migrants, which means that some might stay after their studies.

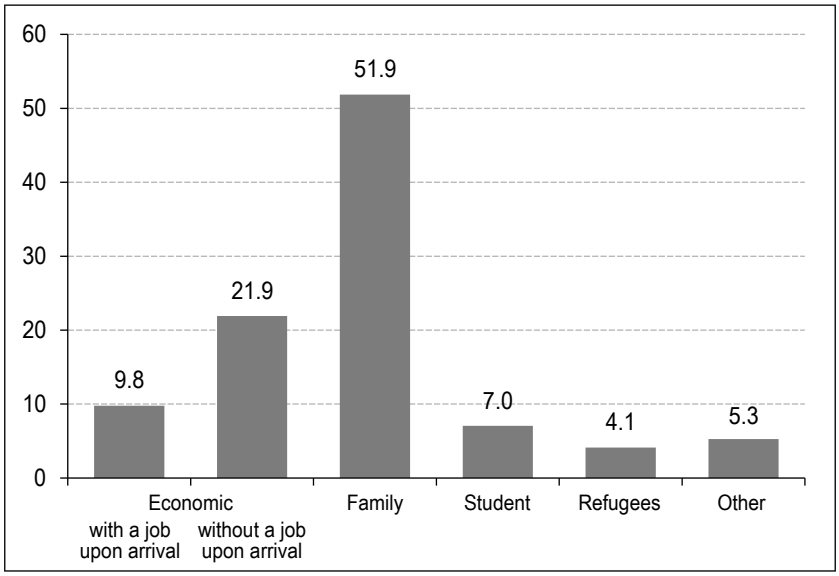
Refugees have, on average, a lower employment rate (57%), similar to that of family migrants. Nearly one third of them are highly skilled (in the same proportion as the native-born). They come mainly from Africa, Other Europe, Asia, and the Middle East. Migrants tend to live in urban city centres rather than in rural areas (see Akgüç & Ferrer, 2015, among others) for

7. Going further in the analysis of labour market integration would require including job quality indicators (e.g. type of employment contract, weekly hours, etc.); this dimension is left to future research.

8. AHM-2014 also provides the category 'Other' among reasons for migration. However, as this group appears to be rather heterogeneous, we do not comment on its characteristics but keep it for the empirical analysis as a residual group.

9. As discussed in a recent report by the European Commission (2019) on the implementation of Directive 2003/86/EC on the Right to Family Reunification, Member States usually require family members to demonstrate and/or acquire language proficiency prior and/or after admission (usually as part of their integration programmes). For more details, see https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0162&from=EN

Figure I – **Migration reasons (%)**



Notes: The sample includes only migrants aged 15-64 and living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland).
Sources: EU-LFS 2014 ad hoc module.

Table 1 – **Summary statistics of individual characteristics of native-born and migrants by reason for migration**

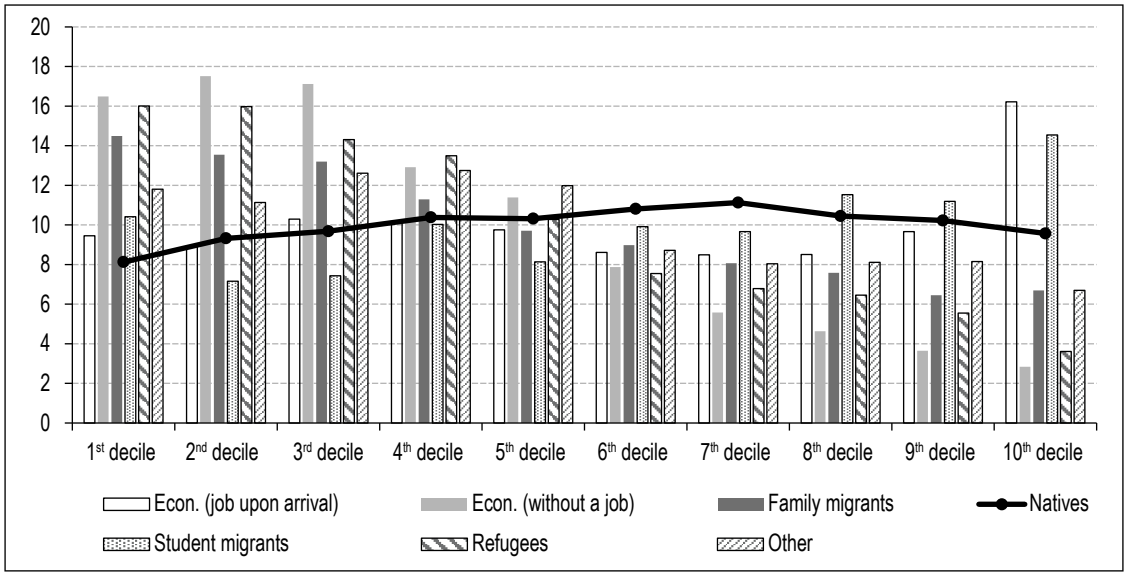
		Native-born	Migrants by reason for migration					
			Economic		Family	Student	Refugees	Other
			with job	without job				
Relative shares among foreign-born (%)		-	9.8	21.9	51.9	7.1	4.1	5.3
Age		40	42	41	39	36	44	44
Women (%)		50	38	41	61	47	44	50
Households with child <15 (%)		32	37	44	42	36	39	34
Household size		3.2	3.0	3.1	3.5	2.8	3.5	2.9
Marital status (%)	*Married*	48.9	60.7	61.1	56.6	48.2	62.2	58.7
	Single	41.5	29.5	27.9	33.3	44	24	26.5
	Widowed, divorced or separated	10	9.9	11	10	7.8	13.8	14.8
Residence: degree of urbanisation (%)								
	Cities (high density)	39	54	55	52	76	60	55
	Towns and suburbs (medium density)	30	28	30	29	16	24	26
	Rural areas (low density)	30	17	15	18	7	17	19
Share of active people (%)		71	91	88	64	74	70	78
Employment rate (%)		63	82	73	53	66	57	67
Skills level (%)	*Low skills*	28	24	41	35	6	35	25
	Medium skills	45	32	40	37	21	37	39
	High skills	26	43	19	26	73	27	36
Migrant-specific variables								
Years since migration			12.1	13.2	21.8	13.5	16	15.6
Age at time of migration			29.5	28	19.7	23	27.8	29
Host country's language skills (%)								
	Beginner or lower		11.5	12.6	10.1	4.3	17.7	10.3
	Intermediate		24	31.8	16.4	15.9	33.7	20.2
	Advanced		35	34.6	29.4	50.1	32.2	33.7
	Mother tongue		29.6	21.1	44	29.7	16.4	35.9
Region of origin (%)	*EU15 and EFTA*		28.2	9.1	21	16	3.7	27.6
	Other EU		24	29	10.3	8	4.7	13.3
	Other Europe		10	16.3	14.6	7.6	22.7	9.8
	North Africa		6.1	11.3	14.7	12.4	13.3	7.9
	Other Africa		4	7.1	10	18	23.6	11.8
	Middle East		1.1	1.3	2	4.5	10	2.9
	Asia		12.1	11	13.4	22.4	16.7	7.2
	North America, Australia and Oceania		4	1.1	2.6	2.7	0.2	3.6
	Central and South America		11.2	14	10.6	7.2	4.4	14.7
Number of observations		512,736	6,961	15,595	33,970	4,920	2,913	3,731

Notes: The sample includes all individuals (natives and migrants) aged 15-64 years living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland).
Source: EU-LFS 2014 ad hoc module.

a number of reasons, such as existing migrant networks, job opportunities or other urban amenities (schools, hospitals, etc.). This is also observed in our sample: more than 80% of all migrant groups live either in densely populated cities or suburbs (compared to 69% of natives). Therefore, we control for residence location in our analysis.

Next, we inspect the earnings distribution by migrant group, taking the native-born average as a benchmark (Figure II). Compared to natives, all migrants are overrepresented in the lowest deciles. Economic migrants with a job on arrival are quite close to natives, with some deviation in the last decile. Student migrants' earnings pattern is close to that of economic migrants with a job. Family migrants and refugees are overrepresented in the lowest deciles compared to the other migrant groups, as well as economic migrants without a job upon arrival. This might be due to the fact that they are more likely to accept low-paid jobs and poor working conditions than family migrants, because finding a job is their primary motivation, whereas family migrants are not under the same constraint and may take more time to search for better-quality employment.

Figure II – **Share of migrants in earnings distribution by migration reason (benchmark group: native-born)**



Notes: The sample includes all individuals (natives and migrants) aged 15-64 and living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland).
Sources: EU-LFS 2014 ad hoc module.

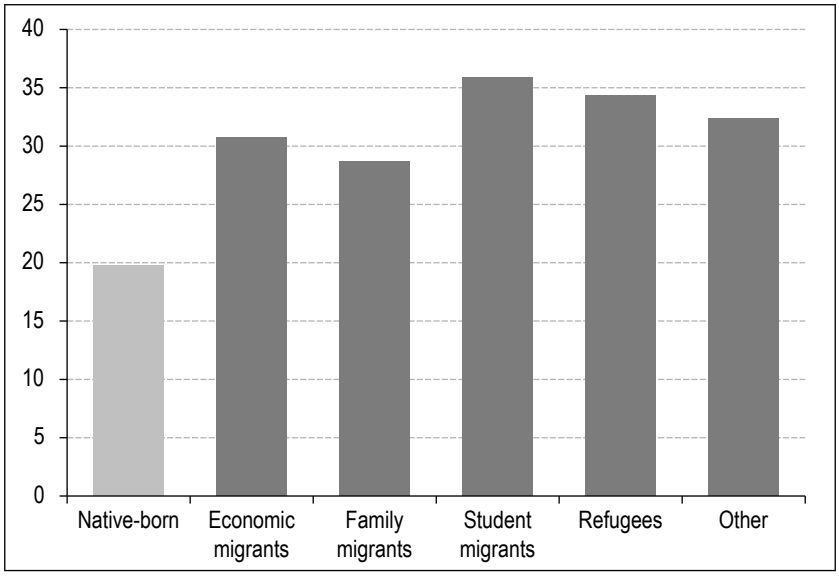
Lastly, we look at the variable that summarises the perception of respondents regarding their potential overqualification in their current occupation.[10] At least one third of all migrants are likely to feel that they are overqualified in their jobs (Figure III) and this is significantly higher than the share among natives (less than 20%). Student migrants and refugees are the top two groups to feel this way.

3. Empirical Methodology

Our objective is to compare the labour market integration of migrants in relation to their reason for migration and their region of origin. We will use the monthly earnings as a measure of economic integration. However, we have to adapt our approach to the data. First of all, the EU-LFS only provides earnings deciles, and more precisely the decile of monthly wage.[11] This has two implications of different order. One is that

10. In particular, the survey asks the following question: 'Do you think that your qualifications and skills would allow you to do more demanding tasks than in your current job?'.
11. As described in the EU-LFS data user guide, the earning deciles are country-specific and not common to the whole distribution of earnings. We address this issue by adding country fixed effects to account for heterogeneity across countries.

Figure III – **Proportion of overqualified individuals for their job, by migration reason (%)**



Notes: The sample includes all individuals (natives and migrants) aged between 15-64 and living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland).
Sources: EU-LFS 2014 ad hoc module.

with earnings deciles (i.e. a discrete variable), we cannot apply the usual linear regression; we will then estimate the wage equation through ordered probit. The other is that self-employed workers' earnings are not observed (since their earnings do not consist in wages), so we cannot take them into account. In addition, we will focus on full-time employees[12] because the measure of earnings in part-time jobs is not accurate.[13]

3.1. Wage Equation

To estimate the wage equations, we have to consider that there may exist some potentially self-selected participants, i.e. a binary selection mechanism, but also some active migrants who cannot access the labour market. As we are particularly interested in the effects of the migration reasons and how it interacts with the region of origin, the selection process could be all the more important: not all migrants are looking for a job in the host country, and some have little access to the job market despite their economic reason for migration. The underlying mechanism can be modelled by binary probit (Gronau, 1974).

We then have to combine the usual self selection estimation (*à la* Heckman), with an ordered probit estimation of the outcome, which is a discrete variable. This extends the linear second step of the Heckman procedure with a non-linear equation. In this case, the ordered probit model with sample selection can be described as follows:[14]

Selection equation:

$$E^* = \beta^T X_1 + \mu \quad (1)$$

$$E = I\left(E^* \geq 0\right) \quad (2)$$

where E^* is the continuous latent variable for the selection process of being full-time employed,[15] X_1 is a vector of exogenous variables, and μ is an error term.

Earnings equation:

$$Y^* = \gamma^T X_2 + \epsilon \quad (3)$$

$$Y = \sum_{h=0}^{H} h\mathbf{1}\left(\alpha_h < Y^* \leq \alpha_{h+1}\right) \text{ if } E{=}1 \quad (4)$$

where Y^* is the continuous latent variable for earnings (to the extent that we only observe discrete classes of earnings), X_2 is a vector of exogenous variables, and ϵ is an error term. Y^* is related to the outcome Y through the observational rule *(4)*, where $\alpha = \left(\alpha_1, ..., \alpha_H\right)$ is a vector of H strictly increasing earnings thresholds that partition Y^* into $H{+}1$ intervals.

Identifying the model parameters requires three restrictions:

- The first restriction is due to the fact that the coefficient γ is not separately identified from the coefficient α because the thresholds are unknown (which is a standard identification issue in ordered probit and logit models). In order to identify these coefficients, we normalise γ to 0, and also make the assumption that the standard deviation of the error term is 1.

- The second restriction is the exclusion restriction: we assume that X_1 contains at least one variable that is not contained in X_2. In our case, the dummies for having at least one child under 15 in the household, the marital status and the presence of another working adult in the household are considered to affect the selection equation and not directly the earnings equation. Consequently, these exclusion variables are included in the access to job market equation, but not in the earnings equation.

- The third restriction concerns the support of the vectors of exogenous variables. In particular, the identification of a semi-parametric specification requires that X_1 and X_2 each contain at least one continuous variable, as a way to guarantee that both vectors of explanatory variables have sufficiently rich supports. For this, age and age squared (both continuous) are included in both vectors of explanatory variables.

3.2. Choice of Variables

In these models, when including categorical variables, we usually take the most frequent category as the reference category, except for our main variables of interest. Concerning the reason for migration, we take the economic migrants with a job as the reference group, because they are particularly well integrated in the labour market (in terms of their employment rate and the employment quality in general, as seen in the summary statistics). As regards the region of origin, we take migrants from countries of the EU15 or EFTA as the reference group, for they are similar to native-born individuals in terms of most of their observable characteristics.

The main explanatory variables of interest are the reason for migration and the region of origin, as well as the interactions between the two.

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12. 76% of the observations in the sample are employed in a full-time job.
13. We also ran models (not reported here, but available upon request) including a part-time dummy; the results suggest, not surprisingly, that part-time significantly lowers the chances of being in high earnings deciles.
14. In particular, we use the Stata package heckoprobit, which estimates ordered probit models with a sample selection. It basically fits the maximum-likelihood ordered probit models with a sample selection, and the package automatically computes the inverse Mills ratio.
15. We estimate the selection of people who are employed full-time with salaries; in other words, we estimate the selection on people working full-time and for whom a monthly wage decile is computed.

These variables also allow to control for some of the unobserved characteristics. For example, the region of origin is a good proxy for culture, which has been found to influence labour market participation and fertility decisions (Fernandez & Fogli, 2009). As for the reason for migration, it could capture some individual aspirations, human or social capital investments, or the perceived gap in wellbeing, financial situation or educational opportunities between the origin and host countries.

As control variables, we consider individual-level characteristics such as age, age squared, gender, education, language ability in the host country (subjectively assessed by the respondent) and the degree of urbanisation of the place of residence. Other variables or specifications were tested, but not conclusive.[16] Moreover, we include host country fixed effects to control for specificities in national labour market access (e.g. different earnings distributions).

The earnings equations are estimated both without (the baseline model) and with self selection. This allows us to test the role of selection into employment when explaining the potential differences observed in the labour market outcomes of migrants with different migration motivations and from diverse geographical and cultural backgrounds. All models include individual controls, country fixed effects and robust standard errors and are estimated with probability weights as provided in the data.

4. Results

4.1. Baseline Estimation of the Earnings Equation

The results for the baseline earnings equation estimation with ordered probit are reported in Table 2 (detailed results are presented in the Online Appendix – see link at the end of the article).

In column 1, we only introduce the reason for migration to check how each migrant category compares to economic migrants with a job. All other categories (except student migration) show significant and negative coefficients, suggesting that all the other reasons for migration are associated with a higher probability of lower earnings, with refugees having the highest negative coefficient in magnitude on the probability of higher earnings. Column 2 then adds the region of origin dummies to check its impact on earnings compared to individuals from the EU15 or EFTA countries. All regions of origin, except North America, Australia and Oceania, are associated with significant and negative coefficients, i.e. significantly lower probabilities for migrants from these regions to reach higher earnings deciles. Column 3 introduces both the reason for migration and country of origin in the baseline model. We see that, generally, both the coefficient estimates for migration reasons and country of origin remain rather stable (significance levels do not change either). Holding everything else constant and controlling for origin and migration reasons jointly, student migration remains not statistically different from economic migration (with a job at arrival). The last column introduces interaction between migration reason and origin, to investigate whether the impact of migration reason on earnings is dependent on origin, which is one of the main hypotheses of the paper.[17] However, uncovering this information from the raw interaction models in column 4 is not straightforward.

To clarify, the next table (Table 3) reports the total effect estimates (with their significance and standard errors) corresponding to the interaction model (Table 2, col. 4). This estimate can be interpreted as the total effect of a certain migration reason (say, international protection) and being from a certain region of origin (say, Middle East).[18] The results confirm our hypothesis and suggest that the impact of

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16. Firstly, we included 'job search method' in the earnings equation, but the results were unchanged for other variables and the coefficient was not significant for this variable; therefore, we do not report them here. Secondly, we also estimated models including the 'duration of stay', or 'years since migration', variable as reported in the summary statistics (with a median of 12.5 years). The duration of stay in the host country is an interesting variable to consider when analysing the integration of migrants; in fact, the longer the length of stay in the host country, the more likely the labour market integration. Less than 1% of the migrants in the sample stayed in their host country for less than a year; while these migrants might not have had enough time to enter the labour market, but given their proportion, we assume that their influence on our estimates is very limited. Adding this variable led to essentially the same coefficients with similar significance results throughout all models (without or with selection correction), which suggests that excluding it does not lead to an omitted variable bias. However, it resulted in a convergence issue in the full-interaction model with selection correction due to the collinearity of this variable with age. For these reasons, we choose not to include the 'years since migration' variable in the models. Finally, we estimated models by gender. The baseline results remained the same; however, the number of observations per migration reason and region of origin dropped significantly, causing convergence issues for estimations with selection correction. For these reasons, we decided to work with the pooled sample by including a dummy variable for gender.

17. We double-checked the number of observations in each cell when interacting migration reasons and region of origin to be sure that this justified the interaction models. The precision of the estimates is also reinforced as we have a pooled sample comprised of a number of destination countries in Europe. Only in some cases, the number of observations was small, which led to estimates that are not relevant.

18. This is done by running a post-estimation command (lincom) after the ordered probit estimations, in order to compute the linear combination of two categorical variables (here migration reason and region of origin) when they each take a certain value. In other words, we compute the sum of the coefficient in front of the migration reason variable (when it takes a certain value, say 5 if international protection) and the coefficient in front of the interaction between migration reason for a particular category (e.g. 5 if international protection) and a particular region of origin (e.g. 6 if Middle East).

Table 2 – **Baseline earnings (decile) estimations (dependent variable: earnings decile, ordered probit estimations)**

	(1)	(2)	(3)	(4)
Reason for migration (Ref. *Economic migrant with job upon arrival*)				
Economic without job	-0.327***		-0.297***	-0.479***
	(0.034)		(0.034)	(0.077)
Family	-0.348***		-0.322***	-0.269***
	(0.037)		(0.037)	(0.074)
Student	-0.085		-0.016	-0.213**
	(0.054)		(0.055)	(0.108)
Refugee	-0.594***		-0.522***	-0.812***
	(0.070)		(0.075)	(0.237)
Other	-0.269***		-0.287***	-0.563***
	(0.053)		(0.054)	(0.102)
Region of origin (Ref. *EU15 and EFTA countries*)				
Other EU		-0.424***	-0.401***	-0.502***
		(0.044)	(0.044)	(0.077)
Other Europe		-0.445***	-0.400***	-0.580***
		(0.044)	(0.044)	(0.093)
North Africa		-0.521***	-0.499***	-0.722***
		(0.063)	(0.063)	(0.154)
Other Africa		-0.406***	-0.362***	-0.399***
		(0.053)	(0.054)	(0.142)
Middle East		-0.317***	-0.245***	-0.013
		(0.085)	(0.085)	(0.316)
Asia		-0.517***	-0.500***	-0.463***
		(0.052)	(0.052)	(0.094)
North America, Australia and Oceania		0.245**	0.272***	0.332*
		(0.100)	(0.100)	(0.189)
Central and South America		-0.524***	-0.505***	-0.763***
		(0.056)	(0.056)	(0.112)
Individual controls	Yes	Yes	Yes	Yes
Host country fixed effect	Yes	Yes	Yes	Yes
Interactions (migration reason × region of origin)	No	No	No	Yes
Pseudo R-squared	0.1002	0.1023	0.1062	0.1091
Prob > Chi2	0.000	0.000	0.000	0.000
Observations	14,637	14,637	14,637	14,637

Notes: All models are estimated with the ordered probit method using probability weights. Only migrants (natives are excluded) aged 15-64, living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland), who were aged 15 or above at the moment of arrival in the host country, and (of those employed) are employed full-time (excluding self-employed people) are included. Robust standard errors are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Source: EU-LFS 2014 ad hoc module.

the migration reason on monthly wage level is highly dependent on region of origin, which is a finding that comes from the interaction model only. For example, any other model would suggest that being a refugee has a negative impact on earnings regardless of origin. Results from Table 3 suggest that this is actually not the case: the effect of being a refugee from the Middle East, Other Africa, Asia and Other Europe on the probability of having higher earnings than other migrants from these regions is negative and significant, meaning that only individuals who migrated for international protection and who are from some regions (Other Europe, Other Africa, the Middle East and Asia) are worse off in terms of earnings (at 1% significance level).

We also observe that in the interaction model, the coefficient associated with the origin 'Middle East' is no longer significant: it seems to come from its underlying heterogeneity across migration reasons. For example, there is a concentrated negative effect of being a refugee or family migrant from the Middle East on the probability of higher earnings, whereas student and economic migrants (without a job) from the Middle East are not penalised, i.e. they seem to be better integrated in their host country's labour market. Moreover, student migrants were generally found to be not statistically different from economic migrants with a job on arrival; however, this also appears to be highly origin-dependent in the interaction models, which could reflect heterogeneity among student

Table 3 – **Interactions total effect estimates for earnings equation**

Interaction: migration reason × region of origin		Total effect estimate	Std.error
Economic migrant with no job	× Other EU	-0.279***	(0.060)
	× Other Europe	-0.197**	(0.080)
	× North Africa	-0.122	(0.152)
	× Other Africa	-0.146	(0.152)
	× Middle East	-0.510	(0.352)
	× Asia	-0.424	(0.098)
	× North America, Australia, Oceania	-0.353	(0.282)
	× Central and South America	-0.136	(0.103)
Family migrant	× Other EU	-0.291***	(0.076)
	× Other Europe	-0.220***	(0.081)
	× North Africa	-0.160	(0.163)
	× Other Africa	-0.406***	(0.151)
	× Middle East	-0.825**	(0.330)
	× Asia	-0.588***	(0.106)
	× North America, Australia, Oceania	-0.504**	(0.240)
	× Central and South America	-0.110	(0.115)
Student migrant	× Other EU	0.048	(0.124)
	× Other Europe	0.364**	(0.164)
	× North Africa	0.031	(0.401)
	× Other Africa	-0.380**	(0.166)
	× Middle East	-0.016	(0.390)
	× Asia	-0.019	(0.124)
	× North America, Australia, Oceania	-0.568*	(0.320)
	× Central and South America	0.476***	(0.171)
Refugee	× Other EU	-0.260	(0.195)
	× Other Europe	-0.326***	(0.125)
	× North Africa	-0.645*	(0.368)
	× Other Africa	-0.738***	(0.167)
	× Middle East	-1.078***	(0.351)
	× Asia	-0.623***	(0.152)
	× North America, Australia, Oceania	4.327***	(0.295)
	× Central and South America	0.728	(0.643)

Notes: The total interaction coefficients are calculated based on the estimates from interaction models in column 4 of Table 2 above. Only migrants (natives are excluded) aged 15-64, living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland), who were aged 15 or above at the moment of arrival in the host country at the age 15, and (of those employed) are employed full-time (excluding self-employed people) are included. Robust standard errors are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Source: EU-LFS 2014 ad hoc module.

migrants. For example, among migrants from Central and South America or Other Europe, student migrants are more likely to have higher earnings than other migrants, while among those from Other Africa and North America, Australia and Oceania, they are more likely to have lower earnings. Thus, full interaction models allow for joint effects of the origin and migration reason on earnings to be highlighted.

4.2. Estimations with a Selection Model

The results of monthly wage estimation with selection in employment are reported in Table 4. Similar to the baseline results, all migrant categories (including student migrants this time) are significantly and negatively associated with higher monthly wages, compared to economic migrants (with a job at arrival). Taking into account selection in employment generally increases the magnitudes of the estimated coefficients of migration reasons compared to those of the baseline results. This suggests that selection might be an important issue to explain the chances of being in different earnings deciles.

Looking at the selection equation (that is, being in full-time salaried employment), we observe that the motive for migration impacts the selection process. While all motives are estimated to negatively impact the probability

of being employed in a full-time job, family migrants are the least likely to be so, whereas economic migrants without a job at arrival are the most advantaged (after those with a job on arrival) in terms of finding a full-time paid job. Refugees are also less likely to be employed full-time compared to economic migrants, but this difference disappears once the region of origin is controlled for.

However, there is one major limitation in these selection models. For each ordered probit, a Wald test is run to check if the self selection is justified: it is justified if the residuals of both equations are significantly correlated. Here, taking into account selection is rejected in all models as reported in Table 4.[19] There could be several reasons for the rejection of the selection models in this context, and firstly, there might

19. We note that it is still valid to interpret the coefficients of both earnings equations even if the selection model is rejected; what we have to keep in mind is that the endogenous selection is rejected, but of course, there is an exogenous selection, which leads to similar estimates in both specifications.

Table 4 – **Earnings (decile) estimations with sample selection (Dependent variable: earnings decile, ordered probit with selection)**

	(1)	(2)	(3)	(4)
Reason for migration (Ref. *Economic migrant with job upon arrival*)				
Economic without job	-0.326***		-0.301***	-0.393***
	(0.032)		(0.031)	(0.069)
Family	-0.422***		-0.415***	-0.391***
	(0.069)		(0.057)	(0.084)
Study	-0.240***		-0.203***	-0.449***
	(0.071)		(0.063)	(0.123)
Refugee	-0.661***		-0.624***	-0.641***
	(0.090)		(0.080)	(0.176)
Other	-0.304***		-0.339***	-0.581***
	(0.063)		(0.058)	(0.099)
Region of origin (Ref. *EU15 and EFTA countries*)				
Other EU		-0.330***	-0.333***	-0.461***
		(0.044)	(0.043)	(0.071)
Other Europe		-0.361***	-0.298***	-0.475***
		(0.040)	(0.040)	(0.084)
North Africa		-0.485***	-0.405***	-0.551***
		(0.062)	(0.070)	(0.129)
Other Africa		-0.356***	-0.277***	-0.248*
		(0.047)	(0.048)	(0.133)
Middle East		-0.474***	-0.335***	-0.218
		(0.087)	(0.087)	(0.272)
Asia		-0.483***	-0.444***	-0.346***
		(0.046)	(0.047)	(0.103)
North America, Australia and Oceania		0.335***	0.352***	0.365*
		(0.091)	(0.091)	(0.191)
Central and South America		-0.453***	-0.425***	-0.632***
		(0.049)	(0.049)	(0.099)
Individual controls	Yes	Yes	Yes	Yes
Host country fixed effect	Yes	Yes	Yes	Yes
Interaction (migration × region)	No	No	No	Yes
Selection equation				
Reason for migration (Ref. *Economic migrant with job upon arrival*)				
Economic without job	-0.116***		-0.105***	-0.197**
	(0.033)		(0.033)	(0.078)
Family	-0.701***		-0.657***	-0.689***
	(0.032)		(0.032)	(0.060)
Study	-0.597***		-0.543***	-0.608***
	(0.046)		(0.046)	(0.093)
Refugee	-0.746***		-0.678***	-0.261
	(0.048)		(0.05)	(0.195)
Other	-0.498***		-0.474***	-0.530***
	(0.045)		(0.045)	(0.082)

➔

Table 4 – *(contd.)*

	(1)	(2)	(3)	(4)
Region of origin (Ref. *EU15 and EFTA countries*)				
Other EU		0.285***	0.190***	0.040
		(0.035)	(0.036)	(0.075)
Other Europe		-0.0613*	-0.0494	-0.308***
		(0.036)	(0.036)	(0.086)
North Africa		-0.568***	-0.528***	-0.385***
		(0.044)	(0.044)	(0.120)
Other Africa		-0.012	0.065	0.162
		(0.042)	(0.043)	(0.177)
Middle East		-0.311***	-0.184***	-0.266
		(0.062)	(0.064)	(0.214)
Asia		0.116***	0.166***	0.567***
		(0.039)	(0.039)	(0.102)
North America, Australia and Oceania		0.120	0.129*	0.486***
		(0.074)	(0.072)	(0.176)
Central and South America		0.065	0.077*	-0.159
		(0.042)	(0.042)	(0.1)
Exclusion variables				
Presence of child in the household	-0.140***	-0.132***	-0.121***	-0.130***
	(0.024)	(0.023)	(0.023)	(0.024)
Any other adult working in the household	0.041	-0.009	0.018	0.017
	(0.031)	(0.031)	(0.031)	(0.031)
Marital status (Ref. *Single*)	Yes	Yes	Yes	Yes
Married	0.105***	0.072***	0.111***	0.123***
	(0.037)	(0.037)	(0.038)	(0.039)
Widowed, divorced, separated	-0.04	-0.089***	-0.027	-0.02
	(0.032)	(0.029)	(0.034)	(0.036)
Individual controls	Yes	Yes	Yes	Yes
Host country fixed effect	Yes	Yes	Yes	Yes
Interaction (migration × region)	No	No	No	Yes
Wald test of indep. eqns. (rho = 0), Prob > chi2	0.8545	0.1026	0.7701	0.8295
Number of observations	37,777	37,777	37,777	37,777

Notes: All models are estimated with the ordered probit method using probability weights, extended with selection model (*heckoprobit*). Only migrants (natives are excluded) aged 15-64, living in private households in an EU country (except Germany, Denmark, the Netherlands and Ireland), who were aged 15 or above at the moment of arrival in the destination country, and (of those employed) are employed full-time (excluding self-employed people) are included. Robust standard errors are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.
Source: EU-LFS 2014 ad hoc module.

be an issue about the validity of the exclusion variables: it is possible that they are not sufficient to isolate the selection mechanism. For example, the dummy for having children under age 15 could be a valid exclusion variable for women, but perhaps not for men. Similarly, the dummy for the presence of another working adult in the household or for the marital status might have an impact on the intensive margin of employment (e.g. hours worked), but it may still not be sufficient to identify the selection to explain the extensive margin (e.g. access to the job market).

Moreover, overall results are quite similar between Tables 2 and 4, implying that for most of these categories of migrants, selection (into being full-time employed) appears to be exogeneous as far as earnings are concerned.[20]

4.3. Alternative Estimations for Occupation Groups by Skills

In order to test the validity of our results on a broader sample, we have estimated a similar model on a sample extended to self-employed migrants. In this case, as mentioned above, earnings deciles are not available for the self-employed, so we turn to another labour market outcome related to the job's qualification which we define based on ISCO occupation categories. We estimate the same model as previously, using the same explanatory variables, but changing the explained variable: the earnings deciles

20. Similar to the baseline case, we ran post-estimation commands (lincom) after the ordered probit estimations with selection. While selection specification is rejected, the signs and significance of estimated coefficients are mostly the same as before (Table 3). The results are available in the Online Appendix.

are replaced by the ordered jobs' qualifications (low-, medium- and high-skilled occupations).[21] Overall, earnings and occupation estimations are consistent with each other (the results are available in the Online Appendix).

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In recent years, the integration of migrants to the labour market has been taking an ever more important place in policy debates around the world. Having recently received large inflows of refugees, European countries are now facing the challenge of implementing migration and integration policies in a context of diverse political discourses and varying public opinion on the subject. When it comes to economic integration, however, it is often forgotten that differences exist between migrants, if only in their individual characteristics and aspirations. In this paper, we focus on reasons for migration together with region of origin to understand the differences in labour market outcomes for migrants in Europe. Given the data available, we only consider labour market outcomes and not social outcomes, but it is evidenced that the two are closely intertwined and that the former is a key predictor of the latter (Hansen, 2012). Using the recently available EU-LFS ad hoc module 2014, we analyse the economic integration of various migrant groups, broken down by reason for migration and region of origin.

Our analysis focuses on earnings (intensive margin), meaning that we go one step further than looking only at activity or employment rates (extensive margin). In the earnings equation, we also investigate the bias that might arise from selection into employment, since some individuals might not be employed in the first place and this could be linked to their migration motive or region of origin, among other reasons. However, we find that the selection model is statistically rejected, which is why we choose to estimate ordered models for earnings by controlling for a large set of individual characteristics and host country fixed effects.

Our results suggest that an economic motive for migrating and already having a job upon arrival is positively associated with higher earnings in the host country. However, our main findings highlight that the impact of the reason for migration should not be considered on its own; rather, it seems to also be highly dependent on the migrant's region of origin. For example, *ceteris paribus*, refugees and family migrants are more likely than other types of migrants to end up with lower monthly wage levels; however, this is the case for migrants from certain regions of origin only (e.g. Other Europe, Middle East or Asia). While these findings are similar to those from the literature (Cortes, 2004; Campbell, 2014; Akgüç, 2014), our paper goes further by analysing origin-specific aspects, with the estimation of interaction models. We also find that an economic motive for migration does not necessarily translate into better earnings. Actually, for certain regions of origin (e.g. Africa, the Middle East or Asia), these migrants seem to perform similarly in the labour market to non-economic migrants, such as family migrants and refugees. Our results also show some evidence of a similarity in earnings between student migrants and economic migrants with a job on arrival.

All in all, our results shed further light on the labour market integration of migrants by providing evidence from the most recent data (to date) in Europe. Our paper highlights the importance of 'reason for migration' and 'region of origin' in explaining where migrants lie in the earnings distribution. It also highlights how the two aspects, migration reason and region of origin, are interrelated to explain the differences in labour market performances amongst heterogeneous foreign-born populations. The results show clearly that migrants are not a homogeneous group, and that differences between them would call for diverse policy measures to improve their integration. However, some key migrant-receiving countries (e.g. Germany or The Netherlands) are missing from the sample, which is a limitation of this paper. Further research is thus needed to analyse in greater depth the underlying mechanisms to successful migrations. □

21. The EU-LFS provides one-digit occupation categories (nine in total, ISCO-08); based on the skill requirements in these categories, we generate three broader occupational groups, defined as low-skilled (groups 8 and 9), medium-skilled (groups 3, 4, 5, 6 and 7) and high-skilled (groups 1 and 2). The ISCO-08 groups are as follows: (1) *Managers,* (2) *Professionals,* (3) *Technicians and associate professionals,* (4) *Clerical support workers,* (5) *Service and sales workers,* (6) *Skilled agricultural, forestry and fishery workers,* (7) *Craft and related trades workers,* (8) *Plant and machine operators and assemblers,* (9) *Elementary occupations. There is also a last category* (0) *for jobs in the Armed Forces (excluded from the estimations).*

Link to Online Appendix: https://www.insee.fr/en/statistiques/5396140/ES-524-525_Akguc-Welter_Online_appendix.pdf

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Combining Work and a Pension – Individual Determining Factors and Combiners' Profiles

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Abstract – Combining work and a pension is one of the ways of extending ones working life that is being encouraged under the 2003 pension reforms. In 2019, 3% of retirees under the general scheme were thus in paid employment in the private sector and, of individuals having retired under the general scheme since 1 January 2004, 10% were in paid employment in the private sector between 2005 and 2016. This article seeks to identify the key characteristics of these employed retirees, or "combiners", prior to any changes in the legislation. The analysis, carried out using administrative data gathered by the CNAV (the French national old-age insurance), shows that the two factors which contribute most to a decision to return to work after retirement are having been in employment before retiring and having the length of insurance cover required for a full pension. Three typical combiner profiles are identified: a profile of men who have had long careers and taken early retirement (24%), a profile of executives (45%) and a profile of women with spells out of work (31%).

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The question of "active ageing", particularly "in employment", has been receiving increasing attention in the European Union since the 1990s, as is reflected in various communications from the Commission (see Guillemard, 2013). In 2000, the Lisbon Council stressed the weakness of employment levels and participation in the labour market by older workers and, at the same time, the effect of ageing on the financing of social protection systems (Lisbon European Council, 2000, points 4 and 23 respectively). In line with this, several countries have systems encouraging the seniors to stay in employment and to postpone their retirement: there are no restrictions on combining work and a retirement pension in the United Kingdom, Sweden and Italy. Germany, Belgium and Spain allow the combining of work and a pension but this may be subject to restrictions depending on the age of the individual and their level of pay (Retirement Guidance Council, 2018).

In France, the 2003 pension reform was intended to "extend people's working lives through national mobilisation in favour of work for employees over the age of 55" (National Assembly, 2003). It established a premium to encourage people to stay in employment, phased retirement allowing people to receive a proportion of their retirement pension whilst holding one or more part-time jobs. It relaxed the system for combining work and a pension. Unlike other systems, combining work and a pension does not result in any postponement of retirement, but allows retirees to return to work once they have started receiving their pension. It also allows the pension system to receive contributions from workers who, in most cases, cannot increase the level of their pension: this is because, since 2015, an individual who has a job which falls within the pension scheme from which they receive a pension does no longer accrue their pension rights under that scheme.[1] Combining work and a pension thus contributes both to increasing the activity of seniors and to improving the financial situation of pension schemes.

Nearly 11% of people who retired under the general scheme in 2015[2] return to paid employment following retirement and, among retirees as a whole under the general scheme, 3% are employees in 2019 according to CNAV data;[3] the proportion is similar according to labour force survey data (Minni, 2019). In 2016, based on the EIR (*Échantillon interrégimes de retraités*, a sample of retirees from several pension schemes), 16.4% of retirees from the 1950 generation combined a pension in their main pension scheme with at least one job since their retirement (DREES, 2019).

This article seeks to provide a picture of retirees who combine their pension and a job prior to any possible change to the system. Indeed, an article in the bill aimed to establish a universal pension system would enable "combiners" to claim new pension entitlements from 2022 onwards irrespective of the future system. (National Assembly, 2020, Article 26[4]).

The study presented here is an extension of the work carried out by Bridenne & Mette (2012) on retirees under the general scheme who return to work as employees in the private sector (excluding agricultural labourers). Combiners appear therein as people who were in employment prior to their retirement, have substantial lengths of insurance cover, are usually unmarried and have sometimes experienced greater career vicissitudes than average retirees. The 2009 law relaxing the combining of work and a pension (*infra*, Box 1) and the significant increase in combining work and a pension among new retirees has probably led to different people being attracted to this system compared to those identified by Bridenne & Mette.

This study also supplements the combiner profiles drawn up by Musiedlak (2017), covering a slightly different population, that of employed people aged 53 or over who are drawing a retirement pension and live in France and based on data from the labour force survey which provides information for all of the possible situations in which work and a pension are combined. He identified three profiles of retirees in regular jobs: elderly executives, self-employed men and young retirees. He also distinguished between two profiles of irregular or part-time jobs. However, data from the labour force survey do not enable the characteristics of combiners to be studied in detail because the size of the sample is too small for a detailed analysis.

In a first section, we study the characteristics of combiners between 2004 and 2016 and the individual factors determining the combining of work and a pension, using the same data as Bridenne & Mette (2012). In a second section, we draw up typical profiles of retirees under the general

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1. Beforehand, an individual having a job covered by a scheme other than that under which they drew their pension could still accumulate pension rights under the combination scheme. This is no longer possible since 1 January 2015.

2. Several years pass between retirement and a return to work. It is therefore not yet possible to establish the proportion of combiners among more recent waves of retirees.

3. https://www.statistiques-recherches.cnav.fr/cumul-emploi-retraite.html

4. "…the improvement of the system for combining employment and retirement is planned from 1 January 2022, without waiting for the universal system to come into force: new pension rights can be acquired after having met the conditions of age and length of insurance specific to the full combination of employment and retirement." (National Assembly, 2020, p. 25 [translated]).

scheme who combine their pension and a job (as employee) in the private sector. They represent 80%[5] of the combiners (within the general scheme, which relates to 350,000 people in 2016).

Throughout the study, combiners are defined as those who have retired under the general old-age insurance scheme and for whom information concerning the holding of a paid job (excluding agricultural labourers) is recorded on their career statement in *N*+1 or thereafter. The population analysed relates to individuals who retired under the general scheme in 2004, 2009 or 2014, and combiners are those earning a salary at least once in the years following their retirement (observable up until 2016, the last year available). The study relates exclusively to individuals retiring between 2004 and 2014 so that any returns to work within at least two years following retirement can be observed. We exclude combiners for whom a single of the salaries observed after the retirement is lower than that enabling a quarter to be validated in the pension scheme. Combiners who retired under the phased retirement system are also excluded.

1. Data and Descriptive Overview

Among those individuals under the general scheme who retired in 2004, 9.4% of men and 7.1% of women earned at least one salary between 2004 and 2016 (53,000 people). Owing to the increased burden on the system and to the 2009 Law – so-called law of liberalisation of the system for combining work and a pension (Box 1) –, the proportion of combiners increased: among retirees under the general scheme in 2010, 12% of men and 11.2% of women returned to work between 2010 and 2016. Among more

5. Cf. Programme de Qualité et d'Efficience « Retraites », Projet de Loi de financement de la Sécurité Sociale 2018, indicateur de cadrage n°6.

Box 1 – **Main Legislative Changes Relating to Pensions Under the General Scheme**

Legislation on combining work and an intra-general scheme pension (retirees under the general scheme and employee in the private sector)

Since 1 April 1983, combining work and a pension has enabled a retired person who is receiving a personal pension under the general scheme, providing they meet the conditions required, to carry out professional activities and combine their professional income and their pension. This system was relaxed on 1 January 2009, the main change being the full and unlimited combining of all means.

From 1 January 2004 onwards, combining a retirement pension under the general scheme and a paid activity has been limited by maximum earnings which cannot be exceeded (the most advantageous to the individual of either an average of the last three salaries or 1.6 times the French minimum wage). In addition, if the professional activity is carried out for the same employer they had when they retired, the individual has to wait at least 6 months before returning to work.

From 1 January 2009 onwards, it is possible to combine work and an intra-general scheme pension without being subject to any upper limit or to any period of inactivity between retirement and returning to work (called "full combination"). To do this, the individual has to have requested all pensions which they can claim, have the length of cover required for a full pension and be of legal retirement age (60 to 62 years of age depending on the generation). If they do not have the length of insurance cover necessary to receive a full pension, the individual must at least be old enough to cancel the reduction (65 to 67 years of age depending on the generation). If these conditions are not met, combining work and a pension remains subject to 2004 legislation (called "limited combination").

In 2015, a reform modified the rules relating to stopping work, but it does not affect the combining of work and an intra-general scheme pension (CNAV, 2018).

Whatever the legislation in force, combining paid employment in the private sector and a pension under the general scheme does not give the person concerned new pension rights.

Main legislative changes relating to pensions under the general scheme since 1993

Extension of the length of insurance cover: In the 1993 reforms, the first increase in the contribution period: from 150 to 160 quarters at a rate of one quarter per generation between the 1933 and 1943 generations. Then, a series of extensions of the length of insurance cover until the 2014 reforms which incorporated the increase in the length of insurance cover at a rate of one quarter every 3 generations to reach 172 quarters for the 1973 generation.

Gradual raising of the legal age: from 60 to 62 years of age, at a rate of 4 months for individuals born between 1 July 1951 and 31 December 1951, then 5 additional months up until the 1955 generation (2010 reforms).

Gradual raising of the retirement age without a reduction: from 65 to 67 years of age, at the same rate as the raising of the legal age (2010 reforms).

Early retirement after long careers (*Retraite anticipée pour les carrières longues*, RACL): Introduction of a system for long careers (2003 reforms) enabling individuals who started working at a young age to take early retirement (before the legal age). Then, relaxation of conditions for accessing the system in 2012 and 2014.

recent waves of retirees, the time span is too short for returns to work after retirement to be observed.[6] However, we show that combining a pension and a job is on the increase among individuals who retire after reaching the legal age with the length of cover required to receive the full pension (cf. Online Appendix – see link at the end of the article). Barring changes in the legislation, it is therefore the extent to which retirees meet these characteristics which will determine the rise in combining work and a pension.

To define the characteristics of individuals who have a job alongside their pension, this first section seeks to identify who the combiners are based on career indicators and retirement under the general scheme. The characteristics of people who return to work after retirement are compared with those of retirees as a whole. We are using administrative data gathered by the *Caisse nationale d'assurance vieillesse* (CNAV, the national old-age insurance) and, more particularly, the "historical database of combiners" (Box 2). It allows a detailed description of the characteristics of combiners, particularly their career paths and the conditions for their retirement and their return to work.

Based on data from 2012, Bridenne & Mette (2012) identified two types of combiners: firstly, individuals who have been in continued employment, resulting in a high pension level; secondly, individuals who have had long careers and experienced interruptions which have impacted upon their pension level. The study was carried out using the same database as that used here, covering retirees from 2004 to 2007 who returned to work between 2005 and 2008. We continue by studying the change in the characteristics of combiners in respect of those retiring between 2004 and 2016.

To make the reading easier, we present results only for people who retired in 2004, 2009 and 2014. 2004 and 2009 are the first years affected by the major changes made to the system, i.e. the overhaul of the system of combining work and a pension (2003 Law) and the "liberalisation" of the system for combining work and a pension (2009 Law) (cf. Box 1). The wave of retirees in 2014 corresponds to the last data available, allowing to observe returns to work in 2015 and 2016.

1.1. Combiners's Career and Earnings Before Retirement

People combining work and a pension have built up large numbers of quarters associated with long professional careers. Half of men combining work and a pension have at least 170 quarters accrued across all schemes irrespective of their year of retirement. The differences in career length between combining men are modest: 90% of those who retired in 2004 then returned to paid work had accrued between 157 and 180 quarters, and 90% of combiners whose retirement began in 2014 had accrued between 152 and 182 quarters. By way of comparison, the average number of quarters is about the same for all retirees and combiners, but it is more dispersed the dispersion is wider among retirees. The gap between the longest and the shortest length of cover (inter-decile ratio) is of about 60 quarters.

6. More than a fifth of combiners return to work at least 4 years after they retire.

Box 2 – **The CNAV Historical Database of Combiners**

The Historical database of combiners is made up of retirees who have retired under the general scheme since 2004 and who earned a salary in the years following their request for a pension and up until 2016. Those who retired longest ago retired in 2004; the maximum historical depth is therefore 12 years including 2016.

The information contained in the CNAV management databases does not show whether the amount received by the retiree corresponds to a regular activity salary or a one-off bonus payment associated with a job held before retirement. However, those who retire can still receive bonus payments some time after retirement, even the following year. Beneficiaries for whom this is the case are therefore included in our database in the same way as people who have jobs after they have retired. They inflate the numbers of actual combiners.

Consequently, to limit this confusion, retirees who have a salary, exclusively in the year following their retirement, which is lower than an annual salary accruing a quarter for a pension under the general scheme (that is to say € 1,450.50 in 2016) have been excluded from the population of combining retirees. Following this logic, an average of nearly 10% of retirees a year who earn a salary exclusively indicated in the year following their retirement are excluded.

Moreover, to make the results easier to understand, we have excluded from the analysis retirees who used the phased retirement system and who return to paid work after finally retiring. They represent 1.05% of combiners who retired under the general scheme between 2004 and 2014 (7,700 people).

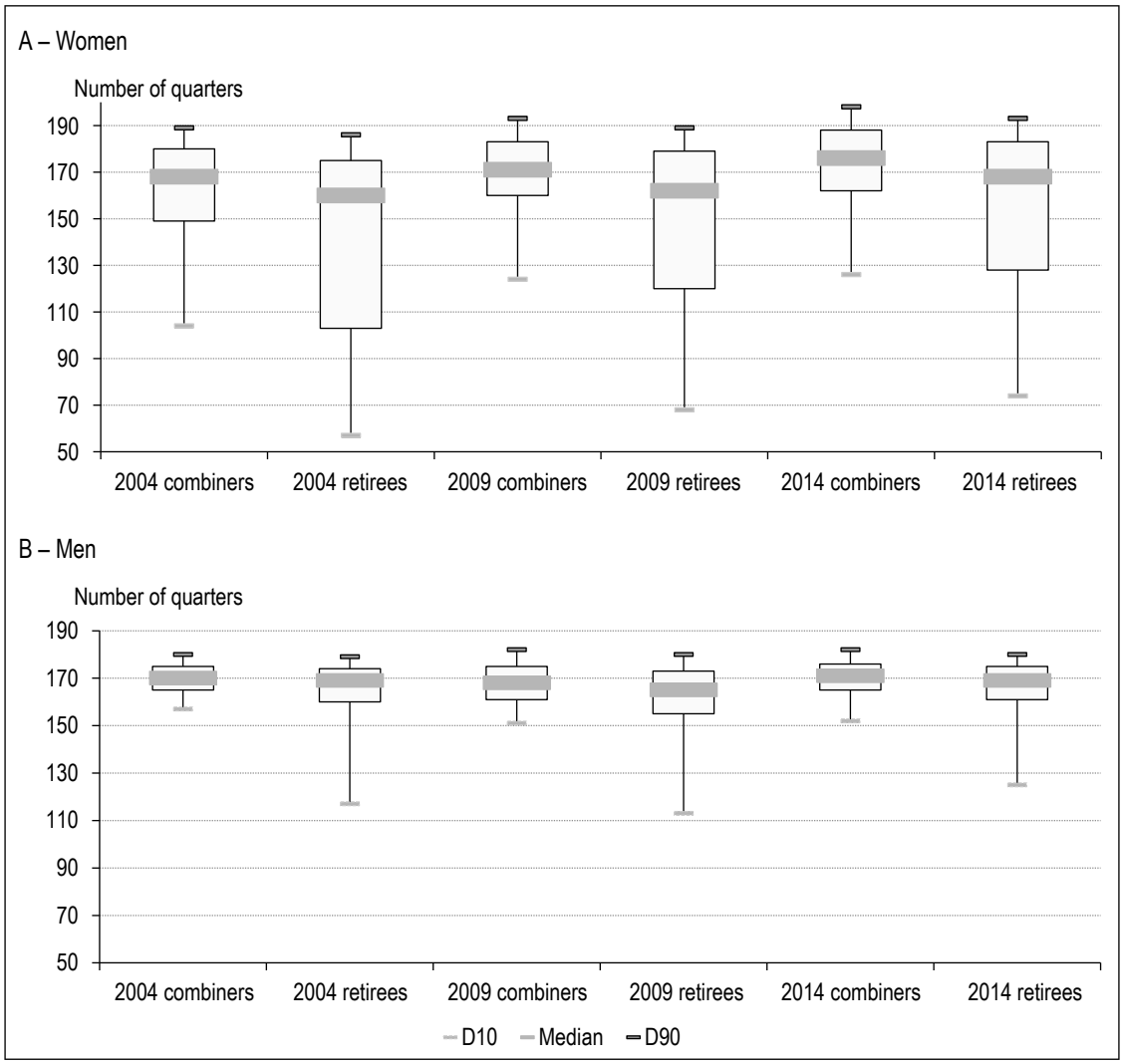
A total of 778,200 combiners under the general scheme are retained for analysis.

Women who combine work and a pension have greater lengths of cover accrued than retired women as a whole. Three quarters of female combiners who retired in 2014 have at least 162 accrued quarters across all schemes whilst, among this 2014 flow as a whole, a quarter have less than 128 quarters. In addition, women who combine work and a pension accrued, on average, as many quarters as men in the same situation, and combiners who retired in 2014 had even more (the median length of cover is 176 for women and 171 for men in 2014, Figure I). Nevertheless, work and a pension are not just combined by people who have had long careers because a tenth of women who combine work and a pension have accrued lengths of cover of less than 105 or 126 quarters depending on the years of retirement.

Since 2004, for female retirees and combiners, the accrued length of cover has grown significantly owing to the improvement in career opportunities for women and better account being taken of breaks associated with looking after children.[7]

7. *Old-age benefits for dependent relatives (*Assurance vieillesse des parents au foyer*, AVPF), established in 1972, affords pension rights if a person stops working entirely or partially during the course of their career. It covers (subject to the resources available to the household and the receipt of benefits paid by the Family Allowance Fund (*Caisse d'Allocations Familiales*, CAF)) pension contributions equal to the minimum salary for parents who have stopped or reduced their professional activities in order to look after their children.*

Figure I – **Dispersion of the length of insurance cover accrued across all schemes according to the year of retirement for combiners and retirees as a whole**



Reading Note: The "box and whisker plots" represent the dispersion of the length of insurance cover accrued across all schemes. The median is represented by the grey bar, the first quartile by the lower bar in the rectangle, the last quartile by the upper bar in the rectangle. The light grey dash corresponds to the first decile and the dark grey dash to the last decile. As a result, the longer the rectangle and the longer the "whiskers", the greater the dispersion of the length of insurance cover. Of the combiners who retired in 2004, half of women accrued less than 168 quarters (median) and 90% accrued more than 104 quarters (first decile).
Sources and Coverage: CNAV, Historical database of combiners 2004-2016 and database of retirees 2004-2016. Combiners: individuals having retired under the general scheme in 2004, 2009 or 2014 and earning a salary at least once in the years following their retirement (observable up until 2016, last available tear). Combiners earning a single salary below that enabling a quarter to be accrued in the years following the request for a pension are not included in the coverage. Combiners who retired under the phased retirement system are also excluded. Retired population: individuals who retired under the general scheme in 2004, 2009 or 2014.

To study the earlier wage levels of retirees and facilitate comparisons between years, we use a measure of the wage earned in the private sector between the ages of 35 and 44 expressed as a function of the social security ceiling.[8] Combiners have had levels of pay close to those of retirees as a whole. On average, whether they combined work and a pension or not, men who retired in 2004 had a salary equal to 77% of the social security ceiling between the ages of 35 and 44 (Figure II). In this same age range, new retirees in 2014 had an average salary corresponding to 70% of the social security ceiling.

Conversely, female combiners have a level of pay ever so slightly below that of women as a whole. Among female retirees in 2014, the average salary between the ages of 35 and 44 was 47% of the social security ceiling for women as a whole and 44% of the social security ceiling for female combiners.

This apparent closeness between combiners' and other retirees' pay between the ages of 35 and 44 must nevertheless be qualified since, a larger proportion of retirees (more women) had no job when in this age group.

1.2. At Least Three Quarters of Combiners Are In Employment Before Retiring

Retirees who return to paid work are very often employed, whether their job is covered by the general scheme or another scheme,[9] in the year preceding retirement. This is the case for nearly three quarters of combiners who retired in 2004 (Figure III). Furthermore, this proportion has increased over the years. When the population of combiners is restricted to those who returned to work within two years following their retirement, the proportion of people in employment increased by 6 points in ten years (82% for combiners who became retirees in 2004 and 88% for those in 2014).

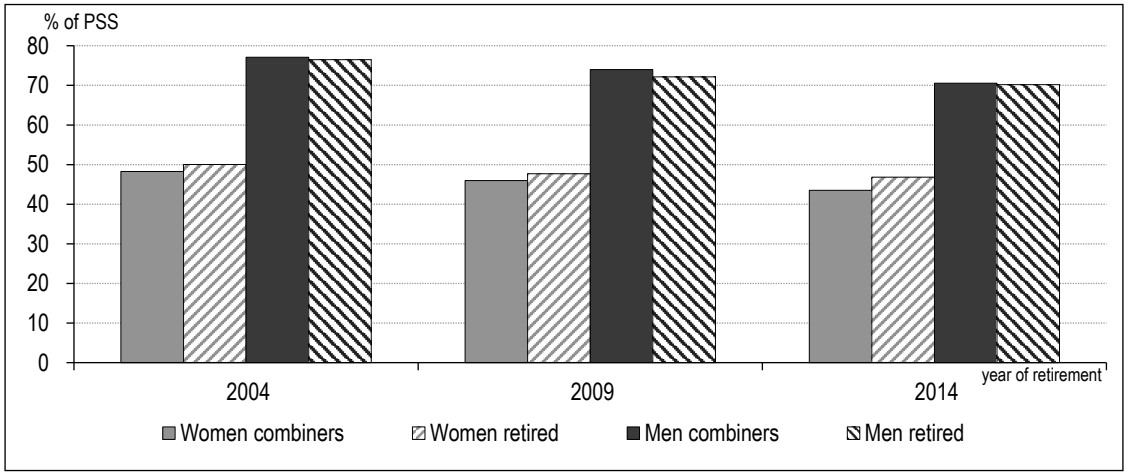
By way of comparison, for retirees under the general scheme in 2004 as a whole, only 45% were in employment before retiring. The proportion employed before retirement has nevertheless increased to a little over one in two retirees (52%) among people who retired in 2014. Nearly a third of retirees were not working before retirement (established from the data on the basis of the absence of a career statement), whilst it was marginal among combiners.

Since 2004, the age of retirement under the general scheme has risen substantially for all retirees owing to the raising of the legal retirement age and the extension of the length of insurance cover (cf. Box 2). Half of those who retired in 2004 are no older than 60. Ten years later, half of those retiring in 2014 are over 61 and a half (Figure IV).

Of those retiring in 2004, combiners retired at a lower age than other retirees. A quarter of combiners thus benefited from their retirement pension before the age of 60, *vs.* only 18% of

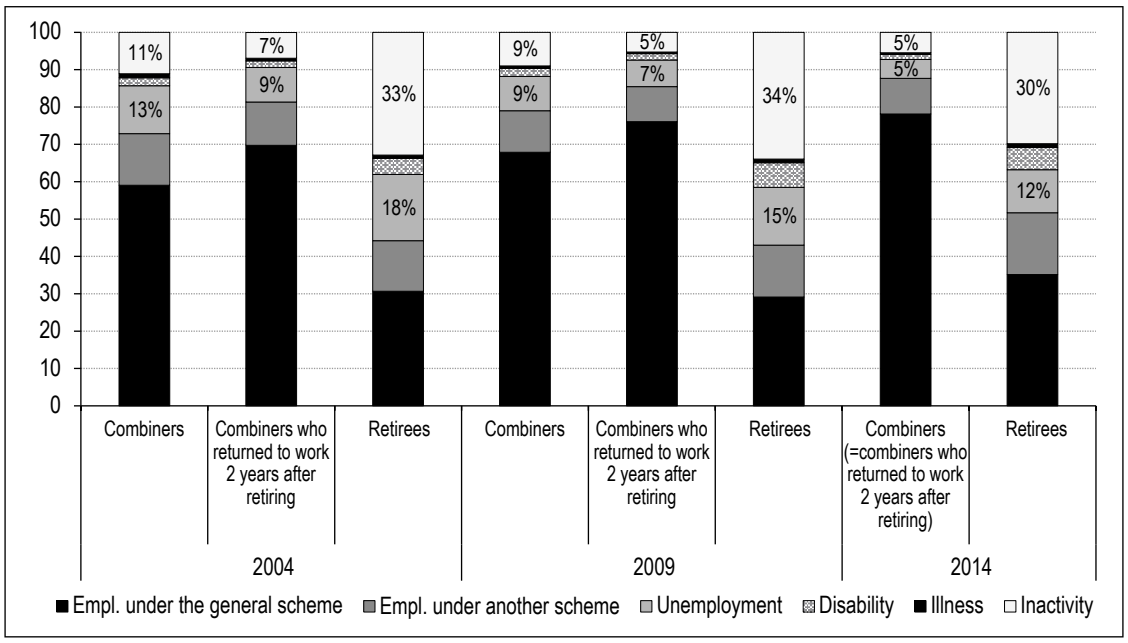
8. The social security ceiling is a reference amount taken into account when calculating the maximum amount of certain social benefits.
9. The other pension schemes mainly relate to civil servants, the self-employed and farmers or agricultural labourers.

Figure II – **Average salary between the ages of 35 and 44 expressed as a function of the social security ceiling (PSS, for *plafond de la sécurité sociale*) by year of retirement**



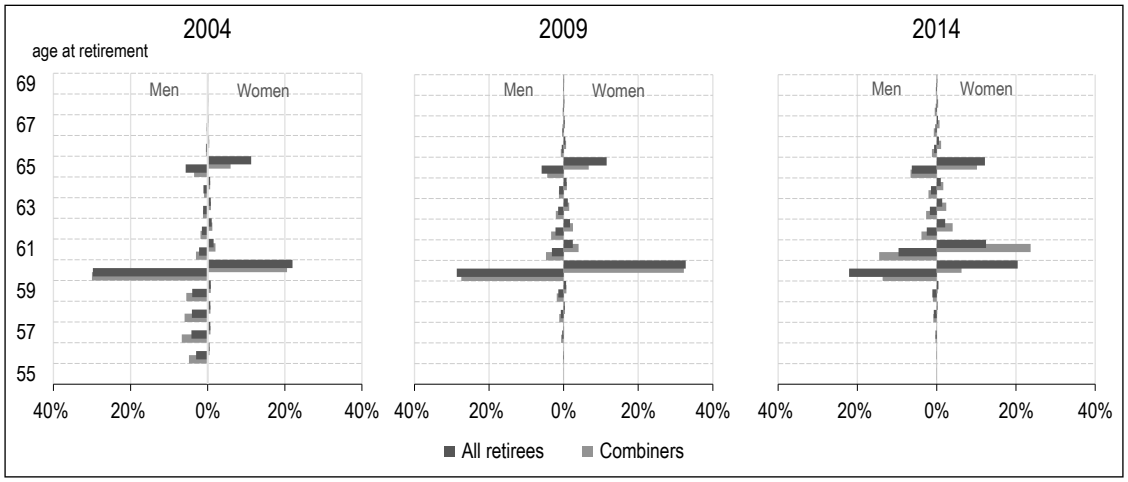
Notes: Only people born after 1912 having accrued 2 salaries under the general scheme between the ages of 35 and 44 are taken into account (around 20% of combiners and 30% of retirees being excluded); zero salaries are not included in the calculation of means.
Reading Note: Men who retired under the general scheme in 2009 and who returned to work during their retirement earned an average salary equivalent to 74% of the social security ceiling between the ages of 35 and 44.
Sources and Coverage: See Fig. I.

Figure III – **Activity status in the year preceding retirement under the general scheme of combiners and retirees as a whole according to their year of retirement**



Notes: The situation before requesting a pension is determined based on salaries and accrued quarters. Where an individual encounters a number of situations in the same year, only one situation is retained according to the order of priority set out in the legend.
Reading Note: Of the combiners who retired in 2014, 78% had a job that was covered by the general scheme in the year preceding their retirement. Given that professional activities have been observed up until 2016, combiners who retired in 2014 all returned to work within 2 years following their retirement (people who return to work subsequently are not yet known about). In order not to distort the comparison of employment levels, the population of combiners who retired in 2004 and 2009 is restricted to people who returned to paid work within 2 years following retirement. As a result, of the individuals who retired in 2004 and started combining work and a pension in 2005 or 2006, 70% had a job that was covered by the general scheme before they retired.
Sources and Coverage: See Fig. I.

Figure IV – **Distribution of combiners and retirees as a whole according to their age when they retired under the general scheme**



Reading Note: Of the retirees in 2004, 11% are women who were 65 years of age when they retired. Among the combiners who retired under the general scheme in 2004, 6% are women who were 65 years of age when they retired.
Sources and Coverage: See Fig. I.

retirees. This reflects that combiners accessed their pension under the "early retirement after a long career" (RACL) system more often than other individuals.

Over more recent years, combiners have been retiring later than other retirees. In 2014, combiners more often retire at the age of 61 or over compared to 60 for retirees as a whole. This is because those who prefer to combine work and a pension are people who have retired with the length of cover required for a full pension (excluding RACL). To gain this length of insurance cover, people do not always retire as soon as they reach the legal age.

Overall, people who work in addition to drawing their pension have a higher pension under the

general scheme than retirees as a whole,[10] partly thanks to their contribution period which is itself long (Figure V). Whatever their year of retirement, male combiners receive an average of € 10,300 a year under the general scheme and female combiners receive an average of € 8,300 a year whilst retirees as a whole receive an average of € 8,900 and € 6,700 a year respectively.[11] It is mainly in relation to individuals who have the lowest pension sums that the difference between combining and non-combining retirees is greatest. Thus, for men, combiners whose retirement pension under the general scheme is the lowest (the first third of combiners) may have an annual pension of up to € 8,000. Conversely, for retirees in this same group, the pension under the general scheme may be up to € 5,200 a year. The same difference between female combiners and female retirees as a whole can be seen among women in the first pension distribution group under the general scheme.

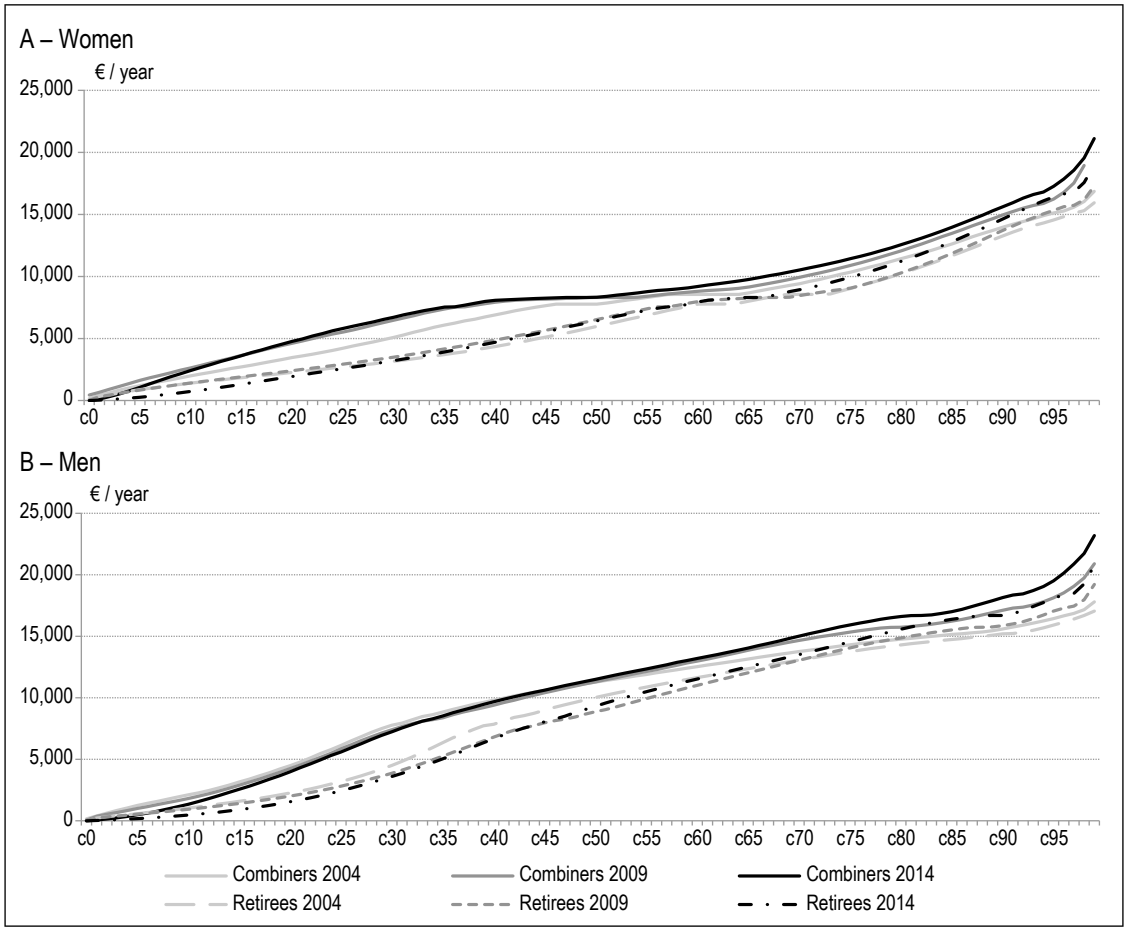
The pension sum paid under the general scheme has increased, especially among women, between the different waves of retirees, mainly owing to the growing presence of women on the labour market. The average pension under the general scheme thus rose from € 6,400 to € 6,900 a year for female retirees as a whole between those retiring in 2004 and those retiring in 2014. For female combiners, over the same period, the average annual pension under the general scheme increased by 12.5% (from € 7,700 to € 8,800).

1.3. Returning to Work after Retirement: Different Factors for Men and Women

Based on this initial description, those who combine work and a pension seem to differ from retirees as a whole mainly through having had a fuller career, having a job before retirement and

10. The pension under the general scheme is representative of the level of the combiners' pensions. This is because, even if half of combiners are multiple-pension claimants, the length of insurance cover accrued under the general scheme represents an average of 80% of the total accrued length of insurance cover.
11. All pension amounts are in Euro at their 2014 value.

Figure V – **Cumulative distribution of the overall pension amount (in € 2014) under the general scheme for combiners and retirees as a whole by year of retirement**



Reading Note: A third of men who are combining work and a pension and retired in 2004 receive a pension (own right) of less than € 8,482 a year under the general scheme (€5,567/year for all retirees). Two thirds of combiners who retired in 2004 receive at least €13,282/year (€12,507/year for all retirees).
Sources and Coverage: see Fig. I.

receiving a slightly higher retirement pension. Nevertheless, this does not tell which factors are determining their decision to combine work and a pension. Being in employment before retiring is linked to having a substantial length of insurance cover, and this is one of the elements taken into account when calculating the pension sum. That is why, based on the indicators presented above, it is impossible to identify which one per se influences the decision to return to paid work after retirement.

To go any further, we turn to a statistical model to construct a fictional situation in which retirees are in comparable situations. It is thus possible to eliminate all but one of the differences between retirees in order to determine its role in any return to work after retirement. In the model, we retain the following variables, which characterise an individual's career and the situation they are in when they retire:

- Their family circumstances at the time of retirement (whether they are single or in a couple): This is important because, as Blanchet & Debrand (2007) have shown, those in couples have a greater desire to retire (and therefore probably not to work again after retirement). We also control for the country of birth since individuals born abroad may have had a career which started late depending on their age when they arrived in France.

- The situation the individual was in when they retired: We use the average annual salary used to calculate the retirement pension under the general scheme. This offers the advantage of being an estimator of the pension level used by the general scheme which is less closely linked to the length of time worked in this scheme than the pension sum. We also include the activity status of the individual in the year preceding retirement. Rapoport (2012) concluded that, from the age of 50 onwards, those who were unemployed, ill or inactive rarely manage to find another job. Being in employment before retirement is therefore probably a strong factor in determining whether a person combines work and a pension.

- Their career: We retain the age of the individual when they accrue 4 quarters of employment in a calendar year for the first time, as an indicator of the person's age when they started working. If they were under 20 years of age, it often indicates early retirement after a long career. We have also retained the distance away from the length of cover required to get a full pension as a proxy of the length of insurance cover accrued. This is in line with descriptive statistics on the one hand, and Bridenne & Mette's (2012) results, who show that combiners have long careers. As an indicator of the level of pay, the average annual salary also provides information on the individual's career since it corresponds to the average of their highest salaries.

We have chosen to estimate the model separately for women and men in order to highlight gender specificities of combining work and a pension.

The reference situation used in the model is a person who is in a couple when they retire, born in France, and who started working between 19 and 20 years of age. They were in employment in the year preceding their retirement and have always been employed in the private sector (being single-pension claimants under the general scheme). They have acquired a length of insurance cover at least equal to that required to get a full pension and earned (under the general scheme) an average annual salary falling in the second quartile of the distribution.

For both sexes, the first thing that the model confirms is the link between combining work and a pension and having a job the year before retiring (Table 1). In addition, combining work and a pension appears to attract both people who started working at an early age and those who, conversely, started working when they were rather older. Retirees who have an accrued length of insurance cover at least equal to the length of cover required for a full pension are the most likely to combine work and a pension.

As for the influence of the amount of pension on the probability of having a paid job once retired, the estimation does not say the same thing for both sexes: For men, the higher the average annual salary, the more likely the retiree is to combine work and a pension. For women, those having a pension around the median are most likely to return to work after retirement.

Having identified the factors influencing why people combine work and a pension, we select those associated with the greatest differences. The results shown in Table 1 cannot tell us this because it is not enough simply to categorise conditions as a function of the absolute value of the parameters estimated by the model. To put factors in order of significance, we calculate the net effects of variables on the combining of work and a pension. This involves converting the estimated values of parameters into percentage points and, based on these, for all of the modalities of the variables, calculating the corresponding net differences so that they can be compared with gross differences (Table 2).

Table 1 – **Characteristics of people combining work and a pension and retirees who do not combine work and a pension (logistic model)**

Variable	Modalities	Reference	Estimated parameter	
			Women	Men
Constant			-1.734***	-1.909***
Family circumstances	Single	Couple	0.34***	0.047***
Age when started working	Aged under 17	Aged 19-20	0.109***	0.086***
	Aged 17-18		0.01*	-0.067***
	Aged 21-23		0.046***	0.056***
	Aged 24 or over		0.155***	0.138***
Situation before requesting a pension	Other	Employed	-1.506***	-1.314***
	Unemployed		-1.229***	-1.004***
	Inactive		-1.909***	-1.149***
Average annual salary	q1	q2	-0.336***	-0.259***
	q3		0.232***	0.12***
	q4		-0.117***	0.163***
Multiple-pension claimant	Multiple-pension claimant	No	-0.105***	0.224***
Country of birth	Abroad	France	0.01*	-0.235***
Distance away from full pension	More than 50 quarters	Full pension period	-0.203***	-0.549***
	Less than 50 quarters		-0.09***	-0.236***

Significance thresholds: *** = 1%; ** = 5%; * = 10%.
Notes: The analysis excludes 1.6% of observations corresponding to people not having accrued at least 4 quarters of activity or those whose family circumstances have not been recorded.
Sources: CNAV, historical database of combiners 2004-2016 and database of retirees on 31 July 2016.

Table 2 – **Gross differences and net differences from the logistic model (percentage points)**

Variable	Modalities	Reference	Women		Men	
			Gross differences	Net differences	Gross differences	Net differences
Family circumstances	Single	Couple	3.49	2.83	-0.72	0.44
Age when started working	< 17	Aged 19-20	-0.65	0.89	1.48	0.81
	Aged 17-18		-0.08	0.08	-0.62	-0.59
	Aged 21-23		0.36	0.37	-0.39	0.51
	Aged 24+		0.4	1.7	-2.93	1.87
Situation before requesting a pension	Other	Employed	-11.78	-11.75	-10.81	-9.58
	Unemployed		-10.42	-10.54	-9.09	-8.17
	Inactive		-13.98	-13.05	-11.17	-8.88
Average annual salary	q1	q2	-2.59	-2.49	-2.95	-2.12
	q3		4.59	2.1	2.2	1.13
	q4		3.98	-0.94	3.96	1.56
Multiple-pension claimant	Multiple-pension claimant	No	0.4	-0.85	1.15	2.04
Country of birth	Abroad	France	-0.43	0.09	-4.51	-2.05
Distance away from full pension	More than 50 quarters	Full pension period	-9.22	-1.58	-9.24	-4.29
	Less than 50 quarters		-5.14	-0.73	-5.74	-2.08

Notes: The analysis excludes 1.6% of observations corresponding to people not having accrued at least 4 quarters of activity or those whose family circumstances have not been recorded.
Reading Note: The proportion of combiners who are men born abroad is 4.51 points lower than the proportion of retirees born in France. Where the retirees in these two groups share the same characteristics (apart from their country of birth), the difference is reduced to 2.05 points.
Sources: CNAV, historical database of combiners and database of retirees on 31 July 2016.

The first finding is the reduction in the size of the differences once the model is estimated. For example, estimated parameters have shown that it is those people having the length of cover required for a full pension who are most likely to combine work and a pension. An analysis of the gross and net differences enables us to go further. For men, where individuals are more than 50 quarters short in terms of reaching the length of cover required for a full pension, the gross difference is -9.2 points. Controlling for the other variables taken into account, the difference is no more than -4.3 points. As a result, nearly 54% of the differences observed are associated with structural effects (measured by variables taken into account in the model), and 46% are explained by the difference in the length of insurance cover.

For women, looking only at combiner rates shows that those who do not have the length of insurance cover required are less likely to combine work and a pension (gross differences are -9.2 points and -5.1 points). However, the net difference becomes virtually zero for women who are less than 50 quarters short. The gross difference observed therefore simply corresponds to structural effects. As a result, women who have a length of insurance cover that is slightly less than that required for a full pension (less than the maximum of 50 quarters) are just as likely to combine work and a pension as women having the length of insurance cover required for a full pension. On the other hand, a short length of insurance cover always has a negative influence on the probability of combining work and a pension.

As has just been shown, it is often not exactly the same factors which influence the decision to return to work after retirement for men and women. For example, being single means that you are more likely to combine work and a pension only if you are a woman (a net difference of 2.8 points). On the other hand, the family circumstances of men do not seem to influence their decision to return to work after retirement (a net difference of 0).

To supplement the analysis of the hierarchy of variables in the model as a function of their degree of influence on returning to work after retirement, we use an information criterion, in this case the Schwartz information criterion (Table 3).

The situation before retirement (whether or not the person is working) is the variable most likely to determine whether that person combines work and a pension. The second factor having a very considerable influence on the probability of combining work and a pension is their average annual salary, even if this is not equally significant for men and women (see above).

Depending on the person's sex, the other factors have varying importance in their decision as to whether or not to combine work and a pension. For women, family circumstances and their age when they started working are the other variables having the greatest influence on whether or not they combine work and a pension. For men, it is whether they are multiple-pension claimants and have a full pension under the general scheme.

2. Three Typical Profiles of Combiners Under the General Scheme

Combiners differ from retirees as a whole through a few key characteristics such as being in employment before retiring and, for men, having a high pension or, for women, being single. The logistic model also shows differences among combiners underlining the influence of conflicting factors, such as the attractiveness of combining work and a pension for people who started working early or late in life. As a result, the estimation suggests that not all combiners are the same. In this second section, we aim to explore this very aspect by studying the profiles of combiners in more detail. We continue the work carried out by Musiedlak (2017) who identified five combiner profiles based on the labour force survey: elderly executives, self-employed men and young retirees, and two profiles of people holding irregular or part-time jobs. With the administrative data gathered by CNAV, which contain a wealth of information on careers, we are able to draw up profiles of retirees under the general scheme who return to a paid activity in the private sector and analyse them in detail.

To do so, we use multiple correspondence analysis (MCA)[12] which enables us to summarise the situation of combiners in terms of their career and retirement, and we supplement this with a

12. MCA involves creating new variables which are linear combinations of variables from the database. It allows a scatter diagram that is initially situated in a large area to be represented in an area of smaller dimensions which best preserves the wealth of initial information.

Table 3 – **Classification of variables used in the model according to their influence on the likelihood of combining work and a pension according to the Schwartz information criterion**

Women		Men	
Range based on the information criteria	Variables	Range based on the information criteria	Variables
1	situation before requesting a pension	1	situation before requesting a pension
2	average annual salary	2	average annual salary
3	family circumstances	3	multiple-pension claimant
4	age when started working	4	distance away from full pension
5	distance away from full pension	5	country of birth
6	multiple-pension claimant	6	age when started working
7	country of birth	7	family circumstances

Sources: CNAV, historical database of combiners 2004-2016 and CNAV, database of retirees 2004-2016.

classification in order to obtain profiles. Based on a limited number of qualitative variables describing the retired at the time of their retirement, MCA creates "summary" variables. The variables retained relate to elements which are known at the time of retirement. To describe a person's career, we use their age when they first reported a salary on their career statement, the length of contribution to the insurance cover and the average salary during the person's career in the private sector, expressed as a percentage of the social security ceiling. Three indicators are used to summarise the individual's situation at the time of their retirement: the reason for their retirement, their conjugal status and the CSG (*Contribution sociale généralisée*) rate applied to the pension. These variables are set against variables relating to the industry of the job combined with a pension and the pension received under the general scheme. These two variables are only included as supplementary variables. The active variables of the MCA all have 4 or 3 modalities and the observations within the various modalities are well balanced so as to prevent any variable carrying too much weight compared to the others. Only the first two axes are used in MCA: these allow use almost all the inertia (i.e. the information contained in all of the initial variables).

Summary variables of the characteristics of combiners have been constructed using the factorial analysis of multiple correspondences. The first variable, represented by axis 1 in Figure VI, compares men who have had long careers (modalities *totcont_q4* and *totcont_q3*) and comparatively high salaries (*meansal = 55-75%* and *meansal = min 75%*) with women who are more often single and have had shorter careers *(totcont_q1*) and low pay (*meansal = 35-55%)*. On axis 2 (the vertical axis), which corresponds to the second summary variable, there are, at the top, those who started work at a young age *(start work = before 15)* associated with the reason for early retirement after a long career *(ralc)* and, at the bottom, those who started later (*start work = 17-19* and *start work = after 19)* associated with a reason for departure being the length of cover (*length*, departure having the length of insurance cover required for a full pension).

We use these summary variables to identify three groups of combiners using a method of rising hierarchical classification combined with automatic classification.[13] Three groups of combiners are thus determined such that each group contains combiners with the most similar characteristics and each group differs as much as possible from the other two.

13. A mixed classification has been used to ensure the most robust method of classification. Unlike automatic classification, it means that there is no need to start the classification algorithm by choosing individuals randomly. Mixed classification involves first of all establishing an ascending hierarchical classification (AHC) to define the number of classes to be determined and to obtain the barycentre of the classes obtained. Then, in a second step, automatic classification is carried out based on the barycentres obtained through the AHC. In addition, owing to the large number of combiners, this mixed classification has been preceded by a first automatic classification.

Figure VI – **Multiple correspondence analysis, representation of the modalities on the first two axes**

Reading Note: As the information is clearly provided by the two axes represented, the modalities represented can be read as a function of their proximity or opposition to one another. As a result, combiners who retire having obtained a full pension thanks to the age of cancellation of the reduction ("age" condition on the graph) often also have a contribution period which is in the first quartile of combiner periods.
Sources and Coverage: See Fig. I.

Table 4 – **Characteristics of combiners by class**

	Class 1 Men-RALC	Class 2 Executives	Class 3 Women–stop-start career
Number of Observations	168,490	314,190	220,170
Distribution	24%	45%	31%
Socio-demographic situation at the time of retirement	63% men in a couple 21% men single	70% in a couple 60% of men	38% women in a couple 41% women single
Pension amount under the general scheme (in € 2014)	10,344	10,917	6,718
Annual pension amount across all schemes (in € 2014)	19,485	26,022	10,601
Average annual salary earned while combining work and a pension (in € 2014)	6,480	11,197	4,952
Proportion of people returning to work within days of retirement	23%	30%	44%
Average length, in months, before returning to work after retirement	18.9	15	13
Age when started combining work and a pension	61.1	63.4	64
Median length, in months, of combined work and pension by people who started combining in 2012 at the latest (*)	39	37	42.5
Age at the end of combined work and pension for people who started combining in 2012 at the latest	64.2	65.8	66.6

(*) The length of time that work and a pension are combined is measured for combiners who started combining work and a pension before 2013 in order to observe a sufficiently long combination period. People who died during this period have been taken into account. The length of time spent combining work and a pension is studied using duration models which make it possible to estimate the likelihood of the person ceasing to combine the two by taking into account individuals for whom ceasing to combine work and a pension has not yet been observed. A non-parametric model using the actuarial method has been applied (see Dardier, 2016).
Sources: CNAV, historical database of combiners 2004-2016.

Over 80% of Class 1 (Men – RALC), which represents 24% of combiners, is made up of men, most of them being in a couple (Table 4). They started working at the youngest age: 92% starting working before the age of 17 (Figure VII). They have been in employment virtually throughout their working lives: between the ages of 18 and 56, the proportion of people who have accrued 4 quarters of employment varies between 85% and 96%. Unemployment appears in this population around the age of 25 and increases with age. However, it is still very marginal, affecting a maximum of 6.8% of the population at any given age. It is also only unemployment over a very short period where the rest of the year is spent in employment. Throughout their careers, combiners in this age category have earned salaries between 70% and 80% of the social security ceiling. Because of their long careers without any interruption, individuals in this group have retired under the general scheme either taking "early retirement after a long career" (72%) or as soon as they reach the legal age with the length of insurance cover required for a full pension (26%). They receive an average annual pension from all schemes of € 19,500.[14]

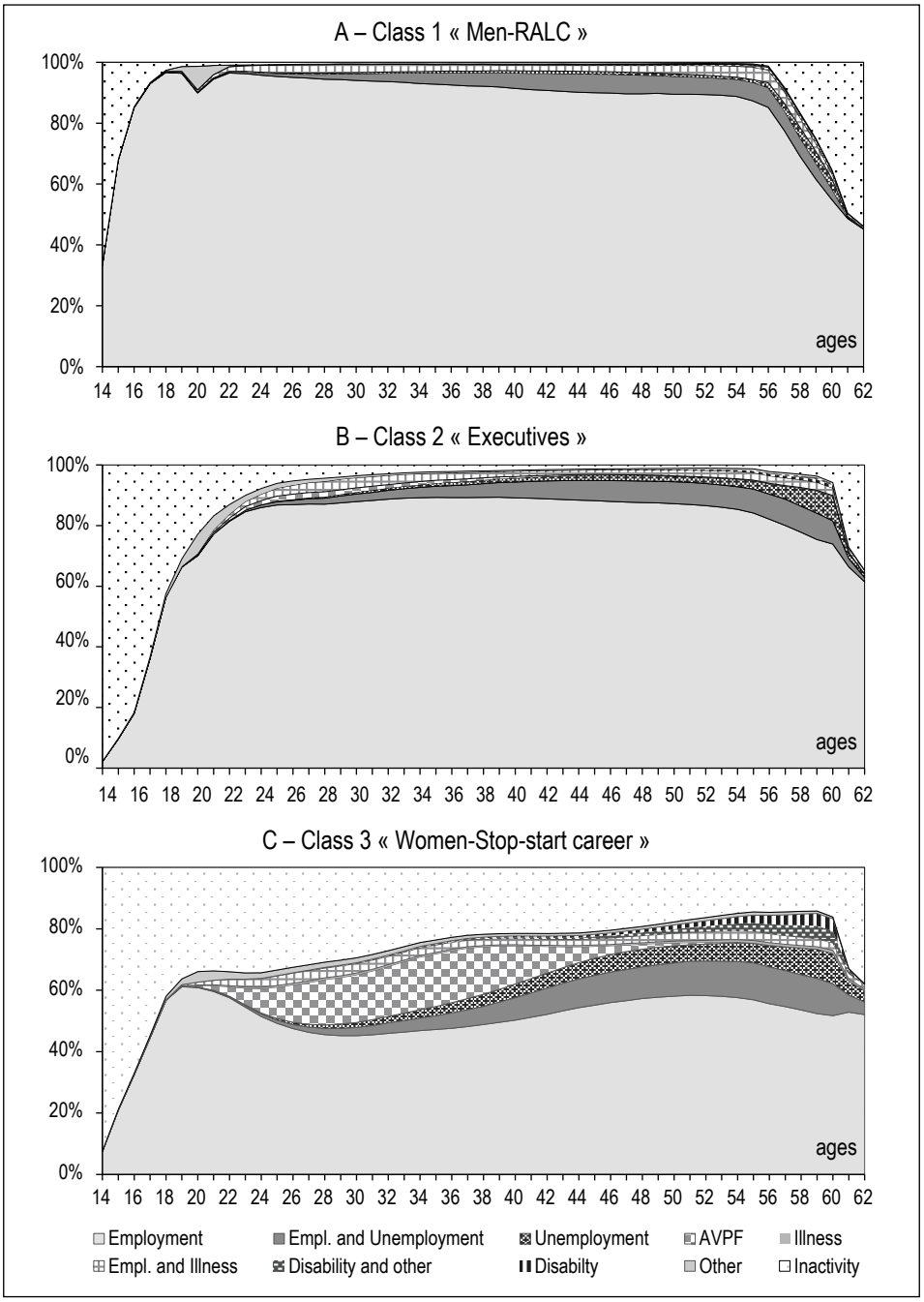
Class 2 (Executives), the largest with 45% of combiners, includes more men (60%) and people in couples (70%). Compared to Class 1, people in this category started working later in life. At least 85% of the population is in employment at every age between 25 and 55. These combiners have therefore tended to be untouched by unemployment or illness even though both are more common than among members of Class 1. Conversely, they have enjoyed better paid careers. Between the ages of 30 and 50, the median salary is equivalent to at least 90% of the social security ceiling. Consequently, they retire with a full pension having the length of insurance cover required (93%) and they receive total annual pension from all schemes that are the highest among combiners (an average of € 26,000 a year).

The last class (Women–Stop-start career), to which 31% of combiners belong, is quite different from the other two classes. It is essentially made up of women (79%). The combiners in this group typically had much less employment than those in the other groups since, between the ages of 25 and 50, only between 45% and 60% of this class managed to accrue 4 quarters of employment in any one year. This is because, whilst 62% of combiners in this group are in employment at 19 years of age, the proportion of people in employment falls from the age of 20 onwards without ever managing to rise again.

14. For comparison purposes, all pension sums and salaries of all combiners are given in EUR at their 2014 value.

This result is largely explained, as far as women are concerned, by childbirth. Old-age benefits for having raised children (*Assurance vieillesse des parents au foyer*, AVPF) are received by between 10% and 17% of women in this class at every age between 25 and 40. The men in this class (21%) have not reduced their professional activities following the birth of their children. On the other hand, from the age of 30 onwards and up until they retire, they sometimes suffer long periods of unemployment. In parallel with this lower level of employment, the combiners in this group have also earned lower pay (on average less than 35% of the social security ceiling). They are also often people who live on their own or in low-income households. As a result, they have less often retire with the length of cover required for a full pension (41%) and they have more frequently obtained a full pension by waiting until they reach the age when the reduction is cancelled (28%). About 30% of them retired with a pension cut by a reduction. The pension from all schemes in this group is the lowest at an average of € 10,600 a year.

Figure VII – **Chronogram of the careers of combiners according to the class to which they belong**



Reading Note: At the age of 38, 92% of individuals in Class 1 are employed throughout the year and 4.5% are employed and unemployed during the course of the year.
Sources and Coverage: See Fig. I.

Given that the three classes of people identified have had different professional careers which translate into distinct retirement pension sums and retirement conditions under the general scheme, it is likely that these three groups have not the same interest in combining work and a pension.

After retiring under the general scheme, retirees in Class 1 (Men–RALC) start combining work and a pension at the lowest ages (61 on average) in line with their retirement at a young age (cf. Table 4). Nevertheless, they wait longer before returning to paid work. Only 23% returned to work within a few days of retirement. On average, people in this class start combining work and a pension 19 months after retirement. This comparatively long period before returning to any professional activity may be explained by the legislation: 60% of combiners in this class retired before 2009 and a number retired under the system of early retirement after a long career without therefore having reached the legal age of retirement. They were therefore subject to the rules on the limited combining of work and a pension (cf. Box 1), obliged to wait at least 6 months after retiring before returning to any activity with the same employer they had before retiring. Individuals combining work and a pension under said limited conditions are also subject to a limit on earnings. That is why, alongside their pension, they receive on average a rather modest salary of € 6,480 a year. Combiners in this group are more often employed in the primary or secondary sector than other combiners. They combine work and a pension for the shortest period of all combiners since half of the people in this group stop the work they are doing during retirement within 39 months (3 years and 3 months) of combining the two. Individuals who started combining work and a pension before 2013 and who ceased all professional activities were on average about 64 years of age when they stopped combining work and a pension, this being the earliest that combiners stopped their professional activities.

30% of combiners in Class 2 (Executives) are in employment within days following their retirement under the general scheme. On average, they return to work 15 months after retiring, that is to say at an average age of 63.4 (cf. Table 4). They therefore start combining work and a pension sooner after retirement than individuals in Class 1. After retirement, they mainly work in the tertiary sector and are paid about € 11,200 a year. The combiners in this class all retired at the legal age with the length of cover required for a full pension and can therefore fully combine work and a pension,[15] not being subject to any restriction on earnings or the period before returning to work. Among those who started combining work and a pension before 2013, the average combination period is 3 years and 1 month.

Combiners in Class 3 (Women–Stop-start career) return to work after retirement sooner than other combiners. 44% have a job within days of retiring under the general scheme and the entire group takes an average of a little over 1 year (an average of 13 months) to get a job after retiring (cf. Table 4). These combiners have an average age of 64 when they return to work. This is the latest compared to the other classes, owing to their later retirement. The activity carried out after retirement is probably a small-scale activity, as shown by the remuneration earned: only an additional € 4,950 a year, and often from service vouchers (*chèque emploi service*), which suggests personal service jobs. On the other hand, these modest jobs are carried out for quite a long period of time (at least 3 and a half years in the case of half of combiners), which is the longest period seen among combiners. Those who started combining work and a pension before 2012 and ceased their professional activities retired from the labour market at the age of 66.6.

* *
*

The draft Law establishing a universal pension system presents combining work and a pension as a way of facilitating the transition between work and retirement and advocates its expansion (Assemblée nationale, 2020, Article 26). By 2022 and irrespective of the introduction of such universal pension system, combining work and a pension could enable activities carried out alongside retirement to create new pension rights for people fully entitled to combine the two.

For men, a high level of pension and a length of insurance cover at least equal to that required for a full pension are strong factors in determining whether they decide to work after retirement. For women, the level of pension is less important than whether they are living on their own when they retire. Nevertheless, for both sexes, the main factor influencing a return to work after retirement is whether they had a job before

15. Apart from 42% of individuals in this class who were subject to the capped combining of work and a pension in force between 2004 and 2009 for all combiners. From 2009 onwards, they have been fully able to combine work and a pension like the rest of those in the class who retired after that date.

retiring. As a result, expanding the practice of combining work and a pension, as sought by the legislators, will rely in part on the capacity of individuals to be in and around the labour market after they have reached the age of 60.

Beyond these characteristics, combiners constitute a heterogeneous population. Our study has identified three groups. A first, representing a third of combiners, mainly women, with careers interruptions primarily through breaks associated with children, but also through long periods of unemployment or illness. They therefore appear to use the option of combining work and a pension as a way of supplementing their resources after retirement. However, the vast majority of people who return to work after retirement have had long careers. They may be executives who have earned high salaries and who have a well-paid job alongside their pension; this second class makes up 45% of combiners. The last group, corresponding to 24% of combiners, consists of men who started working at a young age and retired early after a long career.

The profiles of combiners may change in the years to come. The draft Law proposes that the work carried out during retirement should enable a person to increase their pension in the same way as any professional activities for individuals who retire when they reach the legal age with the length of insurance cover required for a full pension. In that case, it would be in the interest of any individual in employment and meeting these conditions to request their retirement pension. The new legislation could create a windfall effect for those who have hitherto been working beyond the legal retirement age without wishing to retire.[16] We can therefore expect an increase in the number of combiners and a change in the characteristics of this population.

Acquiring pension rights while combining work and a pension removes a key advantage in terms of financing the pension system. At present, combining the two allows pension schemes to receive contributions without engendering additional expenditure for the scheme (the contributions do not afford additional pension rights). However, this will no longer be the case with the new legislation being proposed. Combining work and a pension is still a system which helps keep elderly people in employment, but it is no longer a means of improving the financial equilibrium of the pension scheme.[16]

However, expanding the combining of work and a pension within the population and the benefit of this system as far as the legislators are concerned should not hide the fact that it faces serious obstacles. Firstly, combining work and a pension runs counter to the meaning given to retirement. As noted in the 2003 pension reform, a pension is replacement income, supposed to allow a reasonable standard of living (Assemblée nationale, 2003). Carrying out work alongside a pension brings into question the function of replacement income in retirement. Moreover, during National Assembly debates, some deputies raised concerns that combining work and a pension was a way of avoiding having to upgrade pensions by encouraging retirees to find other sources of income (Assemblée nationale, 2008). Finally, as being in employment before retiring is one of the factors having the greatest influence on a return to work after retirement, not all retirees would have the same options when it comes to returning to work. As already noted by Bridenne & Mette (2012, p. 152), "Increased recourse to combining work and a pension could ultimately contribute to a widening of the disparities between retirees in terms of their options for the diversification of income during retirement and, consequently, an accentuation of the disparities in resources between retirees".

With the perspective of a change that would make combining work and a pension more attractive, the monitoring of the scheme will continue, in particular to carry out work on the profiles of new combiners. □

16. These are particularly individuals who benefit from the premium system, i.e. around 14% of new retirees under the general scheme in 2016.

Link to Online Appendix: https://www.insee.fr/en/statistiques/5396142/ES-524-525_Dardier_Online_appendix.pdf

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Economie et Statistique / Economics and Statistics

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Economie et Statistique / Economics and Statistics publie des articles traitant de tous les phénomènes économiques et sociaux, au niveau micro ou macro, s'appuyant sur les données de la statistique publique ou d'autres sources. Une attention particulière est portée à la qualité de la démarche statistique et à la rigueur des concepts mobilisés dans l'analyse. Pour répondre aux objectifs de la revue, les principaux messages des articles et leurs limites éventuelles doivent être formulés dans des termes accessibles à un public qui n'est pas nécessairement spécialiste du sujet de l'article.

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Les propositions d'articles, en français ou en anglais, doivent être adressées à la rédaction de la revue (redaction-ecostat@insee.fr), de préférence en format MS-Word. Il doit s'agir de travaux originaux, qui ne sont pas soumis en parallèle à une autre revue. Un article standard fait environ 11 000 mots en français (y compris encadrés, tableaux, figures, annexes et bibliographie, non compris éventuelles annexes en ligne). Aucune proposition initiale de plus de 12 500 mots (11 500 pour les soumissions en anglais) ne sera examinée.

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- Un fichier anonymisé du manuscrit complet (texte, illustrations, bibliographie, éventuelles annexes) indiquant en première page uniquement le titre, le résumé, les codes JEL et les mots-clés.

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Economie et Statistique / Economics and Statistics publishes articles covering any micro- or macro- economic or sociological topic, either using data from public statistics or other sources. Particular attention is paid to rigor in the statistical approach and clarity in the concepts and analyses. In order to meet the journal aims, the main conclusions of the articles, as well as possible limitations, should be written to be accessible to an audience not necessarily specialist of the topic.

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- A one-page file providing: the title of the article; the first name, name, affiliation-s (at most two), e-mail et postal addresses of each author; an abstract of maximum 160 words (about 1050 characters including spaces), briefly presenting the question(s), data and methodology, and the main conclusions; JEL codes and a few keywords; acknowledgements.
- An anonymised manuscript (including the main text, illustrations, bibliography and appendices if any), mentioning only the title, abstract, JEL codes and keywords on the front page.

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