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JEL Codes: I10, J14, J26

Keywords: Pension reform, Health, Healthcare consumption



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Does later retirement change your healthcare consumption ? Evidence from France *

Elsa Perdrix

July 20, 2020

Abstract

This paper examines the causal impact of later retirement on doctor visits among the French elderly. This question is of interest since spillover effects may arise if later retirement increases healthcare expenditure. I exploit the 1993 French pension reform in a two-stage least square to deal with the endogeneity of retirement. This reform leads to a progressive increase in claiming age, cohort by cohort from 1934 to 1943. I use a two-part model to disentangle between extensive and intensive margin. I use the administrative data *HYGIE* to observe both healthcare consumption between 2005 and 2015 and past careers. I find that an increase in retirement by four months decreases significantly the probability to have at least one doctor visit per year by 0.815 percentage point and decreases the number of doctor visits by 1.14% between ages 67 and 75. This effect is driven by the consumption of generalist doctor visits, and tends to be stronger for the first ages of consumption observed.

JEL CODES: I10, J14, J26

KEYWORDS: *pension reform, health, healthcare consumption.*

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Introduction

The accelerating number of reforms that increase the claiming age in Europe has led to a growing interest regarding the impact of retirement on health. This interest is threefold. First, it is important to ensure that these reforms do not have adverse health effects. Second, there could be several opposing mechanisms at play, which make the overall effect of such reforms uncertain. Lastly, over the last few years, studying the impact of retirement on healthcare use has been seen as a relevant complement to studies focused on health issues. This additional question has two motivations. First, observations on the impact of later retirement on health, combined with results on healthcare use, provide important information from a public policy perspective. For example, findings showing worse health and less healthcare use could be interpreted as an increase in the number of people forgoing medical care. Second, we must account for spillover effects to avoid an overestimation of the financial benefits associated with pension reforms.

The potential mechanisms explaining the effect of the switch from employment to retirement on health may differ from those explaining the effect of delayed retirement on health¹ and those mechanisms can vary depending on which dimension of health one considers.² The impact of delayed retirement on healthcare consumption may affect retirees through changes in health and health investment, due to the time spent in employment and in retirement. It could also be the result of a change in the expected timing of retirement. Finally, it could be due to a change in inter-temporal income.

This paper explores the causal impact of later retirement on healthcare consumption in France. I focus on doctor visits out of the hospital setting, hospital stays in private hospitals, and expenditure on prescription drugs. I use waves 2005 to 2015 of the administrative data *HYGIE*, which include information on career and healthcare consumption from the private pension scheme *CNAV* and the National Health Insurance. Since individuals can choose to retire for health reasons, there is a reverse causality issue to consider. I use the 1993 French pension reform as an instrumental variable to address this issue. This reform was the first one to induce later retirement in France, and it did not affect

¹For example, the opportunity-cost of time play a role explaining differences at retirement but not explaining differences among retirees according to their retirement timing.

²For example, the increase in the exposure to a repeated physical task over the career due to a pension reform may explain an impact on physical health but not necessarily on cognitive health.

individuals within and between cohorts with the same intensity. However, on average, it led to an increase in claiming age (Aubert, 2009; Benallah and Mette, 2009; Bozio, 2011b) and in elderly' labour force participation (Bozio, 2011b).

This paper aims at contributing to the literature in several ways. First, it is the first one to focus on the French case. Second, I draw several distinction: between the extensive margin and the intensive margin; between volume and price effects, between several categories of healthcare use. Those distinctions allow for analyses of the potential underlying mechanisms. I find that an exogenous increase in claiming age leads to a small but statistically significant decrease in the probability to have at least one doctor visit a year. Moreover, it decreases the average number of doctor visits per year among consumers. The effect is driven by general practitioner visits. When focusing on subsamples by age range, I show that the impact at the extensive margin is significant from ages 68 to 76 while, from ages 66 to 70, it is significant at the intensive margin.

These results are consistent with Bíró and Elek (2018). Using a similar econometric method, they find that an increase in claiming age led to a significant decrease in doctor visits among women in Hungary at the extensive margin, but not at the intensive margin. Hagen (2018) also observe a decrease in drug prescriptions but not in inpatient care among female civil servants in Sweden. While Bíró and Elek (2018) do not provide any potential mechanism explaining these results, Hagen (2018) concludes that working is health preserving. Using a different empirical strategy, Shai (2018) focuses on a reform of the Israeli pension system that increased the statutory retirement age from 65 to 67. He finds a slightly significant increase in doctor visits among men between ages of 65 and 69 who retired later due to a reform compared to a control group of men aged 50 to 64 (not retired) and 70 to 74 (retired from age 65). He suggests that later retirement deteriorates health and increases healthcare expenditure. He assumes that this health decline comes from a delayed entrance in retirement, a time where individuals are more likely to engage in healthier behaviours.

This paper is organised as follows: Section 1 presents the literature and theoretical mechanisms. Section 2 presents the French pension reform used as an instrumental variable. Section 3 presents the administrative data and the empirical strategy. Finally, Section 4 presents the main results and the potential underlying mechanisms.

1 Literature Review and Underlying Mechanisms

There is a large literature on the impact of the switch from employment to retirement, and on the impact of delayed retirement on various dimensions of health. However, studies that focus on healthcare consumption are scarce and most papers are only interested in the consequences of the switch from employment to retirement on healthcare consumption (11 over 13 papers, see Table 1). The expected overall impact is unclear. The Grossman model (Grossman, 1972) predicts contradictory effects of retirement on healthcare use. On the one hand, marginal benefits of health investment decrease at retirement.³ On the other hand, marginal costs also decrease because of a lower opportunity cost of time. Moreover, the budget constraint may vary throughout individuals at retirement through earnings and consumption changes. Lastly, the health stock depreciation may change at retirement.⁴

Only two papers documented the impact of a variation in retirement age on healthcare consumption among retirees, as summed up in Table 1. The impact of delayed retirement among retirees on healthcare consumption is not expected to be the same as the impact of the switch from employment to retirement. Marginal benefits of health investment, budget constraints and depreciation of the health stock vary in an inter-temporal framework. Moreover, changes in the opportunity cost of time cannot explain the differences in healthcare consumption due to a change in retirement timing among pensioners anymore.

Almost all the studies on the impact of the switch from employment to retirement find a decrease in healthcare consumption at retirement. Thus, Coe and Zamarro (2015); Eibich (2015); B  r   and Elek (2018); Shai (2018); Nielsen (2019); Frimmel and Pruckner (2020) and Kuusi et al. (2020) find a decrease in doctor visits in Europe and the USA, in Germany, Hungary, Denmark, Austria and Finland, respectively. Nielsen (2019) finds a statistically significant decrease at the early retirement age threshold but not at the statutory retirement age while Eibich (2015) finds a decrease in healthcare consumption at both thresholds. B  r   and Elek (2018); Gorry et al. (2018); Nielsen (2019); Frimmel and Pruckner (2020); Kuusi et al. (2020) also find a decrease in inpatient care and B  r  

³According to Grossman, health benefits are mainly through work productivity.

⁴Changes in health habits at retirement like physical activities, alcohol and tobacco consumption may impact the depreciation rate of health, which may impact healthcare consumption.

and Elek (2018); Gorry et al. (2018); Kuusi et al. (2020) find a decrease in prescription drugs consumption.

The authors provide several explanations for this decrease. The main mechanism is through an health improvement (Coe and Zamarro, 2015; Eibich, 2015; Shai, 2018; Frimmel and Pruckner, 2020). Thus, Eibich (2015) shows that individuals report a better health at retirement by engaging in healthier habits (smoking less, drinking less alcohol, having a physical activity more often, they also report better sleep and higher sleep duration). Consequently, he attributes the healthcare consumption decrease to an overall better health, due to healthier behaviours and greater well-being. Besides, Coe and Zamarro (2015) point out that most of the previous studies find a better self-reported health at retirement. Frimmel and Pruckner (2020) argue that the decrease in healthcare consumption is partly driven by the decrease in psychiatric and orthopaedic hospital care and in psychotropic drugs medication for musculoskeletal disorders. These care are typically associated with healthcare and not with health prevention.

However, other authors consider this mechanism as unlikely. Bíró and Elek (2018) believe that health changes are slow and that the sudden healthcare consumption change at retirement cannot be attributed to a sudden change in health. They offer three other mechanisms. First, individuals in employment have doctor visits for their sick-leave certificate while pensioners do not need it (see also Nielsen (2019)). Second, individuals may be willing to invest more in their health while working. In this line, Frimmel and Pruckner (2020) show a decrease in screening participation and preventive care at retirement. Third, the income drop at retirement may decrease healthcare consumption. Nielsen (2019) also considers the opportunity cost of time: it would be higher during retirement because individuals would prefer using time off work to visit a doctor rather than using personal time for the visit.

Only three studies do not find a decrease in healthcare consumption at retirement. Grøtting and Lillebø (2018) find a negative non significant result on hospital stays in Norway but a significant decrease among the lowest education levels. Lucifora and Viganì (2018) uses cross-country differences in retirement age in Europe. Assuming normal distribution of the number of doctor visits, they find an increase in doctor visits in Europe at retirement. Their main explanation for this result is the opportunity-cost of time. To

support this explanation, they show that the founded result is higher for those with long working hours. Zhang et al. (2018) also find an increase in healthcare consumption in Urban China. They consider that the main underlying mechanism is the opportunity cost of time, particularly high in Urban China. This could explain the difference with results found in Europe and the United States.

An other strand of the literature focuses on the impact of a change in retirement age on healthcare consumption. As far as I know, only one study targets the impact of later retirement on healthcare consumption (Hagen, 2018) and another one focus on the impact of earlier retirement (Hallberg et al., 2015). Both these studies use reforms that spurred individuals towards an earlier or later retirement. They find either a non significant or a negative impact on healthcare consumption. Thus, Hagen (2018) uses the Swedish pension reform of local government workers as an instrumental variable. This reform increases the claiming age from 63 to 65 years old. He finds no significant change in inpatient care but a significant decrease in drugs consumption for women between ages of 65 and 69. Hagen (2018) assumes that work is health preserving for the women civil servants, and that it explains the results. Hallberg et al. (2015) use the Swedish early retirement offer at age 55 implemented for military officers (rather than 60 before the reform) as an instrumental variable. They focus on the impact of this exogenous decrease in claiming age on healthcare consumption. They find a significant decrease in inpatient care consumption between ages 56 and 70, and interpret it as a consequence of health improvement linked to earlier retirement.

Thus, the literature and underlying mechanisms concerning the impact of the switch from employment to retirement on health is well documented. However, there is little knowledge regarding the impact of later retirement on healthcare consumption among retirees, and the associated underlying mechanisms (in particular, is health a cause or consequence of healthcare consumption changes due to later retirement). The purpose of this paper is to fill this gap.

Table 1: Literature Review on the Impact of Retirement on Healthcare Consumption

Authors (year)	Country	Sample	Age	Method	Instrument	Results on Doctor/Hospi	Drugs
Impact of the switch from employment to retirement							
Coe and Zamarro (2015)	Europe + USA	Men, workers at 50y.o.	50+	RDD	SRA	↗	NS -
Eibich (2015)	DEU	Civil servants & self-employed	55-70	RDD	ERA: 60. SRA: 65	↗	NS -
Bíró and Elek (2018)	HUN	Women	54-60	2SLS (TPM)	ERA: 57	↗	↗
Bíró and Elek (2018)	HUN	Men	57-63	2SLS (TPM)	ERA: 60	↗	↗
Gorry et al. (2018)	USA	Workers at age 50	50-93	2SLS	SS threshold	NS	↗
Grotting and Lillebø (2018)	NOR	-	56-79	FRDD	SRA: 67	-	NS -
Lucifora and Vigani (2018)	EU	-	50-69	RDD	ERA and SRA	↗	-
Shai (2018)	ISR	Men	40-74	DiD	SRA: 65 ⇒ 67	↗	-
Zhang et al. (2018)	CHN	Workers	40-75	RDD	SRA: 60 (♂) 50 (♀)	↗	-
Nielsen (2019)	DNK	Cohort 1939, without ERP or DRP	60-70	2SLS	SRA: 67 ⇒ 65	NS	NS -
Nielsen (2019)	DNK	-	55-65	RDD	ERA: 60	↗	↗
Frimmel and Pruckner (2020)	AUT	Private sector	41-74	FRDD	ERA: 60 ⇒ 65 (♂) 55 ⇒ 60 (♀)	↗	↗ NS
Kuusi et al. (2020)	FIN	Workers before ERA	62-67	2SLS	SRA: 63	-	↗ ↗
Impact of later retirement							
Hagen (2018)	SWE	Women, civil servants	65-69	DiD	SRA: 63 ⇒ 65	-	NS ↗
This paper	FRA	Men, private sector	66-76	2SLS (TPM)	SRA ↗	↗	NS ↗
Impact of earlier retirement							
Hallberg et al. (2015)	SWE	Men, military	56-79	2SLS	SRA: 60 ⇒ 55	-	↗ -

Notes: Results on (1) doctor visits; (2) hospital stays; (3) drugs. No particular sample restriction is notified with “-”.

Abbreviations: Countries abbreviations are 3-letters codes from the United Nation. Column method: (F)RDD, (fuzzy) regression discontinuity design; DiD, difference in difference; 2SLS, two-stage least square; TPM, two part model. Column instrument: ERA, early retirement age; SRA, statutory retirement age. Other columns: NS: non significant at the 5% level; “-” No particular sample restriction, or, for the results’columns: Not applicable; ERP, early retirement pension; DRP, disability retirement pension.

2 The 1993 Pension Reform in the Private Sector

Before the 1993 pension reform, workers from the private sector could claim a pension from age 60. However if they wanted to benefit from a full pension,⁵ they had to have contributed up to at least 150 quarters or to leave at age 65 or after. Individuals may contribute quarters when in employment but also when in sick-leave, maternity-leave, or unemployment. The maximum number of contributed quarters per year is four. Being out of the labour force⁶ prevents an individual from validation of quarters. Lastly, there is no increment (neither before nor after the reform), so no financial incentive arises to claim for pension after reaching the full replacement rate.

In 1993, the first pension reform leading to an increase in career length was implemented. This reform only applied to workers from the private sector. Individuals could not have anticipated it because there was no announcement before the reform. Moreover, the reform was voted and adopted very quickly.⁷

As a consequence, required contribution length for a full pension has gradually increased from 150 to 160 quarters, cohort by cohort, starting with the 1934 cohort. As shown in Table 2, cohort 1934 had to contribute 151 quarters for a full pension, cohort 1935 had to contribute 152 quarters and so on and so forth.

Table 2: Increase in Required Contribution Length in the Private Sector

Birth year	Nb of contr. quarters	
	in quarter	in year
1933 and before	150	37 years and 6 months
1934	151	37 years and 9 months
1935	152	38 years
1936	153	38 years and 3 months
...	...	
1942	159	39 years and 9 months
1943 and after	160	40 years

Notes: Individuals born in 1933 or before, have to have contributed 150 quarters to benefit from a full replacement rate; those born in 1934 have to contribute 151 quarters; and so on.

⁵The full replacement rate is 0.5. It decreases by a δ factor, equal to 1.25 % per quarter of missing contributions. See Appendix A and also Bozio et al. (2019); Blake and Garrouste (2019) for more details on this reform.

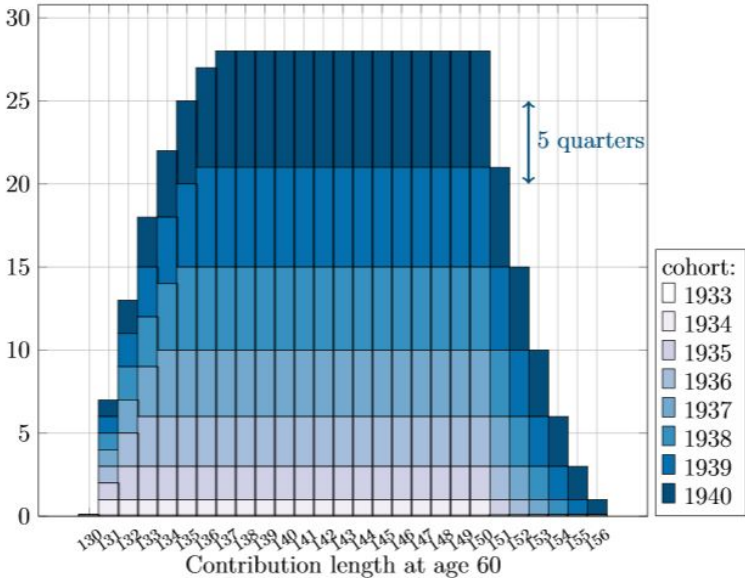
⁶i.e. being unemployed and not looking for a job or unemployed for a long period of time.

⁷The reform was voted in July 1993. The implementing decree was published one month later with an application date on the 1st January 1994.

This reform changed the incentive to claim pension at a certain age. This is different from a change in the mandatory claiming age. Thus, individuals affected by the reform can leave at the same age than before the 1993 reform, if they accept a decrease in their pension. In my analysis, I measure the impact on the compliers (those who delayed retirement if affected and do not if not affected) and not on the always-takers and the never-takers.

Finally, note that workers are not all affected in the same way. Individuals with very short career would only be granted a full pension from age 65 because they had not contributed enough beforehand. Similarly, individuals with very long career have contributed at age 60 largely more than the required contribution length, so that they can leave at age 60 regardless of the required contribution length, and are not affected by the reform. Figure 1 illustrates this fact for the first cohorts affected by the reform. In this paper, I exploit both variation within cohort (between contribution length at age 60) and between cohort (for a same contribution length at age 60).

Figure 1: Impact of the 1993 Reform on Required Contribution Length



Notes: Scheme from Bozio et al. (2019). It shows the number of added quarters required to reach the full-rate by cohort and contribution length at age 60 due to the reform. Cohort 1934 who had contributed at age 60 between 130 and 150 quarters need one quarter more in order to qualify for the full-rate. Cohort 1935 who had contributed at age 60 between 131 and 150 quarters need two quarters more to reach the full replacement rate. Those from the same cohort who had contributed 130 and 151 quarters at age 60 have to delay retirement by one quarter.

3 Data and Empirical Strategy

I use the 1993 pension reform as an instrumental variable to estimate the causal impact of later retirement on healthcare consumption. It requires data including both information on contribution length and claiming age; and information on healthcare consumption.

3.1 Data

I use administrative data *HYGIE*, provided by Irdes,⁸ which include information from the private pension scheme (CNAV) and from the National Health Insurance. It includes 1/20em of all individuals born between 1935 and 1989 and who have contributed at least once in the private sector. The data include information on careers (number of contributed quarter, claiming age, pension). All health information are aggregated at the yearly level for every individual between 2005 and 2015. Thus, the healthcare consumption of individuals born in 1935 is observed between the ages of 70 and 80, those born in 1936, between the ages of 69 and 79 etc. (See Table B1).

The number of doctor visits and total expenditure for visits, the number of days in private hospitals⁹ and the total associated cost, the total cost of prescription drugs constitute the healthcare-related parameters. Doctor visits are split between general practitioners, and specialist practitioners. This includes doctor visits provided out of the hospital. Ambulatory surgeries are excluded. Therefore, doctor visits only include consultation and no acts. More details on the French healthcare system are provided in Appendix A.2.

3.2 Sample Selection

Sample Selection. I selected all men,¹⁰ born between 1935 (the oldest I observe) and 1943 (the last cohort affected by the 1993 reform but not by the following pension reforms);

⁸Institut de recherche et de documentation en économie de la santé.

⁹Private hospitals provide both schedule care and emergency care. In 2015, 25% of emergencies care (excluding paediatric emergencies) were in the private sector (Toulemonde, 2017).

¹⁰The sample selection on men is due to data constraint. See Appendix B for more information. Note that the 1993 reform affects mostly men, and thus, it remains of interest to explore the impact of the reform among men only.

who had contributed at least once during their career in the private sector;¹¹ who had contributed between 131 and 160 quarters at age 60;¹² who were alive and retired before age 67. I observe consumption between the ages of 66 and 76 for individuals born between 1935 and 1943 (See Table B1). As a complementary analysis, I provide results by age range. For this analysis, I select individuals born between 1939 to 1943 and observe their consumption between ages 66 and 68; I select individuals born between 1938 and 1943 and observe their consumption between the ages of 67 and 69 and so on and so forth until the selection of individuals born between 1935 to 1939, for whom I observe their consumption between the ages of 74 and 76 (See Table B2). Note that since the reform has no impact on mortality (Bozio et al., 2019), the selection on individuals alive at different ages does not bias the empirical strategy.

Since the reform only affects individuals who had contributed between 131 and 160 quarters at age 60, the sample is restricted to this population. Small changes in this threshold are not expected to drive the results but large changes may. By including in the panel individuals that were not affected but with very different characteristics than the affected, bias may arise. For example, the inclusion of individuals with very long career (more than 170 quarters at age 60) leads to the inclusion of individuals that were not affected by the reform since they started working around 16 years old (control group) while the treatment group started working between the ages of 23 and 27. Moreover, note that it is not possible to include individuals with either less than 131 quarters or more than 160 quarters since these individuals are not affected by the reform but left at very different claiming ages (the first group left at age 65 and the second at age 60). As a robustness check, I show that the change of this contribution length threshold does not statistically significantly change the results when applying to a small variation of the threshold but changes the results when adding a large range of individuals not affected by the reform but with different characteristics than the treatment group (see Figure C1 of Appendix C.1).

Variables of Interest. I use several measures of healthcare consumption. The first one is the probability of having at least one doctor visit. Second, for consumers, I take into

¹¹The 1993 reform affects only the private sector.

¹²i.e. in the labour force at age 60 at least from 32 years and 9 months and maximum from 40 years.

account the yearly number of doctor visits as well as the expenditure on doctor visits.¹³ This last expenditure includes both the part that is reimbursed by the insurance and the out-of-pocket payment.¹⁴ All these healthcare use variables are used through logarithm transformation among the consumers. I distinguish between general practitioners and specialist practitioners. I also factored in the number of dental visits and the total expenditure on dental visits; the number of days spent in private hospitals and the associated expenditure;¹⁵ the expenditure on prescription drugs, as well as the total expenditure on all the previously quoted medical care.

Descriptive Statistics. Table 3 provides descriptive statistics regarding the health and careers of individuals included in this study. In the main sample, 75.7 % of observations have at least one doctor visit a year. Thus, in the main sample, 24.3 % of observations do not consume any doctor visit. It is higher than the 10 % of non-consumers found among the 75 and older in France by Calvet (2012) and Sourty-Le-Guellec (1999) among the French registered at the National Health Insurance. Moreover, 72 % had at least one general practitioner visit during the year, which is, once again, lower than the national statistics (Calvet and Montaut (2013) show that after age 60 only 7 % do not consume any doctor visit). One explanation may be that I focus on men who worked in the private sector, and had contributed between 131 and 160 quarters at age 60, who usually are in better health than the average French inhabitant.¹⁶

In the whole sample, individuals who have or had a chronic condition after age 65 account for 44% of the observations. Among these individuals, 83% had a doctor visit. Moreover, 71% of observations from the main sample are individuals who benefited from a co-payment exemption, meaning that they did not have any out-of-pocket payment for doctor visits. The 29% of observations without this exemption have an out-of-pocket payment for doctor visit around 30% of the total expenditure if they don't have a supplemen-

¹³In euros 2016. I use the inflation index from the French national institute of statistics INSEE <https://www.insee.fr/fr/information/2417794>.

¹⁴Appendix A.2 provides details about the French health insurance system and reimbursement rate.

¹⁵The impact of delayed retirement on hospital care in the private sector can be interpreted as the impact on the whole hospital care only under two additive assumptions. First, delayed retirement does not change the preference between public and private hospitals. Second, the preference between public and private are not exclusives.

¹⁶This selection leads to the exclusion of self-employed workers, inactive, handicapped, and a large part of blue collars, which are in average in worse health than the whole population.

tary health insurance (see Appendix A.2 for more details). Those with this co-payment exemption are most of the time consumers (94%) which is expected since having large expenditure for healthcare in France is one of the reason why an individual can benefit from a co-payment exemption.

I find no significant differences in career characteristics between the main sample and sub-samples of doctor consumers, of individuals with chronic condition and with co-payment exemption. Thus, the selection of consumers does not appear to bias the sample according to career characteristics. The average claiming age is 61.87 years old for the whole sample as well as the subsample of those with at least one doctor visit a year; the average number of added quarter required due to the reform (ΔRCL) is 3.518 quarters (resp. 3.417 for consumers); the contribution length at age 60 is 149.5 (resp. 149.8).

Figure 2 shows the point estimate of the impact of the number of added quarter required on number of doctor visits by year of consumption (Figure 2a) and by age (Figure 2b), controlling for age, contribution length at age 60, suffering from a chronic disease, and the living area (reduced-form estimation). It shows that the average level of consumption is higher among the not-affected for almost all year of consumption and at all ages. Moreover, it seems that in average, the more an individual is affected, the lower his healthcare consumption is.

Table 3: Descriptive Statistics

	All	GP	Consumers of Specialist	Ambulatory care	Individuals with Co- payment exemption	Chronic condition	
Probability of	General practitioner visit	0.725 (0.447)	1 (0)	0.936 (0.244)	0.957 (0.203)	0.906 (0.292)	0.803 (0.398)
	Specialist practitioner visit	0.510 (0.500)	0.660 (0.474)	1 (0)	0.674 (0.469)	0.637 (0.481)	0.594 (0.491)
	Doctor visit	0.757 (0.429)	1 (0)	1 (0)	1 (0)	0.944 (0.230)	0.831 (0.374)
	Hospital stay	0.120 (0.325)	0.156 (0.363)	0.230 (0.421)	0.158 (0.364)	0.151 (0.358)	0.151 (0.358)
	Chronic condition	0.440 (0.496)	0.487 (0.500)	0.512 (0.500)	0.483 (0.500)	0.488 (0.500)	1 (0)
	Co-payment exemption	0.710 (0.454)	0.888 (0.315)	0.886 (0.318)	0.885 (0.318)	1 (0)	0.788 (0.409)
	Number of	General practitioner visits	4.590 (5.923)	6.335 (6.112)	6.491 (6.413)	6.064 (6.116)	5.836 (6.229)
Specialist practitioner visits		2.458 (4.624)	3.206 (5.077)	4.817 (5.525)	3.248 (5.067)	3.097 (4.934)	3.122 (5.049)
Doctor visits		7.048 (8.531)	9.541 (8.729)	11.31 (9.237)	9.311 (8.664)	8.933 (8.760)	8.901 (9.497)
Hospital stays (in days)		0.433 (4.651)	0.556 (5.040)	0.754 (5.627)	0.554 (5.050)	0.566 (5.396)	0.651 (6.166)
Expenditure for		General practitioner visits	127.0 (142.0)	174.0 (140.3)	182.9 (152.6)	167.3 (141.2)	163.0 (144.5)
	Specialist practitioner visits	236.0 (545.7)	308.6 (606.3)	434.7 (701.7)	310.3 (608.2)	297.6 (608.3)	316.6 (682.2)
	Doctor visits	314.3 (474.1)	420.3 (505.9)	552.7 (560.0)	415.2 (505.0)	399.4 (507.3)	411.1 (559.0)
	Prescription drugs	713.2 (1258.6)	934.6 (1337.7)	1047.6 (1535.2)	926.2 (1362.4)	922.6 (1399.2)	966.6 (1545.6)
	Hospital stays	291.0 (1749.8)	374.5 (1904.6)	540.5 (2297.3)	378.8 (1957.3)	378.6 (2033.1)	427.9 (2241.7)
	Total expenditure	2277.8 (4200.6)	2973.0 (4501.1)	3630.8 (5211.4)	2960.3 (4569.0)	2922.9 (4708.0)	3041.6 (5121.6)
	Career	Claiming age	61.87 (2.113)	61.73 (2.019)	61.79 (2.048)	61.78 (2.043)	61.83 (2.073)
Added quarters		3.518 (3.073)	3.411 (3.050)	3.417 (3.043)	3.434 (3.051)	3.547 (3.087)	3.232 (2.966)
Contrib. length at age 60		149.5 (8.076)	149.8 (8.028)	149.8 (7.997)	149.7 (8.050)	149.6 (8.106)	149.6 (8.129)
<i>N</i>	66,698	48,324	34,040	50,488	47,365	29,323	

Notes: “Added quarters” is the number of added quarters required due to the reform. “Contrib. length at age 60” is the contribution length at age 60. Hospital stays include only private hospital stays. Drugs include only prescription drugs.

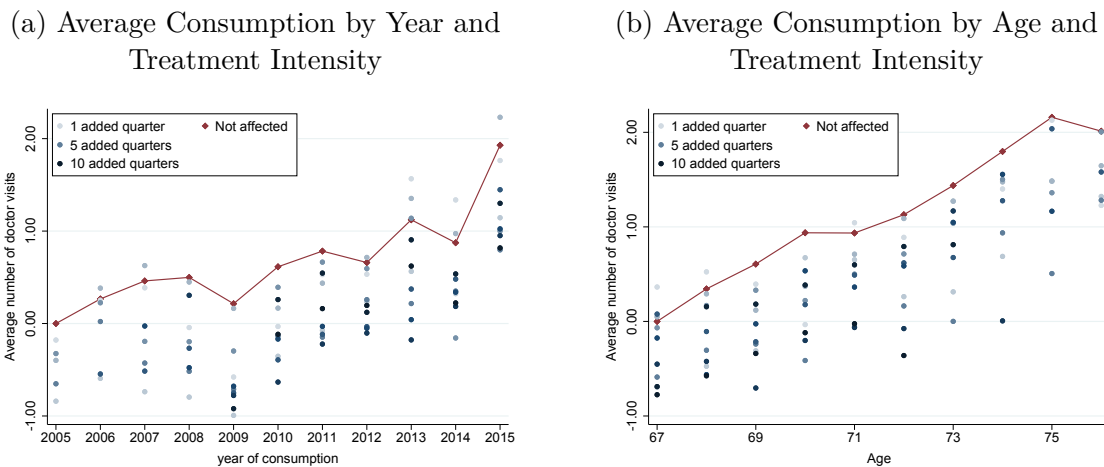
Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67, ages comprised between 66 and 76.

Source: HYGIE 2005 – 2015.

3.3 Empirical Strategy

Using Log-transformation. As reminded by Lumley et al. (2002) the normality assumption is a strong one in the empirical strategy I planned to use. The skewness of healthcare distribution prevents from this assumption (Figure B2a and B2b). This skewness is due to both left-censor data and long right-tail distribution. Using a logarithm transformation among the consumers solves the long-right-tail issue (Figure B2c and B2d).

Figure 2: Healthcare Consumption among Individuals Affected and not Affected by the Reform



Notes: This graph presents the reduced-form. It is the point estimates of the number of added quarter required on the number of doctor visits, controlling for age, year, contribution length at age 60, department, and having a chronic condition, estimated using OLS regression. It shows the number of doctor visits by year (Figure a) and by age (Figure b) for individuals not affected by the reform (red square) and individuals affected (blue circles). The most dark blue the circle is, the most important the treatment intensity is.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67, ages comprised between 66 and 76.

Source: HYGIE 2005-2015.

Using Two-part Model. A large proportion of the observed population has zero consumption for a given point of time. Two main models enable us to tackle this issue: sample selection models (eg. Heckman models) and two-part models. As reminded by Madden (2008), there is a huge literature on the choice between these two models (Leung and Yu, 1996; Jones, 2000). I chose a two-part model for two main reasons: first, delayed retirement may affect differently the probability to consume and the level of consumption. From a public policy point of view, this distinction is of great interest, because the potential mechanisms explaining a zero consumption may differ from those explaining a change in level.¹⁷ Moreover, only measuring the overall effect could lead to a wrong interpretation in terms of public policy.¹⁸ The second reason to study both extensive and intensive

¹⁷One may argue that foregoing healthcare can only be measured through the probability to consume and not through the level of consumption.

¹⁸Let us imagine that the pension reform leads to both an increase of the share of individuals foregoing healthcare for financial reason but also deteriorates the health of those who can still afford care. The latter increase their healthcare consumption as a consequence of a worse health. We could at this point conclude that the reform is detrimental to both health and access to the healthcare system. However, without any distinction between extensive and intensive margin, such a conclusion is impossible. Consider this numerical example: a population with 80% of consumers before the reform and each consumer consume 10 euros. It means an average consumption of 8 euros. Due to a reform, the share of consumers decreases

margins is that two-part models allow for logarithm transformation without issue regarding logarithm transformation for individuals with zero consumption. Equation 1 is an ordinary least square regression.¹⁹ It gives the impact of claiming age on the probability to consume care (impact at the extensive margin). Using logarithm transformation in an ordinary least square model, Equation 2 gives the impact of claiming age on the level of consumption (intensive margin) among the consumers.

$$\mathbb{1}_{HC_{i,t}>0} = \beta_0 + \beta_1 A_{i,t} + \beta_2 X_{i,t} + v_{1,t} + \varepsilon_{i,t} \quad (1)$$

$$\log(HC_{i,t} |_{HC_{i,t}>0}) = \gamma_0 + \gamma_1 A_{i,t} + \gamma_2 X_{i,t} + v_{2,t} + \nu_{i,t} \quad (2)$$

$HC_{i,t}$ is the healthcare consumption of individual i at date t and $\mathbb{1}_{HC_{i,t}>0}$ its associated dummy. $A_{i,t}$ is the claiming age of individual i . It is constant across t . $X_{i,t}$ is a control vector for contribution length at age 60, number of contributed quarters for sick-leave, logarithm of pension, department,²⁰ year of birth. These variables are also time-invariant. Finally, v_t is a wave fixed effect. $\varepsilon_{i,t}$ and $\nu_{i,t}$ are error terms, following a normal distribution, and jointly independent. Thus, these two equations are assumed to be independent.²¹ Note that there is no individual fixed effect since all independent variables are time invariant. The main specification includes a weight inversely proportional to the number of observations, to avoid a bias associated with the number of time each individuals is observed. All individuals are alive at age 72 and the only reason I can not observe every individual the same number of time is the re-sampling process. Finally, as an additional result, the regressions are estimated in balanced panels of three ages of observation. All individuals are therefore observed the same number of time, at the same ages. Thus, the absence of individual fixed effect is not an issue.

This model takes into account the skewness of the healthcare consumption distribution, but not the reverse causality issue. I use an instrumental variable (IV) to measure the

to 60%, and the consumption per individual increases to 12 euros. The average consumption is 7,20 euros. We wrongly conclude that the reform decreases the healthcare consumption. In reality, it increases the consumption among the consumers but decreases the probability to consume.

¹⁹I check that the marginal effect from the probit model provides similar results. See Appendix C.2.

²⁰This control serves as a proxy for local supply of healthcare services and also to control for specificities of Alsace-Moselle departments, which were used to be a part of Germany from 1871 to 1919, and kept for historical reason a higher National Health Insurance coverage.

²¹It is one of the main difference with Heckman models.

causal impact of claiming age on healthcare consumption.

Using Instrumental Variable. The reverse causality issue emerges as soon as the explanatory variable may be both a cause and a consequence of the variable to explain. In this study, individuals may choose to retire due to their health (Llena-Nozal Ana et al., 2004). As a consequence, individuals who leave later may be in better health than those who leave earlier. To observe the causal impact of later retirement on health, I use the 1993 pension reform as an instrumental variable. This reform is exogenous to the individuals' health, and leads individuals to delay their retirement. I assume that the reform is independent from the health status (exclusion restriction). This assumption is not testable but highly credible because the reform applies to every worker in the private sector, without health consideration. Secondly, to be relevant, the reform must impact the claiming age (non-zero assumption). I show in the following section that this assumption is verified. Thirdly, I assume total independence with respect to the instrument. This assumption means, in particular, that there is no anticipation effect nor bypass effect.²² It is highly credible for the first cohorts affected. Those individuals cannot have anticipated this reform since it is the first one to increase the claiming age in France. On the opposite, the last affected cohort was aware of the reform next to a decade before their retirement. They could then choose to be never-taker and not react to the reform, which is not an issue since I am interested in the compliers. Moreover, they have very low flexibility to change their contribution length. Finally, I assume that individuals react in the same direction to the incentive (ie. there is no defiers, it is the monotonicity assumption).

The combination of a two part model and instrumental variable strategy can be written as following:

First part: impact at the extensive margin.

$$A_{i,t} = \alpha_0 + \alpha_1 \Delta RCL_{i,t} + \alpha_2 X_{i,t} + v_{1,t} + \varepsilon_{i,t} \quad (3)$$

$$\mathbb{1}_{HC_{i,t} > 0} = \beta_0 + \beta_1 \hat{A}_{i,t} + \beta_2 X_{i,t} + v_{2,t} + \nu_{i,t} \quad (4)$$

²²There is no way for individuals to move from the treatment to the control group.

Second part: impact at the intensive margin for the consumers.

$$A_{i,t}|_{HC_{i,t}>0} = \delta_0 + \delta_1 \Delta RCL_{i,t} + \delta_2 X_{i,t} + v_{3,t} + \varepsilon'_{i,t} \quad (5)$$

$$\log(HC_{i,t})|_{HC_{i,t}>0} = \gamma_0 + \gamma_1 \hat{A}_{i,t} + \gamma_2 X_{i,t} + v_{4,t} + v'_{i,t} \quad (6)$$

HC_i is the healthcare consumption of individual i , $\mathbb{1}_{HC_{i,t}>0}$ its associated dummy variable, and $\log(HC_{i,t})|_{HC_{i,t}>0}$ is the logarithm of healthcare consumption among the consumers. $A_{i,t}$ is the claiming age of individual i and $\hat{A}_{i,t}$ the variation of claiming age of individual i due to the reform. It is invariant with t . $\Delta RCL_{i,t}$ the number of added quarter due to the reform for individual i given his birth cohort and its contribution length at age 60 and $X_{i,t}$ the control vector for contribution length at age 60, number of contributed quarters for sick-leave, logarithm of pension, department, year of birth. These variables are also time invariant. v_t is wave fixed effect.

The first part measures the impact of an exogenous increase in claiming age on the probability to consume healthcare. The second part measures the impact of an exogenous increase in claiming age among the consumers on the level of healthcare consumption. In both part, I use a two stage least square estimator.²³ Thus, Equation 3 and Equation 5 estimate the effect of an increase in required contribution length on claiming age (1st stage). If the first stage is relevant, the reform can be used as an instrumental variable (non-zero assumption verified). Then, Equation 4 estimates the impact of an exogenous increase in claiming age on the probability to consume and Equation 6 on the level of healthcare consumption among consumers (2nd stage).

Note that in many case, it is not possible to disentangle retirement from income effect, since both changes occur at the same time. In this empirical strategy, due to the nature of the reform used as an IV, I can observe the effect of later retirement independently from income effect of retirement. The reform affects the amount of pension of all the retirees with the same intensity. Since I observe the difference between cohort and within cohort for different contribution length, this effect is isolated. Another income effect could happen since those who choose not to delay their retirement when affected see a decrease of

²³As a robustness check, I show in Table C2 that the results are very close using alternative models like count data models, generalized method of moments, generalised least square, and iv-probit in the first part.

their pension. However, the 2SLS estimator measures the impact for the compliers (local average treatment effect, LATE). Thus, there is no issue regarding those who choose not to react to the reform.

4 Results

4.1 Impact of the Reform on Claiming Age

Table 4 shows the impact of one added quarter required to benefit from a full pension on claiming age (in quarter). The results are shown for a large set of samples. Column (1) shows the whole sample and the sub-samples of individuals having at least once a year a general practitioner visit, specialist practitioner visit or other healthcare. Column (2) and (3) present the same results for the sub-samples of individuals who benefit from a co-payment exemption and individuals who have or had a chronic condition after age 65. An added quarter required to get a full pension increases claiming age by 0.859 quarter. This impact is similar in all samples: between 0.778 quarter for the sample of individuals who have at least one specialist doctor visit; and 0.880 in the sample of individuals with a chronic condition and who receive at least one generalist doctor visit during the year. This result is consistent with the existing literature Bozio (2011a) and Bozio et al. (2019).

Figure 3 shows that the average claiming age increases by added required quarters, following a linear trend with a leading coefficient very close to one. This result shows that this impact is not only driven by the least or the most affected by the reform. Thus, I conclude that the 1993 reform can serve as an instrumental variable to highlight the causal impact of later retirement on healthcare consumption, and that the variation in intensity can be assumed as linear.

4.2 Impact of Later Retirement on the Probability to Consume Care

Column (1) of Table 5 shows the causal impact of delaying retirement on the probability to have at least one general practitioner visit, specialist practitioner visit, dental visit, any doctor visit, prescription drugs and stay in private hospitals. An exogenous increase in

Table 4: Impact of the Reform on Claiming Age

		(1) Main sample	(2) Co-payment exemption	(3) Chronic condition
All	Reform	0.859*** (0.0123)	0.850*** (0.0224)	0.874*** (0.0163)
	<i>N</i>	66,698	47,365	29,323
General practitioner visit	Reform	0.844*** (0.0115)	0.840*** (0.0231)	0.880*** (0.0181)
	<i>N</i>	48,324	42,911	23,546
Specialist practitioner	Reform	0.778*** (0.0134)	0.753*** (0.0173)	0.800*** (0.0288)
	<i>N</i>	34,040	30,161	17,429
Dental visit	Reform	0.796*** (0.0157)	0.786*** (0.0192)	0.837*** (0.0289)
	<i>N</i>	7,396	6,149	3,524
Ambulatory care	Reform	0.830*** (0.0698)	0.816*** (0.0849)	0.866*** (0.0677)
	<i>N</i>	50,488	44,705	24,376
Prescription drugs	Reform	0.830*** (0.0698)	0.816*** (0.0849)	0.866*** (0.0677)
	<i>N</i>	51,855	45,846	24,773
Hospital stay	Reform	0.839*** (0.0105)	0.833*** (0.0203)	0.874*** (0.0220)
	<i>N</i>	8,008	7,140	4,428
Any of the previous care	Reform	0.863*** (0.00538)	0.860*** (0.0194)	0.891*** (0.0176)
	<i>N</i>	52,463	46,317	24,943

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

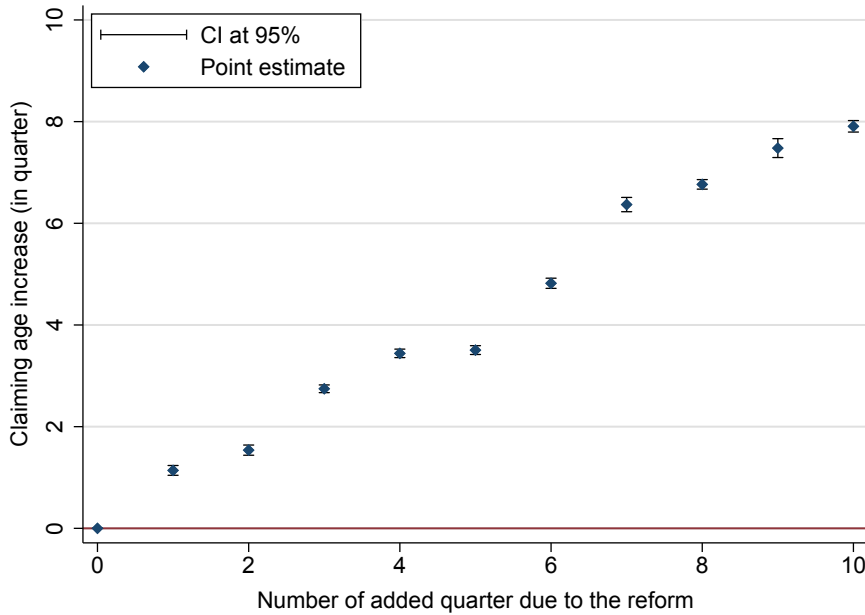
Notes: This table shows the impact of the number of added quarters required due to the reform on claiming age.

Sample: Main sample is men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67. Column (1): estimation in the main sample. Column (2), estimation in the sub-sample of individuals with a co-payment exemption. Column (3): estimation in the sub-sample of individuals with a chronic condition. The first line is with all individuals following the selection criterion of the column, the second line is among individuals who visit at least once during the year a general practitioner, the third line, a specialist practitioner, and the last line is among individuals who either have at least once a doctor visit (general, specialist or dentist), a stay in private hospital, or a consumption of prescription drugs.

Source: HYGIE 2005-2015.

claiming age by one quarter statistically significantly decreases the probability to have at least one doctor visit by 0.815 percentage point ie. one consumer less over 120 individuals. Moreover, the decrease in the probability to visit a general practitioner visit (-0.828 percentage point) is greater than the decrease in the probability to visit a specialist practitioner (-0.724 percentage point). Probably as a consequence of the decrease in doctor visit, the probability to consume prescription drugs decreases by 0.599 percentage point. However, the probability to visit a dentist and have an hospital stay does not

Figure 3: Impact of the Reform on Claiming Age



Notes: This graph shows the average impact of the number of added quarters an individual experiences due to the reform on the claiming age (1st stage regression). Confidence Intervals at 95 %.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

change significantly.

4.3 Impact of Later Retirement on Healthcare Consumption

Among the consumers, an exogenous increase by one quarter in claiming age statistically significantly decreases the number of doctor visits by 1.14 % (Table 5, Column (2)). One a baseline of 9.30 doctor visits per year, it means a decrease in the number of visits by 0.10 visit per individual, ie. around one visit less for one individual over 10. The overall consumption of doctor (taking into account both the extensive and intensive margin) decreases significantly by 0.9% the number of practitioner visits. Expenditure for doctor visits decreases by 1.64% among consumer but the price per doctor visits does not significantly changes. Thus, the variation in expenditure is driven by the decrease in the number of doctor visits. The overall effect on the expenditure for doctor visits decreases by 4% of annual expenditure.

Table 5: Impact of Later Retirement on Healthcare Consumption

		Probability	Number of	Expenditure for	Price for
Generalists	Claiming age	-0.00828*** (0.00104)	-0.00522** (0.00260)	-0.00370 (0.00259)	0.00152 (0.000987)
	<i>N</i>	66,698	48,324	48,324	48,324
Specialists	Claiming age	-0.00724*** (0.00253)	-0.00797 (0.00533)	-0.0177** (0.00766)	-0.00970*** (0.00341)
	<i>N</i>	66,698	34,040	34,040	34,040
Dentists	Claiming age	-0.000332 (0.000889)	-0.00252 (0.00525)	-0.0202* (0.0120)	-0.0177* (0.00984)
	<i>N</i>	61,567	7,396	7,396	7,396
Total ambulatory	Claiming age	-0.00815*** (0.00126)	-0.0114*** (0.00349)	-0.0164*** (0.00564)	-0.00499 (0.00315)
	<i>N</i>	66,698	50,488	50,488	50,488
Drugs	Claiming age	-0.00599*** (0.00105)	n.a. n.a.	-0.0138*** (0.00290)	n.a. n.a.
	<i>N</i>	66,698	n.a.	51,855	n.a.
Hospital	Claiming age	-0.000433 (0.00110)	-0.00661 (0.00948)	-0.00917 (0.00906)	-0.00257 (0.00734)
	<i>N</i>	66,698	8,008	8,008	8,008
Total	Claiming age	-0.00516*** (0.000871)	n.a. n.a.	-0.0236*** (0.00444)	-n.a. n.a.
	<i>N</i>	66,698	n.a.	48,468	n.a.

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Retire one quarter later due to the reform leads to a decrease in the probability to have a doctor visit by 0.815 percentage point, and a decrease in the number of doctor visits among the consumers by 1.14%, the expenditure for doctor visits by 1.64% and the expenditure per visit by 0.00499 (but not significantly).

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

This effect on doctor visits can be split between the effect on generalist practitioners and specialist practitioner visits. Interestingly, the number of generalist doctor visits significantly decreases by 0.522% but not the price per generalist practitioner visits. At the reverse, the number of specialist practitioner visits does not varies significantly but the price per visit significantly decreases by 0.97%. A large part of the generalist practitioners in France have an agreement with the National Health Insurance to apply the regulated price (23€ for a standard visit in 2015). At the reverse, a minority of specialist practitioner have such an agreement. It may explain the reason why there is no price effect for generalist practitioners consumption but there is one for specialists. Regarding the decrease in price for specialist, two mechanisms could apply. First, individuals who retire later would choose more often specialist doctors with an agreement (ie. in average, at a given speciality, less expensive). Second, individuals who retire later would visit different

type of specialist practitioners.²⁴

There is no significant impact on the number of dental visits or expenditure for dentist. There is also a negative non significant impact on the number of days in private hospital and on the expenditure for hospital stays. It supports the absence of substitution effect between ambulatory care and hospital care.

The decrease in healthcare consumption is similar in the whole sample and in the sub-sample of individuals having a chronic condition (Table D1). Later retirement decreases the probability to have a doctor visit by 1.45 percentage points and the number of doctor visits by 1.67% among consumers among those having a chronic condition. The decrease is slightly lower in the main sample, meaning that the impact is not massively driven neither by those with a chronic condition nor those without.

Figure 4 shows the point estimate for sub-sample of individuals between ages 66 and 68, 67 and 69 and so on and so forth until a sample of individuals aged between 74 and 76. It shows that the effect is most of the time negative but not always significant. The negative impact at the extensive margin tend to be statistically significant only for the oldest samples while the negative impact at the intensive margin is mainly statistically significant for the youngest samples.

4.4 Underlying Mechanisms

As highlighted by numerous studies, one may think individuals who retire later consume less healthcare because they are in better health. This mechanism could apply for at least three reasons. First, work could be health preserving (us-it-or-loose it hypothesis);²⁵ second, a longer working life could increase the duration during which individuals had an incentive to invest in health because of the opportunity cost of sick-leave; third, a more progressive retirement through arrangement with the employers could happens due to the reform²⁶ at the end of the working life for those who were affected by the reform. This effect would be consistent with the literature on self-reported health. However, this potential “health” mechanism has to be mitigated. Table D3 shows a slightly significant increase by 0.209 percentage point in the probability to have a chronic condition after age

²⁴Each speciality has a different average price.

²⁵Cognitive and physical abilities are preserved when used. Thus, later retirement preserves health.

²⁶Working scheduling, or lighter working hours, part-time paid full time, pre-retirement offer...

65 due to later retirement.

The variation in inter-temporal income is not likely to play a major role in this study for at least two reasons. First, all individuals in a given cohort see the amount of their pension affected by the reform the same way. Second, Table D2 of Appendix D shows that, among those with a co-payment exemption, the results are similar (a decrease by 0.740 percentage point in the probability to have a doctor visit, and a decrease by 1.30% in the number of doctor visits). There is no impact on dentist visits and private hospital stays. It suggests that neither the healthcare cost nor the income would explain the observed decrease. Thus, the decrease is probably not associated with an increase in the share of individual foregoing healthcare consumption. The increase seems to be due to a decrease among those with a high level of consumption (See Tables D4 and D5).

Lastly, one may think the decrease is attributable to a decrease in health investment, through a decrease in preventive care for those who retire later. This decrease could be a compensation of an increasing investment during working life or due to the fact individuals affected by the reform are, at the same age, closer to their retirement date (and thus, to their last investment). This result would be consistent with the decrease in preventive care found at retirement by Frimmel and Pruckner (2020). Unfortunately, this hypothesis cannot be tested in this study.

Conclusion

In this paper, I use a two stage least square estimator in a two part model to estimate the causal impact of later retirement on healthcare consumption at extensive and at intensive margins. I focus on a sample of men who worked in the private sector, aged from 66 to 76. I use the first French pension reform that increased claiming age as an instrumental variable. Moreover, this paper is one of the first to focus on the impact of a variation in retirement timing on retirees on their healthcare consumption rather than on the impact of the switch from employment to retirement. I show that a one quarter delayed retirement due to the reform decreases statistically significantly the probability to have at least one doctor visit (extensive margin) and the number of doctor visits among consumers (intensive margin). This result is consistent with previous findings.

Three main potential mechanisms could explain it. First, one may think that the better individual's health is, the latter he retire. It would be the case if the use-it-or-loose-it hypothesis holds; if individuals invest more in their health when in employment; or if later retirement due to this reform is associated with a better anticipation of retirement life. In this study, I cannot provide evidence of this underlying mechanism since I don't have health, well-being or life-satisfaction indicators. However, the slightly significant increase in the probability to have a chronic condition after age 65 make this "health mechanism" potentially unlikely or not the only one to play a role. Another mechanism could be an increase in the share of individuals foregoing healthcare among those who delayed retirement. However, I found a similar impact among those with a co-payment exemption, which make this mechanism unlikely. Finally, one may think that individuals who retire later decrease their healthcare investment more often than the others, and thus, consume less preventive care. This mechanism could be a compensation of a longer investment in health (through a longer working life) or by the fact that at each given age, they are closest to their last health investment from their working life.

The decrease in healthcare consumption due to the reform is of double financial gain for the public finance.²⁷ However, it is impossible to draw a conclusion from a public policy perspective without any qualitative understanding regarding the underlying mechanism explaining this result. This paper shows the importance for more research in this field. If the decrease in healthcare consumption is associated with a better health, through a confirmation of the use-it-and-loose-it hypothesis, the public policy recommendation would be in favor of a policy that increase the incentive for retirees to have social, physical and cognitives activities. If the health improvement is through the health investment during employment, the public policy advice would be to increase incentives for health investment during retirement. If there is no health variation due to delayed retirement but a decrease in preventive healthcare utilisation, the public policy would increase incentives for health investment during retirement.

Finally, this paper does not pretend to have an external validity. Those results stand only for men from the private sector, with average career length. The extrapolation to women, self-employed or civil servants may be wrong. Moreover, an increase in claiming

²⁷A decrease both in public expenditure for pension and for healthcare.

age for individuals who retire between age 60 and 65 may have a different impact on health than an increase in claiming age for those who retire between age 65 and 67. Thus, the results should not be extended to other pension reforms that change claiming age at an earlier or later age.

References

- AUBERT, P. (2009): “Âge de cessation d’emploi et de liquidation d’un droit à la retraite. Le cas de la génération 1938,” *Etudes et résultats*, 1–6.
- BENALLAH, S. AND C. METTE (2009): “Âge moyen de départ en retraite : tendances récentes et évolutions attendues,” *Retraite et société*, 2, 166–183.
- BLAKE AND GARROUSTE (2019): “Collateral Effects of a Pension Reform in France,” *Annals of Economics and Statistics*, 57–86.
- BOZIO, A. (2011a): “La réforme des retraites de 1993 : l’impact de l’augmentation de la durée d’assurance,” *Economie et statistique*, 441, 39–53.
- (2011b): “Mesurer l’impact de l’augmentation de la durée d’assurance: le cas de la réforme des retraites de 1993,” *Économie et statistique*, 441–442.
- BOZIO, A., C. GARROUSTE, AND E. PERDRIX (2019): “Impact of later retirement on mortality: Evidence from France,” *PSE Working Paper*, 48.
- BÍRÓ, A. AND P. ELEK (2018): “How does retirement affect healthcare expenditures? Evidence from a change in the retirement age,” *Health Economics*, 27, 803–818.
- CALVET, L. (2012): “Dépenses de santé, hospitalisations et pathologies des personnes âgées de 75 ans ou plus,” *Les comptes nationaux de la santé*, 55–70.
- CALVET, L. AND A. MONTAUT (2013): “Dépenses de soins de ville des personnes âgées dépendantes,” *Dossiers Solidarité et Santé*, 3–26.
- COE, N. B. AND G. ZAMARRO (2015): “Does Retirement Impact Health Care Utilization?” *SSRN Electronic Journal*.
- DAVIE, E. AND M. MAZUY (2010): “Fécondité et niveau d’études des femmes en France à partir des enquêtes annuelles de recensement,” *Population*, 65, 475.
- EIBICH, P. (2015): “Understanding the effect of retirement on health: Mechanisms and heterogeneity,” *Journal of Health Economics*, 43, 1–12.

- FRANC, C., M. PERRONNIN, AND A. PIERRE (2007): “Changer de couverture complémentaire santé à l’âge de la retraite. Un comportement plus fréquent chez les titulaires de contrats d’entreprise,” *Questions d’économie de la santé*, 6.
- FRIMMEL, W. AND G. J. PRUCKNER (2020): “Retirement and healthcare utilization,” *Journal of Public Economics*, 184, 104146.
- GORRY, A., D. GORRY, AND S. N. SLAVOV (2018): “Does retirement improve health and life satisfaction?” *Health Economics*, 27, 2067–2086.
- GROSSMAN, M. (1972): “On the concept of health capital and the demand for health,” *Journal of Political Economy*, 80, 223–255.
- GRØTTING, M. W. AND O. S. LILLEBØ (2018): “Health Effects of Retirement: Evidence from Survey and Register Data.” *WP University of Bergen*, 10/18, 45.
- HAGEN, J. (2018): “The effects of increasing the normal retirement age on health care utilization and mortality,” *Journal of Population Economics*, 31, 193–234.
- HALLBERG, D., P. JOHANSSON, AND M. JOSEPHSON (2015): “Is an early retirement offer good for your health? Quasi-experimental evidence from the army,” *Journal of Health Economics*, 44, 274–285.
- HANSEN, L. P. (1982): “Large Sample Properties of Generalized Method of Moments Estimators,” *Econometrica*, 50, 1029.
- JONES, A. M. (2000): “Health econometrics,” in *Handbook of Health Economics*, Elsevier, vol. 1, 265–344.
- KUUSI, T., P. MARTIKAINEN, AND T. VALKONEN (2020): “The influence of old-age retirement on health: Causal evidence from the Finnish register data,” *The Journal of the Economics of Ageing*, 100257.
- LAPINTE, A. AND M. PERRONNIN (2018): “96 % des salariés ont accès à une assurance complémentaire santé d’entreprise en 2017,” *Questions d’économie de la santé*, 6.
- LEUNG, S. F. AND S. YU (1996): “On the choice between sample selection and two-part models,” *Journal of Econometrics*, 72, 197–229.

- LLENA-NOZAL ANA, LINDEBOOM MAARTEN, AND PORTRAIT FRANCE (2004): “The effect of work on mental health: does occupation matter?” *Health Economics*, 13, 1045–1062.
- LUCIFORA, C. AND D. VIGANI (2018): “Health care utilization at retirement: The role of the opportunity cost of time,” *Health Economics*, 27, 2030–2050.
- LUMLEY, T., P. DIEHR, S. EMERSON, AND L. CHEN (2002): “The Importance of the Normality Assumption in Large Public Health Data Sets,” *Annual Review of Public Health*, 23, 151–169.
- MADDEN, D. (2008): “Sample selection versus two-part models revisited: The case of female smoking and drinking,” *Journal of Health Economics*, 27, 300–307.
- NIELSEN, N. F. (2019): “Sick of retirement?” *Journal of Health Economics*, 65, 133–152.
- SHAI, O. (2018): “Is retirement good for men’s health? Evidence using a change in the retirement age in Israel,” *Journal of Health Economics*, 57, 15–30.
- SOURTY-LE-GUELLEC, M.-J. (1999): “Profils de consommateurs de soins: France 1995,” *Questions d’économie de la santé*, 1–4.
- TOULEMONDE, F. (2017): “La médecine d’urgence,” in *Les établissements de santé, Panoramas de la Drees santé*, 127–130.
- ZHANG, Y., M. SALM, AND A. VAN SOEST (2018): “The Effect of Retirement on Healthcare Utilization: Evidence from China,” *Journal of Health Economics*.

Appendix to

Does Later Retirement Change your Healthcare Consumption?

A Institutional Framework

A.1 The 1993 Pension Reform

The pension is computed using the following formula:

$$P = \tau \times PC \times W_{ref}$$

with τ the replacement rate; PC , the proratisation coefficient; and W_{ref} the reference wage. W_{ref} is equal to the best N years of wages.

The replacement rate formula is:

$$\tau = 0.5 - \delta \times \max[0; \min(4 \times (65 - a); D - d)]$$

with a , the claiming age; D , the required contribution length to benefit from a full replacement rate; d the number of quarters contributed; and δ , the minimization coefficient, equal to 1.25 % per missing quarter.

The 1993 reform changes :

- D , The number of quarters required to benefit from a full pension
 - For cohorts born before 1934, D equals 150 quarters
 - Each cohort born in 1934 and after has one added quarters compared to the previous cohort
 - From cohort 1943, D equals 160 quarters
- N , the number of best years of wages
 - Before 1993, N equals 10

- N increases by one year every year
 - N equals 25 years from 2010
- Pensions are indexed on price and not wages. In practice, this indexation applies already from 1987.

Thus, the change on the number of quarters required affects only a little share of individuals in each cohort, because all individuals with very short career will leave at age 65 whatever the change in D , and individuals with very long career will leave at age 60 whatever the change in D . The change in N affects each cohort in the same way. The indexation change affects all cohorts in the same way. As a consequence, assuming that all individuals in each cohort are affected in the same way by the change in N and indexation, the difference between individuals affected and not affected by the D change within each cohort captures only the effect of this part of the 1993 reform.

A.2 The Health Insurance System in France

In France, there is a public mandatory health insurance for almost all the French. The reimbursement rate is defined at the national level for each care.²⁸ Moreover, contribution varies according to the status on the labour market (student, worker, unemployed, retired...).

In average, this mandatory public coverage reimburse 78 % of the healthcare expenditure. However, there is heterogeneity in the reimbursement rate. In particular, individuals suffering from chronic diseases benefit from a 100% reimbursement of their expenditures associated with their chronic disease from the public health insurance to cover.

To cover expenditure which are not reimbursed by the National Health Insurance, individuals can subscribe to a private supplementary health insurance. It can be through an individual contract or a collective firm contract. Before 2016,²⁹ private sector employees can benefit from supplementary health insurance through a collective firm contract paid both by employees and employers. The firm has to pay at least 50% of the insurance fees. 51 % of private sector firms offer a collective supplementary insurance in 2015 (Lapinte and Perronnin, 2018) and 75 % of private sector employees benefit from a collective

²⁸Except in Alsace-Moselle area, where there is a higher coverage rate.

²⁹This supplementary coverage is mandatory for private sector employee from 2016.

supplementary insurance. At retirement, employees can keep on benefiting from this coverage but without any of the firm previous contribution. Since the Evin Law (1989), the insurance has to apply the same fees the three first years after retirement. Once these three years passed, the fees of supplementary insurance can change. However, in average, a major part of retirees are not affected by this price change because most of them change their health insurance at retirement. Thus, Franc et al. (2007) show that 51% of beneficiaries of mandatory collective firm contract change their contract at retirement, 39% of beneficiaries of optional collective firm contract change their supplementary insurance at retirement, 23% of new retirees with an individual supplementary health insurance change their contract at retirement.

The healthcare supply is highly regulated in France, following different rules at hospital (inpatient care) and out of hospital (ambulatory care). Ambulatory care are provided by generalists³⁰ and specialist practitioners.³¹ The standard regulated price for generalist doctor visits in France was 23€ in 2015. For the specialist, there is a higher variation according to the speciality. Thus, the fees go from 25 to 150€. The National Health Insurance reimburses 70% of the regulated doctor fees, with a few exceptions. The healthcare pathway encourages patients to visit first general practitioners, and if needed, benefit from a prescription to visit specialist practitioners.³² Following this healthcare pathway is highly encouraged since the reimbursement rate from National Health Insurance is cut by 40% if the patient does not visit first a general practitioner. Fees of ambulatory care are regulated for both generalists and specialists.

Inpatient care are provided in hospital which can be private for-profit, private non-for-profit and public. If an individual benefits from an administrative acknowledgement of long-term care illness, its reimbursement rate is 100 % for all medical care related to his long-term care illness. There is several other conditions to benefit from a co-payment exemption: having an inpatient stay longer than 30 days or having a work accident, for example.

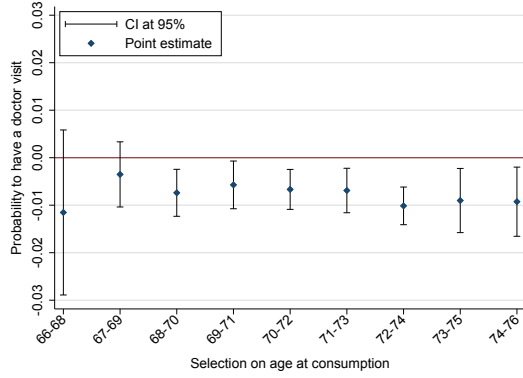
³⁰Generalist is one of the French speciality of medicine. General practitioners provide primary care and ensure the continuity of medical follow-up.

³¹In France, there is 26 main medical specialities including oncology, rheumatology, dermatology, ophthalmology, cardiology...

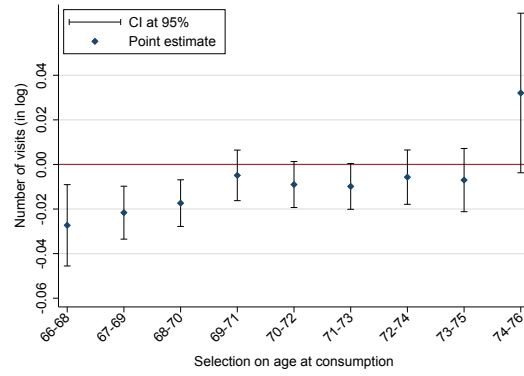
³²This system was voted in 2004, and implemented from July, 2005, through the Douste-Blazy law.

Figure 4: Impact of Later Retirement on Healthcare use by Age Range

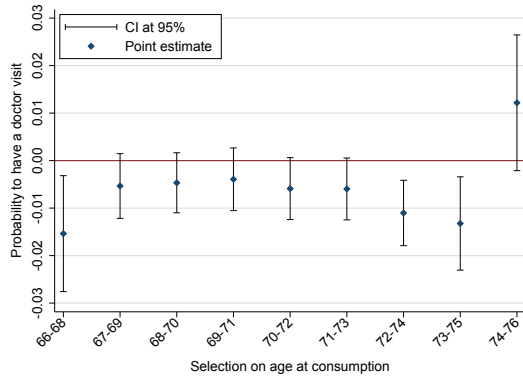
(a) Effect on the Probability to Have a General Practitioner Visit



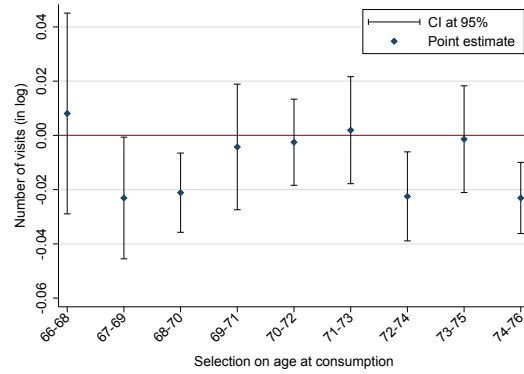
(b) Effect on the Number of General Practitioner Visits (among Consumers)



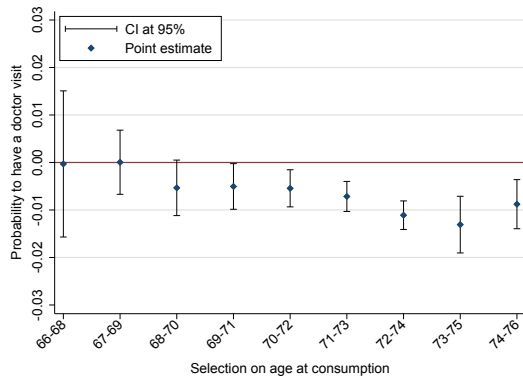
(c) Effect on the Probability to Have a Specialist Practitioner Visit



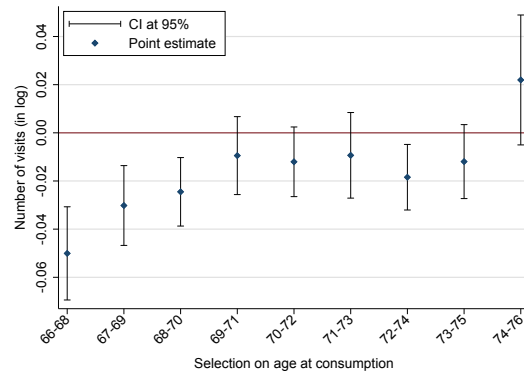
(d) Effect on the Number of Specialist Practitioner Visits (among Consumers)



(e) Effect on the Probability to Have a Doctor Visit



(f) Effect on the Number of Doctor Visits (among Consumers)



Notes: Point estimates of the impact of later retirement on the probability to have a general practitioner visit (Figure a), a specialist practitioner visit (Figure c) and any doctor visit (figure e). It shows a significant decrease in the probability of having a generalist doctor visit among individuals aged between 68 to 70, and all older groups. Figure (b), (d) and (f) respectively show, among consumers, the impact of later retirement on the number of doctor visits (general, specialist, all).

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

B Data Details

Table B1: Age of each Cohort per Wave

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1935	70	71	72	73	74	75	76	77	78	79	80
1936	69	70	71	72	73	74	75	76	77	78	79
1937	68	69	70	71	72	73	74	75	76	77	78
1938	67	68	69	70	71	72	73	74	75	76	77
1939	66	67	68	69	70	71	72	73	74	75	76
1940	65	66	67	68	69	70	71	72	73	74	75
1941	64	65	66	67	68	69	70	71	72	73	74
1942	63	64	65	66	67	68	69	70	71	72	73
1943	62	63	64	65	66	67	68	69	70	71	72

Notes: I observe cohort 1935 between ages 70 and 80; cohort 1936 between ages 69 and 79; etc. In the main sample, the observation in gray are excluded.

Table B2: Age of each Cohort per Wave – Selection for the Analysis by Age Range

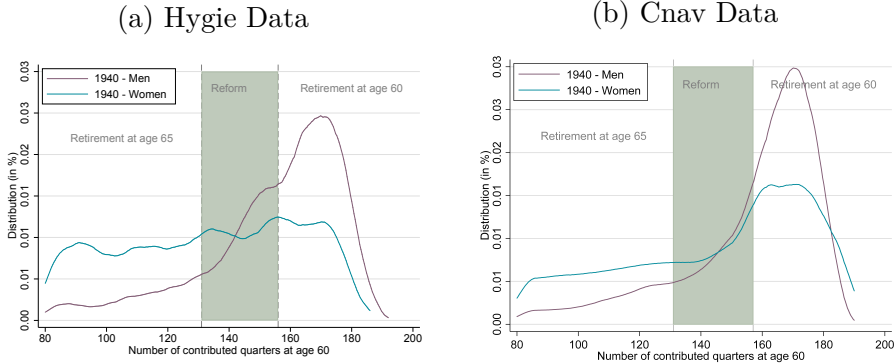
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1935	70	71	72	73	74	75	76	77	78	79	80
1936	69	70	71	72	73	74	75	76	77	78	79
1937	68	69	70	71	72	73	74	75	76	77	78
1938	67	68	69	70	71	72	73	74	75	76	77
1939	66	67	68	69	70	71	72	73	74	75	76
1940	65	66	67	68	69	70	71	72	73	74	75
1941	64	65	66	67	68	69	70	71	72	73	74
1942	63	64	65	66	67	68	69	70	71	72	73
1943	62	63	64	65	66	67	68	69	70	71	72

Notes: I observe cohort 1935 between ages 70 and 80; cohort 1936 between ages 69 and 79; etc. In blue, observations selected in the analysis between ages 66 and 68. The selection is shifted by one year. It leads, three time later, to the selection in red of individuals aged between 69 to 71 years old, until the group of those aged between 74 and 76 years old, in orange in the Table.

The Selection of Men. On Figure B1, the distribution by contribution length at age 60 is drawn. The Figure B1a shows the distribution in the HYGIE data. The Figure B1b shows the same picture using the exhaustive data from the private pension scheme (Cnav). The male distribution is similar in both datasets while it not the case for women. HYGIE data do not include information on the additive quarters one may get. Since these additional quarters are mainly for childbirth, and for years were a parent stop working to raise children, the consequence is a wrong contribution quarters length for women that benefit from these added quarters. I underestimate the number of contributed

quarter for women in HYGIE data, and in particular for women with a high number of contributed quarter at age 60. This is not a surprise for two reasons. First, women with a high contribution length at age 60 are those with the lowest level of education. In France, it is a group with in average more children (Davie and Mazuy, 2010) and therefore, more quarters for childbirth. Secondly, they may probably stop working to raise children more often and thus, have associated contributed quarters I do not observe in Hygie data.

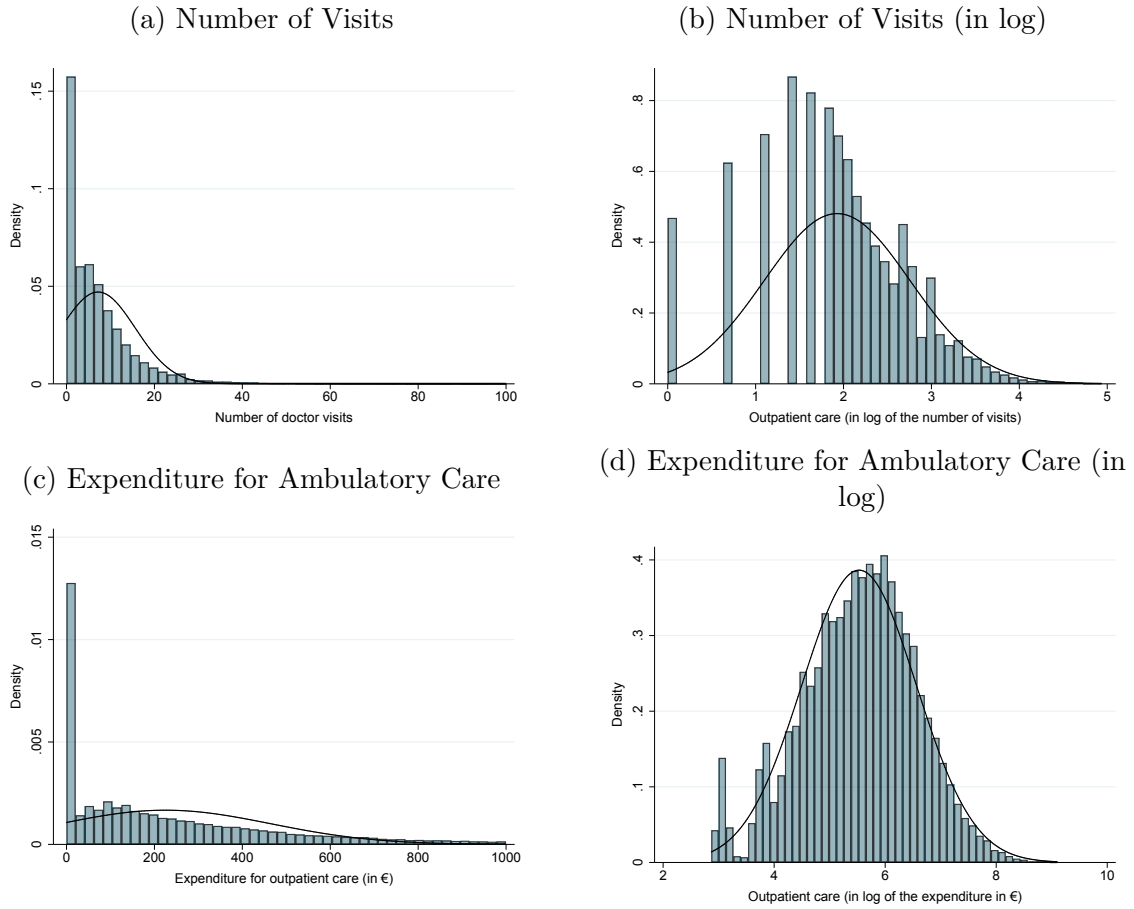
Figure B1: Distribution by Contribution Length at Age 60



Notes: Kernel density by contribution length at age 60 of individuals who had contributed between 80 to 200 quarters at age 60.
Source: Figure (a): HYGIE data. Sample of individuals born in 1940, who had contributed at least once in the private sector. Figure (b): Cnav 2017. Stock of individuals born in 1940. The Cnav data include all the French who had contributed at least once in the private sector. It shows the real distribution of contribution length at age 60.

Distribution of Healthcare Consumption. The following Figures show the number of doctor visits and expenditure for doctor visits both without and with log transformation.

Figure B2: Healthcare Distribution



Notes: This graph shows the density of the number of doctor visits (a) and the log of the number of doctor visits among the consumers (b). It also shows the expenditure for doctor visits (c) and the log of expenditure among consumers (d).

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005-2015.

C Robustness Check

C.1 Sample Selection on Contribution Length

In the main analysis, I select individuals who have contributed between 131 and 160 quarters at age 60. All individuals who have contributed between 131 and 151 quarters are affected by the reform. Those who have contributed between 152 and 159 quarters are not all affected, depending on their birth year. In a difference-in-difference design, I have to include at least one contributed quarter where nobody is affected by the reform. Thus, I can include all individuals who have contributed less than 130 quarters and those who

have contributed more than 160. However, I cannot include both because those who have contributed less than 130 quarters leave with a full replacement rate from age 65 while those who have contributed more than 160 leave at age 60. I include as a control group those who have contributed 160 quarters and more. This choice is more logical since the affected are those who would have been retired at age 60 but have to leave later due to the reform. As a consequence, it make less sense to compare it to the group of individuals who leave at age 65 than the group who leave at age 60.

Lastly, note that the identification strategy relies on the fact that those who are affected are similar to those who are not affected. It is true when considering individuals who have contributed 159 quarters compared to those who have contributed 160 quarters. However, it is probably wrong when comparing those with 159 quarters with those with 180 quarters. Thus, the empirical strategy becomes probably less precise, or wrong with the inclusion of individuals with a very large contribution length.

Figure C1 shows the results using alternative sample selection regarding to the contribution length. The dash line separates the case where the treated are compared to the non treated who leave at age 65 (all points at the left of the line) and the case where the treated group is compared to the non treated group who leave at age 60 (points at the right of the line). The expected results of this robustness check is that the main sample (131 to 160 quarters) provides results not statistically different from the results using close contribution length thresholds.

Figures C1(a) and (b) show the impact of the reform on claiming age. Points the most on the left of these figures show smaller average impact. This is expected since the more the dot is on the left, the more individuals not affected by the reform and leaving at age 60 are included.

Figures C1(c) show the impact of delayed retirement by one quarter due to the reform on the probability to consume. The effect founded is not statically different from adjacent samples. However, adding a high number of individuals not affected by the reform that leave at age 65 (thus, later than the affected) leads to a non significant impact or, in three cases over eight, a positive significant impact very close to zero. Adding individuals with very long career, who leave at age 60 and are not affected by the reform leads to a smaller effect but still significant, except for the three last sample tested (those with individuals

who started working close to age 16).

Figures C1(d) show the impact of one quarter more due to the reform on the number of doctor visits (in log). The impact is never statistically different when adding individuals who leave at age 65. It is not statistically different for the two samples with individuals who leave at age 60 and that are the closest to the main estimation. However, once adding a high number of individuals not affected by the reform, who leave at age 60, the effect turns non significant. Note that it is probable that the individuals with between 170 and 180 quarters contributed at age 60 have different health condition than those between 150 and 160 quarters contributed and thus, are not very comparable.

Note that I never consider individuals with more than 180 quarters. Individuals with more than 180 quarters are those who started working before age 16. These individuals exists only for the cohorts born before 1943 (a law forbid full time employment before age 16 from 1959). In my sample, these individuals are rare and I consider these individuals as atypical compared to the rest of the sample.

Table C1: Individuals Affected and not Affected in the Sample

Contrib. length at age 60		Claiming age	If continuous career, Started working at age
[0; 130]	Not affected (NT)	65 y.o.	27,5 y.o. and later
[131; 151]	Affected (T)	btw 60 and 65 y.o.	between 22,25 and 27,25 y.o.
[152; 159]	NT + T	btw 60 and 65 y.o.	between 20,25 and 22 y.o.
[160; 180]	Not affected (NT)	60 y.o.	between 16 and 20 y.o.

Notes: Individuals who contributed between 0 and 130 quarters at age 60 are not affected by the reform, they retire from age 65 at the full replacement rate, and started working at age 27,5 years old if they had a continuous caree. Individuals who contributed between 131 and 151 quarters are affected by the reform, they retire with a full replacement rate between age 60 and 65, and if they had a continuous career, they started working between age 22,25 and 27,25.

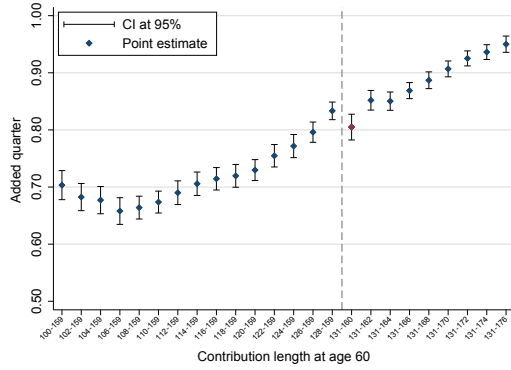
C.2 Results Using Other Econometric Specifications

To test the robustness of the econometric specification, I provide in Table C2 results using alternative econometric specification. I measure the impact of later retirement on the probability to consume using probit regression and using Poisson regression.

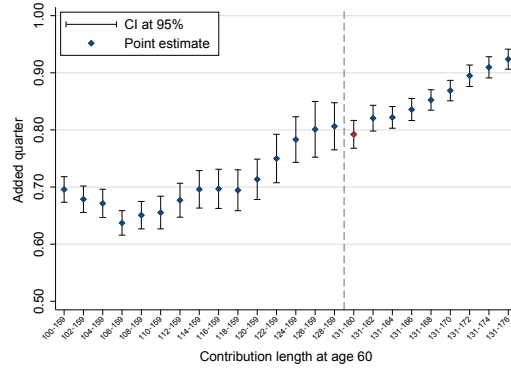
I measure the impact of later retirement on the number of doctor visits among consumers, using a semi-parametric specification using discrete transformation of healthcare variables, in a generalized method of moments (GMM) (Hansen, 1982). It also shows similar results.

Figure C1: Sensitivity to Contribution Length Selection

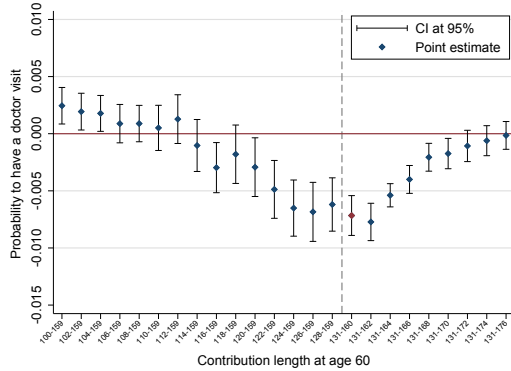
(a) Impact of the Reform on Claiming age (1st stage) – All



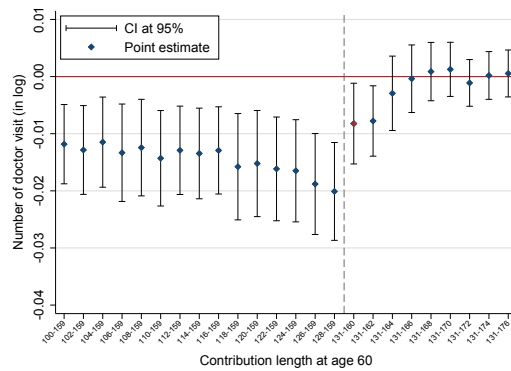
(b) Impact of the Reform on Claiming age (1st stage) – Consumers



(c) Impact of Later Retirement on Probability to Have a Doctor Visit (2nd Stage) – All



(d) Impact of Later Retirement on the Number of Doctor Visits (2nd Stage) – Consumers



Notes: Point estimates of the impact of later retirement on doctor visits. The red dot is the point estimate of our main sample.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60, retired before age 67.

Source: HYGIE 2005-2015.

Table C2: Impact of Later Retirement on Healthcare Consumption using Alternative Models

	Probability to consume			Level of consumption
	iv-probit	iv-reg GMM	iv-poisson GMM	iv-poisson GMM
Generalist	-0.00750*** (0.00209)	-0.00828*** (0.00217)	-0.00752*** (0.00214)	-0.00419 ** (0.00173)
Specialist	-0.00713*** (0.00257)	-0.00722*** (0.00269)	-0.00464*** (0.00265)	-0.00685 (0.00473)
Dentist	-0.000265 (0.00166)	-0.000227 (0.00163)	-0.000584 (0.00189)	-0.0205 (0.0411)
Ambulatory	-0.00960*** (0.00253)	-0.00998*** (0.00266)	-0.00679*** (0.00210)	-0.00560*** (0.00183)
Drugs	-0.00789*** (0.00255)	-0.00803*** (0.00264)	-0.00472*** (0.00199)	-0.00224 *** (0.00047)
Hospital	-0.000308 (0.00162)	-0.000247 (0.00164)	-0.000518 (0.00183)	-0.0218 (0.0291)
Any care	-0.00709*** (0.00257)	-0.00722*** (0.00263)	-0.00386*** (0.00198)	-0.00346 *** (0.000655)
<i>N</i>	66,698	66,698	66,698	66,698

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: All coefficients are marginal effects. Retire one quarter later due to the reform leads to an average increase in the probability to have a generalist practitioner visit by 0.7 percentage point, estimated using a probit model.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

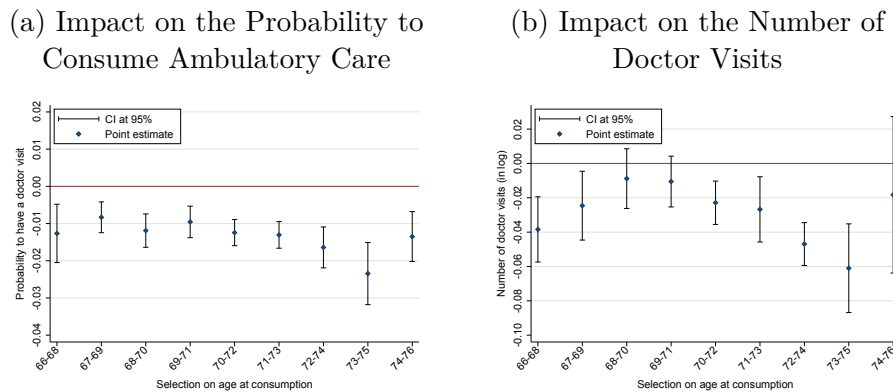
Source: HYGIE 2005 – 2015.

D Additional Results

D.1 Results for Alternative Samples

Impact among Individuals with Chronic Condition. To test if the effect is driven by individuals with particular healthcare consumption, I observe the impact of later retirement on the probability to consume doctor visits and on the level of consumption among individuals who had or have a chronic condition.³³ Table D1 shows that among individuals with chronic condition, a one quarter increase in claiming age due to the reform decreases significantly the probability to have a doctor visit by 1.46 percentage point and the number of doctor visits by 1.80% among consumers. The decrease is slightly higher than the main result.

Figure D1: Impact of Later Retirement among those with a Chronic Condition



Notes: This graph shows the average impact of later retirement on the number of doctor visits at particular age range. Confidence Intervals at 95%.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

Impact among Individuals with Co-payment Exemption. To test the potential price-sensitivity effect, I focus on the subsample of those who benefit from a co-payment exemption.³⁴ Table D2 shows the impact of later retirement on the probability to consume and the level of healthcare consumption. It shows that delay retirement by one quarter

³³I identify those with a chronic condition through the variable “Have an administrative recognition of a chronic condition”.

³⁴Can benefit from this exemption in the sample: individuals who need care associated with work accident and occupational illness; individuals with long-term illness.

Table D1: Results among the Healthcare Consumers with Chronic Condition

		Probability	Number of	Expenditure for	Price for
Generalists	Claiming age	-0.0138*** (0.00114)	-0.0103** (0.00506)	-0.0103* (0.00569)	-0.0000628 (0.00172)
	<i>N</i>	29,323	23,546	23,546	23,546
Specialists	Claiming age	-0.0155*** (0.00359)	-0.0126** (0.00519)	-0.0293*** (0.00914)	-0.0167*** (0.00634)
	<i>N</i>	29,323	17,429	17,429	17,429
Dentists	Claiming age	-0.00128 (0.00228)	-0.000441 (0.00671)	-0.0125 (0.0181)	-0.0121 (0.0151)
	<i>N</i>	27,317	3,524	3,524	3,524
Total ambulatory	Claiming age	-0.0146*** (0.00120)	-0.0180*** (0.00502)	-0.0300*** (0.00863)	-0.0119** (0.00536)
	<i>N</i>	29,323	24376	24,376	24,376
Drugs	Claiming age	-0.0122*** (0.00120)	n.a. n.a.	-0.0261*** (0.00625)	n.a. n.a.
	<i>N</i>	29,323	n.a.	24,773	n.a.
Hospital	Claiming age	-0.00210 (0.00162)	-0.0267* (0.0161)	-0.0294** (0.0142)	-0.00266 (0.0153)
	<i>N</i>	29,323	4,428	4,428	4,428
Total	Claiming age	-0.0121*** (0.00132)	n.a. n.a.	-0.0307*** (0.00749)	n.a. n.a.
	<i>N</i>	29,323	n.a.	23,218	n.a.

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Delay retirement by one quarter due to the reform significantly decreases by 1.46 percentage point the probability to consume a doctor visit and decreases the number of doctor visits by 1.80% among the consumers.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67, and have or had after age 65 an administrative recognition of a chronic condition.

Source: HYGIE 2005 – 2015.

due to the reform significantly decreases by 0.740 percentage point the probability to consume a doctor visit and decreases the number of doctor visits by 1.30% among the consumers. These results are not statistically different from the main sample, meaning that the effect is not driven by a price elasticity effect.

D.2 Results for Alternative Outcomes

Results on the Probability to Have a Chronic Condition After Age 65. Table D3 show that delayed retirement by one quarter leads to an increase in the probability to have a chronic condition after age 65 by 0.209 percentage points. This effect seems to be temporary. Thus, as shown in figure D3 this result holds only between age 67 and 70. Thereafter, there is no significant impact between age 70 and 75.

Table D2: Results among the Healthcare Consumers with Co-payment Exemption

		Probability	Number of	Expenditure for	Price for
Generalists	Claiming age	-0.00822*** (0.00178)	-0.00625** (0.00303)	-0.00460* (0.00275)	0.00165* (0.000972)
	<i>N</i>	47,365	42,911	42,911	42,911
Specialists	Claiming age	-0.00784*** (0.00261)	-0.00947* (0.00531)	-0.0176** (0.00712)	-0.00809** (0.00382)
	<i>N</i>	47,365	30,161	30,161	30,161
Dentists	Claiming age	-0.000730 (0.00114)	-0.0000767 (0.00706)	0.00554 (0.0145)	0.00561 (0.0135)
	<i>N</i>	43,525	6,149	6,149	6,149
Total ambulatory	Claiming age	-0.00740*** (0.000986)	-0.0130*** (0.00376)	-0.0178*** (0.00550)	-0.00484 (0.00332)
	<i>N</i>	47,365	44,705	44,705	44,705
Drugs	Claiming age	-0.00416*** (0.00108)	n.a. n.a.	-0.00889** (0.00423)	n.a. n.a.
	<i>N</i>	47,365	n.a.	45,846	n.a.
Hospital	Claiming age	-0.000167 (0.00150)	-0.00757 (0.0114)	-0.00522 (0.00923)	0.00235 (0.00819)
	<i>N</i>	47,365	7,140	7,140	7,140
Total	Claiming age	-0.00285*** (0.000718)	n.a. n.a.	-0.0224*** (0.00360)	n.a. n.a.
	<i>N</i>	47,365	n.a.	42,567	n.a.

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Delay retirement by one quarter due to the reform significantly decreases by 0.740 percentage point the probability to consume a doctor visit and decreases the number of doctor visits by 1.30% among the consumers.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67, and benefit from a co-payment exemption.

Source: HYGIE 2005 – 2015.

Table D3: Impact on the Probability to Have a Chronic Condition after Age 65 and Co-payement Exemption

	Chronic Condition	Exemption
Claiming age	0.00209*** (0.000608)	-0.00224 (0.00227)
<i>N</i>	66,698	66,698

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

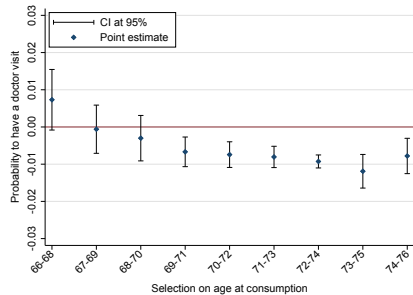
Notes: Delayed retirement by one quarter leads to an increase in the probability to have a chronic condition after age 65 by 0.209 percentage points. Delayed retirement by one quarter leads to a non significant decrease in the probability to benefit from a co-payment exemption by 0.224 percentage points.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

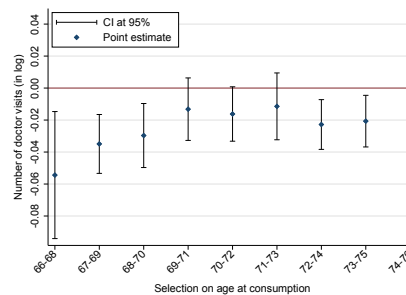
Source: HYGIE 2005 – 2015.

Figure D2: Impact of Later Retirement among those with a Co-payment Exemption

(a) Impact on the Probability to have a Doctor Visit



(b) Impact on the Number of Doctor Visits

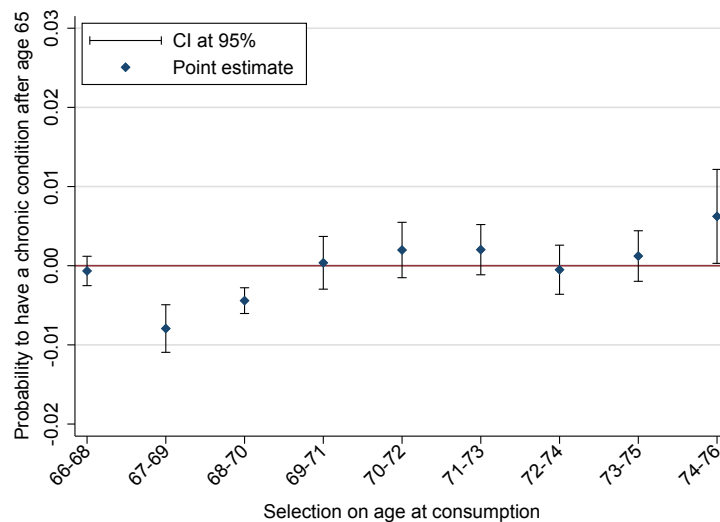


Notes: This graph shows the average impact of later retirement on the number of doctor visits at particular age range. Confidence Intervals at 95%.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 130 and 180 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

Figure D3: Impact of Later Retirement on the Probability to Have a Chronic Condition after Age 65



Notes: This graph shows the average impact of later retirement on the probability to have a chronic condition after age 65, by age range. Confidence Intervals at 95%.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 130 and 180 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

Impact on each Quartile of Healthcare Distribution. Studying the impact of later retirement on consumption quartile provides additional information regarding the impact of later retirement on healthcare consumption. Thus, Table D4 shows the impact

of later retirement on the probability to be in each quartile of healthcare distribution. It shows that there is a significant increase in the probability to be in the first quartile of consumption and a decrease in the probability to be in the last quartile of the distribution. It can be interpreted as an overall negative impact driven by a increase in the number a “small” consumers.

Table D5 shows the impact of later retirement on the quartile of healthcare distribution (ie. the outcome is a discrete variable having the value 1, 2, 3 and 4). It shows similar results: individuals who delayed retirement tend to be “smaller” consumers than the others.

Table D4: Results on the Probability to be in each Healthcare Expenditure Quartile

	$P(0 < HCE < 523)$	$P(523 \leq HCE < 1075)$	$P(1075 \leq HCE < 1994)$	$P(1994 \leq HCE)$
Claiming age	0.00601*** (0.00133)	0.00200 (0.00235)	-0.00359** (0.00181)	-0.00354* (0.00210)
<i>N</i>	52,463	52,463	52,463	52,463

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Retire one quarter later due to the reform leads to an average increase in the probability to be in the first quartile of healthcare expenditure by 0.6 percentage point, and a decrease in the probability to be in the last quartile by 0.36 percentage point.

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.

Table D5: Results on the Healthcare Quartile

	Impact of later retirement on
Generalist visit quartile	-0.0106** (0.00479)
<i>N</i>	48,324
Specialist visit quartile	-0.0136 (0.0101)
<i>N</i>	34,040
dentist visit quartile	-0.0170 (0.0220)
<i>N</i>	7,396
Doctor visit quartile	-0.0121* (0.00728)
<i>N</i>	50,488
Drugs expenditure quartile	-0.0155*** (0.00212)
<i>N</i>	51,855
Hospital stay quartile	-0.0304*** (0.0112)
<i>N</i>	8,008
Total healthcare expenditure quartile	-0.0194*** (0.00576)
<i>N</i>	48,468

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Retire one quarter later due to the reform leads to a decrease in the quartile of doctor consumption by 0.0121 (the number of doctor practitioner visits of one individual over 100 is in the quartile directly lower due to the reform).

Sample: Men who had contributed at least once in the private sector and had contributed at age 60 between 131 and 160 quarters, retired before age 67.

Source: HYGIE 2005 – 2015.