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

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

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

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

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

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

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

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

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

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

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

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

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

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

1. Materials and Method

1.1. Context, Data and Sample

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

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

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

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

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

1.2. Variables

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

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

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

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

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

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

1.3. Identification Strategy

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

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

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

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

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

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

2.1. A Specific and Multifaceted Population

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

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

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

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

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

Table 1 – **Sample Description**

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

Sources: ESPS (2012).

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

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

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

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

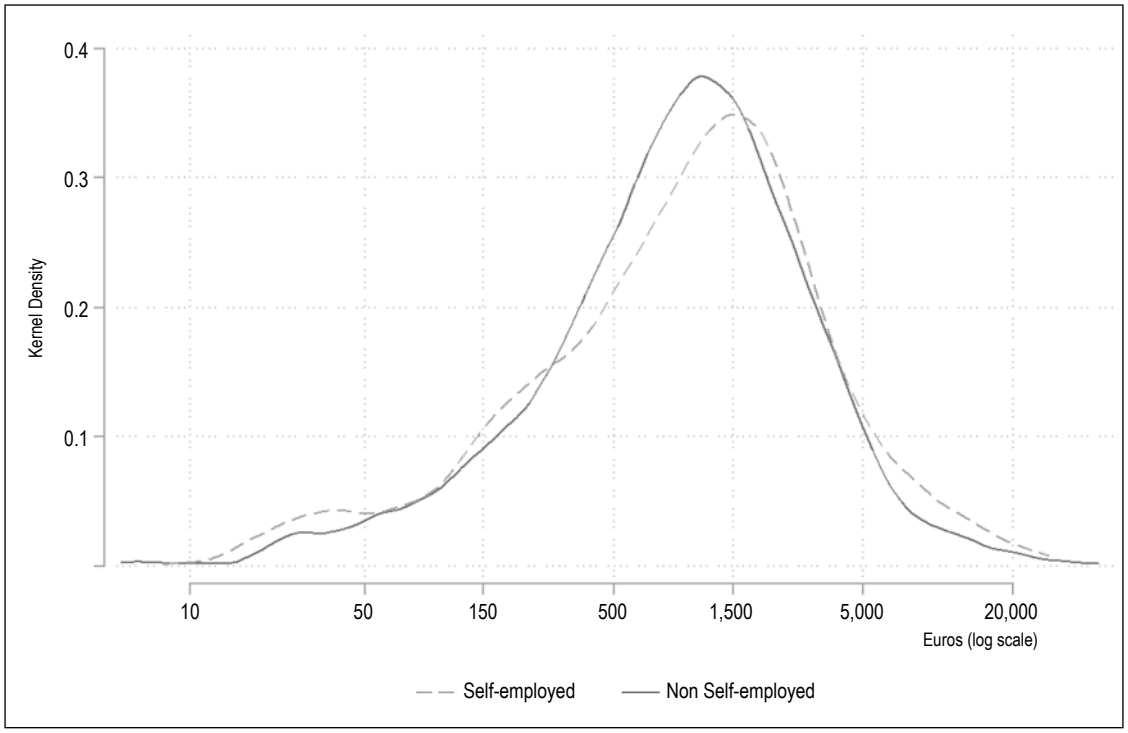
2.2. Bivariate and Multivariate Analysis

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

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

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

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



Sources: ESPS (2012).

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

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

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

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

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

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

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

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

3.1. Differences by Age and Gender

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

Table 4 – **Determinants of HCE**

A – Extensive margin

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

➔

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

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

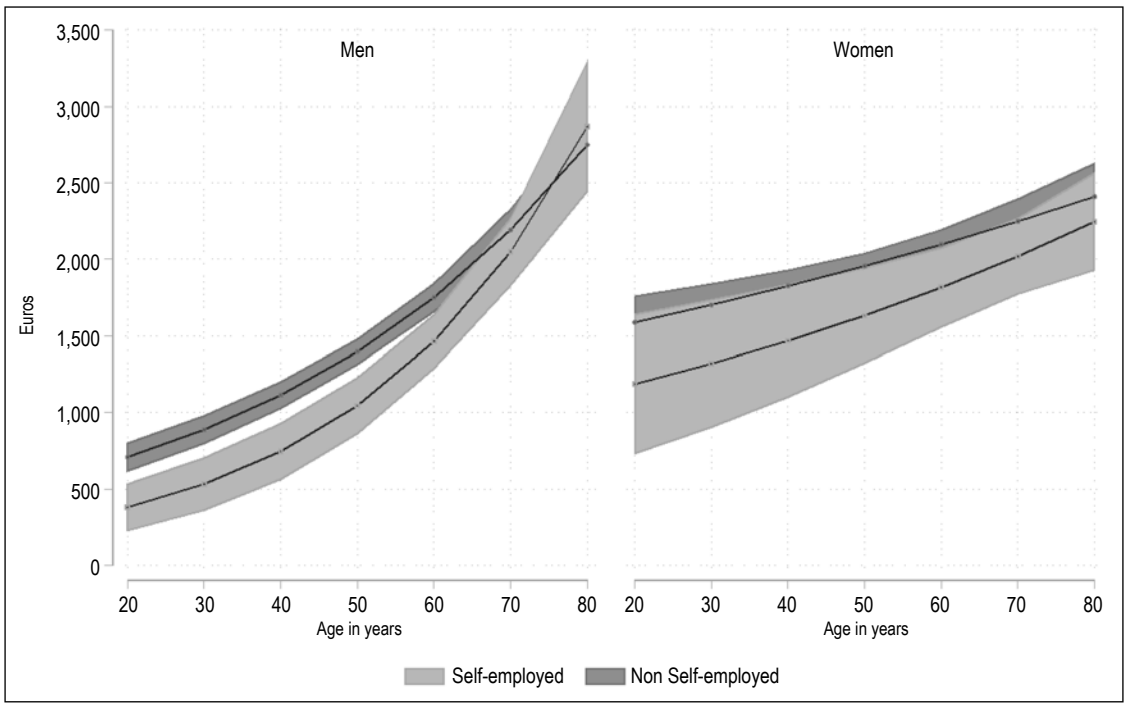
Notes: Extensive margin displays marginal effects from Probit models. Intensive margin displays lognormal retransformed OLS coefficients into euros by a scale factor. Standard errors in parenthesis. * p<0.1, ** p<0.05, *** p<0.01.

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

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

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

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



Sources: ESPS (2012).

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

3.2. On Potential Limits

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

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

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

A – Extensive margin

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

➔

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

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

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

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

* *
*

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

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

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

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

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

BIBLIOGRAPHY

Algava, É., Cavalin, C. & Célérier, S. (2013). The remarkably good health of the self-employed. *Travail et Emploi*, (Hors-série), 55–70. https://doi.org/10.4000/travailemploi.6296

Algava, E., Chouanière, D., Cohidon, C., ... & Weibel, L. (2011). Stress au travail et santé : situation chez les indépendants.hal-0281097. https://hal.inrae.fr/hal-02810971

Allin, S. & Masseria, C. (2009). Unmet need as an indicator of healthcare access. *Eurohealth*, 15(3), 7–10. http://eprints.lse.ac.uk/id/eprint/28454

Bíró, A. (2016). Outpatient visits after retirement in Europe and the US. *International Journal of Health Economics and Management*, 16(4), 363–385. https://doi.org/10.1007/s10754-016-9191-7

Boaz, R. F. & Muller, C. F. (1989). Does having more time after retirement change the demand for physician services? *Medical Care*, 1–15. https://doi.org/10.1097/00005650-198901000-00001

Carree, M. A. & Thurik, A. R. (2010). The impact of entrepreneurship on economic growth. *In: Handbook of Entrepreneurship Research*, pp. 557-594. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-1191-9_20

Célant, N., Guillaume, S. & Rochereau, T. (2014). *Enquête sur la santé et la protection sociale 2012* (pp. 1–302). Paris: Institut de recherche et documentation en économie de la santé (IRDES). https://www.irdes.fr/recherche/rapports/556-enquete-sur-la-sante-et-la-protection-sociale-2012.pdf

Chevreul, K., Brigham, B., Durand-Zaleski, I. & Hernández-Quevedo, C. (2015). France: Health system review. *Health Systems in Transition*, (17/3). http://eprints.lse.ac.uk/id/eprint/65775

Dean, K. (1989). Self-care components of lifestyles: the importance of gender, attitudes and the social situation. *Social Science & Medicine*, 29(2), 137–152. https://doi.org/10.1016/0277-9536(89)90162-7

Doorslaer, E. V., Koolman, X. & Jones, A. M. (2004). Explaining income-related inequalities in doctor utilisation in Europe. *Health Economics*, 13(7), 629–647. https://doi.org/10.1002/hec.919

Ekelund, J., Johansson, E., Järvelin, M. R. & Lichtermann, D. (2005). Self-employment and risk aversion – evidence from psychological test data. *Labour Economics*, 12(5), 649–659. https://doi.org/10.1016/j.labeco.2004.02.009

European Commission (2017). European Employment Strategy: Supporting entrepreneurs and the self-employed. https://ec.europa.eu/social/main.jsp?catId=952&langId=en

Garrouste, C., Paraponaris, A. & Sirven, N. (2020). 'When the going gets tough the tough get going' – The Health Gap for Self-employed in Europe. *mimeo*.

Goetz, S. J., Fleming, D. A. & Rupasingha, A. (2012). The economic impacts of self-employment. *Journal of Agricultural and Applied Economics*, 44(3), 315–321. http://ageconsearch.umn.edu/record/130267

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy*, 80(2), 223–255. https://www.journals.uchicago.edu/doi/abs/10.1086/259880

Gruber, S. & Kiesel, M. (2010). Inequality in healthcare utilization in Germany? Theoretical and empirical evidence for specialist consultation. *Journal of Public Health*, 18(4), 351–365. https://doi.org/10.1007/s10389-010-0321-2

Herber, G. C., Schipper, M., Koopmanschap, M., ... & Uiters, E. (2020). Health expenditure of employees versus self-employed individuals; a 5 year study. *Health Economics*. https://doi.org/10.1002/hec.4149

Hessels, J., Rietveld, C. A. & van der Zwan, P. (2017). Self-employment and work-related stress: The mediating role of job control and job demand. *Journal of Business Venturing*, 32(2), 178–196. https://doi.org/10.1016/j.jbusvent.2016.10.007

Jamal, M. (2007). Burnout and self-employment: a cross-cultural empirical study. *Stress and Health: Journal of the International Society for the Investigation of Stress*, 23(4), 249–256. https://doi.org/10.1002/smi.1144

Janssen, R. (1992). Time prices and the demand for GP services. *Social Science & Medicine*, 34(7), 725–733. https://doi.org/10.1016/0277-9536(92)90359-X

Karasek R. & Theorell T. (1990). *Healthy work: stress, productivity, and the reconstruction of working life*. NY: Basic Books.

Koellinger, P. D. & Roy Thurik, A. (2012). Entrepreneurship and the business cycle. *Review of Economics and Statistics*, 94(4), 1143–1156. https://doi.org/10.1162/REST_a_00224

Lallo, C. & Raitano, M. (2018). Life expectancy inequalities in the elderly by socioeconomic status: evidence from Italy. *Population Health Metrics*, 16(1), 7. https://doi.org/10.1186/s12963-018-0163-7

Lewin-Epstein, N. & Yuchtman-Yaar, E. (1991). Health risks of self-employment. *Work and Occupations*, 18(3), 291–312. https://doi.org/10.1177/0730888491018003003

Lucifora, C. & Vigani, D. (2018). Health care utilization at retirement: The role of the opportunity cost of time. *Health Economics*, 27(12), 2030–2050. https://doi.org/10.1002/hec.3819

Manning, W. G. & Mullahy, J. (2001). Estimating log models: to transform or not to transform? *Journal of Health Economics*, 20(4), 461–494. https://doi.org/10.1016/S0167-6296(01)00086-8

OECD (2015). Hours Worked: Average usual weekly hours worked - averages. OECD Employment and Labour Market Statistics (database), https://doi.org/10.1787/data-00306-en

Park, J., Han, B. & Kim, Y. (2019). Comparison of occupational health problems of employees and self-employed individuals who work in different fields. *Archives of Environmental & Occupational Health*, 1–14. https://doi.org/10.1080/19338244.2019.1577209

Pfeifer, C. (2013). Cyclical absenteeism among private sector, public sector and self-employed workers. *Health Economics*, 22(3), 366–370. https://doi.org/10.1002/hec.2808

Rietveld, C. A., Van Kippersluis, H. & Thurik, A. R. (2015). Self-employment and health: Barriers or benefits?. *Health Economics*, 24(10), 1302–1313. https://doi.org/10.1002/hec.3087

Riphahn, R. T., Wambach, A. & Million, A. (2003). Incentive effects in the demand for healthcare: a bivariate panel count data estimation. *Journal of Applied Econometrics*, 18(4), 387–405. https://doi.org/10.1002/jae.680

Salembier, L. & Théron, G. (2020). Panorama de l'emploi et des revenus des non-salariés. *Emploi et revenus des indépendants*, 11–28. https://www.insee.fr/fr/statistiques/4470794?sommaire=4470890

Schumpeter, J. (1911). *Theorie der wirtschaftlichen Entwicklung* (transl. 1934, *The Theory of Economic Development: An inquiry into profits, capital, credit, interest and the business cycle*). Vienna: Kyklos.

Sewdas, R., Tamminga, S. J., Boot, C. R., … & van der Beek, A. J. (2018). Differences in self-rated health and work ability between self-employed workers and employees: Results from a prospective cohort study in the Netherlands. *PloS one*, *13*(11), e0206618. https://doi.org/10.1371/journal.pone.0206618

Sirven, N. & Rapp, T. (2017). The cost of frailty in France. *The European Journal of Health Economics*, 18(2), 243–253. https://doi.org/10.1007/s10198-016-0772-7

Spasova, S., Bouget, D., Ghailani, D. & Vanhercke, B. (2017). Access to social protection for people working on non-standard contracts and as self-employed in Europe. *A study of national policies, European Social Policy Network (ESPN)*. Bruxelles: Commission européenne.
https://op.europa.eu/en/publication-detail/-/publication/fb235634-e3a7-11e7-9749-01aa75ed71a1/language-en

Stephan, U. & Roesler, U. (2010). Health of entrepreneurs versus employees in a national representative sample. *Journal of Occupational and Organizational Psychology*, 83(3), 717–738.
https://doi.org/10.1348/096317909X472067

Toivanen, S., Griep, R. H., Mellner, C., Vinberg, S. & Eloranta, S. (2016). Mortality differences between self-employed and paid employees: a 5-year follow-up study of the working population in Sweden. *Occupational and Environmental Medicine*, 73(9), 627–636. http://dx.doi.org/10.1136/oemed-2015-103472

Torp, S., Paraponaris, A., Van Hoof, E., ... & de Boer, A. G. (2018). Work-Related Outcomes in Self-Employed Cancer Survivors: A European Multi-country Study. *Journal of Occupational Rehabilitation*, 1–14.
https://doi.org/10.1007/s10926-018-9792-8

Van der Heyden, J. H. A., Demarest, S., Tafforeau, J. & Van Oyen, H. (2003). Socioeconomic differences in the utilisation of health services in Belgium. *Health Policy*, 65(2), 153–165.
https://doi.org/10.1016/S0168-8510(02)00213-0

Wardle, J., Haase, A. M., Steptoe, A., Nillapun, M., Jonwutiwes, K., & Bellisie, F. (2004). Gender differences in food choice: the contribution of health beliefs and dieting. *Annals of Behavioral Medicine*, *27*(2), 107–116. https://doi.org/10.1207/s15324796abm2702_5

APPENDIX 1

THE MEASUREMENT OF WORKING CONDITIONS

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

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

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

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

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

APPENDIX 2

HCE AND ITS DETERMINANTS AT THE EXTENSIVE AND INTENSIVE MARGINS

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

1 – Intensive margin

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

2 – Extensive margin

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

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Table A2-1 – (*contd.*)

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

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

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

A2-2.1 – Extensive margin

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

A2-2.2 – Intensive margin

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

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