Employer-Mandated Complementary Health Insurance in France: The likely effects on social welfare

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Preliminary version

Abstract

In France, the ANI reform has mandated private sector employers to compulsory offerfrom January 1st, 2016, a sponsored complementary health insurance to all their employeesand to their unemployed former employeesfor up to 12 months. This reform is going to reduce the cost of complementary health coverage for employees but prevents them to choose their optimal level of coverage. Moreover, it may deteriorate the health risk of the pool of insured covered by individual contracts and thus, increase individual premiums. Wages may also potentially decrease by the employer subsidy amount.

Taking into account the Expected utility theory framework, we simulate the likely effects of this law on the welfare of the population and its distribution, according to several scenarios on the evolution of premiums and wages.This research is based on the 2012 Health, Health Care and Insurance survey linked to the administrative data of the National Health Fund, which provides information on health, complementary health insurance, employment status, risk preferences and healthcare expenditures.

Assuming that premiums and wages will remain the same after the reform, the law will increase the social welfare of the population, despite the loss of those who previously chose to be uninsured. This positive effect is mainly driven by the employer subsidy rather by the reduction of financial risk exposure. Assuming a 20% increase in individual premiums, collective welfare will decrease. Those who sufferedthe most from the reform are the poor, the elderly and those with poor health status. Finally, the law will induce a loss of collective welfare if wages decrease by the employer subsidy.

Codes JEL: I13, D63.

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1. Introduction

In France, despite the predominant role of mandatory health insurance in financing health expenditure, access to healthcare remains heavily dependent on the purchase of a Complementary Health Insurance (CHI). Access to CHI remains an important issue for the French government despite the existence of various devices aimed mainly at low-income individuals in the 2000s (CMU-C, ACS),an issue again recently reaffirmed in the national health strategy. In the context of the National Inter-professional Agreement (Ani) of January 2013, a new measure, presented as "iconic", was proposed. It generalisesemployer-sponsored CHIpartly funded by the employer to all private sector employees from 1 January 2016 and its portability to the unemployed until 12 months after the loss of employment.

However, recent studies have shown that generalisation of employer-sponsored CHI does not allow *a priori*to reduce disparities of CHI coverage as the individuals targeted by the reforminitially had better coverage than those who were excluded (Pierreand Jusot, 2015). Otherwise, beyond the effects of this reform on CHI coverage, it is essential to consider the consequences, in terms of welfare, of the introduction of compulsory insurance. Indeed, according to the expected utility theory, risk-averse individuals may choose to take out insurance to reduce the financial risks associated with probability of occurrence of an illness (Nyman, 1999; Newhouse, 1978; Arrow, 1963). This choice depends on the level of risk aversion, resulting from thetrade-offbetween the gain in welfare associated with reduced risk and loss of welfare related to the cost of the insurance premium. By requiring all employees to subscribe to insurance, this reform forces those who prefer to remain uninsuredto subscribe to health insurancedespite the financial participation of the employer to the premium: the decision not to subscribe to a policymay result from an informed economic trade-off in such that the insurance requirement may reduce the welfare of some of uninsured individuals. Conversely, for other more risk-averse employees and those exposed to a high risk level of out-of-pocket expenditures, the employer subsidy to the premium may induce an increase in welfare viathe subscription to aCHI contract that was unaffordablebefore the reform,the improvement of CHI coverage or a decrease in the premium paid by the employees.

In the United States, Marquis and Long (1995) showed that the introduction of a health insurance requirement by employers led to a significant loss of welfare of employees, the latter being insensitive to the participation of employer to the cost of the policy. Similarly, the introduction of the Medicare expansion led to a very limited increase in the welfare of the concerned senior citizens (Engelhardt and Gruber, 2010). In France, although the absence of CHI coverage seems mostly related to financial barriers, individuals without CHI before the implementation of the reformwere significantly less risk-averse than CHI insured, suggesting the existence of a deliberate choice not to subscribe to CHI

(Pierre and Jusot, 2015). Furthermore, to the extent that this reform reinforces the segmentation of health risks between the “individual contracts” and “group contracts”markets, this measure could lead to an increase in premiums in the individual market, whichmay induce a loss of welfare for individuals not directly affected by the law. Ultimately, it is difficult to anticipate the loss or gain of welfare induced by this measure for employees and more widely,forthe overall population.

Taking into account the Expected utility theory, we simulate the gains and losses of welfare induced by generalisation of employer-sponsored CHI for the entire populationfocusing on several insurance paths defined according to which CHI coverage change is induced by the law (in terms of level and type of coverage). We also assume several scenarios concerning a potential increase in individual contracts premiums and a potential decrease in wages.This research is based on the 2012 Health, Health Care and Insurance survey linked to the administrative data of the National Health Fund, which provides information on health status, socio-economic characteristics, complementary health insurance, employment status, and individual risk preferences and level of out of pocket expenditures.After an overview of the context in which generalisation of employer-sponsored CHIwas introduced and the regulations thereof (section 2), we describe the data used (section 3), the theoretical framework and the assumptions made to compute expected utility variations before and after the reform (section 4). We then present and discuss the results (sections 5 and 6).

2. The Anireform

In January 2013, the Ani, signed by the majority of the social partners on "*business competitiveness and securing jobs and careers of employees*", proposed, in return togreater flexibility in the labour market, two articles onemployer-sponsored CHI. Firstly, the purchase of employer-sponsored CHI is generalisedto all private sector employees, i.e. to require all employers to implement CHIand finance at least 50% of thepremium. Secondly, the portabilityrights are generalised and increased, i.e. to allow unemployed individuals to continue to benefit from their employer-sponsored CHI. The duration of this device depends on the duration of the last employment joband cannot exceed 12 months.

The agreement, voted by MPs on 14 June 2013, became effective on 1 January 2016. Negotiations with supplemental organisations were to begin on 1June 2013 at the industry level and then on 1 July 2014 at the corporate level. Companies that failed to reach an agreementby 1 July 2015 must now establish a CHI contractthat provides the minimum coverage defined by law: all co-payment fees on consultations, drugs reimbursed at 65% and the procedures and services reimbursed by the medical insurance; the hospital daily charge indefinitely; dental care at a minimum reimbursement of 125% of the compulsory health insurance rates and optical costs by two-year periods, amounting to €100 minimum for simple corrections, €150 minimum for simple and complex mixed corrections and €200

minimum for complex corrections: these ratesare annual for minors or in case of a change in eye sight. Note here that the new definition of responsible policies published in the circular of 30 January 2015 also imposes maximum reimbursement of up to 125% for excess fees of doctors not having signed the access to care policy (100% in 2017) and the maximumreimbursement of optical fees amounting to €470 for simple eyeglasses (including the frame).

3. Data

This researchis based on the 2012 Health, Health Care and Insurance Survey linked to the administrative data of the National Health Fund. This survey providesinformation on the health status, demographics and socio-economic characteristics(income, employment status) as well as on the typeof CHIcoverage (individual *vs.* collective). It also provides information related to the risk preference of individuals aged 15 years and over with the following question: "*In terms of behaviour to risk, where do you place yourself on a scale of 0 to 10, i.e. from very conservative to very adventurous*?"Data from healthcare insurance reimbursements allowed us to know the costs of healthcare incurred by individuals and the out-of-pocket expenditures that remain after reimbursement by the public health insurance. We then simulate out-of-pocket expenditures remaining after reimbursement by the CHI making several imputations concerningthe level and the premium of CHI coverage.The survey questioned all members of the household of the sampled individuals in the insured records of the three major compulsory health insurance schemes (CNAMTS, RSI and MSA). However, some questions, including risk aversion,were only asked of individuals aged 15 years and over. Furthermore, when matching health insurancedata, only healthcare consumption of the sampled individuals and those belonging to the same "cluster of insured individuals" (i.e.dependants) were available. In total, we only retained individuals aged 15 years and over who werenot beneficiaries of the “Universal Complementary Health Insurance” (called *CMU-C*)[1],for whom the administrative data were available,as well as for their risk preference, their employment and CHIstatuses and their income (per CU).

Thanks to the employment status observed in 2012, two categories of individualswere identified as being affected by the Anireform: 1. private sector employees directly affected by the employer mandate; 2.former private sector employees unemployed for fewer than twelve months directly affected by portability coverage. Furthermore, as portability is effective on the condition of receiving unemployment benefit, we excluded unemployed individuals of a household in which noindividual collected unemployment benefit. A total of 42% of the sampled individuals wereaffected bythe Ani

[11] The beneficiaries of the CMU-C have the right to refuse the employer-sponsored CHI. Moreover, they are not affected by higher premiums on the individual CHI market as they benefit from a free public CHI coverage.

and among them, 96% were private sector employees.Our sample consists of 5,370 individuals (Table 1): 64% of individuals in the sample arecovered by an individual CHI, 31% by a collective CHI and 5% do not benefit from any CHI. Only 30% of individuals affected by the Aniarecovered by an individual CHI contract and 3.5% have noCHI. A total of 68% of the sample report being in good or very good health, and this proportion reaches 78% among individuals affected by the Ani. Regarding the risk aversion of individuals, 32% choose one of the three lowest scores (0, 1 or 2), which is a very strong risk aversion, while 7% choose one of the three highest scores (8, 9 or 10), revealing a lower risk aversion, or just a taste for risk. The individuals affected by the Anireform were slightly less risk-averse.

Table 1: Description of the sample and the individuals concerned by the Ani

	Sample		Individuals affected by the Ani reform			Sample		Individuals affected by the Ani reform	
	Number	%	Number	%		Number	%	Number	%
CHI coverage					**Age**				
Without CHI	242	4,7	66	3,5	15/20 years old	363	5,7	21	1,2
Employer-sponsored CHI policy	1933	36,1	1431	66,2	21/30 years old	507	12,5	344	20,8
Individual CHI policy	3195	59,2	624	30,2	31/40 years old	813	18,4	545	29,6
Employment status					41/50 years old	1021	16,6	650	25,3
Employed	2786	55,3	2033	95,5	51/60 years old	978	16,6	512	21,0
Retired	1531	27,8	0	0,0	61/75 years old	1142	19,8	49	2,0
Unemployed	275	5,4	88	4,5	Over 75 years old	546	10,4	0	0,0
Students	349	5,4	0	0,0	**Risk preference**				
House wife/husband	270	3,3	0	0,0	0 (very cautious)	626	11,1	167	7,3
Other	154	2,7	0	0,0	1	393	7,4	130	6,3
Unknown	5	0,1	0	0,0	2	636	11,6	232	10,7
Personnes concernées par l'Ani					3	646	12,0	287	13,3
Private secor employees	2033	40,4	2033	95,5	4	527	9,9	240	11,4
Short term unemployed	88	1,9	88	4,5	5	1211	22,8	495	23,5
All	2121	42,3	2121	100	6	475	8,9	215	10,2
Income per CU					7	470	9,0	188	9,0
<= 650 €	169	2,6	38	1,3	8	276	5,1	118	5,8
651€/1000€	933	15,6	249	10,5	9	60	1,2	32	1,6
1001€/1400€	1388	25,8	531	24,6	10 (daring)	50	1,0	17	0,9
1401€/2000€	1554	30,3	687	33,7	**Perceived health status**				
2001€/3000€	933	18,1	435	21,2	Very good/Good	3601	68,2	1623	78,2
> 3000€	393	7,6	181	8,6	Fair	1357	24,3	428	18,8
Sexe					Bad/Very Bad	412	7,6	70	3,0
Men	2546	46,9	1095	50,3					
Women	2824	53,1	1026	49,7	**Total**	**5370**	**100**	**2121**	**100**

4. Analysis framework

4.1 The expected utilitytheory

To evaluate the gains and losses in welfare before and after the Ani, we used the expected utility model. We assumedthatindividuals$n = (1, \dots, N)$ had a welfare function matching their expectations of one-dimensional utility depending on their disposable income *x*, i.e. their income minus the premium for supplemental health insurance and theOut-Of-Pocket expenditures (OOP) that remain after reimbursement of both public health insurance and CHI.

$$U_n = U(x_n) = U(R_n - premium - OOP)$$

Assuming that the preferences, income and risk of individuals remainthe same before and after the Ani reform, the expected utility $t = \{before, after\}$of an individual *n* belonging to the age group *r* and facing the distribution of states of nature $i = \{1, \dots I\}$, is written as:

$$EU_{nt} = \sum_{i=1}^{I} p^i U\left(R_n - \pi_{jt}^{ar} - l_t^{ai}\right) \quad \text{(Eq. 1)}$$

where:

$i = \{1, \dots, I\}$is all possible states of nature for the risk class *r* and $p^i$is the probabilities associated with each state of nature;

$R_n$is the income per CU of the individual *n*;

π_{jt}^{ar} is the premium payable by the individual *n* belonging to the age group *r*for the insurance policy on the market *j* with $j = \{ind, coll\}$ of the coveragequality level $a = \{0, A, \dots\}$.

$a = 0$corresponds to the situation where the individual does not have supplemental coverage;

l_t^{ai} is the OOPof an individual facing the state of nature *i* and whom level of CHI coverageis *a*.

l_t^{ai} is independent of the type of CHI contract ("individual" or "collective") since the reimbursement A, B, and C correspond to identical levels of reimbursements on these two markets.

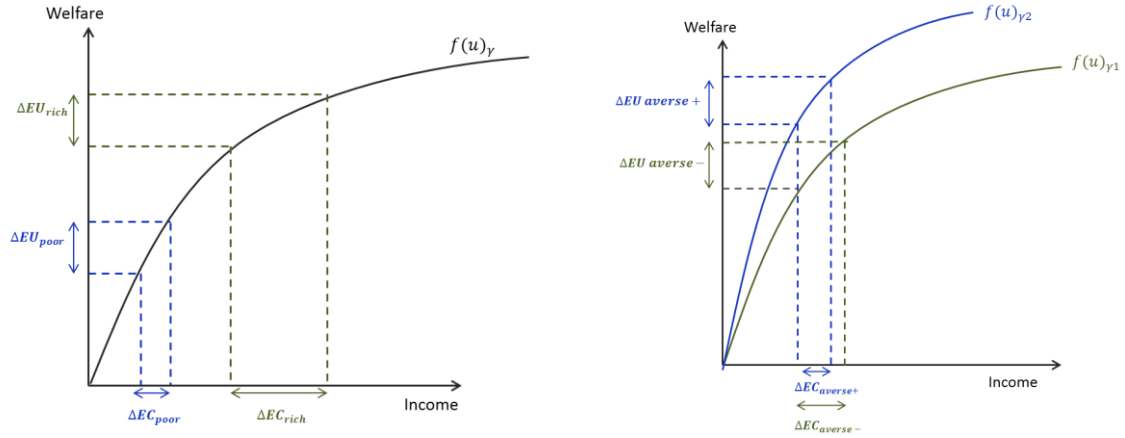
Note that $\pi_{jt}^{0} = 0$ and $l^{0i} = L^i$ with L^i the OOP expenditures that remain after reimbursement of public health insurance.

4.2 Analysis strategy

Gains and losses of welfare induced by generalisationof corporate supplemental health insurance were calculated for each individual by differentiating their expected utility observed before and after the Ani: $\Delta EU_n = EU_{nAfter} - EU_{nBefore}$.

To measure the monetary value of gains and losses of welfare induced by the Ani reform, we also present the certaintyequivalents related to variations in expected utility of individual. They correspond to the level of wealth that provides individuals with the same satisfaction level as the gain or loss of expected utility which they face. They depend on the level of disposable income of individuals and their degree of risk aversion: the same variation of expected utility had a lower monetary value for a poor individual (for a given risk aversion) or more risk-averse (for a given income; Figure 1).

Chart 1: Representation of changes in expected utility and certainty equivalents at different income levels and risk aversion



We first evaluate the Anireform using a utilitarian social welfare function where the collective welfare is the sum of individual expected utility (Eq.2).

$$\Delta EU = \sum_n^N \Delta EU_n = \sum_n^N \left[EU_{nApr\,ès} - EU_{nAvant}\right] \qquad \text{(Eq. 2)}$$

Then, to study the magnitude of gains and losses in the population, we analyse changes in the relative distributions of welfare in the population and according to several insurance paths defined following the CHI coverage change induced by the Ani reform (in terms of level and type of coverage).We also identified the winners and losers of the reform according to certain individual characteristics, such as age, income and level of risk aversion, to investigate how the reform benefits or not the most vulnerable individuals of the population.

5. Working hypotheses and imputations

To calculate changes in welfare, a functional form of the utility function must be chosen. Moreover, regardless of the form of preferences, changes in welfare depend on possible changes in the type of CHI policy$j = \{ind, coll\}$ and theCHI coverage quality$a = \{0, A, \dots\}$ that result in, for the individual risk class *I*, changes to the premium π_{jt}^{ai} and the co-paymentl^{ai} (in case of a change of policy *a*). As the level of coverageof CHI policies and premiums paid are not known in the ESPS survey, a methodological work consists ofimputingthis information thanks to available data and several assumptions presented below.

5.1 Hypotheses about the form of preferences

We use the standard hypothesis that individuals had a CRRA (Constant Relative Risk Aversion)utility function, which is equivalent to assuming that the relative risk aversion is constant with the level of wealth. This is a power functionwritten as:

$$\begin{cases} u_n(x) = \dfrac{1}{(1-\gamma)} x^{(1-\gamma)} \text{ if } \gamma \neq 1 \\ u_n(x) = \log(x) \text{ if } \gamma = 1 \end{cases}$$

where$x$is the level of available wealth of individuals and $\gamma$is the relative risk aversion parameter whose sign indicates the individual preferences towards risk:

$\gamma > 0 \leftrightarrow u_n''(x) < 0$: Concave utility, risk-averse preferences

$\gamma = 0 \leftrightarrow u_n''(x) = 0$: Linear utility neutral preferences

$\gamma < 0 \leftrightarrow u_n''(x) > 0$: Convexutility risk-taking preferences

Although the hypothesis of a constant risk aversion relative to income is relatively strong without empirical justification, using a CRRA function is common in the literature and in the field of health economics (Camerer and Ho, 1994; Barsky et al., 1997; Holt and Laury, 2002; Palacios-Huerta and Serrano, 2006; Abellan et al., 2006; Arrondel and Pardo, 2008, Engelhardt and Gruber, 2010; Barcellos and Jacobson 2014). This specification has the advantage of summarising the preferences for risk in a single parameter γ. Estimating the distribution of this parameter resulted in work on US data (Barsky et al., 1997) and more recently on French data (Arrondel and Pardo, 2008). To identify the value of this parameter γ, Barsky *et al.* (1997) proposed different sets of lotteries for individuals to determine their willingness to accept change their employment knowing the probabilities of their current income may increase or decrease by a certain amount. When specifying a function of the CRRA utility, the authors identified three levels of risk aversion on segmenting the population into four groups: those for which $\gamma < 1$, the least risk-averse; those for which $1 \leq \gamma < 2$; those for which $2 \leq \gamma < 3{,}76$ and those, for which$\gamma \geq 3{,}76$, the most risk-averse. In an additional analysis, Barsky (1997) then estimated the average relative aversion parameter in each of these four groups: 0.7, 1.5, 2.9 and 15.8, respectively. Using the same lotteries, Arrondel and Pardo (2008) estimated the relative risk aversion distribution parameter γ in French data: 58.3%, the most risk-averse, for which $\gamma \geq 3{,}76$, 26.6% for which $2 \leq \gamma < 3{,}76$, 10.2% for which $1 \leq \gamma < 2$ and 4.8% of individuals for which $\gamma < 1$.

The ESPS survey did not directly estimate parameter γ, but collected a subjective score of attitude towards risk. Assuming the rangeswere comparable to parameter γ, we attributed a value of the relative risk aversion of each individual in our sample respecting the distribution observed by Arrondel and Pardo (2008) and by linearly extrapolation from the average value observed in groups by Barsky et al. (1997, Table 2).

Table 2: Attribution of the relative risk aversion

	ɣ parameter of the relative risk aversion										
	ɣ>3.76					3.76<ɣ<= 2		2<ɣ<=1	<1		
ɣ distribution (Arrondel and Calvo)											
Cumulative% in the population	58.3					84.9		95.1	100		
Risk aversion note (ESPS)	0	1	2	3	4	5	6	7	8	9	10
Cumulative% in the sample	11.1	18.5	30.1	42.1	52.0	74.8	83.7	92.7	97.8	99.0	100
Average ɣ per group (Barsky et al.)	15.8					2.9		1.5	0.7		
Attributed value of ɣ	**26.5**	**19.4**	**15.8**	**12.8**	**6.8**	**3.3**	**2.5**	**1.5**	**0.9**	**0.7**	**0.5**

Note:To calculate a value of the relative risk aversion for the least-averse individuals, we limited the possible values of ɣto 30, which is twice the average.

5.2 Attribution of supplemental health insurancereimbursement levels before the Ani

We assume that there are four possible levels of CHI reimbursement including the absence of CHI coverage and threelevel of CHI policies (A, B and C), selected on the basis of the typology of the subscribed policiesrealised by the Drees (Garnero and Le Palud, 2014). Policy A wasthe "high end" of the typology, Policy B was the average reimbursement of the two intermediate policiesof the typology and Policy C was the average level of the two entry-level policiesof the typology (see Appendix 1 for the description coverageof Policies A, B and C).

Ourdatabase provides whetherindividuals areinsured or not by CHI. The attribution of levels A, B or C to CHI insured isdefined to meet the known distribution of these policies in the population according to the most recent modal policy survey: in 2013, 3% insured individuals in the individual market level opted for PolicyA, 49% for PolicyB and 48% for Policy C. Among those covered by a collective policy, 53% opted for Policy A, 39% forPolicy B and 9% forPolicy C.

Following this information, we thus assumethat individual policies cannot be PoliciesB or C while collective policies may be Policies A, B or C. The attributionmethods of thepolicy coverage depend on the type of coverage observed in the survey. For individual policies, reimbursement levelsareattributed by crossing the opinions expressed on levels of reimbursement with the level of income by CUof the individuals. Indeed, several studies have shown that income is a major determinant of the level of premiums of individual supplemental health insurance policies. For collective policies, we cross the

opinions expressed on reimbursement levels with the size of the company offering the policy: according to the latest Corporate Supplemental Social Protection survey, collective policies offering the highest coverage are usually offered by larger companies (Perronnin*et al.*, 2012).

The choice of assigning policy levels according to these different variable cross-tabulationsis shown in Table 3. In our sample, among individuals covered by an individual policy, 45% werecovered byPolicy B and 55% by a standard Policy C. For those covered by a collective policy, 54% opted for Policy A, 36% for Policy B and 9% for Policy C.

Table 3: ImputationsofCHI policy reimbursement levels

INDIVIDUAL CHI POLICIES			
Opinion	**Revenue per CU**	**%**	**Policyattributed**
Very good	Less than €1,400	7.7	B
Very good	€1,400/€3,000	6.8	B
Very good	More than €3,000	0.8	B
Rather good	Less than €1,400	21.0	C
Rather good	€1,400/€3,000	22.7	B
Rather good	More than €3,000	3.2	B
Poor/very poor	Less than €1,400	14.8	C
Poor/very poor	€1,400/€3,000	12.3	C
Poor/very poor	More than €3,000	1.4	C
Unspecified	Less than €1,400	5.5	C
Unspecified	€1,400/€3,000	3.5	B
Unspecified	More than €3,000	0.4	B
COLLECTIVECHI POLICIES			
Opinion	**Company size**	**%**	**Policyattributed**
Very good	Over 250	15.8	A
Very good	50/250	5.8	A
Very good	Less than 50	5.7	B
Very good	Unspecified	2.8	A
Rather good	Over 250	26.9	A
Rather good	50/250	9.0	B
Rather good	Less than 50	10.5	B
Rather good	Unspecified	5.8	B
Poor/very poor	Over 250	4.1	B
Poor/very poor	50/250	1.9	C
Poor/very poor	Less than 50	3.1	C
Poor/very poor	Unspecified	1.0	C
Unspecified	Over 250	2.8	A
Unspecified	50/250	1.3	B
Unspecified	Less than 50	2.7	C

Reading guide: Individuals covered by individual CHI policies reporting very good reimbursement supposedly are covered by Policy B, while those who reported poor reimbursementswerecovered by Policy C. When the opinionswere rather good or unspecified, we assumed that the most vulnerable individuals werecovered byPolicy C and the others werecovered byPolicy B.

5.3 Hypotheses on insurance coverage trajectories before and after the Ani

According to the law, we assume that after the Ani reform, all private sector employees will be covered by a collective CHI policy. We also assumed that individuals not affected by the Anireform retained their initial status (level *a*and type *j*) and that companies already offering a collective policy before the Anireform will continue to offerthe same one (that is to say the same CHI guaranty level) after the reform. For companies that did not offer collective policies before the Ani, we assume that the new collective policies will offerthe minimum coverage required by law, i.e.Policy C. We thus identify nine insurance paths based on these assumptions (Table 4). The distribution of individuals in the various insurance paths according to their individual characteristics is presented in Appendix A.2.

Table 4: Insurance trajectories according to individual coverage before and after the Ani

	CHI coverage beforeAni	CHIcoverage after Ani	Numbers	% weight
	Collective			
Path1	Collective level A	Collective level A	1,045	19%
Path2	Collective level B	Collective level B	708	13%
Path3	Collective level C	Collective level C	180	3%
	Individual			
Path4	Individual levelB	Individual levelB	1,123	21%
Path5	Individual levelB	Collective level C	286	6%
Path6	Individual levelC	Individual levelC	1,448	26%
Path7	Individual levelC	Collective level C	338	7%
	Without insurance			
Path8	No supplemental	Collective level C	66	2%
Path 9	No supplemental insurance	No supplemental insurance	176	3%
All			5,370	100%

5.4 Hypothesis on premiums π_{jt}^{air}

- **Attribution of premiums paid before the Ani reform (*t = before)***

To imputelevels of insurance premiums to individuals covered by CHI before the Ani, we consider key dimensions known to influence the amount of premiums: the level of policycoverage ($a = \{A, B, C\}$), its type j ("individual" or "collective"), the age of insured for those covered by individual policies (associated by proportion with risk classes *r*)and the employer's subsidy for insured covered by a collective policy.

The 2013 Drees survey on the most policies taken out describes the average premiums per insured according to both the level of coverage and the type policy (Appendix Table A.3). Individual premiums policies, that depend on age,are collectedat 20, 40, 60 and 75 years. A linear extrapolation allowed us to attribute these amounts by age ranges of 10 years (Table 5). Considering the results of the latest 2009 survey ofcompany complementary social protection (Perronnin*et al.*, 2012), we assume that collective CHI insured receive a subsidy of 50% of their premium by their employer. We also assume that employers who already offered CHI to their employees before the Ani also covered their employees' children and spouse, financing 50% of their premiums and that the premium paid by the employer is the same for all employees regardless of the composition of their household.

Tables 5: Premiums imputedto CHI insured

	Individual policies		Collective policies (individual bonuses)			Collective policies (households premiums)		
	Policy B	Policy C	Policy A	Policy B	Policy C	Policy A	Policy B	Policy C
Aged 15-20 years	€28.50	€24.80	€90	€55	€50.50	€234	€143	€125
Aged 20-30 years	€43.30	€37.40	€90	€55	€50.50	€234	€143	€125
Aged 30-40years	€53.80	€46.10	€90	€55	€50.50	€234	€143	€125
Aged 40-50 years	€65.90	€56.60	€90	€55	€50.50	€234	€143	€125
Aged 50-60 years	€79.60	€68.90	€90	€55	€50.50	€234	€143	€125
Aged 60-75 years	€99.00	€84.50	€90	€55	€50.50	€234	€143	€125
Aged over 75 years	€124.00	€103.50	€90	€55	€50.50	v234	€143	€125

Note: Average individual policy premiums were reconstituted by age by linear extrapolation of the premiums observed at ages 20, 40, 60 and 75 years of the modal policiessurvey (Appendix A.2). Individual premiums of collectivepolicies corresponded to premiums observed in the modal policiessurvey for a subscriber of a collectivepolicy. Premiums for collective policiesfor households were calculated by considering two adults and one child per policy, or Policy A, €90+€90+€54=€234.

- **Attribution of premiums paid after the Ani (*t = after)***

To impute the premiums paid by individuals after the Ani reform, we first assume that the reform willhave no impact on the costs of collective policies. Regarding the employer's subsidy, we assume that if the collective policy already existed before the Ani, the employer's participation did not change after the Ani: the employer would continue to fund 50% of the CHI premium for its employees and their dependants. For collective policies implemented as part of the Ani reform, we consider two scenarios:

- In the first scenario, we assume that the employer's subsidy is the minimum participation required by law, i.e. 50% of the employee's premium only, calculated on the basis of the individual premiums presented in Table 5.
- In the second scenario, we assumed that the employer incorporated the cost of the collective policyinto the employee's salary and therefore the employer's participation was fully paid by theemployees.

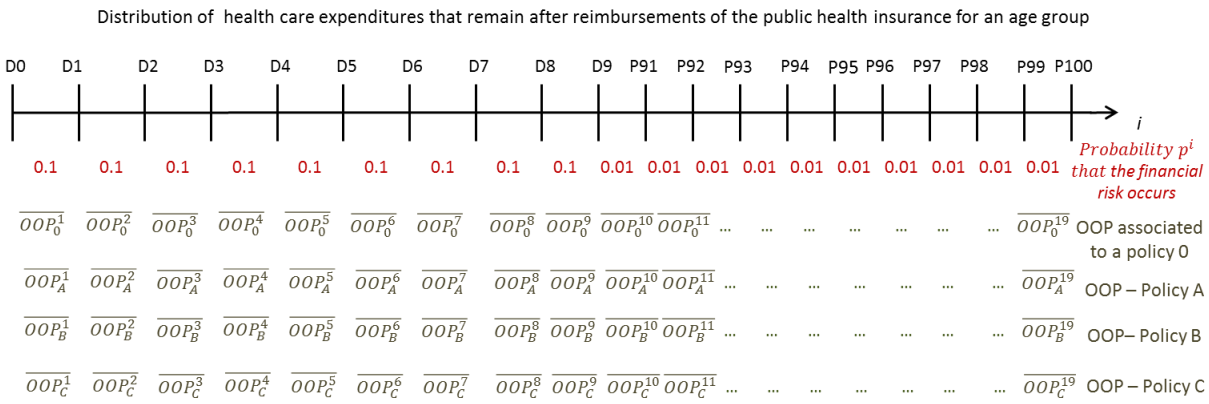
Concerning individuals covered by an individual policy after the Ani, we considered two scenarios:

- In the first scenario, we assumed that the Aniwill have no effect on individual policy premiums: $\pi_{jAvant}^{ar} = \pi_{jApr\,ès}^{ar}$
- In a second scenario, we assume that the strengthening of risk segmentation between individual and collective markets induced by the Anireform will cause an increase in individual policiespremiums, excluding civil servantpolicies[2], 10%: $\pi_{jApr\,ès}^{ar} = 1{,}1 * \pi_{jAvant}^{ar}$; and then 20%: $\pi_{jApr\,ès}^{ar} = 1{,}2 * \pi_{jAvant}^{ar}$. This is part of a static framework where the increase of premiums does not change the choice of CHI policyon the individual market.

5.6 "Health risk": probability of occurrence of risk and co-payment (p^i, l_t^{ai})

The expected utility of the individuals (Eq. 1) depends on the probability p^ithat a financial risk associated with a health status*i* (previously called state of nature) become true and itsrelated level of health care expenditure(l_t^{ai}).We assume that the financial risk to which each individual faces depends on the distribution of OOPexpenditures before reimbursement of CHIof the individuals of its age group. Fivegroupsare considered: 15-29 years old, 30-44 years old, 45-60 years old, 60-75 years old and over 75 years old. As the co-payment of individuals in our sample (Appendix A.4), and more generally of the entire French population (Mikou and Roussel, 2015; HCAAM 2011), ishighly concentrated in the last decile of the distribution, we considered the first nine deciles and the lowest 10 percentiles of the health expenditure distribution (19 states of nature *i*) in order to be as close as possible to the financial risk faced by individuals:

[2] Civil servant contracts were not subject to the same pricing as the other individual contracts.



We consider that individuals have a one in 10 chance that their healthcare expenditure before reimbursement by the CHI belongsto the first decile of the distribution of their agegroup (p^i). This is the same until the 9th decile from which the probability that the financial risk is realised is one in 100. We then consider that the health expenditurethat an individual would bear in case of realisation of the risk (l_t^{ai}) corresponded to the average co-payment in each age grouppreviously defined if respectively, all individuals had no CHI or if they all had the same type of Policy A, B or C. Co-payments then matched the co-payments associated withthe level of coverage.

6. Results

6.1 Expected changes in welfare

The expected effects of the Anireform on the welfare of individuals dependon thechange in level of coverage before and after the reform, the evolution of individual policy premiums and whether the employer's subsidiesto the collective policy premiumsarededucted or not from the employee's salary (Table 6).Concerning individuals whose insurance coverageis affected by the Anireform (paths5,7 and 8) andif we consider that the employer's subsidyto collective policyis not deducted from the employee's salary, the welfare of private sector employees formerly covered by an individual Policy C (trajectory 7) increases. This is due to a decrease in the insurance premium caused by a switch from a single premium adjusted to age to a collective premium negotiated by companies and not adjusted to age. For private sector employees covered by an individual CHI Policy B (trajectory 5), welfarewill be modify in one direction *a priori* unknown: after the Ani reform, these employees will be covered by a lower quality collective policy, Policy C, involving higher OOP expenditures and a decreased insurance premium related to a decrease of coverage, their employers' subsidy, and by switching from a single premium to a collective premium. The effect on welfare isalso unknown for individualswithout CHI before the Anireform and who will benefit from a collective Policy Cafter it: they will have lower OOP but have to pay a premium.

Considering that the employers will pass their subsidies on employees' wages, individuals who will switch from an individual policy to a collective one will have to pay the entire amount of the collective premium policy, which for the same coverageis less expensive than the individual policies for individuals aged over 40 years, but more expensive for those aged under 40 years. The expected change in welfare of individuals of path 7 who switch froman individual PolicyC to a collective Policy C becomes indefinite.

Consideringthat the individual policy premiumswill increase, the welfare of individuals who will remaincovered by the same individual policybefore and after the Ani lawwill decreasealthough they are not directly affected bythe reform (trajectories 4 and 6).

Table 6: Expected effects of the Ani on welfare according to the insurance trajectories

			Decrease of wages: NO Increase of individual premiums: NO	Decrease of wages: YES Increase of individual premiums: NO	Decrease of wages: NO Increase of individual premiums: YES	Decrease of wages: YES Increase of individual premiums: YES
Path	**Before Ani**	**After Ani**				
1	A Collective	A Collective	0	0	0	0
2	B Collective	B Collective	0	0	0	0
3	C Collective	C Collective	0	0	0	0
4	B Individual	B Individual	0	0	-	-
5	B Individual	C Collective	?	?	?	?
6	C Individual	C Individual	0	0	-	-
7	C Individual	C Collective	+	?	+	?
8	Non couvert	C Collective	?	?	?	?
9	Uninsured	Uninsured	0	0	0	0
All			?	?	?	?

6.*2 Effect of the Ani on the welfare of the entire population*

We first present the effects of the Anireform on the welfare of the population assuming that individual policies premiums will not increase. We then present the results under the assumption that the ANI reform will have an indirect effect on individual policiespremiums.

Under the assumptionthat individual policies premiums remain the same

Considering firstly that employerswill not reduce their employees' wages by their subsidyamount to the premium, the results show that the reform may induce an absolute increase in social welfare 17.88, which is an increase of 0.07% of the initial welfare corresponding to a total annual monetary gain of €239,338 for the 5,370 individuals in our sample: a gain of €45 per individual (Table 7). This gain, however, concerns only a small part of the population: expected utility increases for only 13% of individuals ("winners", Table 8). For 86% of the population, the expected utility remains the same ("neutrals") and for 1% of individuals ("losers"), it decreases. The maximum loss of expected utility ismuch higher than the maximum gain: -211% when expected utility decreases vs. 100% when

expected utility increases (Table 9). The decreaseof welfarecorresponds to aloss of €438 while the maximum monetary gain raises€2,412 (Table 10).

Considering that employers reduce their employees' wages by their subsidyamount to the premium, the Anireform may induce a reduction in the collective welfare of 7.55 (-0.07% of the initial level of welfare). In this scenario, there would be 7% of losers and 7% of winners(vs. 1% and 13% assuming that the employersdo not pass their subsidyon their employees' wages) and the maximum loss of utility could reach -771%. Note that thedecrease of the collective expected utility is associated with a monetary gain of €24,958 for the 5,370 individuals in our sample: a gain of €5 per individual. This is due to the fact that small changes in expected utility correspond to very significant monetary gains among the richest and least risk-averse individuals.

Under the assumptionthat individual policy premiums increase

Considering the indirect effects of the Anireform on the individual policies market, the Anireform has almost noeffect on collective welfareunder the assumptionof a 10% increase and a negative effect under the assumption of a 20% increase (-10.4,i.e. -0.04% corresponding to an annual monetary loss of €209,367, or €39per individual, Table 7). In this case, the gain in welfare of employees and short-term unemployed does not compensate the loss of welfare of individuals covered by individual policies: the welfare decreases for41% of individuals and increases for only 13% (Table 8). The losses are very high for someof the population: expected utility decreases by over 34% for 10% of individuals and the value of the loss raises more than €243 (Table 9).

Assuming in addition that employers will deducttheirsubsidy to the CHI from the employees' wages, the Anireform has a largely negative effect on the welfare of the general population: the collective expected utility decreasesby 0.08% and 0.14%,respectively when considering a rise in individual premiums (of 10% and 20%, respectively). The monetary loss then amounts to €197,686 and €423,746, respectively (i.e. an average loss of €37 and €79).

6.3 The changesin welfare according to the insurancepaths

Considering firstly individuals directly affectedby the Ani reform, regardless of the assumption related to the existence of a substitution between the employers' subsidies and the employees' wages, collective utility increases for individuals initially covered by an individual policy (paths5 and 7) and decreases for those initially uninsuredby CHI (path8, Table 7).

For individuals of the insurance path7, the positive effect of the Anireform was expected under the assumption of no substitution as they retain the same level of coverage, but benefit from a reduction of their premiums, although a marginal proportion of them (1%;Table 8) havea tiny decreased welfare due to our assumption on "household" pricing of collective policies: for individualsaged under 20 years, the cost of Policy C is slightly lower in the individual market than in the collective market, despite the employer's participation. Considering however that the employer'ssubsidyis deducted from wages, collective gain of expected utility and its certainty equivalent are greatly reduced (from €361 on average to €82on average). The proportion of losers, which corresponds to employees under40 years old of this trajectory, is45%.

For individuals of the insurance path5 whoswitch from an individual policy to a collective policywitha lesser quality, the Anireform positively impacts their collective welfare since it is assumes nodecrease of the employees' wages. The rise of social expected utilityis0.54%, which corresponded to a currency gain of €282 on average (Table 7). In this case, the gain in welfare due to a decreased premium was higher than the loss they suffer due to the increase of their OOP expenditures. However, this was not the case for all individuals of this insurance path: welfare decreases for 4% (up to a decrease of -211% in welfare and up to a loss of €438 (Tables 9 and 10). Assuming however thatemployers will reduce the employees' wages by the amount of their subsidy, the Anireform has almost no effect on the collective welfare of individuals of this insurance path.The positive effect previously observed vanishes for a large proportion of them: 60% become losers after the reform.

For individuals of the insurance path 8 who wereuninsured before the reform and who will be covered by a collective policy after, the effect of the Anireform on collective welfareis less clear. Indeed, the sum of expected utility decreases regardless of the assumption related tothe existence of the decrease of wages. However, under no substitution assumption, the monetary gains ison average larger than the monetary losses in such thatthe Anireform induced a monetary gain of €211on average. There is a total of 52% of losers, with quite low lossesof welfare compared to the gains: -8% for the maximum relative loss of expected utility and -€155 for the maximum monetary loss vs. 100%and €2,412 for the maximum gain, respectively. Contrarily,under the assumption employees' wages will decrease by the employers' subsidy amount, the Anireform causes an average loss of €36 per individual initially without insurance: 67% are losers(up to -52% of the initial expected utility and up to -€461, respectively).

Concerning individuals covered by an individual policy after the Anireform (insurance paths 4 and 6), their social welfare decreases whenever we assume an increase in their premiums. Considering an increase of 10%, the decrease in welfare representsan average monetary cost of €94and €86respectively for individuals of paths 4 and 6. The loss of welfare amounts to €189and €173on

average when considering a 20% increase, respectively. This represents more than €200for half of the individuals covered by an individual policy.

Table 7: Impact of the Anireform on collective welfare

	Expected Utility		Certainty Equivalents	
	Absolute Variation	relative Variation	All	On Average
All the population				
Without substitution nor increase in individual premiums	17,88	0,07%	239 338 €	45 €
Increase of individual premiums (+10%) - Without substitution	4	0,02%	16 693 €	3 €
Increase of individual premiums (+20%) - Without substitution	-10,4	-0,04%	-209 367 €	-39 €
Substitution - Without increase in individual premiums	-7,55	-0,03%	24 958 €	5 €
Substitution and increase in individual premiums (+10%)	-21,43	-0,08%	-197 686 €	-37 €
Substitution and increase in individual premiums (+20%)	-35,83	-0,14%	-423 746 €	-79 €
Trajectoire 4: B Ind. => B Ind. (Eff=1123)				
Without increase in individual premiums (with or without substitution)	0	0%	0 €	0 €
Increase of 10% (with or without substitution)	-8,92	-0,15%	-102 909 €	-94 €
Increase of 20% (with or without substitution)	-18,05	-0,31%	-208 213 €	-189 €
Trajectoire 5: B Ind. => C Coll. (Eff=286)				
Without substitution (with or without increase in individual premiums)	12,49	0,54%	90 664 €	282 €
With substitution (with or without increase in individual premiums)	0,78	0,03%	-2 042 €	-6 €
Trajectoire 6 : C Ind. => C Ind. (Eff=1448)				
Without increase in individual premiums (with or without substitution)	0	0%	0 €	0 €
Increase of 10% (with or without substitution)	-4,95	-0,14%	-119 736 €	-86 €
Increase of 20% (with or without substitution)	-10,23	-0,30%	-240 492 €	-173 €
Trajectoire 7 : C Ind. => C Coll. (Eff=338)				
Without substitution (with or without increase in individual premiums)	8,63	0,88%	131 746 €	361 €
With substitution (with or without increase in individual premiums)	3,15	0,32%	29 852 €	82 €
Trajectoire 8 : Sans Couverture => C Coll. (Eff=66)				
Without substitution (with or without increase in individual premiums)	-3,25	-0,26%	16 928 €	211 €
With substitution (with or without increase in individual premiums)	-11,48	-0,32%	-2 851 €	-36 €

Table 8: Proportion of winners, neutrals and losers

	All			
	Without Substitution nor increase in individual premiums	Increase in individual premiums	Substitution	Substitution and increase in individual premiums
Winners	13%	13%	7%	7%
Neutrals	86%	46%	86%	46%
Losers	1%	41%	7%	48%

	Path 4 B Ind/B Ind Eff=1123	**Path 5 B Ind/C Coll Eff=286**	**Path 6 C Ind/C Ind Eff=1448**	**Path 7 C Ind/C Coll Eff=338**	**Path 8 NC/C Coll Eff=66**
Without substitution nor increase in individual premiums					
Winners	0%	96%	0%	99%	44%
Neutrals	100%	0%	100%	0%	0%
Losers	0%	4%	0%	1%	56%
With Substitution for paths 5, 7 and 8 and increase in indivual premiums for paths 4 and 6					
Winners	0%	40%	0%	55%	33%
Neutrals	16%	0%	11%	0%	0%
Losers	84%	60%	89%	45%	67%

Only the insurance pathsfor which there are no 100% neutrals for each scenario are presented.

Table 9: Impact of the Anireform on individual variations on welfare

	All					
	Without Substitution nor increase in individual premiums	Substitution	10% Increase in premiums	20% Increase in premiums	**Substitution + 10% increase in premiums**	**Substitution + 20% increase in premiums**
Average	**1,9%**	-0,2%	-2,9%	-13,6%	**-5,0%**	**-15,7%**
Distribution						
P100	**100%**	100%	100%	100%	**100%**	**100%**
P99	**47%**	23%	47%	47%	**23%**	**23%**
P95	**12%**	1%	12%	12%	**1%**	**1%**
P90	**2%**	0%	2%	2%	**0%**	**0%**
P75	**0%**	0%	0%	0%	**0%**	**0%**
P50	**0%**	0%	0%	0%	**0%**	**0%**
P25	**0%**	0%	-2%	-4%	**-4%**	**-6%**
P10	**0%**	0%	-15%	-32%	**-16%**	**-33%**
P5	**0%**	-1%	-25%	-57%	**-27%**	**-59%**
P1	**0%**	-16%	-61%	-161%	**-65%**	**-171%**
P0	**-211%**	-771%	-1411%	-31487%	**-1411%**	**-31487%**

	Path 4			**Path 5**		**Path 6**			**Path 7**		**Path 8**	
	B Ind / B Ind			**B Ind / C Coll**		**C Ind/C Ind**			**C Ind/C Coll**		**NC/C Coll**	
	Increase in premiums			**Substitution**		**Increase in premiums**			**Substitution**		**Substitution**	
	+0%	**+ 10%**	**+ 20%**	**No**	**Yes**	**+0%**	**+ 10%**	**+ 20%**	**No**	**Yes**	**No**	**Yes**
Average	0%	-6,7%	-15,7%	5,8	-9,8%	0%	-13,4%	-47,5%	19,8%	4,6%	14,5%	8,2%
Distribution												
P100	0%	0%	0%	46%	46%	0%	0%	0%	100%	100%	100%	100%
P99	0%	0%	0%	30%	24%	0%	0%	0%	83%	77%	100%	100%
P95	0%	0%	0%	24%	7%	0%	0%	0%	66%	40%	98%	96%
P90	0%	0%	0%	21%	5%	0%	0%	0%	51%	23%	66%	66%
P75	0%	0%	0%	12%	1%	0%	-1%	-1%	32%	8%	7%	1%
P50	0%	-2%	-3%	5%	0%	0%	-4%	-8%	11%	1%	0%	-1%
P25	0%	-9%	-19%	1%	-5%	0%	-15%	-33%	3%	-2%	0%	-4%
P10	0%	-19%	-43%	0%	-15%	0%	-32%	-75%	1%	-9%	-1%	-13%
P5	0%	-26%	-60%	0%	-32%	0%	-49%	-123%	0%	-17%	-2%	-42%
P1	0%	-59%	-164%	-82%	-242%	0%	-95%	-289%	0%	-39%	-8%	-52%
P0	0%	-110%	-381%	-211%	-771%	0%	-1411%	-31487%	-1%	-48%	-8%	-52%

Only the insurance pathswhere the effects of the Anireform arenot zero for each scenario are presented.

Table 10: Impact of the Anireform on individual variations in welfare expressed in certainty equivalents

	All					
	Without Substitution nor increase in individual premiums	Substitution	10% Increase in premiums	20% Increase in premiums	**Substitution + 10% increase in premiums**	**Substitution + 20% increase in premiums**
Average	**45 €**	3 €	-39 €	5 €	**-37 €**	**-79 €**
Distribution						
P100	**2 412 €**	2 412 €	2 412 €	2 412 €	**2 412 €**	**2 412 €**
P99	**597 €**	597 €	597 €	448 €	**448 €**	**448 €**
P95	**382 €**	382 €	382 €	75 €	**75 €**	**75 €**
P90	**159 €**	159 €	159 €	0 €	**0 €**	**0 €**
P75	**0 €**	0 €	0 €	0 €	**0 €**	**0 €**
P50	**0 €**	0 €	0 €	0 €	**0 €**	**0 €**
P25	**0 €**	-97 €	-194 €	0 €	**-107 €**	**-197 €**
P10	**0 €**	-122 €	-243 €	0 €	**-131 €**	**-245 €**
P5	**0 €**	-134 €	-266 €	-67 €	**-147 €**	**-282 €**
P1	**-19 €**	-148 €	-306 €	-325 €	**-325 €**	**-329 €**
P0	**-438 €**	-438 €	-438 €	-798 €	**-798 €**	**-798 €**

	Path 4			**Path 5**		**Path 6**			**Path 7**		**Path 8**	
	B Ind / B Ind			**B Ind / C Coll**		**C Ind/C Ind**			**C Ind/C Coll**		**NC/C Coll**	
	Increase in premiums			**Substitution**		**Increase in premiums**			**Substitution**		**Substitution**	
	+0%	**+ 10%**	**+ 20%**	**No**	**Yes**	**+0%**	**+ 10%**	**+ 20%**	**No**	**Yes**	**No**	**Yes**
Moyenne	0 €	-94 €	-189 €	282 €	-36 €	0 €	-86 €	-173 €	361 €	82 €	211 €	-36 €
Distribution												
P100	0 €	0 €	0 €	829 €	2 412 €	0 €	0 €	0 €	1 063 €	1 063 €	2 412 €	2 412 €
P99	0 €	0 €	0 €	812 €	1 821 €	0 €	0 €	0 €	861 €	848 €	2 070 €	1 821 €
P95	0 €	0 €	0 €	561 €	1 172 €	0 €	0 €	0 €	684 €	557 €	1 539 €	1 172 €
P90	0 €	0 €	0 €	512 €	1 015 €	0 €	0 €	0 €	557 €	444 €	1 015 €	1 015 €
P75	0 €	-60 €	-132 €	410 €	159 €	0 €	-61 €	-132 €	522 €	217 €	193 €	159 €
P50	0 €	-120 €	-240 €	251 €	-340 €	0 €	-97 €	-194 €	379 €	72 €	-33 €	-340 €
P25	0 €	-121 €	-243 €	149 €	-409 €	0 €	-120 €	-240 €	246 €	-62 €	-103 €	-409 €
P10	0 €	-145 €	-301 €	122 €	-456 €	0 €	-127 €	-254 €	138 €	-168 €	-150 €	-456 €
P5	0 €	-146 €	-305 €	60 €	-460 €	0 €	-132 €	-265 €	138 €	-168 €	-154 €	-460 €
P1	0 €	-155 €	-324 €	-375 €	-461 €	0 €	-141 €	-282 €	-6 €	-312 €	-155 €	-461 €
P0	0 €	-160 €	-334 €	-438 €	-461 €	0 €	-168 €	-340 €	-6 €	-312 €	-155 €	-461 €

6.4 Characteristics of winners, neutrals and losers of the reform

Beyond analysing the effects of the Anireform on the welfare of individuals by insurance trajectories, we examine how the reform benefits or not the most vulnerable individuals. Table 11 shows the breakdown of winners, neutralsand losers by demographic and socioeconomic characteristics, and the

level of risk aversion. Table 12 shows the variations of utility and certain equivalents according to these characteristics.

Under the assumptionthat the individual policy premiums remain unchanged

If employers do not substitute their CHI subsidy to the employees' wages, the results in Table 11 show that the reform will mostly impact individuals who belong to the middle income groups: 14% winners and 1.3% losers (compared to 12.4% and 0.9%, respectively,for the most vulnerable and 8.2% and 0.7% for the wealthiest). The reform represents a relative utility gain of 3% for the most vulnerable (vs. 1% for the richest; Table 12) corresponding to a monetary value of €55(vs.€29 for the richest). Individuals reporting good or very good perceived health are usually winners: 14.1% vs. 5.6% among those reporting poor perceived health (which are 93% neutrals). Their relative change in welfare (+2%) corresponds to a monetary value of €45 vs.€33 for those in poor and very poor perceived health. Concerning the least risk-averse individuals, the welfare decreases for 3.8% of them (vs. 0.6% among the most risk-averse) whereas it increases for 11.8% (vs. 12.4%). Their change in welfarecorresponds to an average monetary gain of €35 (vs. €43 among the most risk-averse).

If employers reduce the employees' wages to their CHI subsidy amount, the proportion of losers in the general population increases (7.6% vs. 1% in case of no substitution) and the gains in welfare decrease (€5 vs.€45 on average). This is especially true for the middle income brackets (9% losers, average gain of €3), the least risk-averse (11% losers, -€12), but also forindividuals in good or very good perceived health (9% of losers, +€1).

Under the assumptionthat the individual policy premiums increase

Considering an increase in premiums for individual policies induces a change in the structure of neutrals and losers (Table 11). Regardless of the assumption of substitution, the most vulnerable often become more often losers (and less often neutrals) than the wealthiest: 59% of individuals with an income per CUunder €1,100 are losers vs.37% of those with an income per CU over€2,000. This is the same for those withpoor or very poor health status (almost 70% are losers vs. nearly 40% of those with good and very good health status) and for those over60 years old (87.5% losers among 61-70 years old and over 90% of those over 70 years old). The losers rate was also particularly high among the most risk-averse (58% vs. almost 40% among the least risk-averse), since they arecertainly more often covered by an individual policy.

Table 11 Proportion of losers/winners/neutrals according todemographic and socioeconomic characteristics

		Assumptions considered											
		Without substitution nor increase in premiums			Without Substitution With increase in premiums			With Substitution Without increase in premiums			With Substitution With increase in premiums		
	Num.	Winners % pond.	Neutrals % pond.	Losers % pond.	Winners % pond.	Neutrals % pond.	Losers % pond.	Winners % pond.	Neutrals % pond.	Losers % pond.	Winners % pond.	Neutrals % pond.	Losers % pond.
Income per CU													
<= 1100€	1421	12,4	86,7	0,9	12,4	28,6	59,0	8.3	85.2	6.5	8.3	32.7	59.0
1101€/1500€	1375	14,9	84,0	1,2	14,9	38,3	46,9	7.0	83.1	9.9	7.0	42.3	50.7
1501€/2000€	1248	14,0	84,7	1,3	14,0	43,2	42,9	7.0	84.1	9.0	7.0	47.6	45.4
>2000€	1326	8,2	91,1	0,7	8,2	55,3	36,5	4.4	90.5	5.0	4.4	58.9	36.6
Age													
under 18 years old	207	0	99,4	0,6	0	66,0	34,0	0.0	99.2	0.8	0.0	69.4	30.6
18/30 years old	663	25,5	71,1	3,4	25,5	56,1	18,4	5.0	72.5	22.6	5.0	57.1	37.9
31/40 years old	813	21,3	77,5	1,2	21,3	63,8	14,9	1.9	78.4	19.7	1.9	65.6	32.4
41/50 years old	1021	18,7	80,0	1,3	18,7	64,2	17,1	16.2	81.1	2.7	16.2	65.8	18.1
51/60 years old	978	16,6	82,3	1,1	16,6	55,0	28,4	16.0	82.7	1.3	16.0	56.3	27.8
61/70 years old	856	1,7	98,3	0	1,7	10,8	87,5	1.6	98.1	0.3	1.6	10.7	87.6
71/80 years old	543	0	100	0	0	3,7	96,3	0.0	100.0	0.0	0.0	3.8	96.2
over 80 years old	289	0	100	0	0	6,6	93,4	0.0	100.0	0.0	0.0	7.1	92.9
Perceived health status													
Very good/Good	3601	14,1	84,9	1,0	14,1	48,5	37,4	6.7	84.3	9.0	6.7	52.5	40.8
Fair	1357	10,8	88,3	0,9	10,8	28,8	60,4	6.9	87.6	5.6	6.9	32.5	60.6
Poor/Very poor	412	5,6	93,2	1,2	5,6	23,0	71,4	5.0	92.9	2.1	5.0	25.2	69.8
Risk preference													
The most averse	1655	10,9	88,6	0,6	10,9	31,3	57,8	5.8	87.4	6.7	5.8	36.3	57.9
Fairly averse	3329	13,3	85,8	0,9	13,3	45,0	41,7	7.2	85.3	7.6	7.2	49.1	43.7
The least averse	386	11,8	84,4	3,8	11,8	50,2	37,9	5.4	82.9	11.7	5.4	53.3	41.3
Household composition													
Singles	925	11,7	87,0	1,4	11,7	27,7	60,6	7.1	85.4	7.5	7.1	29.9	62.9
Single parent families	311	22,5	75,9	1,6	22,5	47,2	30,3	11.2	76.6	12.2	11.2	47.4	41.3
Couples without children	1734	7,4	92,3	0,3	7,4	27,1	65,5	5.3	91.1	3.7	5.3	29.9	64.8
Couples with children	2316	15,7	83,3	1,0	15,7	65,8	18,5	6.6	83.2	10.2	6.6	65.8	27.6
Others	84	10,9	84,4	4,7	10,9	31,8	57,3	10.4	83.1	6.5	10.4	34.2	55.4
Employment status													
Employed	2786	22,2	75,8	2,0	22,2	65,8	12,0	9.4	76.9	13.8	9.4	66.5	24.1
Retired	1531	0	100	0	0	5,5	94,5	0.0	100.0	0.0	0.0	5.8	94.2
Unemployed	275	28,3	71,7	0	28,3	31,3	40,4	27.2	72.8	0.0	27.2	33.9	38.9
Students	349	0	100	0	0	64,2	35,8	0.0	100.0	0.0	0.0	67.3	32.7
House wife/husband	270	0	100	0	0	31,4	68,6	0.0	100.0	0.0	0.0	36.0	64.0
Others	154	0	100	0	0	18,3	81,7	0.0	100.0	0.0	0.0	18.1	81.9
Unknown	5	/	/	/	/	/	/	0.0	100.0	0.0	0.0	22.6	77.4
All	**5370**	**12,4**	**86,6**	**1,0**	**12,4**	**40,9**	**46,7**	**6.6**	**85.7**	**7.6**	**6.6**	**45.6**	**47.8**

Note:Ifno substitution or increase in individual premiumsisconsidered, there are 12.4% winners, 86.7% neutrals and 0.9% losers among those whose income per CU is less than €1,100.

Table 12: Relative variation of the expected utility and amounts of certain equivalents accordingdemographic and socioeconomic characteristics

		Assumptions considered											
		Without Substitution nor increase in premiums		Without substitution 10% increase		Without Substitution 20% increase		With Substitution Without increase in premiums		With substitution 10% increase		With substitution 20% increase	
	Num.	UE Variation	Certainty Equivalent	UE Variation	Certainty Equivalent	UE Variation	Certainty Equivalent	UE Variation	Certainty Equivalent	UE Variation	Certainty Equivalent	UE Variation	Certainty Equivalent
Income per CU													
<= 1100€	1421	3%	55 €	-10%	2 €	-46%	-52 €	0%	16 €	-10%	-37 €	-49%	-90 €
1101€/1500€	1375	2%	50 €	-1%	9 €	-6%	-32 €	0%	3 €	-1%	-38 €	-9%	-80 €
1501€/2000€	1248	1%	44 €	-1%	5 €	-3%	-34 €	0%	-2 €	-1%	-41 €	-5%	-81 €
>2000€	1326	1%	29 €	0%	-5 €	-1%	-39 €	0%	2 €	0%	-32 €	-2%	-66 €
Age													
under 18 years old	207	0%	0 €	0%	-7 €	-1%	-18 €	0%	-3 €	0%	-10 €	-1%	-21 €
18/30 years old	663	2%	44 €	1%	37 €	1%	30 €	-1%	-26 €	1%	-33 €	-2%	-40 €
31/40 years old	813	2%	53 €	2%	45 €	1%	37 €	-2%	-9 €	2%	-17 €	-3%	-24 €
41/50 years old	1021	3%	72 €	3%	61 €	1%	50 €	0%	17 €	3%	6 €	-2%	-5 €
51/60 years old	978	4%	89 €	-1%	64 €	-28%	39 €	2%	39 €	-1%	14 €	-30%	-11 €
61/70 years old	856	0%	12 €	-8%	-85 €	-20%	-182 €	0%	6 €	-8%	-91 €	-20%	-188 €
71/80 years old	543	0%	0 €	-15%	-117 €	-40%	-235 €	0%	0 €	-15%	-117 €	-40%	-235 €
over 80 years old	289	0%	0 €	-19%	-125 €	-49%	-254 €	0%	0 €	-19%	-125 €	-49%	-254 €
Perceived health status													
Very good/Good	3601	2%	45 €	-1%	15 €	-7%	-16 €	-1%	1 €	-1%	-29 €	-10%	-60 €
Fair	1357	2%	46 €	-5%	-15 €	-20%	-78 €	0%	12 €	-5%	-50 €	-21%	-112 €
Poor/Very poor	412	2%	33 €	-13%	-45 €	-51%	-123 €	1%	13 €	-13%	-65 €	-52%	-143 €
Risk preference													
The most averse	1655	4%	43 €	-9%	-14 €	-42%	-73 €	-1%	6 €	-9%	-52 €	-46%	-111 €
Fairly averse	3329	1%	46 €	0%	11 €	-2%	-25 €	0%	6 €	0%	-29 €	-3%	-65 €
The least averse	386	0%	35 €	0%	8 €	0%	-20 €	0%	-12 €	0%	-39 €	0%	-66 €
Household composition													
Singles	925	2%	46 €	-7%	-18 €	-21%	-82 €	0%	7 €	-7%	-57 €	-23%	-122 €
Single parent families	311	4%	75 €	1%	52 €	-4%	27 €	0%	10 €	1%	-13 €	-8%	-37 €
Couples without children	1734	1%	33 €	-6%	-36 €	-18%	-105 €	0%	7 €	-6%	-61 €	-19%	-131 €
Couples with children	2316	2%	48 €	1%	36 €	-8%	25 €	-1%	0 €	1%	-11 €	-11%	-23 €
Others	84	3%	60 €	-4%	10 €	-16%	-41 €	1%	13 €	-4%	-37 €	-18%	-88 €
Employment status													
Employed	2786	3%	65 €	2%	58 €	2%	50 €	-1%	-7 €	2%	-15 €	-2%	-22 €
Retired	1531	0%	0 €	-12%	-111 €	-30%	-223 €	0%	0 €	-12%	-111 €	-30%	-223 €
Unemployed	275	6%	155 €	4%	127 €	-1%	100 €	6%	155 €	4%	127 €	-1%	100 €
Students	349	0%	0 €	-1%	-9 €	-1%	-22 €	0%	0 €	-1%	-9 €	-1%	-22 €
House wife/husband	270	0%	0 €	-13%	-67 €	-78%	-135 €	0%	0 €	-13%	-67 €	-78%	-135 €
Others	154	0%	0 €	-22%	-78 €	-126%	-158 €	0%	0 €	-22%	-78 €	-126%	-158 €
Unknown	5	/	/	/	/	/	/	0%	0 €	-2%	-51 €	-4%	-102 €
All	**5370**	**0,3%**	**45 €**	**-2,9%**	**3 €**	**-13,6%**	**-39 €**	**-0,2%**	**5 €**	**-5,0%**	**-37 €**	**-15,7%**	**-79 €**

Note:If no substitution or increase in individual premiums is considered, expected utility increased by 3% on average among individuals whose income per CU is less than €1,100. This corresponds to a currency gain of €55.

7. Discussion

In this work, we simulate the likely effects of the Anireform on the welfare of the study population taking into account several insurancepaths defined according to which CHI coverage change is induced by the reform (in terms of level and type of coverage). We assume several possibilities concerning the amount of the premium paid ultimately by individuals who switch from an individual policy to a collective one as well as for those who remain covered by an individual policy. We first consider that employers do not reduce the employees' wages by the amount for their CHI subsidy. We then assume that wages decrease in such that employees fully financed the premium of the collective CHI policy. Concerning individuals who remain cover by an individual CHI policy, we assume three changes in the premiums policies: they remain the same; they increase by 10% then 20%.

Assuming no increase in individual premiums or decrease in wages, we show that the Anireform induces a rise in the collectivewelfare corresponding to a currency gain of €45 per individual. Welfare

increases for about one in 10 individuals, mainly private sector employees who were covered by an individual policy before the Ani. Even if they have to switch for a lower policy quality, the possible increased co-payment is offset by the decreasedcost of theirpremium. The situation isless clear for those who were not insured before the reform: welfare increases for half of them who made a deliberate choice not to take out CHI, and decreases for the other half for whomnon-coverage was probably strongly financially constrained (Célant*et al.*, 2014). These results come from the most optimistic scenarios concerning the premiums paid by employees and individuals who remain covered by an individual policy. Assuming that employers reduce the employees' wages, the Anireform causes an increase in social welfare corresponding to a gain of €5 on average with only 7% of winners. Considering also potential negative effects on the individual policy premiums, the reformhas a largely negative impact on the social welfare, estimated at between -€39 and -€79 per individual depending on the extent of the increase in question (10% or 20%). In this case, the gain in welfare of employees who benefit from the reform does not compensate for the loss of welfare of individuals who remain covered by individual policies, while the latter are most made of vulnerable individuals.

The effects of the Anireform on the welfare of the population therefore depend on the evolution of individual policy premiums and the strategy that employers establish to finance their CHI premium subsidy. The fact that they deducted their participation from their employees' salariesis probableas the companiesthat did not offer employer sponsored CHIbefore the reform weremainly small businesses (Perronnin*et al.*, 2012) with little room for manoeuvre. Although a direct reduction in wages seems unlikely on short term, employers may decide to recuperate their expenditure on other benefits such as bonuses, meal tickets, etc. Consideration of an increase in individual policy premiums is also very credible due to the deterioration of the risk health of the insured pool covered by an individual policy causedby the departure of a lot of employed people, who are generally "good health risks", from the individual health insurance market to the collective one. Moreover, the intensity of price competition on the collective CHImarket may lead insurersto propose cheappolicies that damage their technical balance. They may therefore introduce higher loading ratios on individual policies where policyholders have no bargaining power and are faced to an opacity supply. These premium increases were not anticipated at the time of signing the Ani reform. Generalisation of the employer sponsored CHI was presented as a social advancement for employees who could therefore benefit from employer subsidy to the premium. This reform was therefore negotiated by trade unions as a counterpart of greater flexibility in the labour market. Providing additional control measures via public devices to favour CHI for the most vulnerable, especially the poorest and the oldestwill be necessary to induce more competition on the individual market and ultimately avoid adverse perverse effects of the collective insurance market to the individual one.

This work was carried out based on several assumptionsthat needto be discussed. Firstly, we used a CRRA-typeexpected utility function for which we imputed the values of the relative risk aversion assuming that, according to the work of Barsky*et al.*, (1997); the maximum value of this parameter was 30. As the effects of the Anireform on welfare may greatly depend on this threshold, we presentin Appendix A.5, A.6 and A.7 the effects of the reform on welfareby testing three other imputation methods. The first one considers a maximum value of 8, which corresponds, according to Gollier (2001),to twice the credible and rational threshold. The second one uses the 4 values observed by Barsky*et al.* (1997) without and making any assumptionon the maximum value. The third one assumed, as in the articles of Barcellos and Jacobson (2014) and Englehardt and Gruber (2010), a unique value of 3 for all of the relative risk aversion. The results confirm the stability of our analyses with a lower magnitude of gains and losses on welfare.

Consequently, we have assumed that the employers who had not established collective health insurance before the reform offer the minimum CHI level of coverage imposed by law. It is quite possible that some employers offeredpolicies with higher reimbursement, in particular if negotiations conducted at the level of branches have succeeded. Moreover, some employees may have decided to subscribe, at their own expense, to an individual CHI policy that completes their collective CHI. We also considered that employees' dependents (children and spouse) would not becovered by the employer-sponsored CHI implemented in the context of the Ani whereas if they financed their premium fully, they may be covered by the employer-sponsored CHI.

This evaluation is based on a static framework where individual characteristics, such as health status and health expenditures,remain unchanged after the reform. Although these assumptionsare particularly credible on short term, it would be interesting to consider potential changes in health status, use of healthcare orlabour market in order to assess the impact of the Anireform on longer term. The objective function of the regulator may also be questioned. As part of a "welfarist" framework, we have selected a utilitarian welfare function that gives equal weight to all individuals. It would be interesting to analyse this reform assuming that the regulator has a utility function giving more weight to lower utilities or by applying a "Rawlsian" concept to the individual whose expected utility is the lowest. The effect of the Ani on social welfare would be probably lower than presented in a utilitarian framework.

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9. Appendices

Table A.1: Reimbursement by healthcare discipline ofsupplemental healthinsurance Policies A, B and C

	Policy A	Policy B	Policy C
Specialists	100% actual cost	100% basic reimbursement	30% basic reimbursement
GPs	100% actual cost	50% basic reimbursement	30% basic reimbursement
Medical and paramedical procedure	30% basic reimbursement	30% basic reimbursement	30% basic reimbursement
Biology	30% basic reimbursement	30% basic reimbursement	30% basic reimbursement
Dentures	400% basic reimbursement	300% basic reimbursement	100% basic reimbursement
Eyeglasses and lenses			
Frames	150 €	150 €	50 €
Simple lenses	160€/lense	75€/lense	45€/lense
Complex lenses	275€/lense	125€/lense	75€/lense
Contact lenses	Actual cost	150 €	100 €
Hospitalisation			
Daily rate	100% actual cost	100% actual cost	100% actual cost
Cost of stay	100% basic reimbursement	100% basic reimbursement	100% basic reimbursement
Excess fees	100% actual cost	100% basic reimbursement	30% basic reimbursement

Note: Reimbursements calculated based on the results of the modal policies survey on certain healthcare sectors: specialists, dentures, hospitalisation fees and eyeglasses.

Table A.2: Distribution of individuals in the various insurance trajectories according to their individual characteristics

	Path 1 A Coll/A Coll	Path 2 B Coll/B Coll	Path 3 C Coll/C Coll	Path 4 B Ind/B Ind	Path 5 B Ind/C Coll	Path 6 C Ind/C Ind	Path 7 C Ind/C Coll	Path 8 NC/C Coll	Path 9 NC/NC	All Num.
CHI (Before the ANI reform)										
Without CHI	0%	0%	0%	0%	0%	0%	0%	32%	68%	242
Collective policy	53%	37%	10%	0%	0%	0%	0%	0%	0%	1933
Individual policy	0%	0%	0%	35%	10%	44%	12%	0%	0%	3195
Income per CU										
<= 1100€	11%	7%	4%	9%	2%	47%	11%	2%	8%	1421
1101€/1500€	15%	14%	4%	13%	5%	34%	11%	2%	3%	1375
1501€/2000€	19%	17%	4%	29%	11%	14%	4%	2%	2%	1248
>2000€	31%	16%	3%	30%	7%	10%	2%	1%	1%	1326
Age										
15/29 years old	21%	23%	28%	8%	25%	10%	20%	36%	17%	789
30/44 years old	41%	40%	40%	13%	39%	12%	43%	45%	14%	1291
45/59 years old	34%	34%	30%	19%	30%	15%	35%	15%	25%	1509
60/74 years old	3%	3%	3%	40%	6%	37%	2%	4%	27%	1174
75 years old and over	0%	0%	0%	20%	0%	26%	0%	0%	18%	607
Perceived health status										
Very good/Good	24%	15%	4%	19%	7%	20%	7%	2%	2%	3601
Fair	12%	10%	3%	24%	5%	35%	7%	1%	3%	1357
Poor/Very poor	4%	6%	2%	22%	1%	49%	5%	2%	11%	412
Risk preferences										
The most risk averse	16%	9%	2%	23%	5%	33%	7%	1%	4%	1655
Fairly risk averse	21%	15%	4%	20%	7%	23%	7%	1%	3%	3329
The least risk averse	21%	17%	3%	16%	7%	19%	6%	4%	6%	386
Type of household										
One individual	11%	8%	2%	24%	5%	37%	7%	2%	5%	925
Single parent family	15%	9%	5%	15%	6%	27%	14%	3%	6%	311
Couple without children	11%	9%	2%	31%	5%	34%	3%	1%	3%	1734
Couple with children	31%	20%	5%	11%	7%	14%	8%	2%	2%	2316
Other	8%	4%	12%	27%	2%	29%	12%	2%	4%	84
Employment status										
Employed	29%	21%	5%	11%	10%	10%	11%	2%	1%	2786
Retired	1%	0%	0%	41%	0%	53%	0%	0%	5%	1531
Unemployment	12%	7%	2%	13%	7%	29%	14%	6%	11%	275
Students	33%	21%	3%	15%	0%	25%	0%	0%	3%	349
House wife/husband	14%	7%	5%	26%	0%	40%	0%	0%	9%	270
Other inactive	5%	1%	0%	27%	0%	56%	0%	0%	11%	154
Unknown	/	/	/	/	/	/	/	/	/	5
All - Number by path	**1045**	**708**	**180**	**1123**	**286**	**1448**	**338**	**66**	**176**	**5370**
% in the sample	**19%**	**13%**	**3%**	**21%**	**6%**	**26%**	**7%**	**2%**	**3%**	**100%**

Interpretation: Among individuals whose income per CU is less than €1,000 per month, 11% belonged to trajectory 1 (A Coll./A Coll.). A total of 31% belonged to this trajectory including those whose income per CU exceeded €2,000.

Table A3: Average premiums observed per insured individual in the modal policies survey

	Individual policies				Collective policies
	20 years	**40 years**	**60 years**	**75 years**	
Policy A	/	/	/	/	€90
Policy B	€38	€59	€86.50	€111.50	€55
Policy C	€33	€50.50	€75	€94	€50.50
All	€33	€51	€76	€95	€70

Source: Survey of the most subscribed policies in 2013, Drees

Table A.4: Distribution of co-payment per sampled individuals

	P_0	P_10	P_20	P_30	P_40	P_50	P_60	P_70	P_80	P_90	P_100
OOP payments after reimbursement of the public health insurance (Observed)											
15/29 years old	0	17	36	64	100	148	232	353	461	763	3614
30/44 years old	0	19	46	82	137	215	336	462	646	1009	9296
45/59 years old	0	22	87	152	246	348	510	695	940	1378	8827
60/74 years old	0	72	171	262	372	505	694	887	1151	1773	6892
75 years old and over	0	132	246	379	499	653	746	988	1392	2194	5998
All	0	28	73	136	224	334	462	645	890	1351	9296
OOP payments after reimbursment of CHI (Simulated) - Policy A											
15/29 years old	0	1	9	16	24	33	46	65	94	164	805
30/44 years old	0	2	12	22	34	55	76	104	157	250	3664
45/59 years old	0	3	18	40	64	92	126	172	238	408	4372
60/74 years old	0	26	67	105	153	198	251	328	445	656	3684
75 years old and over	0	74	120	170	230	290	355	446	564	826	4022
All	0	5	19	37	61	91	133	190	281	472	4372
OOP payments after reimbursement of CHI (Simulated) - Policy B											
15/29 years old	0	2	11	20	29	41	55	78	115	207	1905
30/44 years old	0	4	14	25	43	66	92	136	200	342	3664
45/59 years old	0	5	27	55	88	125	178	247	361	579	4372
60/74 years old	0	33	81	126	182	238	309	407	560	836	3798
75 years old and over	0	80	133	192	269	321	396	497	671	954	4770
All	0	7	24	46	76	114	172	249	360	600	4770
OOP payments after reimbursement of CHI (Simulated) - Policy C											
15/29 years old	0	2	14	23	38	59	96	144	215	395	3214
30/44 years old	0	4	15	30	57	87	149	219	337	563	5120
45/59 years old	0	7	37	74	119	183	266	401	586	866	8184
60/74 years old	0	42	97	159	231	319	422	557	761	1194	5154
75 years old and over	0	87	155	220	314	393	499	636	878	1283	5304
All	0	9	30	62	107	172	247	366	537	863	8184

Note: Distribution of OOP payments after reimbursement of CHIPoliciesA, B and C corresponds to the distribution of OOP paymentsobserved if all individuals in the sample were covered byPolicy A, B or C.

Table A.5: Analysis of the robustness of the relative risk aversion values attribution method - Results 1

	Imputation Gammas - 2				Imputation Gammas - 3				Imputation
	EU		Certainty equivalents		EU		Certainty Equivalents		EU	
	Absolute Variation	Relative Variation	All	On Average	Absolute Variation	Relative Variation	All	On Average	Variation absolue	Variation relative
All										
Without substitution nor increase in individual premiums	17,88	0,07%	234 079 €	44 €	15,51	0,06%	242 475 €	45 €	<0,01	*<0,01%*
Without substitution - With 10% individual premiums increase	4	0,02%	16 371 €	3 €	3,92	0,02%	19 752 €	4 €	<0,01	<0,01%
Without substitution - With 20% individual premiums increase	-10,4	-0,04%	-204 698 €	-38 €	-8,07	-0,03%	-206 409 €	-38 €	>-0,01	>-0,01%
With substitution - Without individual premiums increase	-7,55	-0,03%	22 911 €	4 €	-5,1	-0,02%	27 983 €	5 €	>-0,01	>-0,01%
With substitution and 10% individual premiums increase	-21,43	-0,08%	-194 798 €	-36 €	-16,69	-0,07%	-194 740 €	-36 €	>-0,01	*>-0,01%*
With substitution and 20% individual premiums increase	-35,83	-0,14%	-415 867 €	-77 €	-28,68	-0,11%	-420 900 €	-78 €	>-0,01	-0,01%
Path 4: B Ind. => B Ind. (Num=1123)										
Without increase in individual premiums	0	0%	0 €	0 €	0	0%	0 €	0 €	0	0%
10% increase	-8,92	-0,15%	-101 993 €	-93 €	-5,21	-0,12%	-102 733 €	-39 €	>-0,01	-1,85%
20% increase	-18,05	-0,31%	-206 328 €	-188 €	-10,63	-0,25%	-207 856 €	-189 €	>-0,01	-3,80%
Path 5: B Ind. => C Coll. (Num=286)										
Without substitution	12,49	0,54%	103 991 €	324 €	8,75	0,47%	92 464 €	288 €	<0,01	4,09%
With substitution	0,78	0,03%	11 959 €	37 €	0,73	0,04%	-138 €	0 €	<0,01	0,20%
Path 6 : C Ind. => C Ind. (Num=1448)										
Without increase in individual premiums	0	0%	0 €	0 €	0	0%	0 €	0 €	0	0%
10% increase	-4,95	-0,14%	-115 715 €	-83 €	-6,38	-0,14%	-119 990 €	-86 €	>-0,01	-2,30%
20% increase	-10,23	-0,30%	-232 449 €	-167 €	-12,95	-0,29%	-241 027 €	-173 €	>-0,01	-4,81%
Path 7 : C Ind. => C Coll. (Num=338)										
Without substitution	8,63	0,88%	129 253 €	355 €	7,98	0,64%	132 151 €	363 €	<0,01	9,12%
With substitution	3,15	0,32%	29 637 €	81 €	0,72	0,06%	30 101 €	83 €	<0,01	4,01%
Path 8 : Sans Couverture => C Coll. (Num=66)										
Without substitution	-3,25	-0,26%	835 €	10 €	-1,21	-0,12%	17 859 €	223 €	<0,01	4,07%
With substitution	-11,48	-0,90%	-18 685 €	-233 €	-6,54	-0,63%	-1 980 €	-25 €	<0,01	0,41%

Gammas 2 imputation: Imputation of the relative risk aversion values assuming a maximum value of 8.

Gammas 3 imputation: Imputationof the relative risk aversion values using average values observed by Barsky et al. (1997).

Gammas 4 imputation: Imputationof the relative risk aversion values assuming an identical value of 3 for all.

Table A.6: Analysis of the robustness of the relative risk aversion values attribution method - Results 2

	All			
	Without Substitution Without increase in individual premiums	Increase in individual premiums	Substitution	Substitution and increase in individual premiums
Imputation Gammas - 2				
Winners	13%	13%	7%	7%
Neutrals	86%	46%	86%	46%
Losers	1%	41%	7%	48%
Imputation Gammas - 3				
Winners	13%	13%	7%	7%
Neutrals	86%	46%	86%	46%
Losers	1%	41%	8%	48%
Imputation Gammas - 4				
Winners	13%	13%	7%	7%
Neutrals	86%	46%	86%	46%
Losers	1%	41%	7%	48%

	Path 4 B Ind/B Ind	**Path 5 B Ind/C Coll**	**Path 6 C Ind/C Ind**	**Path 7 C Ind/C Coll**	**Path 8 NC/C Coll**
Imputation Gammas - 2					
Without substitution nor increase in individual premiums					
Winners	0%	98%	0%	99%	35%
Neutrals	100%	0%	100%	0%	0%
Losers	0%	2%	0%	1%	65%
With substitution for paths 5,7 and 8 and with increase of individual premiums for paths 4 and 6					
Winners	0%	47%	0%	55%	25%
Neutrals	16%	0%	11%	0%	0%
Losers	84%	53%	89%	45%	75%
Imputation Gammas - 3					
Without substitution nor increase in individual premiums					
Winners	0%	98%	0%	99%	44%
Neutrals	100%	0%	100%	0%	0%
Losers	0%	2%	0%	1%	56%
With substitution for paths 5,7 and 8 and with increase of individual premiums for paths 4 and 6					
Winners	0%	42%	0%	55%	35%
Neutrals	16%	0%	11%	0%	0%
Losers	84%	58%	89%	45%	65%
Imputation Gammas - 4					
Without substitution nor increase in individual premiums					
Winners	0%	98%	0%	99%	25%
Neutrals	100%	0%	100%	0%	0%
Losers	0%	2%	0%	1%	75%
With substitution for paths 5,7 and 8 and with increase of individual premiums for paths 4 and 6					
Winners	0%	48%	0%	55%	21%
Neutrals	16%	0%	11%	0%	0%
Losers	84%	52%	89%	45%	79%

Gammas 2 imputation: Assuming a maximum value of 8.
Gammas 3 imputation: Using average values observed by Barsky et al. (1997).
Gammas 4 imputation: Assuming an identical value of 3 for all.

Table A.7: Analysis of the robustness of the relative risk aversion values attribution method - Results 3

	All (Num: 5370)					
	Without Substitution nor increase in individual premiums	Substitution	10% increase	20% increase	**Substitution + 10% increase**	**Substitution + 20% increase**
Gamma2						
Average	**0,9%**	-0,3%	-1,6%	0,2%	**-1,1%**	**-2,4%**
P100	**99%**	99%	99%	99%	**99%**	**99%**
P95	**7%**	7%	7%	1%	**1%**	**1%**
P75	**0%**	0%	0%	0%	**0%**	**0%**
P50	**0%**	0%	0%	0%	**0%**	**0%**
P25	**0%**	-1%	-3%	0%	**-2%**	**-3%**
P5	**0%**	-6%	-12%	-1%	**-6%**	**-12%**
P0	**-5%**	-97%	-322%	-22%	**-97%**	**-322%**
Gamma3						
Average	**2,1%**	-1,8%	-8,5%	0,2%	**-3,7%**	**-10,4%**
P100	**100%**	100%	100%	100%	**100%**	**100%**
P95	**14%**	14%	14%	1%	**1%**	**1%**
P75	**0%**	0%	0%	0%	**0%**	**0%**
P50	**0%**	0%	0%	0%	**0%**	**0%**
P25	**0%**	-2%	-4%	0%	**-5%**	**-8%**
P5	**0%**	-20%	-43%	-1%	**-21%**	**-44%**
P0	**-92%**	-671%	-8157%	-364%	**-671%**	**-8157%**
Gamma4						
Average	**0,6%**	0,0%	-0,6%	0,1%	**-0,5%**	**-1,1%**
P100	**48%**	48%	48%	48%	**48%**	**48%**
P95	**4%**	4%	4%	1%	**1%**	**1%**
P75	**0%**	0%	0%	0%	**0%**	**0%**
P50	**0%**	0%	0%	0%	**0%**	**0%**
P25	**0%**	-1%	-2%	0%	**-1%**	**-2%**
P5	**0%**	-2%	-5%	-1%	**-3%**	**-5%**
P0	**-3%**	-12%	-28%	-10%	**-12%**	**-28%**

Gammas 2 imputation: Assuming a maximum value of 8.
Gammas 3 imputation: Using average values observed by Barsky et al. (1997).
Gammas 4 imputation: Assuming an identical value of 3 for all.

Table A.8: Analysis of the robustness of the relative risk aversion values attribution method - Results 4

	All (Num: 5370)					
	Without Substitution nor increase in individual premiums	Substitution	10% increase	20% increase	**Substitution + 10% increase**	**Substitution + 20% increase**
Gamma2						
Average	44 €	3 €	-38 €	4 €	-36 €	-77 €
P100	1 869 €	1 869 €	1 869 €	1 869 €	1 869 €	1 869 €
P95	380 €	380 €	380 €	73 €	73 €	73 €
P75	0 €	0 €	0 €	0 €	0 €	0 €
P50	0 €	0 €	0 €	0 €	0 €	0 €
P25	0 €	-96 €	-193 €	0 €	-97 €	-193 €
P5	0 €	-124 €	-246 €	-60 €	-145 €	-279 €
P0	-155 €	-219 €	-440 €	-461 €	-461 €	-461 €
Gamma3						
Average	45 €	4 €	-38 €	5 €	-36 €	-78 €
P100	2 131 €	2 131 €	2 131 €	2 043 €	2 043 €	2 043 €
P95	381 €	381 €	381 €	74 €	74 €	74 €
P75	0 €	0 €	0 €	0 €	0 €	0 €
P50	0 €	0 €	0 €	0 €	0 €	0 €
P25	0 €	-97 €	-194 €	0 €	-107 €	-197 €
P5	0 €	-132 €	-264 €	-67 €	-146 €	-282 €
P0	-309 €	-309 €	-340 €	-703 €	-703 €	-703 €
Gamma4						
Average	43 €	3 €	-38 €	4 €	-36 €	-77 €
P100	1 229 €	1 229 €	1 229 €	1 229 €	1 229 €	1 229 €
P95	379 €	379 €	379 €	72 €	72 €	72 €
P75	0 €	0 €	0 €	0 €	0 €	0 €
P50	0 €	0 €	0 €	0 €	0 €	0 €
P25	0 €	-96 €	-193 €	0 €	-97 €	-193 €
P5	0 €	-121 €	-242 €	-60 €	-144 €	-262 €
P0	-151 €	-180 €	-391 €	-457 €	-457 €	-457 €

Gammas 2 imputation: Assuming a maximum value of 8.
Gammas 3 imputation: Using average values observed by Barsky et al. (1997).
Gammas 4 imputation: Assuming an identical value of 3 for all.