Employer-mandated complementary health insurance in France: the likely effect on social welfare

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Preliminary version

Abstract

In France, the Ani reform mandates all private sector employers to offer sponsored Complementary Health Insurance (CHI) to all of their employees beginning on January 1st, 2016. If this mandate may reduce the cost of CHI coverage for employees, it may also prevent them choosing their optimal level of coverage given their health care needs, their income and their risk preferences. Furthermore, as employees are on average in good health status, the mandate is going to deteriorate the health risk of the pool of insured covered by individual policies, which may increase premiums. Welfare of individuals not affected by the reform (as retired and long term unemployed) may thus decrease. Wages may also potentially decrease by the employer subsidy amount.

This research simulates the likely effects of this employer CHI mandate on the social welfare of the population making the most likely scenarios on the increase in individual policies premiums and the decrease in wages. It 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 socio-economic characteristics, CHI, health status, risk preferences and health care expenditures.

The first results using an utilitarian social welfare function and an expected utility theory framework show that, if wages do not decrease and if we consider the lowest increase in individual CHI premiums, the Ani reform may induce a very weak increase in social welfare. This positive effect of the reform is mainly driven by the employer subsidy rather by the reduction of financial risk exposure and exists despite the loss of welfare of those who previously chose to be uninsured. However, as soon as we assume a decrease in wages by the employer subsidy, the reform may greatly reduce social welfare. The loss of welfare that may suffer insured on the CHI individual market is therefore hardly offset by the gain in welfare that may benefit private sector employees, while the former are more often vulnerable. There may be a lot of losers while the part of winners is rather small. Those first results will be completed by an additional analysis using an Atkinson social welfare function in order to explore the consequences of various degrees of inequalities aversion in the evaluation of this reform.

Codes JEL: I13, D63.

Keywords: Social welfare, Risk aversion, Inequality aversion, Complementary health insurance

1. Introduction

The goal of health insurance is to protect individuals against the risk of unexpected and catastrophic health expenditures. For efficiency and equity arguments, this protection is mainly provided by public health insurance that covers higher than 70% of health expenditures in most of OECD countries, with a notable exception in the US where it only reaches 49% (OCDE, 2015). However, public insurance is always partial since it concerns either a limited basket of care (e.g. in Canada, where drugs are out of the public system or in Spain and in the UK where services provided by private physicians are uncovered), a limited population (as in the US where public coverage only covers old, vulnerable and poor populations) or since it lets copayments on a quite large basket of care through coinsurance rates and deductibles (as in Belgium, in France or in Switzerland). As a consequence, private health insurances exist in most countries. They can be either individually subscribed, or provided by an employer. Indeed, employer-sponsored health insurance is developed in many OECD countries (Sagan and Thomson, 2016).

Requiring employers to compulsory offer and sponsor health insurance policies for their employees is scarce but may be tempting for policymakers in a context of more and more pressures on public budget (Summers, 1989). However, such employer mandate questions its consequences in terms of efficiency and equity because of its potential effects on welfare. In terms of equity, this mandate excludes all the individuals who are not employed – i.e. the poorest and the sickest – and whose well-being may be improved by a sponsored health insurance (Pierre and Jusot, 2017, Dick, 1994, Summers, 1989). In terms of efficiency, this mandate prevent employees choosing their optimal level of coverage given their needs for care, their income, and their preferences, especially in the face of risk. Indeed, according to the expected utility theory, risk-averse individuals choose to take out insurance to reduce the financial risks associated with probability of occurrence of illnesses (Nyman, 1999; Newhouse, 1978; Arrow, 1963). Considering that premiums are not actuarial, risk-averse individuals may prefer being uninsured or poorly covered if the gain in welfare associated with a reduced financial risk is lower than the loss of welfare associated with the cost of the insurance premium, despite the employer subsidy. In the United States, Marquis and Long (1995) showed that without a high level of subsidy, employer-mandated health insurance may induce high welfare costs for employees previously uninsured. Engelhardt and Gruber (2010) showed that the Medicare expansion that covers drugs for the elderly induced a rather small welfare gain, due to a decrease in risk financial exposure for 20% of them only.

In France, public health insurance covers on average 77% of health expenditures but let uncapped out-of-pocket payments for most types of care. Therefore, access to healthcare depends greatly on having a Complementary Health Insurance (CHI) and on its coverage level. Consistently, 95% of the French

population is already covered by a CHI policy, provided or not by an employer. However, access to CHI remains an important issue for the French government (Touraine, 2014). Indeed, despite two devices aimed at low-income individuals ("Universal Complementary Health Insurance" called CMU-C and the "Assistance in Financing Complementary Health Insurance" called ACS), the poorest are more frequently uninsured or poorly covered. This is due to the cost of individual policies premium and to the fact that employer-sponsored CHI are mainly offered to the less deprived employees, i.e. workers of large companies, in long term contract and, with high level of qualification. In the context of the National Inter-professional Agreement (Ani) of January 2013, a new reform, presented as "iconic", was proposed. It mandates all private sector employers to offer partially financed compulsory CHI to all of their employees beginning on January 1st, 2016. This reform also aimed to improve the portability of coverage for the unemployed for up to 12 months after the end of their last job (Franc and Pierre, 2015). On one hand, thanks to the employer subsidy to the premium, this reform may improve welfare of private sector employees, especially for those previously uninsured with low income. On the other hand, for those who decided not to subscribe CHI coverage because of low risk aversion or low health care needs (Pierre and Jusot, 2017), this reform may decrease welfare despite the employer subsidy. The likely effects of the Ani reform on employees' welfare are even more difficult to anticipate considering that employers may recover their costs reducing employee's wages by their subsidy amount or by limiting their labour demand (Buchmueller *et al.*, 2011; Lee *et al.*, 2005). Moreover, a distinctive feature of the French context in which this reform is implemented is that nearly 97% of private sector employees already benefited from CHI coverage before the reform. Therefore, this mandate is more likely to induce a change in the type of coverage (from individual policies to collective policies) than an improvement of the CHI coverage rate. This change is not neutral on the CHI market as employees are on average in better health status than individuals outside the labour market. The leaving of employees from the CHI individual market is likely to deteriorate the average health risk insured by this market, which may probably increase the premiums. The individuals not affected by the reform, as retired, long term unemployed, students, etc., may therefore suffer from a decrease in welfare.

Taking into account the Expected utility theory, we simulate the gains and losses of collective welfare induced by the Ani reform for the entire population and focusing on which change is induced by the reform in CHI coverage. We consider the most likely scenarios concerning the rise in individual policies premiums and the decrease in employees' wages. We also investigate how the reform may benefit or not the most vulnerable individuals by analysing the proportion of winners, neutrals and losers, as well as the average gain of welfare, according to individual characteristics as age, income, employment status, health and, level of risk aversion. This research is based on the 2012 Health, Health Care and Insurance survey linked to the administrative data of the National Health Fund. It provides information on health status, socio-economic characteristics, complementary health

insurance, risk preferences and, level of out-of-pocket expenditures. After an overview of the context in which the Ani reform was introduced and the regulations thereof (section 2), we describe the expected utility model (section 3), the data used (section 4), the imputations and the assumptions related to an ex-ante evaluation (section 5). We then present and discuss the results (sections 6 and 7).

2. The Ani reform

In January 2013, the Ani, signed by the majority of the trade unions on "*business competitiveness and securing jobs and careers of employees*", proposed, in return to greater flexibility in the labour market, two articles on employer-sponsored CHI. Firstly, the purchase of employer-sponsored CHI is generalised to all private sector employees, i.e. to require all employers to implement CHI and pay at least 50% of the premium. Secondly, the portability rights 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 job and cannot exceed 12 months.

The agreement, voted by MPs on 14 June 2013, became effective on 1 January 2016. Employer CHI must provide at least the minimum coverage defined by law: full reimbursement of copayments computed on the basis of the regulated prices and some extra fees for dental and optical care (100€ for simple corrections, 150€ for simple and complex mixed corrections and 200€ for complex corrections). Employer-sponsored CHI may therefore provide higher level of coverage - in respect with the limits permitted under the definition of responsible policies[1] - which may result either from an agreement negotiated at the branch/the company level or from a unilateral decision of the employer.

3. The expected utility model

3.1 Theoretical framework

This work is based on the expected utility model. We assume that individuals $n = \{1, ..., N\}$ have a welfare function matching their expectations of one-dimensional utility depending on their disposable income *x,* i.e. their income minus the CHI policy premium and the Out-Of-Pocket expenditures (OOP) that remain after reimbursement of CHI.

$$U_n = U(x_n) = U(Income_n - Premium_n - OOP_n)$$

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[1] The new definition of responsible contracts published in the circular of January 30, 2015 imposes reimbursement ceilings for up to 125% of regulated prices for physicians' extra fees who have not signed the access to care contract (100% in 2017) as well as refund ceilings for optic devices, for example, at € 470 for simple lenses and frame.

To evaluate the gains and losses in welfare before and after the Ani, we assume that risk preference remain the same over time. At the time $t = \{before, after\}$, the expected utility of an individual n is written as:

$$EU_{nt} = EU(x_{nt}) = EU(Income_{nt} - Premium_{nt} - OOP_{nt})$$

$$EU_{nt} = \sum_{i=1}^{I} p^i U(Income_{nt} - Premium_{nt} - OOP_{nt}^i) \qquad \text{(Eq. 1)}$$

With: $i = \{1, ..., I\}$ the states of nature the individuals face to and, p^i the probabilities that each state of nature become true.

Since the levels of utility are difficult to interpret, we can analyze the certain equivalent w^*, which corresponds to the level of wealth that provides individuals the same satisfaction level as the expected utility they gain given the risk p^i they face to at time t (Eq.2). It is therefore a subjective measure which depends on both the disposable income and the risk-aversion degree. It can be decomposed in two indicators. The first one is the expected gains: it measures the monetary gain (or loss) that an individual can expect from a risk situation, regardless its level of risk-aversion (Eq.3). The second one is the risk premium: it measures, according to the risk aversion level of each individual, the gain (or the cost) induced by a decrease (or an increase) in risk-exposure (Eq.4).

Certainty Equivalents w_{nt}^*: $U_{nt}(w^*) = EU(Income_{nt} - Premium_{nt} - OOP_{nt})$ \qquad (Eq.2)

Expected Gains: $E(x_{nt}) = Income_{nt} - Premium_{nt} - \sum_{i=1}^{I}(OOP_{nt}^i)$ \qquad (Eq.3)

Risk Premiums: $\pi_{nt} = E(x_{nt}) - (w_{nt}^* - w_{0,nt})$ \qquad (Eq.4)

For each individual n, gains and losses of welfare corresponds to the variation in welfare before and after the reform:

$$\Delta EU_n = EU_{nAfter} - EU_{nBefore}$$

The variations in certainty equivalents, expected gains and risk premiums express the monetary gains (respectively losses) that correspond to an increase (decrease) in welfare. For an individual n, a positive variation in certainty equivalent corresponds to the monetary value of an increase in expected utility. As risk premium is positive considering that individuals are risk-averse, a negative risk premium variation expresses a decrease in risk exposure (that is to say an improvement of welfare for risk-averse people).

Variation in Certainty Equivalents:

$\Delta w_n^* = w_{n\,After}^* - w_{n\,Before}^*$

Variation in Expected Gains:

$$\Delta E(x_n) = E\left(x_{n\,After}\right) - E\left(x_{n\,Before}\right)$$

Variation in Risk premiums:

$$\Delta \pi_n = \pi_{n\,After} - \pi_{n\,Before} = E\left(x_{n\,After}\right) - \left(w^*_{After} - w_0\right) - E\left(x_{n\,Before}\right) + \left(w^*_{Before} - w_0\right)$$

$$\Delta \pi_n = E\left(x_{n\,After}\right) - E\left(x_{n\,Before}\right) - \left(w^*_{After} - w^*_{Before}\right)$$

$$\Delta \pi_n = \Delta E(x_n) - \Delta w^*_n$$

3.2 Analytical strategy

To evaluate the likely effects of the Ani reform on collective welfare, we assume that the social planner has an utilitarian social welfare function. Collective welfare is therefore performed at each time *t* as the sum of individual expected utility. We analyse the change in collective welfare by presenting the variation over time of the sum of expected utility (Eq.5). We discuss its extent by focusing on the variation of the sum of certainty equivalents, risk premiums and expected gains.

$$\Delta EU = \sum_{n=1}^{N} \Delta EU_n = \sum_{n=1}^{N}\left[EU_{n\,After} - EU_{n\,Before}\right] \qquad \text{(Eq. 5)}$$

The change in collective welfare is therefore analysed by sub-populations according to insurance paths induced by the reform.

Note that if for each individual *n*, an increase in expected utility always corresponds to positive change in certainty equivalent, an increase in collective welfare may however correspond to a negative change in the sum of certainty equivalents. This is due to the fact that a same variation of expected utility corresponds to a lower monetary gain for a poorest (for a given risk aversion) or more risk-averse (for a given income) individual (Figure 1). As a result, collective welfare may increase and correspond to a loss of wealth in the overall population. It may be the case if, for a given level of risk aversion, the reform induces a gain in welfare for the poorest and a loss of welfare for the richest, but in terms of monetary value, the loss of the richest is not compensate by the gain of the poorest. It may by the same if, for a given income, the reform induces a gain in welfare for the less risk averse and a loss of welfare for the most risk averse, but the monetary value of the most risk averse is not compensate by that of the less risk averse.

Figure 1: Representation of changes in expected utility and certainty equivalents at different income levels and risk aversion
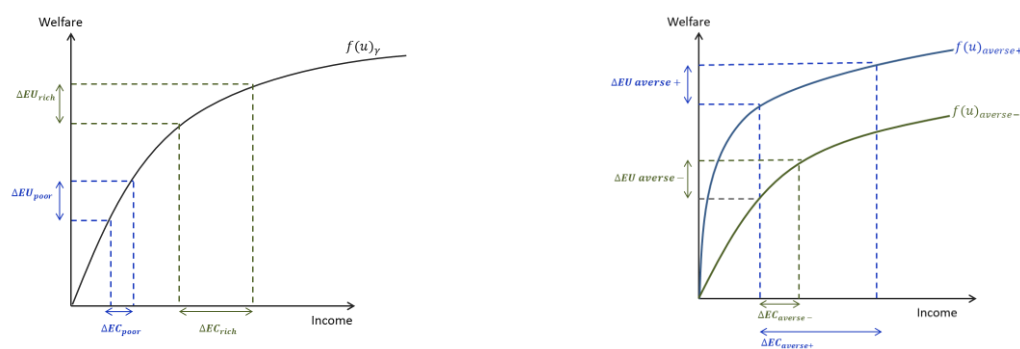
We then focus on the effects of the Ani reform on individual change in welfare. We analyse the proportion of winners, neutrals and losers of the reform (i.e. those for who welfare increases, remains the same or decreases) in order to evaluate if the reform is Pareto improving, which may be the case if welfare increases for all or part of the population without deteriorating the welfare of any individual. We therefore analyse the distribution of individual variation in expected utility, certainty equivalent, expected gains and risk premiums. These two analyses are conducted on the overall population and according to each insurance path. In order to investigate how the reform may benefit or not the most vulnerable individuals, we finally analyse the proportion of winners, neutrals and losers, as well as the average gain of welfare, according to individual characteristics as age, income, employment status, health and, level of risk aversion.

4. Data

This research is based on the 2012 Health, Health Care and Insurance Survey linked to the administrative data of the National Health Fund. The survey provides information on health status (as measured by the three indicators of the European minimodule), socio-economic characteristics (income, employment status) and, on CHI coverage (lack of coverage, collective or individual policy, free public policy coverage "Universal Complementary Health Insurance"). It also provides information related to the risk preference of individuals aged 15 years and over with the following question: "*In terms of your attitude regarding risk, where would you place yourself on a scale from 0 to 10 i.e. from very cautious to very adventurous*?". Data from the National Health Fund provide out-of-pocket expenditures that remain after reimbursements of the Public Health Insurance. It allows us to compute out-of-pocket payments remaining after reimbursement of CHI making some assumptions on CHI policies level.

The sample focus on individuals aged 15 years and over (for who the question related to risk preference is collected) who are not beneficiaries of the "Universal Complementary Health

Insurance"[2] and for whom employment status, type of CHI coverage and income per CU are known. It consists of 6,122 individuals (Table 1): 60% of them are covered by an individual CHI policy (chosen by themselves), 35% by a collective CHI policy (subscribed by an employer) and 5% do not benefit from any CHI. 68% of the sample report being in good or very good health. Regarding the risk-aversion indicator, 31% 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.

Thanks to the employment status observed in 2012, 42% of the sample is identified as being affected by the Ani reform: 1) the private sector employees affected by the employer mandate (40%); 2) former private sector employees unemployed for fewer than twelve months affected by the portability coverage[3] (2%). Only 3.7% of the individuals affected by the Ani do not benefit from CHI coverage before the reform and 31% are covered by an individual CHI policy. Compared to the overall sample, individuals affected by the reform are more often in good health status (78% versus 68%) and slightly less risk-averse (24% declare being cautious versus 31%).

Table 1: Description of the sample and of the individuals affected by the Ani reform

	Sample		Individuals affected by the Ani reform			Sample		Individuals affected by the Ani reform	
	Number	%	Number	%		Number	%	Number	%
CHI coverage					**Age**				
Without CHI	264	4.5	78	3.7	15/20 years old	410	5.8	31	1.5
Employer-sponsored CHI policy	2165	35.4	1594	65.7	21/30 years old	567	12.2	381	20.6
Individual CHI policy	3693	60.1	706	30.6	31/40 years old	882	17.5	590	28.7
Employment status					41/50 years old	1168	16.7	731	25.5
Employed	3155	54.8	2283	95.7	51/60 years old	1106	16.5	588	21.7
Retired	1801	28.8	0	0	61/75 years old	1339	20.4	56	2.1
Unemployed	293	5.1	95	4.3	Over 75 years old	650	10.9	1	0
Students	390	5.4	0	0	**Risk preference**				
House wife/husband	311	3.3	0	0	0 (very cautious)	720	11.2	191	7.5
Other	167	2.5	0	0	1	452	7.5	138	5.9
Unknown	5	0.1	0	0	2	731	11.8	263	10.9
People affected by the Ani reform					3	724	11.8	320	13.2
Private secor employees	2283	39.7	2283	95.7	4	594	9.7	268	11.3
Short term unemployed	95	1.8	95	4.3	5	1383	22.9	552	23.5
All	2378	41.5	2378	100	6	541	8.8	237	10
Income per CU					7	545	9.1	216	9.2
<= 650 €	171	2.4	37	1.2	8	303	5	132	5.7
651€/1000€	1071	16	280	10.7	9	68	1.2	34	1.5
1001€/1400€	1569	25.5	596	24.7	10 (daring)	61	1	27	1.2
1401€/2000€	1759	30	765	33.3	**Perceived health status**				
2001€/3000€	1085	18.4	484	21	Very good/Good	4097	68	1814	78
>3000€	467	7.8	216	9.1	Fair	1566	24.6	490	19.2
Sexe					Bad/Very Bad	459	7.4	74	2.8
Men	2899	46.8	1226	50.1					
Women	3223	53.2	1152	49.9	**Total**	6122	100	2378	100

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[2] The CMU-C beneficiaries, who benefit from a free public CHI coverage, do not have to subscribe to the employer-sponsored CHI.

[3] As portability coverage is effective only if unemployed individuals receive benefit, we exclude those of a household in which no individual collected unemployment benefit.

5. Assumptions and imputations

To compute changes in welfare induced by the reform, we first must choose a functional form for the utility function. Moreover, regardless of the form of preferences, variation of welfare depends on changes that may occur in the CHI premiums as well as in the level of coverage. As the latter ones are unknown in the ESPS survey, we present the methodological work and the assumptions making it possible to impute this information. Finally, we present the assumptions related to the Ani reform implementation, which characterize the framework of this ex-ante evaluation.

5.1 A Constant Relative Risk Aversion (CCRA)

We use a CRRA utility function. We thus assume that relative risk aversion is constant with the level of wealth, which is quite 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 Calvo, 2008, Engelhardt and Gruber, 2010; Barcellos and Jacobson 2014). The function has the advantage to summarise the preferences for risk in a single parameter γ:

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

Where x is the level of available wealth of individuals and γ is the relative risk aversion parameter whose sign indicates the preferences face to risk:

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

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

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

Estimating the values of γ resulted in an experimental US work (Barsky et al., 1997) in which the authors analysed the individuals willingness to change job knowing the risk that their current income may increase or decrease by a certain amount. Using a CRRA function utility, the authors identified three levels of γ and gathered 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 another work, Barsky (1997) estimated the average of γ in each of these groups: 0.7, 1.5, 2.9 and 15.8, respectively. Using the same method, Arrondel and Calvo (2008) estimated the distribution of γ in the French population: 4.8% are the least risk-averse ($\gamma < 1$), 10.2% have a γ value comprised between 1 and 2, for 26.6% it is comprised between 2 and 3.76 and, 58.3% are the most risk-averse ($\gamma \geq 3.76$).

The ESPS survey does not estimate γ. However, it has the advantage to collect a subjective note about the behaviour towards risk (Table 2). Assuming that its ranges are the same to those of the parameter γ estimated in France, we attribute a value of γ for each individual of the sample respecting the distribution observed by Arrondel and Calvo (2008) and using the average value observed in each group by Barsky et al. (1997).

Table 2: Association between the risk aversion note and the relative risk aversion parameter

	Parameter of the relative risk aversion ɣ										
	<1 (the least risk-averse)			2<ɣ<=1	3.76<ɣ<= 2		ɣ>3.76 (the most risk-averse)				
ɣ distribution (Arrondel and Calvo)											
% in the population by group		4.9%		10.2%	26.6%				58.3%		
Risk behaviour note	10	9	8	7	6	5	4	3	2	1	0
% in the sample	1%	1.2%	5%	9.1%	8.8%	22.9%	9.7%	11.8%	11.8%	7.5%	11.2%
% in the sample by group		7.2%		9.1%	31.7%				52%		
Average ɣ per group (Barsky et al.)		0.7		1.5	2.9				15.8		
Attributed value of ɣ	0.5	0.7	0.9	1.5	2.5	3.3	6.8	12.8	15.8	19.4	26.5

Note: The attributed values of ɣ are computed making a linear extrapolation of the average observed by Barsky et al. and capping to 30 the maximum value of the relative risk aversion (which is twice the average observed by Barsky et al).

5.2 Imputations of CHI coverage, premiums and, risk financial exposure before the Ani reform

- **The level of CHI policy coverage**

We assume that there are 3 levels of CHI reimbursement when individuals benefit from a CHI coverage: A, the most advantageous policy; B, the middle one and, C, the lowest one (see Appendix A.1 for the description coverage of Policies A, B and C). According to the most recent survey on modal policies survey (Garnero and Le Palud, 2014), we know that in 2013, before the reform, almost all people insured by an individual policy benefited either from a policy B or C (49% and 48%, respectively) while those covered by a collective policy mainly benefited either from a policy A or B (53% and 39%, respectively) leaving 9% benefited from a policy C (9%).

To best affect a CHI policy level, we follow this known distribution imputing either a level B or C for people insured by an individual policies, and a level A, B, or C for those insured by a collective policy. For each individual, the imputation is run crossing the opinions declared on outpatient care reimbursements (very good, rather good or poor) with his income if they are insured by an individual policy (Jusot *et al.*, 2012) or with the company size if they are covered by a collective policy (Perronnin *et al.*, 2012). The table 3 shows the imputation strategy according to these different variable cross-tabulations.

Table 3: Imputations of CHI policy reimbursement levels

INDIVIDUAL POLICIES				COLLECTIVE POLICIES			
Opinion on CHI coverage	Revenue per CU	%	Imputation	Opinion on CHI coverage	Company size	%	Imputation
				Very good	> 250	16,2	A
Very good	< €1,400	7,8	B	Very good	50/250	5,7	A
Very good	€1,400/€3,000	6,4	B	Very good	< 50	5,9	B
Very good	> €3,000	0,8	B	Very good	Unknown	2,6	A
				Rather good	> 250	26,0	A
Rather good	< €1,400	21,3	C	Rather good	50/250	8,9	B
Rather good	€1,400/€3,000	22,1	B	Rather good	< 50	10,7	B
Rather good	> €3,000	3,3	B	Rather good	Unknown	5,7	B
				Poor / Very poor	> 250	4,3	B
Poor / Very poor	< €1,400	15,6	C	Poor / Very poor	50/250	1,9	C
Poor / Very poor	€1,400/€3,000	12,4	C	Poor / Very poor	< 50	3,2	C
Poor / Very poor	> €3,000	1,4	C	Poor / Very poor	Unknown	1,3	C
Unknown	< €1,400	5,2	C	Unknown	> 250	3,2	A
Unknown	€1,400/€3,000	3,4	B	Unknown	50/250	1,4	B
Unknown	> €3,000	0,4	B	Unknown	< 50	3,1	C

Reading guide: We assume that individuals insured through an individual CHI policy who report very good reimbursements benefit from the best individual policy level (B), while those who report poor and very poor reimbursements benefit from the poorest individual policy level (C). When the opinion is "rather good", we use the income level to impute either a policy level B or C.

- **The CHI premiums**

To impute CHI policies premiums, we still use the information collected by the modal policies survey conducted by the health ministry about the premium amounts per insured for each level of coverage and each type of policy (individual or collective, Table A.2).

As individual policies are priced on age, we impute individual CHI policies premiums according to the age brackets of insured. For each age bracket (of 10 years), the premiums are computed by linear extrapolation of premiums amounts collected by the health ministry survey for insured aged of 20, 40, 60 and 75 years old. In accordance with the results of the latest survey of company complementary social protection (Perronnin *et al.*, 2012), we assume that collective CHI policies implemented before the Ani reform are sponsored at 50% by employers for their employees and their dependants (spouse and children) and that the premium paid by the employees is the same regardless of their household composition and their age. These premiums were computed considering a household of 2 adults and 1 child. Premiums finally imputed are presented in the table 4.

Table 4: Premiums imputed to CHI insured

	Individual policies		Collective policies (household premium after the employer subsidy of 50%)		
	Level B	Level C	Niveau A	Niveau B	Niveau C
15/20 years old	28,5 €	24,8 €	117 €	71,5 €	62,5 €
20/30 years old	43,3 €	37,4 €	117 €	71,5 €	62,5 €
30/40 years old	53,8 €	46,1 €	117 €	71,5 €	62,5 €
40/50 years old	65,9 €	56,6 €	117 €	71,5 €	62,5 €
50/60 years old	79,6 €	68,9 €	117 €	71,5 €	62,5 €
60/75 years old	99 €	84,5 €	117 €	71,5 €	62,5 €
Over 75 years old	124 €	103,5 €	117 €	71,5 €	62,5 €

- **The financial risk associated with health status**

The expected utility of the individuals (Eq. 1) depends on the probability p^i that a financial risk associated with a health status i (previously called state of nature) become true and its related level of OOP expenditures.

We assume that the financial risk to which each individual faces corresponds to the observed distribution of OOP expenditures of individuals with the same age and the same health status. We thus run quantile regressions of OOP expenditures taking into account the age (under 25 years old, 25/34 years old, 35/44 years old, 45/54 years old, 55/64 years old, over 64 years old), the perceived health status (very good, good, fair, poor, very poor) and the fact of benefiting from the "ALD scheme" (a more advantageous public health insurance because of long term diseases). We estimate the 99 first percentiles of the OOP expenditures distribution that each individual would have to pay if respectively, all of them were insured by a CHI policy A, B, C or if all of them were uninsured. We thus consider 99 states of nature i for which each individual has a probability of 1/99 to face (p^i). Expected utility can therefore be written as:

$$EU_{nt} = \sum_{i=1}^{99} \frac{1}{99} U\big(R_n - \pi_t^{aj} - \widehat{l_t^{ai}}\big)$$

$$EU_{nt} = \frac{1}{(1-\gamma)} \sum_{i=1}^{99} \frac{1}{99} \big(R_n - \pi_t^{aj} - \widehat{l_t^{ai}}\big)^{1-\gamma}$$

With: R_n the income per CU of the individual n;

π_t^{aj} the premium paid by the individual n for the CHI policy $j = \{ind, coll\}$ with quality level $a = \{0, A, B, C\}$.

$\widehat{l_t^{ai}}$ is the estimated OOP expenditures of an individual with a CHI policy a facing the state of nature i. Note that a=0 and $\pi_{jt}^0 = 0$ correspond to a situation without CHI coverage. In this case, l^{0i} corresponds to the OOP expenditures that remain after reimbursement of the public health insurance.

5.3 Assumptions about the Ani reform implementation

- **Changes in guarantee level**

First of all, we assume that, according to the law, all private sector employees will be covered by a collective CHI policy after the reform. We consider that individuals not targeted by the reform (that is to say those who are not private sector employees) will retain the same level of coverage before and after the reform. We also assume that companies that already offered a collective policy before the reform will continue to offer the same one after it (in terms of level of coverage, subsidy amount and, dependants inclusion).

For companies that did not offer collective policies before the reform, we assume that the new collective policy will offer the minimum coverage required by law, i.e. Policy C+ for employees only (and not for their dependants). Policy C+ coverage is very close to the policy C coverage, but is a little bit more advantageous on dental and optical care reimbursements (see Appendix A.1). We thus identify 9 insurance paths (Table 5). A description of individuals of each insurance path is presented in Appendix A.3.

Table 5: Insurance paths assumed before and after the Ani reform

	Before the ANI reform	After the ANI reform	Number	%
	Collective			
Path 1	Collective - Level A	Collective - Level A	1162	19%
Path 2	Collective - Level B	Collective - Level B	799	13%
Path 3	Collective - Level C	Collective - Level C +	204	3%
	Individual			
Path 4	Individual - Level B	Individual - Level B	1308	21%
Path 5	Individual - Level B	Collective - Level C +	321	6%
Path 6	Individual - Level C	Individual - Level C	1679	26%
Path 7	Individual - Level C	Collective - Level C +	385	7%
	Without CHI			
Path 8	No CHI	Collective - Level C +	78	2%
Path 9	No CHI	No CHI	186	3%
All			6122	100%

- **Scenarios in CHI premiums**

Concerning collective CHI implemented before the Ani reform, we assume that the premium paid by the employee will remain the same after the reform (table 4). For collective policies implemented as part of the Ani reform, we assume that the employer offer the minimum subsidy required by law, i.e. 50% of the premium. The premium paid by the employee is therefore 25.25€ (50% of the CHI premiums with level C+). We consider 2 scenarios concerning the way employers will fund their subsidy:

➢ In a first scenario, we assume that the employers will fund this additional cost without changing their employees' wages and benefits.

➢ In a second scenario, we take into account the fact that such employer mandates may impact the labour market (Buchmueller et al., 2011; Lee et al., 2005). We therefore assume that employers will incorporate this cost to their employees' wages reducing their wages by their subsidy amount. This assumption implies that employees will ultimately pay the full amount of the collective CHI premium. For a given CHI level, collective policies are therefore less expensive than individual policies for insured over 40 years old and more expensive for those aged under 40 years (table A2). In the following of the paper, this scenario is called "Substitution".

Concerning individual policies and given that 31% of employees are going to switch from an individual CHI to a collective one, we assume that the Ani reform is going to change the risk pooled of individual CHI insured which may increase the premiums:

➢ In a first scenario, we assume a short-term dimension where the individual CHI premiums remain unchanged.

➢ In a second scenario, we consider a medium-term dimension where insurers are led to increase individual contract premiums to cope with higher average OOP payments they face. We consider a 10% increase in premiums (excepted for civil servants policies that do not depend on the same market logic), which corresponds to the increase in OOP payments observed between the pool of individual CHI insured before the reform and the pool of individual CHI insured after the reform (Appendix A.4). We then consider a 15% increase, in order to take into account of cross-subsidies between the individual and collective CHI markets. Indeed, the financial equilibrium of the CHI market is based on cross-subsidies between the collective market (relatively competitive but deficit) and the individual market (more opaque but surplus) (Drees, 2016). By extending the collective market, the Ani reform may lead insurers to increase the loading rates of individual policies to retain their profit margin. We assume, however, that the increase in premiums due to cross-subsidies would be small and could not exceed 5% (i.e a 15% increase in premiums in total).

5.4 Expected changes in welfare

The likely effects of the Ani reform on welfare depend on the changes induced by the reform in the level of CHI coverage, the premiums paid, and the fact that employees' wages will decrease or not by the employer's subsidy amount.

Premiums paid by the individuals who switch from an individual policy to a collective one (paths 5 and 7) will decrease under the assumption that wages will remain the same.

For those who retain the same level of coverage (path 7), this is due to the fact that premiums will be partially paid by the employers and to the fact that collective market is more competitive than individual market. For the older ones, it is also induces by the fact that collective CHI premiums do not depend on age (contrary to the individual market). They are thus likely to gain welfare. For the other ones (path 5), the decrease in premiums is also due to a decrease in guaranties level which will increase their OOP expenditures and change their welfare in a priori unknown direction, especially considering a decrease in wages by the employer's subsidy amount. The expected effect is also unknown for those uninsured before the reform and covered by a collective policy after it (path 9): they will have lower OOP expenditures but have to pay a premium. The welfare of individuals who remain covered by an individual policy (paths 4 and 6) is expected to decrease as we consider a rise in their premiums. Considering all these likely changes in welfare, the effect of the Ani reform on collective welfare is therefore unknown.

Table 7: Expected effects of the Ani reform on welfare according to the assumption on substitution (whatever the rise extent – 10% or 15% – in individual policies premiums)

Path	CHI coverage		Assumption on substitution	
	Before the reform	After the reform	Decrease in wages: NO	Decrease in wages: YES
1	Collective A	Collective A	0	0
2	Collective B	Collective B	0	0
3	Collective C	Collective C+	+	?
4	Individual B	Individual B	-	-
5	Individual B	Collective C+	?	?
6	Individual C	Individual C	-	-
7	Individual C	Collective C+	+	?
8	Without CHI	Collective C+	?	?
9	Without CHI	Without CHI	0	0
	All		**?**	**?**

6. Results

We first describe the individuals' CHI coverage before the Ani reform, in 2012, in order to identify who will be affected by the reform and by a change in CHI premiums or in a level of coverage. We then present the likely effects on social welfare regarding the different scenarios on the Ani reform implementation and the different insurance paths induced by the reform.

6.1 Who is affected by the reform, by the increase in premiums and by the potential decrease in wages?

In 2012, 4.5% of our sample (aged over 15 years old) did not benefit from any CHI coverage, 35.4% were insured by a collective policy (by their own employer or as a dependant) and 60.1% were insured by an individual policy. Being insured by a collective policy before the reform (which concerns individuals in paths 1, 2 and 3) was more frequent among wealthy people (47.9% for those with more than 2,000€ per CU by month against 22.4% for those with less than 1,100€ per CU) and, among individuals with good health status (41.8% against 11.7 among those with poor health). It was also the case for those with the lowest risk-aversion (41.3% versus 27% among those with the highest risk-aversion) [table 6]. Conversely, being covered by an individual policy was more frequent among the oldest (more than 90% for those over 60 years old against 51% among the 18/30 years old), the poorest (71.2% versus 51%) and those with the strongest risk-aversion (69.5% versus 54.3% for those with the lowest risk-aversion). As already showed, the poorest and the oldest were also over represented among the uninsured, as well as the least risk-averse (Pierre and Jusot, 2017).

Due to the reform, 34.2% of the uninsured and 21.1% of those insured by an individual policy will be covered by a collective policy after the reform (insurance paths 5, 7 and 8). This applies mainly to young, middle-income, healthy and low risk-averse individuals. These individuals are also those who may be affected by a decrease in their wages if employers introduce their cost subsidy into wages. The individuals who will retain an individual CHI policy after the reform (paths 4 and 6) are those who may be affected by an increase in their premiums. The individuals who may be affected by an increase in their premium are those who will remain insured by an individual policy after the reform (paths 4 and 6), that is to say the oldest, the poorest, those with poor health status and the most risk-averse (table 6). They are mainly the oldest, the poorest, those with poor health status and the most risk averse.

Table 6: Description of the individuals according to their coverage before and after the Ani reform

	Individuals already insured by a collective policy before the reform (Paths 1, 2 and 3)	Individuals insured by a collective policy thanks to the reform (Paths 5, 7 and 8)	Individuals who remain insured by an individual policy after the reform (Paths 4 and 6)	Individuals who remain uninsured after the reform (Path 9)	Total (%)
Age					
Under 18 years old	60.7	0.7	37.0	1.6	100
18/30 years old	46.4	28.1	22.9	2.6	100
31/40 years old	53.7	21.8	22.9	1.6	100
41/50 years old	54.3	18.5	25.2	2.0	100
51/60 years old	43.3	17.9	35.5	3.2	100
61/70 years old	5.5	1.9	88.1	4.5	100
71/80 years old	0.5	0	96.7	2.8	100
Over 80 years old	0	0.3	93.2	6.5	100
Employment status					
Employed	54.5	23.5	21.1	1.0	100
Retired	1.2	0	94.3	4.4	100
Unemployment	22.4	26.9	41.6	9.0	100
Students	56.5	0	40.7	2.8	100
House wife/husband	25.7	0	66.3	8.0	100
Others	5.9	0	83.8	10.4	100
Mensual income per CU					
<= 1100€	22.4	14.7	56.5	6.4	100
1101€/1500€	32.0	17.1	48.1	2.8	100
1501€/2000€	38.5	15.5	44.5	1.6	100
>2000€	47.9	9.7	41.3	1.2	100
Perceived health status					
Very good/good	41.8	15.7	40.4	2.1	100
Rather good	24.9	12.3	59.8	3.1	100
Poor/very poor	11.7	6.8	71.2	10.3	100
Risk preferences					100
The most risk-averse	27.0	12.1	57.4	3.6	100
Middle risk aversion	38.9	14.8	43.9	2.5	100
The least risk-averse	41.3	18.3	36.0	4.4	100
CHI coverage					
Without CHI	0	34.2	0	65.8	100
Collective CHI policy	100	0	0	0	100
Individual CHI policy	0	21.1	78.9	0	100
Total	**35.4**	**14.2**	**47.4**	**2.9**	**100**

6.2 The effects of the Ani reform on collective welfare

The effects of the Ani reform on collective welfare are presented in table 8. Table 9 highlights the proportion of winners (those who gain welfare), losers (those who loss welfare) and, neutrals. Table 10 shows the distribution of relative change in welfare in the overall population. We firstly present the results considering that wages will remain the same. We then discuss the results considering that the employers will recover their costs reducing employees' wages.

Under the assumption that the employers will not reduce employees' wages by their subsidy amount to the premium, the results show that the reform is likely to induce a very weak rise in social welfare of +0.05% if individual policies premiums increase by 10%. It corresponds to a total annual monetary gain of 49,428€ for the 6,122 individuals of the sample, that is to say an average gain of 8€ per individual for which 6€ provides from an increase in expected gains and 2€ from a decrease in risk exposure (columns "Expected Gains" and "Risk Premiums", respectively, table 8). The effect of the Ani reform is almost zero (+0.03%) considering an increase of 15% in individual policies. It even

corresponds to a loss of –83,457€ (–14€ on average per individual), which means that the rise in welfare mainly concerns people who poorly evaluate the change in welfare whereas the loss mainly concerns people who highly evaluate a change.

Regarding the table 9, one can see that there are a lot of losers compared the number of winners: 14% gain welfare whereas 42% lose welfare (and 44% retain the same level of welfare). The reform is therefore not at all Pareto improving. Otherwise, according to the distribution of the relative change in welfare (table 10), the losers may lose a lot of their initial welfare: 5% of the population may lose more than –23% or –37% of their initial welfare according to the rise extent in individual premiums (10% or 15%), whereas 5% may see their welfare increase by more than 14%. Those who suffer from the higher loss are therefore those who previously had low level of welfare before the Ani reform. The highest monetary gain are therefore larger than the highest monetary losses (over +419€ for 5% of the population versus under –136€ for 5% of the population considering an increase of 10% in individual policies premiums and under –203€ considering an increase of 15%). Analysing the distribution of both risk premiums and expected gains, the results show that changes in welfare are mainly induced by a change in expected gains and hardly by a change in risk exposure.

6.3 The changes in welfare according to the insurance paths

The change in welfare of the individuals who may gain a collective CHI thanks to the reform depends on their initial CHI coverage: the welfare increases for those previously insured by an individual policy before the reform (paths 5 and 7) whereas it decreases for those previously uninsured (path 8), regardless of the assumption on wages (table 8).

For those who remain insured by the same level of coverage (path 7), and if we consider that wages remain the same, the gain in welfare corresponds to a monetary gain of 425€ for each of them for which 398€ is induced by the benefit of the employer's subsidy (expected gains) [table 8]. This gain is reduced at 126€ per individual if we consider decrease in wages. The proportion of losers, which corresponds to those less than 40 years old, would therefore be 43% (table 9). The loss of welfare would be over –151€ for 10% of the individuals of this insurance path (table 11).

For those who benefit from a collective CHI policy coverage with a lower quality than their previously individual policy (path 5), the gain in welfare corresponds to 371€ on average if the wages remain the same (table 8). The welfare gain induced by the lower cost of collective policies premium is then higher than the welfare loss induced by the rise in OOP expenditures (excepted for 1% who loss welfare, table 9). It is interesting to note that, as the policy quality decreases, the variation of risk premiums is positive: the rise in risk exposure costs on average 22€ per individual. However, as above, it still remains well below the increase in expected gain (393€). Assuming now that employers will reduce the employees' wages by their subsidy amount, the positive effect previously observed

vanishes: the reform has almost no effect on this insurance path collective welfare. 48% would be winners and 52% would be losers.

Concerning the individuals who previously chose not to be insured and who will benefit from a collective policy after the reform (path 8), the collective welfare decreases regardless of the assumption on substitution between premium subsidy and wages. However, assuming no substitution, the monetary losses associated to a decrease in welfare are on average lower than the monetary gains: the reform may therefore induce a global gain of 183€ on average for which 165€ are due to a decrease in risk exposure and 18€ to an increase in expected gains. There would be a total of 44% of losers and 56% of winners. The highest relative changes in welfare would be greater for the winners than for the losers (5% would gain more than +97% of their initial welfare and 5% would loss more than –4%). The highest relative welfare gains mainly affect people who initially had low level of welfare. However, considering a decrease in wages, the collective welfare decreases. The loss would represent 123€ on average per individual. The gain induced by a decrease in risk exposure (163€) could therefore not compensate the loss of expected gain due to the premium cost (–286€). 75% would be losers and 5% may lose more than 41% of their initial welfare.

Finally, concerning the individuals who retain an individual policy after the Ani reform (paths 4 and 6), social welfare decreases as expected since we consider a rise in their premiums. Considering a rise of 10% in their premiums, the decrease in welfare represent –94€ and –81€ on average for each individual insured with a CHI level B or C, respectively (–143€ and –122€, respectively, considering a rise of 15%). All of them would be losers (excepted for those who subscribe civil servants CHI policies). The welfare loss can be quite high for some of them: 10% of those insured with a CHI policy B may lose more than –29% of their initial welfare even though they are not directly affected by the reform.

Table 8: Impact of the Ani reform on collective welfare

	Expected Utility		Certainty Equivalents		Risk Premiums		Expected gains	
	Absolute variation	Relative variation	All	On average	All	On average	All	On average
All the population (6122)								
Substitution NO - Increase of 10%	16.48	0.05%	49,428 €	8 €	-9,980 €	-2 €	39,448 €	6 €
- Increase of 15%	8.87	0.03%	-83,457 €	-14 €	-6,784 €	-1 €	-90,241 €	-15 €
Substitution YES - Increase of 10%	-22.61	-0.08%	-192,415 €	-31 €	-8,689 €	-1 €	-201,104 €	-33 €
- Increase of 15%	-30.22	-0.01%	-325,299 €	-53 €	-5,493 €	-1 €	-330,792 €	-54 €
Path 4 (1308) - Individual B / Individual B								
Increase of 10%	-9.05	-0.15%	-122,864 €	-94 €	869 €	1 €	-121,994 €	-93 €
Increase of 15%	-13.82	-0.22%	-187,317 €	-143 €	1,357 €	1 €	-185,960 €	-142 €
Path 5 (321) - Individual B / Collective C+								
Substitution NO	16.27	0.62%	119,107 €	371 €	6,945 €	22 €	126,052 €	393 €
Substitution YES	0.56	0.02%	16,096 €	50 €	7,247 €	23 €	23,344 €	73 €
Path 6 (1679) - Individual C / Individual C								
Increase of 10%	-5.28	-0.13%	-136,425 €	-81 €	5,378 €	3 €	-131,047 €	-78 €
Increase of 15%	-8.12	-0.21%	-204,855 €	-122 €	8,088 €	5 €	-196,770 €	-117 €
Path 7 (385) - Individual C / Collective C+								
Substitution NO	16.91	0.97%	163,467 €	425 €	-10,226 €	-27 €	153,241 €	398 €
Substitution YES	7.77	0.45%	48,479 €	126 €	-9,392 €	-24 €	39,088 €	102 €
Path 8 (78) - Uninsured / Collective C+								
Substitution NO	-3.45	-0.21%	14,286 €	183 €	-12,889 €	-165 €	1,397 €	18 €
Substitution YES	-17.7	-1.08%	-9,558 €	-123 €	-12,735 €	-163 €	-22,293 €	-286 €

Table 9: Proportion of winners, neutrals and losers

	Winners	Neutrals	Losers
All the population (6122)			
Substitution NO (increase of 10% or 15% in premiums)	14%	44%	42%
Substitution YES (increase of 10% or 15% in premiums)	7%	44%	49%
Path 4 - Individual B / Individual B			
Increase in premiums (10% or 15%)	0%	15%	85%
Path 5 - Individual B / Collective C			
Substitution NO	99%	0%	1%
Substitution YES	48%	0%	52%
Path 6 - Individual C / Individual C			
Increase in premiums (10% or 15%)	0%	11%	89%
Path 7 - Individual C / Collective C			
Substitution NO	100%	0%	0%
Substitution YES	57%	0%	43%
Path 8 - Uninsured / Collective C			
Substitution NO	56%	0%	44%
Substitution YES	25%	0%	75%

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

	Expected Utility				Certainty Equivalents				Risk Premiums				Expected Gains			
	Substitution NO		Substitution YES		Substitution NO		Substitution YES		Substitution NO		Substitution YES		Substitution NO		Substitution YES	
	Increase in premiums				Increase in premiums				Increase in premiums				Increase in premiums			
	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%	10%	15%
Distribution																
P99	49%	49%	29%	29%	683 €	683 €	478 €	478 €	30 €	37 €	31 €	37 €	568 €	568 €	458 €	458 €
P95	14%	14%	2%	2%	419 €	419 €	128 €	128 €	12 €	17 €	12 €	17 €	407 €	407 €	101 €	101 €
P90	2%	2%	0%	0%	244 €	244 €	0 €	0 €	5 €	7 €	5 €	7 €	258 €	258 €	0 €	0 €
P75	0%	0%	0%	0%	0 €	0 €	0 €	0 €	0 €	1 €	0 €	1 €	0 €	0 €	0 €	0 €
P50	0%	0%	0%	0%	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €	0 €
P25	-2%	-3%	-3%	-4%	-97 €	-145 €	-101 €	-150 €	0 €	0 €	0 €	0 €	-96 €	-144 €	-96 €	-144 €
P10	-14%	-21%	-14%	-22%	-121 €	-181 €	-131 €	-183 €	0 €	0 €	0 €	0 €	-120 €	-180 €	-120 €	-180 €
P5	-23%	-37%	-24%	-37%	-136 €	-203 €	-145 €	-228 €	-5 €	-5 €	-5 €	-5 €	-120 €	-180 €	-144 €	-228 €
P1	-50%	-85%	-51%	-86%	-146 €	-231 €	-283 €	-283 €	-73 €	-73 €	-69 €	-69 €	-144 €	-228 €	-298 €	-298 €

6.4 Characteristics of winners, neutrals and losers of the reform

To analyse how the reform may benefit or not the most vulnerable individuals, the table 12 shows the part of winners, neutrals and losers as well as the change in expected utility and certainty equivalent according to age, income, employment status, health and, level of risk aversion.

If employers do not integrate their subsidy to their employees' wages, winners would be overrepresented among the middle income group (16.7% versus 14.5% among the poorest and 9.2 among the richest). This is the same for people aged between 31 and 45 years old (21% of winners), with good health status (14.9%) and with a middle risk-aversion (14.5%). The losers would be mostly among the poorest (52.9% versus 34.8% among the richest considering an increase of 10% in premiums), the oldest (more than 89.4% among those over 61 years old), those with poor health status (68.7%) and among the most risk-averse (52.7%). The extent of loss of welfare is also largest for the elderly and those with a poor health status: –18% of initial welfare for those over 75 years old and –10% for those with poor health status. Their losses would represent –126€ and –43€ on average, respectively.

If employers reduce the employees' wages by their CHI subsidy amount, the proportion of losers become even more important among the poorest (58.8% versus 52.9% without substitution), as well as among those with poor health status (70.6% versus 68.7%) and the most risk averse (57.3% versus 52.7%). If we consider an increase in premiums of 10%, the welfare loss would represent –32€ on average for the poorest, –63€ for those with poor health status and, –47€ for the most risk averse (–58€, –102€ and –73€, respectively considering an increase of 15%). These losses are mainly almost driven by a decrease in expected gains.

Table 11: Distribution on the variation of welfare change and its related monetary values

	Path 4 (Ind B/Ind B)		Path 5 (Ind B/Coll C+)		Path 6 (Ind C/Ind C)		Path 7 (Ind C/Coll C+)		Path 8 (NC/Coll C+)			Path 4 (Ind B/Ind B)		Path 5 (Ind B/Coll C+)		Path 6 (Ind C/Ind C)		Path 7 (Ind C/Coll C+)		Path 8 (NC/Coll C+)	
	Premiums increase		Substitution		Premiums increase		Substitution		Substitution			Premiums increase		Substitution		Premiums increase		Substitution		Substitution	
	10%	15%	No	Yes	10%	15%	No	Yes	No	Yes		10%	15%	No	Yes	10%	15%	No	Yes	No	Yes
	Expected Utility											**Certainty Equivalents**									
P99	0%	0%	44%	29%	0%	0%	83%	71%	100%	100%	**P99**	0 €	0 €	767 €	710 €	0 €	0 €	907 €	870 €	2,073 €	1,746 €
P95	0%	0%	32%	12%	0%	0%	64%	48%	97%	95%	**P95**	0 €	0 €	578 €	448 €	0 €	0 €	751 €	579 €	1,003	948 €
P90	0%	0%	26%	9%	0%	0%	51%	29%	32%	29%	**P90**	0 €	0 €	536 €	236 €	0 €	0 €	622 €	461 €	376 €	321 €
P75	0%	0%	16%	3%	-1%	-1%	32%	11%	4%	0%	**P75**	-60 €	-96 €	476 €	196 €	-60 €	-96 €	552 €	258 €	202 €	-1 €
P50	-2%	-3%	6%	0%	-4%	-5%	10%	1%	0%	-1%	**P50**	-120 €	-180 €	278 €	-28 €	-96 €	-145 €	404 €	98 €	31 €	-277 €
P25	-9%	-14%	2%	-2%	-14%	-22%	3%	-1%	0%	-5%	**P25**	-121 €	-181 €	155 €	-153 €	-110 €	-166 €	264 €	-42 €	-66 €	-372 €
P10	-18%	-29%	0%	-8%	-29%	-46%	1%	-4%	-2%	-27%	**P10**	-144 €	-229 €	139 €	-167 €	-128 €	-193 €	155 €	-151 €	-119 €	-425 €
P5	-24%	-41%	0%	-14%	-40%	-66%	0%	-12%	-4%	-41%	**P5**	-146 €	-230 €	134 €	-175 €	-135 €	-203 €	152 €	-154 €	-164 €	-470 €
P1	-50%	-91%	0%	-31%	-71%	-124%	0%	-31%	-11%	-68%	**P1**	-156 €	-247 €	-15 €	-321 €	-142 €	-213 €	9 €	-297 €	-167 €	-473 €
	Risk Premiums											**Expected Gains**									
P99	13 €	20 €	201 €	211 €	22 €	34 €	0 €	0 €	-1 €	-1 €	**P99**	0 €	0 €	774 €	720 €	0 €	0 €	857 €	857 €	309 €	309 €
P95	3 €	5 €	74 €	77 €	15 €	23 €	-1 €	-1 €	-1 €	-1 €	**P95**	0 €	0 €	678 €	455 €	0 €	0 €	573 €	572 €	240 €	240 €
P90	1 €	2 €	51 €	52 €	12 €	18 €	-1 €	-1 €	-3 €	-3 €	**P90**	0 €	0 €	546 €	244 €	0 €	0 €	558 €	457 €	191 €	191 €
P75	0 €	0 €	21 €	22 €	4 €	6 €	-2 €	-2 €	-5 €	-5 €	**P75**	-60 €	-96 €	537 €	233 €	-60 €	-96 €	548 €	245 €	109 €	-197 €
P50	0 €	0 €	8 €	8 €	1 €	1 €	-7 €	-7 €	-20 €	-20 €	**P50**	-120 €	-180 €	372 €	66 €	-96 €	-144 €	398 €	92 €	-5 €	-311 €
P25	0 €	0 €	2 €	2 €	0 €	0 €	-24 €	-22 €	-84 €	-83 €	**P25**	-120 €	-180 €	155 €	-151 €	-96 €	-144 €	262 €	-44 €	-115 €	-421 €
P10	0 €	0 €	1 €	1 €	0 €	0 €	-68 €	-62 €	-267 €	-266 €	**P10**	-144 €	-228 €	142 €	-164 €	-120 €	-180 €	152 €	-154 €	-122 €	-428 €
P5	0 €	0 €	1 €	1 €	0 €	0 €	-98 €	-90 €	-763 €	-763 €	**P5**	-144 €	-228 €	142 €	-164 €	-120 €	-180 €	151 €	-155 €	-168 €	-474 €
P1	0 €	0 €	1 €	1 €	0 €	0 €	-265 €	-239 €	-1,964 €	-1,943 €	**P1**	-144 €	-228 €	-13 €	-319 €	-120 €	-180 €	8 €	-298 €	-169 €	-475 €

Table note: Only the insurance paths where the effects of the Ani reform are not zero for each scenario are presented.

Table 12 Description of the losers, winners and neutrals according to demographic and socioeconomic characteristics

	10% or 15% premiums increase			10% increase in premiums				15% increase in premiums			
Substitution: NO	Winners	Neutrals	Losers	Expected Utility	Certainty Equivalent	Risk Premium	Expected Gains	Expected Utility	Certainty Equivalent	Risk Premium	Expected Gains
Mensual income per CU											
<= 1100€	14.5	32.6	52.9	-6%	6 €	-6 €	0 €	-12%	-20 €	-4 €	-24 €
1101€/1500€	16.7	41.2	42.1	-1%	18 €	-2 €	16 €	-3%	-3 €	-2 €	-5 €
1501€/2000€	14.6	46.2	39.2	-1%	10 €	1 €	11 €	-2%	-11 €	1 €	-10 €
>2000€	9.2	56	34.8	0%	-2 €	0 €	-2 €	-1%	-21 €	0 €	-20 €
Age											
Under 30 years old	19.1	58.7	22.2	1%	28 €	0 €	27 €	1%	23 €	0 €	22 €
31/45 years old	21.0	64.0	15.0	3%	57 €	-4 €	53 €	2%	53 €	-4 €	49 €
46/60 years old	18.3	58.7	23.1	2%	77 €	-5 €	71 €	2%	67 €	-5 €	62 €
61/75 years old	1.5	9.1	89.4	-7%	-87 €	2 €	-85 €	-12%	-136 €	3 €	-133 €
Over 75 years old	0.2	5.2	94.7	-18%	-126 €	5 €	-120 €	-30%	-194 €	8 €	-186 €
Perceived health status											
Very good/good	14.9	51	34.1	0%	21 €	-1 €	20 €	-2%	5 €	0 €	4 €
Rather good	12.6	31.5	55.9	-4%	-11 €	-2 €	-14 €	-8%	-43 €	-1 €	-45 €
Poor/very poor	6.8	24.5	68.7	-10%	-43 €	-7 €	-51 €	-17%	-83 €	-6 €	-89 €
Risk preferences											
The most risk-averse	11.8	35.5	52.7	-6%	-9 €	-5 €	-13 €	-13%	-38 €	-3 €	-42 €
Middle risk aversion	14.5	47.7	37.9	0%	15 €	0 €	15 €	-1%	-4 €	0 €	-4 €
The least risk-averse	16	51.3	32.7	0%	20 €	0 €	20 €	0%	6 €	0 €	6 €
Employment status											
Employed	22.1	65.4	12.5	3%	67 €	-4 €	63 €	3%	63 €	-4 €	59 €
Retired	0	5.8	94.2	-11%	-110 €	3 €	-107 €	-18%	-167 €	4 €	-163 €
Unemployment	32.2	28.7	39	5%	157 €	-9 €	148 €	4%	144 €	-9 €	135 €
Students	0	66.5	33.5	0%	-10 €	0 €	-10 €	-1%	-18 €	0 €	-18 €
House wife/husband	0	35.2	64.8	-9%	-66 €	3 €	-64 €	-14%	-100 €	4 €	-96 €
Substitution: YES	Winners	Neutrals	Losers	Expected Utility	Certainty Equivalent	Risk Premium	Expected Gains	Expected Utility	Certainty Equivalent	Risk Premium	Expected Gains
Mensual income per CU											
<= 1100€	8.7	32.6	58.8	-8%	-32 €	-5 €	-38 €	-15%	-58 €	-4 €	-62 €
1101€/1500€	7.9	41.2	50.9	-3%	-29 €	-2 €	-31 €	-5%	-50 €	-2 €	-52 €
1501€/2000€	8	46.2	45.8	-2%	-36 €	1 €	-34 €	-3%	-57 €	1 €	-55 €
>2000€	5.1	56	38.9	-1%	-29 €	0 €	-29 €	-2%	-48 €	0 €	-48 €
Age											
Under 30 years old	3.9	58.7	37.3	-1%	-26 €	0 €	-26 €	-2%	-31 €	0 €	-31 €
31/45 years old	7.6	64.0	28.4	0%	-3 €	-4 €	-7 €	0%	-8 €	-4 €	-12 €
46/60 years old	17.2	58.7	24.1	1%	24 €	-5 €	19 €	0%	14 €	-5 €	10 €
61/75 years old	1.4	9.1	89.5	-7%	-91 €	2 €	-90 €	-12%	-140 €	3 €	-137 €
Over 75 years old	0.2	5.2	94.7	-18%	-126 €	5 €	-121 €	-30%	-194 €	8 €	-186 €
Perceived health status											
Very good/good	7.6	51	41.4	-2%	-23 €	-1 €	-24 €	-3%	-39 €	0 €	-39 €
Rather good	7.4	31.5	61.1	-6%	-45 €	-2 €	-47 €	-10%	-77 €	-1 €	-78 €
Poor/very poor	4.9	24.5	70.6	-10%	-63 €	-7 €	-70 €	-18%	-102 €	-6 €	-108 €
Risk preferences											
The most risk-averse	7.1	35.5	57.3	-10%	-43 €	-4 €	-47 €	-17%	-73 €	-3 €	-76 €
Middle risk aversion	7.5	47.7	44.8	-1%	-26 €	0 €	-26 €	-2%	-44 €	0 €	-44 €
The least risk-averse	6.9	51.3	41.8	0%	-30 €	0 €	-31 €	0%	-45 €	0 €	-45 €
Employment status											
Employed	10.4	65.4	24.1	0%	-5 €	-4 €	-9 €	0%	-10 €	-4 €	-13 €
Retired	0	5.8	94.2	-11%	-110 €	3 €	-107 €	-18%	-167 €	4 €	-163 €
Unemployment	32.2	28.7	39	5%	157 €	-9 €	148 €	4%	144 €	-9 €	135 €
Students	0	66.5	33.5	0%	-10 €	0 €	-10 €	-1%	-18 €	0 €	-18 €
House wife/husband	0	35.2	64.8	-9%	-66 €	3 €	-64 €	-14%	-100 €	4 €	-96 €

Note: If no substitution is considered, there are 14.5% winners, 32.6% neutrals and 52.9% losers among people with income per CU under €1,100 per month.

7. Discussion

In this work, we simulate the likely effects of the Ani reform on the welfare of the study population taking into account the most likely changes in CHI coverage and individual characteristics such as age, income, health status and, risk aversion. We consider that employers may integrate their subsidy to their employees' wages. More specific to the French context, we take into account the likely harmful consequences of the reform on the individual policies premiums induced by the fact that mostly all employees were already insured by an individual policy before the reform.

The results show that, if wages do not decrease and if we consider the lowest increase in individual CHI premiums, the Ani reform may induce a weak increase in social welfare corresponding to an average gain of €8 per individual over 15 years old. However, as soon as we take into account the fact that employers may integrate their subsidy to their employees' wages, the reform reduces greatly social welfare which represents a monetary cost comprised between –31€ and –53€ (depending on the magnitude of individual CHI premiums increase) on average per individual. The loss of welfare that suffer insured on the CHI individual market is therefore hardly offset by the gain in welfare that benefit private sector employees, while the former are more often vulnerable. Otherwise, there may be a lot of individuals who would suffer from the reform while the part of winners is rather small. Note that as almost all employees were already insured before the Ani reform, the change in welfare is mainly driven by a change in the cost premiums and not by a decrease in risk exposure. For the small part of those who chose not to be insured before the reform and who may gain welfare when the employer partly pays the premium, the gain in welfare is mainly induced by a decrease in risk exposure, i.e. by a better protection against catastrophic out-of-pocket expenditures.

The effects of the Ani reform on the welfare of the population therefore depend on the strategy employers will establish to fund their subsidy. Although a direct decrease in wages seems unlikely in the very short term in France, employers may reduce the increase in wages on the middle term. They can also recover their costs reducing benefits such as bonuses, meal tickets, etc. This is especially credible as companies that did not offer collective CHI before the reform were mainly small businesses with limited room for manoeuvre (Perronnin *et al.*, 2012). Concerning the magnitude of individual policies premiums increase, a rise of 10% is pretty credible as it corresponds to the rise in OOP expenditures providers of individual policies will face due to the departure of employees. A rise of 15% is also possible, but more uncertain, if providers continue to offer deficit policies on the collective market. None of these assumptions were anticipated at the time of signing the Ani reform that was presented as a social advancement for employees who could benefit from employer subsidy to the premium. Providing additional control measures via public devices to favour CHI for the most vulnerable, especially the poorest and the oldest will be necessary to induce more competition on the individual market.

This *ex ante* evaluation is based on several assumptions that need to be discussed. Firstly, we use a CRRA-type expected utility function and 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. We present in Appendix A.6, A.7 and A.8, the effects of the reform on welfare by testing three other imputation methods. The first one considers a maximum value of 8, which corresponds, according to Gollier (2001), to twice a credible and rational threshold. The second one uses the 4 values observed by Barsky *et al.* (1997) without making any assumption on 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 individuals. The results confirm the robustness of our analyses with a lower magnitude of gains and losses on welfare. We then have considered that employer-sponsored CHI implemented as part of the Ani reform will offer the minimum level of coverage required by law for their employee only (not for their dependant). However, it is quite possible that some employers offer policies with higher reimbursement or that some employees decide to subscribe an extra policy to complete their collective one or to pay the entire amount of the collective policy in order to include their children and their spouse. Finally, this ex-evaluation is based on a static framework where individual characteristics, such as health status and health expenditures, will remain unchanged after the reform whereas some works have shown the role of the level of health insurance coverage on health expenditures (Buchmueller et al., 2004; Albouy and Crepon, 2007; Franc et al., 2015). However, we have showed that almost all the individuals may retain the same level of coverage (85%) and that only 2.5% may really gain an improvement of their coverage. The effect of the Ani reform on access to health care may therefore be quite limited, even if, given all the possible changes; it is difficult to anticipate it. Only an *ex post* evaluation, that will be important to run, will make it possible to do so.

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9. Appendices

Table A.1: Reimbursement of CHI policies A, B, C and C+

	Policy A	Policy B	Policy C	Policy C+
Specialists	100% actual cost	100% RP	30% RP	30% RP
GPs	100% actual cost	50% RP	30% RP	30% RP
Medical and paramedical procedures	30% RP	30% RP	30% RP	30% RP
Biology	30% RP	30% RP	30% RP	30% RP
Dentures	400% RP	300% RP	100% RP	125% RP
Eyeglasses and lenses				
Frames	150 €	150 €	50 €	50 €
Simple lenses	160€/lense	75€/lense	25€/lense	25€/lense
Simple lense+Complex lense	160€/lense	75€/lense	37,5€/lense	50€/lense
Simple lense+Very complex lense	160€/lense	75€/lense	37,5€/lense	37,5€/lense
Complex lenses	300€/lense	125€/lense	75€/lense	75€/lense
Complex lense+Very complex lense	300€/lense	125€/lense	75€/lense	75€/lense
Very complex lenses	300€/lense	125€/lense	75€/lense	75€/lense
Contact lenses	Actual cost	150 €	100 €	100 €
Hospitalisation				
Daily rate	100% actual cost	100% actual cost	100% actual cost	100% actual cost
Cost of stay	100% RP	100% RP	100% RP	100% RP
Excess fees	100% actual cost	100% RP	30% RP	30% RP

* RP = Regulated Prices

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: 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€	86.5€	111.5€	55€
Policy C	33€	50.5€	75€	94€	50.5€
All	33€	51€	76€	95€	70€

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

Table A.3: Description 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 Uninsured/ C Coll	Path 9 Uninsured / Uninsured	Total Eff.
CHI (Before the ANI reform)										
Without CHI	0%	0%	0%	0%	0%	0%	0%	34%	66%	264
Collective policy	53%	37%	10%	0%	0%	0%	0%	0%	0%	2,165
Individual policy	0%	0%	0%	35%	10%	44%	11%	0%	0%	3,693
Income per CU										
<= 1100€	11%	7%	4%	9%	2%	47%	10%	2%	6%	1,582
1101€/1500€	14%	14%	4%	13%	4%	35%	11%	1%	3%	1,590
1501€/2000€	19%	16%	4%	31%	10%	14%	4%	2%	2%	1,398
>2000€	30%	15%	3%	31%	7%	10%	2%	1%	1%	1,552
Age										
15/29 years old	24%	19%	6%	10%	9%	17%	9%	3%	3%	889
30/44 years old	29%	20%	5%	10%	9%	12%	11%	3%	2%	1,423
45/59 years old	26%	18%	4%	15%	8%	15%	9%	1%	3%	1,703
60/74 years old	4%	2%	1%	41%	2%	46%	1%	0%	4%	1,389
75 years old and over	0%	0%	0%	37%	0%	59%	0%	0%	5%	718
Perceived health status										
Very good/Good	23%	15%	4%	20%	7%	21%	7%	2%	2%	4,097
Fair	12%	10%	3%	24%	4%	36%	6%	2%	3%	1,566
Poor/Very poor	4%	6%	2%	22%	1%	49%	4%	1%	10%	459
Risk preferences										
The most risk averse	16%	9%	2%	24%	4%	34%	6%	1%	4%	1,903
Fairly risk averse	20%	15%	4%	20%	6%	24%	7%	1%	3%	3,787
The least risk averse	20%	18%	4%	16%	7%	20%	7%	4%	4%	432
Employment status										
Employed	29%	21%	6%	11%	10%	10%	11%	2%	1%	3,155
Retired	1%	0%	0%	42%	0%	53%	0%	0%	4%	1,801
Unemployment	12%	8%	2%	13%	7%	28%	15%	5%	9%	293
Students	32%	21%	3%	14%	0%	27%	0%	0%	3%	390
House wife/husband	14%	8%	5%	25%	0%	41%	0%	0%	8%	311
Other inactive	4%	1%	0%	29%	0%	55%	0%	0%	10%	167
Unknown	0%	0%	0%	41%	0%	59%	0%	0%	0%	5
All - Number by path	1,162	799	204	1,308	321	1,679	385	78	186	6,122
% in the sample	19%	13%	4%	21%	6%	26%	7%	2%	3%	100%

Interpretation: Among individuals whose income per CU is less than €1,100 per month, 11% belong to the insurance path 1 (A Coll./A Coll.).

Table A.4: Evolution in OOP expenses that remain after reimbursements of the public health insurance between the pools of individual CHI before and after the Ani reform

Time	Average	Evolution	P25	Evolution	P50	Evolution	P75	Evolution
Before the Ani reform	643 €	8%	142 €	19%	393 €	11%	840 €	8%
After the Ani reform	695 €		169 €		436 €		904 €	

Table A.5: 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)										
0	29	76	141	231	337	467	653	900	1357	9296
OOP payments after reimbursment of CHI (Simulated) - Policy A										
0	1	6	11	19	27	41	58	75	106	3080
OOP payments after reimbursment of CHI (Simulated) - Policy B										
0	2	9	18	29	47	68	93	157	330	3676
OOP payments after reimbursment of CHI (Simulated) - Policy C										
0	2	10	23	44	72	115	208	358	624	7816
OOP payments after reimbursment of CHI (Simulated) - Policy C+										
0	2	10	23	44	72	111	205	352	611	7816

Table A.6: Robustness of the relative risk aversion attribution method – Results 1 (Collective welfare)

	Imputation - Gamma 2				Imputation - Gamma 3				Imputation - Gamma 4			
	Expected Utility		Certainty Equivalents		Expected Utility		Certainty Equivalents		Expected Utility		Certainty Equivalents	
	Absolute variation	Relative variation	All	On average	Absolute variation	Relative variation	All	On average	Absolute variation	Relative variation	All	On average
All the population (6122)												
Substitution NO - Increase of 10%	16.48	0.05%	41,568 €	7 €	11.26	0.04%	46,119 €	8 €	-1.2E-08	-0.08%	40,914 €	7 €
- Increase of 15%	8.87	0.03%	-88,903 €	-15 €	4.63	0.02%	-86,635 €	-14 €	-8.7E-08	-0.56%	-89,111 €	-15 €
Substitution YES - Increase of 10%	-22.61	-0.08%	-199,266 €	-33 €	-14.17	-0.05%	-195,564 €	-32 €	-1.2E-07	-0.76%	-199,819 €	-33 €
- Increase of 15%	-30.22	-0.10%	-329,737 €	-54 €	-20.81	-0.07%	-328,319 €	-54 €	-1.9E-07	-1.25%	-329,844 €	-54 €
Path 4 (1308) - Individual B / Individual B												
Increase of 10%	-9.05	-0.15%	-122,129 €	-93 €	-5.67	-0.12%	-122,621 €	-94 €	-3.3E-08	-1.53%	-122,057 €	-93 €
Increase of 15%	-13.82	-0.22%	-186,170 €	-142 €	-8.7	-0.18%	-186,943 €	-143 €	-5.2E-08	-2.42%	-186,058 €	-142 €
Path 5 (321) - Individual B / Collective C+												
Substitution NO	16.27	0.62%	123,701 €	385 €	9.9	0.49%	118,684 €	370 €	2.3E-08	4.17%	124,369 €	387 €
Substitution YES	0.56	0.02%	20,921 €	65 €	1.06	0.05%	15,661 €	49 €	2E-09	0.36%	21,613 €	67 €
Path 6 (1679) - Individual C / Individual C												
Increase of 10%	-5.28	-0.13%	-132,430 €	-79 €	-6.98	-0.13%	-136,415 €	-81 €	-1.1E-07	-1.78%	-131,640 €	-78 €
Increase of 15%	-8.12	-0.21%	-198,859 €	-118 €	-10.59	-0.20%	-204,849 €	-122 €	-1.7E-07	-2.70%	-197,663 €	-118 €
Path 7 (385) - Individual C / Collective C+												
Substitution NO	16.91	0.97%	156,090 €	405 €	13.47	0.77%	162,789 €	423 €	1E-07	7.03%	155,117 €	403 €
Substitution YES	7.77	0.45%	41,754 €	108 €	3.47	0.20%	47,941 €	125 €	2.8E-08	1.97%	40,846 €	106 €
Path 8 (78) - Uninsured / Collective C+												
Substitution NO	-3.45	-0.21%	4,529 €	58 €	-1.14	-0.10%	11,854 €	152 €	4E-09	1.45%	3,322 €	43 €
Substitution YES	-17.70	-1.08%	-19,188 €	-246 €	-7.73	-0.66%	-11,958 €	-153 €	-9E-09	-3.27%	-20,384 €	-261 €

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: Robustness of the relative risk aversion values attribution method - Results 2 (Part of winners, losers and neutrals)

	Imputation - Gamma 2			Imputation - Gamma 3			Imputation - Gamma 4		
	Winners	Neutrals	Losers	Winners	Neutrals	Losers	Winners	Neutrals	Losers
All the population (6122)									
Substitution NO (increase of 10% or 15% in premiums)	14%	44%	42%	14%	44%	42%	14%	44%	42%
Substitution YES (increase of 10% or 15% in premiums)	7%	44%	49%	7%	44%	48%	7%	44%	49%
Path 4 - Individual B / Individual B									
Increase in premiums (10% or 15%)	0%	15%	85%	0%	15%	85%	0%	15%	85%
Path 5 - Individual B / Collective C									
Substitution NO	99%	0%	1%	99%	0%	1%	99%	0%	1%
Substitution YES	50%	0%	50%	49%	0%	51%	50%	0%	50%
Path 6 - Individual C / Individual C									
Increase in premiums (10% or 15%)	0%	11%	89%	0%	11%	89%	0%	11%	89%
Path 7 - Individual C / Collective C									
Substitution NO	100%	0%	0%	100%	0%	0%	100%	0%	0%
Substitution YES	54%	0%	46%	55%	0%	45%	54%	0%	46%
Path 8 - Uninsured / Collective C									
Substitution NO	51%	0%	49%	57%	0%	43%	53%	0%	47%
Substitution YES	22%	0%	78%	26%	0%	74%	17%	0%	83%

Table A.8: Robustness of the relative risk aversion values attribution method - Results 3 (Welfare and certainty equivalents distributions)

	All				Path 4		Path 5		Path 6		Path 7		Path 8		All				Path 4		Path 5		Path 6		Path 7		Path 8	
	Subs. NO		Subs. YES		Ind B/Ind B		Ind B/Coll C+		Ind C/Ind C		Ind C/Coll C+		NC/Coll C+		Subs. NO		Subs. YES		Ind B/Ind B		Ind B/Coll C+		Ind C/Ind C		Ind C/Coll C+		NC/Coll C+	
	Premiums increase				Prem. increase		Subs.		Prem. increase		Subs.		Subs.		Premiums increase				Prem. increase		Subs.		Prem. increase		Substitution		Subs.	
	10%	15%	10%	15%	10%	15%	No	Yes	10%	15%	No	Yes	No	Yes	10%	15%	10%	15%	10%	15%	No	Yes	10%	15%	No	Yes	No	Yes
Gamma 2																												
Average	0%	-1%	-1%	-2%	-2%	-3%	5%	1%	-3%	-4%	8%	2%	2%	-2%	7 €	-15 €	-33 €	-54 €	-95 €	-145 €	346 €	58 €	-82 €	-123 €	373 €	100 €	48 €	-205 €
P95	7%	7%	2%	2%	0%	0%	13%	6%	0%	0%	22%	16%	23%	9%	410 €	410 €	108 €	108 €	0 €	0 €	676 €	451 €	0 €	0 €	613 €	574 €	365 €	268 €
P90	2%	2%	0%	0%	0%	0%	10%	4%	0%	0%	18%	10%	7%	6%	255 €	255 €	0 €	0 €	0 €	0 €	538 €	239 €	0 €	0 €	576 €	457 €	266 €	203 €
P75	0%	0%	0%	0%	0%	0%	8%	2%	-1%	-1%	12%	4%	2%	0%	0 €	0 €	0 €	0 €	-60 €	-96 €	522 €	218 €	-60 €	-96 €	552 €	252 €	189 €	-105 €
P50	0%	0%	0%	0%	-1%	-2%	4%	0%	-2%	-3%	7%	1%	0%	-1%	0 €	0 €	0 €	0 €	-120 €	-180 €	352 €	45 €	-96 €	-144 €	402 €	96 €	3 €	-303 €
P25	-2%	-2%	-2%	-3%	-3%	-4%	2%	-1%	-4%	-6%	3%	-1%	0%	-6%	-96 €	-144 €	-97 €	-145 €	-120 €	-180 €	155 €	-151 €	-99 €	-149 €	263 €	-43 €	-99 €	-405 €
P10	-4%	-6%	-4%	-6%	-5%	-7%	0%	-3%	-6%	-9%	1%	-3%	-2%	-10%	-120 €	-180 €	-122 €	-181 €	-144 €	-228 €	141 €	-165 €	-122 €	-182 €	155 €	-151 €	-119 €	-425 €
P5	-5%	-8%	-6%	-9%	-6%	-9%	0%	-4%	-8%	-12%	0%	-5%	-3%	-16%	-124 €	-185 €	-144 €	-228 €	-144 €	-228 €	137 €	-169 €	-123 €	-185 €	152 €	-154 €	-164 €	-470 €
Gamma 3																												
Average	-1%	-3%	-3%	-5%	-5%	-9%	11%	0%	-8%	-13%	19%	6%	10%	1%	8 €	-14 €	-32 €	-54 €	-95 €	-145 €	332 €	44 €	-84 €	-127 €	389 €	115 €	126 €	-127 €
P95	18%	18%	2%	2%	0%	0%	31%	13%	0%	0%	57%	43%	73%	70%	418 €	418 €	134 €	134 €	0 €	0 €	668 €	449 €	0 €	0 €	724 €	581 €	677 €	677 €
P90	2%	2%	0%	0%	0%	0%	28%	10%	0%	0%	49%	30%	35%	25%	241 €	241 €	0 €	0 €	0 €	0 €	536 €	237 €	0 €	0 €	615 €	459 €	383 €	323 €
P75	0%	0%	0%	0%	0%	0%	20%	3%	-1%	-1%	35%	12%	8%	1%	0 €	0 €	0 €	0 €	-60 €	-96 €	457 €	177 €	-60 €	-96 €	552 €	259 €	204 €	68 €
P50	0%	0%	0%	0%	-2%	-2%	7%	0%	-5%	-7%	10%	1%	0%	-1%	0 €	0 €	0 €	0 €	-120 €	-180 €	285 €	-26 €	-96 €	-145 €	404 €	98 €	58 €	-248 €
P25	-2%	-3%	-4%	-5%	-9%	-14%	2%	-2%	-13%	-20%	3%	-1%	0%	-5%	-97 €	-145 €	-100 €	-150 €	-120 €	-181 €	155 €	-151 €	-112 €	-167 €	264 €	-42 €	-68 €	-375 €
P10	-12%	-19%	-13%	-20%	-13%	-22%	0%	-11%	-21%	-34%	1%	-4%	-3%	-24%	-121 €	-181 €	-129 €	-183 €	-144 €	-229 €	138 €	-168 €	-127 €	-190 €	155 €	-151 €	-118 €	-424 €
P5	-18%	-28%	-19%	-29%	-19%	-32%	0%	-14%	-27%	-43%	1%	-14%	-4%	-41%	-136 €	-203 €	-145 €	-224 €	-145 €	-230 €	129 €	-178 €	-134 €	-201 €	152 €	-154 €	-164 €	-470 €
Gamma 4																												
Average	0%	0%	0%	-1%	-1%	-2%	3%	1%	-1%	-2%	5%	1%	1%	-3%	7 €	-15 €	-33 €	-54 €	-95 €	-145 €	348 €	60 €	-81 €	-122 €	371 €	98 €	35 €	-217 €
P95	5%	5%	1%	1%	0%	0%	8%	5%	0%	0%	12%	9%	4%	4%	408 €	408 €	106 €	106 €	0 €	0 €	671 €	453 €	0 €	0 €	584 €	573 €	262 €	256 €
P90	2%	2%	0%	0%	0%	0%	6%	3%	0%	0%	9%	6%	4%	3%	257 €	257 €	0 €	0 €	0 €	0 €	539 €	239 €	0 €	0 €	571 €	458 €	216 €	204 €
P75	0%	0%	0%	0%	-1%	-1%	4%	2%	-1%	-1%	7%	3%	2%	-2%	0 €	0 €	0 €	0 €	-60 €	-96 €	526 €	223 €	-60 €	-96 €	552 €	250 €	187 €	-118 €
P50	0%	0%	0%	0%	-1%	-1%	3%	0%	-1%	-2%	5%	1%	0%	-3%	0 €	0 €	0 €	0 €	-120 €	-180 €	359 €	52 €	-96 €	-144 €	402 €	96 €	12 €	-294 €
P25	-1%	-2%	-1%	-2%	-1%	-2%	2%	-1%	-2%	-3%	3%	-1%	-1%	-5%	-96 €	-144 €	-96 €	-145 €	-120 €	-180 €	154 €	-152 €	-97 €	-146 €	264 €	-42 €	-104 €	-410 €
P10	-2%	-3%	-2%	-3%	-2%	-3%	1%	-2%	-3%	-4%	2%	-2%	-2%	-7%	-120 €	-180 €	-121 €	-181 €	-144 €	-228 €	140 €	-166 €	-121 €	-181 €	155 €	-152 €	-114 €	-420 €
P5	-2%	-4%	-3%	-4%	-2%	-4%	1%	-2%	-3%	-5%	1%	-3%	-2%	-8%	-121 €	-182 €	-144 €	-223 €	-144 €	-228 €	139 €	-167 €	-121 €	-182 €	152 €	-154 €	-161 €	-467 €