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Out-of-pocket Maximum Rules under a Compulsory Health Care Insurance Scheme: A Choice between Equality and Equity[1]

Thierry Debrand[a, b] and Christine Sorasith[a]

Abstract

Using the microsimulation model ARAMMIS, this study attempts to measure the impacts of introducing an out-of-pocket (OOP) maximum threshold, or a safety net threshold, on consumer copayments for health care financed by the abolition of the Long-term Illness Regime (ALD) in France. The analysis is based on a comparison of different safety net threshold rules and their redistributive effects on patients' OOP payments. We attach particular importance to indicators that bring to light changes in OOP payment levels and measure their impact on the equity of OOP distribution. The first section outlines the French National Health System to provide a better understanding of the stakes involved in reforming the health care reimbursement rules under the Compulsory Health Care Insurance scheme. In the second section, we describe the hypotheses retained, the database and the microsimulation model. The final section presents key findings, measuring the impact of the reform at both individual and system levels.

Keywords: Microsimulation, Health expenditure, Out-of-pocket payment.

Codes JEL: I18, H51, D63.

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Résumé

Bouclier sanitaire : choisir entre égalité et équité[2]
Une analyse à partir du modèle ARAMMIS

Cet article cherche à mesurer, à l'aide du modèle d'Analyse des réformes de l'Assurance maladie par micro-simulation statique (ARAMMIS), les effets de la mise en place d'un bouclier sanitaire financé par la suppression du régime des affections de longue durée (ALD). Notre étude repose sur la comparaison des conséquences redistributives de différentes règles de boucliers sur les restes à charge des patients dans le secteur ambulatoire en France. Nous attachons une importance particulière aux indicateurs permettant de mettre en évidence les modifications des restes à charge et de mesurer l'évolution du système en termes d'équité. Nous présentons, dans une première partie, le cadre général du système de santé en France pour mieux comprendre le contexte et les enjeux d'une refonte du mode de remboursement lié à l'Assurance maladie obligatoire. Dans une deuxième partie, nous décrivons les hypothèses retenues, la base de données et le modèle de micro-simulation. Enfin, nous consacrons la dernière partie à la présentation des principaux résultats mesurant l'impact de la réforme tant au niveau des individus qu'au niveau du système.

Mots-clefs: Micro-simulation, Dépenses de santé, Restes à charge.

Codes JEL: I18, H51, D63.

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Introduction

The present Social Security system in France officially came into being with the Ordinance of 1945, which established a pact of solidarity between all French citizens. *'A Social Security system has been instituted to guarantee workers and their families protection against social risks of whatever nature susceptible of reducing or impeding their ability to earn a living, to cover maternity costs or family expenses.'* Its aim is to protect individuals from social risks related to health, employment, the family and retirement. In terms of health, social protection is provided by a Compulsory Health Care Insurance scheme, to which contributions are mandatory, based on the fairly simple principle that 'each pays according to their abilities and receives according to their needs.' To this basic principle are added a certain number of schemes that permit health care costs partially covered by Social Security (Sickness Insurance) to be wholly reimbursed for certain diseases or under specific circumstances (e.g., long-term illness, or the ALD scheme, pregnancy, and occupational accidents). The system exhibits specific reimbursement characteristics: independent of income and remaining out-of-pocket payments (OOP) can be excessive (OOP payments are the difference between actual health expenditures and the amount reimbursed by Compulsory Health Care Insurance).

Excessive or 'catastrophic' OOP payments can be defined in two ways. In the first definition, catastrophic OOP payments are associated with a period of illness that temporarily or durably deteriorates a patient's health status and requires extremely expensive care that is not always reimbursed by the Compulsory Health Care Insurance scheme. In the second definition, OOP payments are considered as an absolute value measured against income or an individual's ability to pay (Abul Naga and Lamiraud, 2008). In this case, OOP payments are qualified as 'catastrophic' if they lower a household's standard of living or if they represent a significant percentage of the household income over and above a certain critical threshold (Xu *et al.*, 2003; Wagstaff and van Doorslaer, 2003; van Doorslaer et al., 2007; Pradhan and Prescott, 2002 and Flores *et al.*, 2008). Economic literature provides a number of studies that estimate this threshold at between 5% (Berki, 1986) and over 40 % (Xu *et al.*, 2003) according to country and social protection systems.

Catastrophic OOP payments are an indicator of a health insurance system's performance and can reveal insufficient risk coverage (Scheil-Adlung *et al.*, 2006). The notion of equity in a reimbursement system effectively implies that households should be protected against such excessive expenditures. Moreover, a link between poverty levels and excessive health expenditures has already been established (Abul Naga and Lamiraud, 2008). According to Whitehead, Dahlgreeb and Evans (2001), an increase in OOP payments pushes some families down to the poverty level and aggravates hardship among families already at the poverty level. These additional health expenditures replace short-term consumption and long-term savings, thereby reducing families' well-being. In France, even if the majority of excessive OOP expenses are captured by the specific health insurance schemes, high OOP expenses persist (Tabuteau, 2006).

The way OOP payments are distributed between patients and the inequalities they generate have led public policy-makers and economists to question the sustainability of the current system and to imagine possible evolutions. One of these alternatives involves substituting the long-term illness scheme (ALD: system that provides 100% coverage for patients with a recognized chronic disease), with one that provides an

OOP maximum threshold or a copayment safety net threshold[3] (Bras, Grass and Obrecht, 2007). Briet and Fragonard (2007) present the interests, impacts and limitations of instituting a safety net system introducing a threshold on OOP payments. These authors consider that an OOP maximum threshold would protect households from catastrophic health expenditures, reduce the number of households foregoing care by protecting low-income households and, finally, simplify the current complexities of the reimbursement system whilst facilitating the control of public health spending.

The nature of the OOP maximum threshold thus depends on the chosen definition of catastrophic OOP payments. Based on the first definition of catastrophic OOP, the safety net would introduce a uniform, fixed OOP maximum applicable to all and independent of income. If one retains the second definition, in which OOP payments are related to income, the safety net threshold would necessarily be determined according to income level. The notion of 'equality' in the distribution of OOP payments is defined as the equal treatment of all individuals, and 'equity' is defined as the notion of 'proportional equality,' suggesting that all individuals are treated equally but according to income level.

Our objectives in this study are to simulate hypothetical reform models and to measure their redistributive effects. Particular importance is thus attached to indicators that enable us to measure the evolution of equity within the system under analysis. In this context, the study is structured as follows: The first section outlines the French National Health System to provide a better understanding of the stakes involved in reforming the health care reimbursement rules under the Compulsory Health Care Insurance scheme. The second section describes the retained hypotheses, the database and the microsimulation model, ARAMMIS (Analyse des Réformes de l'Assurance Maladie par Microsimulation Statique; Analysis of Health Insurance Reforms by Static Microsimulation). ARAMMIS is a static, exogenous microsimulation model built by IRDES with the aim of simulating different reforms by modifying the variables used in calculating the financial burden of the insured, such as reimbursement rates, financial contributions and the possibility of abolishing one or several forms of exoneration. The final section is devoted to presenting the key findings, using different tools to measure the impact of the reform at both individual and system levels.

1. The stakes involved in reforming the reimbursement system

In France, health insurance is mainly provided by the Compulsory Health Care Insurance scheme. Essentially Bismarkian, the system was originally financed in the majority by employer-employee contributions. Around the mid-1970's, with the arrival of mass unemployment, the reduced share of wages in the national revenue, the aging of the population and a certain desire for greater social justice, the system evolved to adopt a more Beveridgian logic, as it effectively became more and more dependent on financing from taxes (Palier, 2005). The health insurance scheme is essentially financed by social contributions deducted from earnings, income tax and other taxes, such as the General Social Tax (CSG). This supplementary income tax, created in 1990, accounts for approximately 30% of Compulsory Health Care Insurance funding. Contributions are thus income-related rather than risk-related, which can be interpreted as a redistribution mechanism that should guarantee a degree of equality between the insured in terms of health care costs. These statutory contributions cover a percentage of the health expenditures of all the insured. Other sources of health insurance funding come from

3 For us, in this article an OOP maximum threshold and a copayment safety net threshold are synonymous.

copayments, the percentage of a patient's health expenditures that are not reimbursed by the insurance system (*cf.* Elbaum, 2008, for a more detailed presentation of patient contributions to health expenditures in France).

Since the beginning of the 2000's, the distribution of health expenditures reimbursed by the Compulsory Health Care Insurance system has remained relatively stable; 65% of expenditures concern ambulatory care (outside hospital care expenditures), even if the latest statistics indicate a slight drop. This relative stability in fact hides radical changes that occurred in the wake of two contradictory trends. The first was an increase in patients' individual contributions, which effectively decreased collective contributions. The second came from the introduction of the Long-Term Illness scheme (ALD), through which an increasing number of insured were able to benefit from 100% reimbursement of health care expenditures. The two together altered the nature of the reimbursement system. Stability is obtained through the selection of risks: the system provides less protection from small risks by increasing patients' financial contributions and, *on the contrary*, provides better risk and expense coverage for patients that are chronically ill. Progressively, this risk selection leads to the 'non-avowed' questioning of the 1945 solidarity pact that in turn radically modifies the system's redistributive effect.

1.1. Health insurance: increase in expenditures and patients' financial contributions

The National Health Insurance system designers instituted patient copayments from the beginning with the introduction of the *'ticket modérateur,'* a fixed copayment system. Uniformly applied to all of the insured, it can nevertheless have a negative impact on access to health care. The *'ticket modérateur'* was legitimized, on the one hand, by the desire to reduce social injustices and, on the other, by its potential to reduce *ex-post* moral hazard by instilling a greater sense of consumer responsibility.

Driven by technological progress, health care consumption behaviors and use rates, and to a lesser extent the impact of an aging population, health spending nevertheless continued to outpace national wealth (Grignon, Huber and Dormont, 2006). Public health expenditures increased more rapidly than public revenues (Elbaum, 2008). Since 1950, successive governments have initiated a series of recovery plans. The Veil, Barrot, Seguin, Evin, Bianco (and the followings) reform plans, initiated between 1967 and 1995, concerned increases in contribution levels, cut-backs in the reimbursement of prescribed medicines, raising copayments for hospital care and the creation of a fixed copayment for hospital services. These reforms proved to be financially ineffective (the Health Insurance budget deficit still exists) and socially unjust (affecting all individuals whatever their income). Subsequent governments introduced more structural reforms with the aim of regulating the health system and modifying agents' behaviors (Juppé Ordinances of 1995). The 2004 Douste-Blazy Reform Plan instituted the introduction of the fixed 1€ copayment for consultations, increased copayments for hospital services from 12 to 16€ and introduced the Personal Medical File aimed at coordinating a patient's care path. In 2006, a fixed, universal copayment of 18€ on medical acts costing over 91€ was introduced and, in 2008, deductibles on prescribed drugs, paramedical care and transport.

It should not be forgotten, however, that a reduction in Social Security reimbursements designed to more or less offset budget deficits can have an adverse effect on lower-income populations that may be inclined to forego care in the face of increased costs. It can also significantly increase OOP payments for the chronically ill.

1.2. Health insurance and health and social risk coverage

There are three main insurance systems, either 'public' or 'private,' to cover these two types of risk.

The first, a 'public' insurance system, is the Universal Health Insurance Coverage (CMU-Couverture Maladie Universelle). It allows the most disadvantaged population group (individuals whose monthly income per consumption unit is below 598€) to benefit from 100% health expenditure [4] coverage that, in theory, exempts them from OOP expenses. The effects of this universal coverage are not analyzed in this study.

The second, a 'private' insurance system, concerns supplementary health insurance. It completes the reimbursement levels offered by the statutory health insurance scheme[5] (Grignon, Perronnin and Lavis, 2008). Even if 93% of the French have supplementary insurance coverage (of which 7% thanks to the CMU), households without supplementary insurance are often the most fragile with the lowest income levels. Transferring the weight of reimbursements from National Health Insurance to supplementary insurance, however, may result in increasing health inequalities and reinforcing the CMU threshold effect. The introduction of the ACS (Aide à la Complémentaire Santé) scheme, providing financial assistance for the acquisition of supplementary insurance, aims at limiting this threshold effect (Grignon and Kambia-Chopin, 2009). Moreover, it should not be forgotten that supplementary insurance is paid directly or indirectly by individuals and that all the additional health care services covered by these private insurance schemes are rapidly translated into higher premiums paid by the insured. This is all the more problematic because the premiums are not proportional to income.

Finally, the third system, a 'public' insurance scheme that will be dealt with more specifically in this study, concerns the Long-Term Illness Scheme (ALD). Individuals suffering from a chronic illness are covered at 100% for all expenses related to that specific illness. For any other unconnected health event, reimbursements come under the general insurance statutory insurance scheme. The ALD is not a medical concept but a medico-administrative one. Its aims are economic, on the one hand, by attempting to neutralize 'catastrophic' health costs and medical on the other hand, by ensuring the better follow-up care of patients recognized as suffering from a long-term illness. The list of recognized diseases does not include all chronic, costly diseases but rather focuses on diseases with high long-term therapeutic costs. The number of patients admitted to the ALD scheme increases by 3.5% every year (Païta and Weill, 2009). This scheme currently generates 62.3% of National Health Insurance reimbursements, whereas it only concerns 14.6% of the population insured, that is, 8.3 million individuals (Païta and Weill, 2008), and will represent over 70% of expenditures in 2015 (Obrecht, 2009). Despite its usefulness and importance, the ALD scheme is not without its shortcomings. Firstly, it creates ratchet effects: few individuals leave the scheme 'voluntarily.' Secondly,

4 Health professionals are obliged to apply binding tariffs to individuals benefitting from the CMU (price fixed by the government without the possibility of charging above the statutory fee).

5 Supplementary insurance offers incomplete coverage. It does not, for example, cover deductibles.

the diseases covered by the ALD scheme are extremely heterogeneous, and there is no correlation between the cost and gravity of an illness and its inclusion in the ALD scheme. Thirdly, it can be a source of inequalities. It is the General Practitioner (GP), in a one-to-one relationship with the patient in a specific environment, who decides whether or not the patient is eligible for ALD. Finally, it does not completely resolve the problem of catastrophic OOP payments for all the patients benefiting from the ALD scheme (Geoffard, 2006).

This two-fold observation: the trend dynamics that point to an increase in the number of persons benefiting from ALD and the continued existence of large OOP payments lead to reflections on possible ways of improving the current system (Bras, Grass and Obrecht, 2007). One possibility would be to replace the ALD scheme with a system of OOP maximums. Briet and Fragonard (2007) proposed the safety net threshold for OOP payments, a system already in place in numerous European countries.

2. The reform: hypotheses, simulation tools and fields of investigation

The idea is based on a system that would impose a safety net threshold for OOP payments. In other words, once the threshold is reached, additional health expenditures would be universally reimbursed at 100%, regardless of the disease or care motive. The ultimate goal is to find an equitable reimbursement system that is not simply aimed at curbing public health costs to the point of penalizing the sick.

In Europe, countries such as Switzerland, Germany, Sweden, the Netherlands and Belgium have already instituted a system of OOP maximums either globally or by sector (Chambaretaud and Hartman, 2007). In Belgium and Germany, OOP maximums are fixed according to annual household income. In these countries, where copayments are intended to increase user responsibility with regards to health care consumption, recourse to supplementary insurance is limited, prohibited in Switzerland and non-existent in the Netherlands and Sweden. Compared to these countries, France appears to be behind in dealing with this issue but has several targeted protection mechanisms related to health status (insured through the ALD scheme) or status (e.g., pregnant women, the disabled and occupational accidents). These two systems (general insurance scheme with OOP maximums or specifically targeted policies) are seemingly incompatible [6]. In European countries, another criterion aside from revenue can intervene in the definition of OOP maximums: health status. In Germany and Belgium, specific schemes for patients suffering from chronic diseases exist without a predetermined list of eligible diseases having been established beforehand.

6 In all of these countries, however, there exist targeted protection mechanisms aimed at pregnant women and the elderly.

2.1. Hypothetical OOP safety net threshold models

The reforms tested are based on several hypotheses: the abolition of the Long-Term Illness scheme (ALD), the creation of an OOP expenses safety net threshold and the neutrality of the insurance system (the health insurance system will neither gain nor lose from the reform). Mathematically, the condition statement optimization program consists of finding the OOP maximum that confirms the following equilibrium:

$$\Delta = \sum_i OOP_{current} - \sum_i OOP_{reform} = 0$$

where i represents the insured in our database, $OOP_{current}$ are OOP payments before reform and OOP_{after} are OOP payments after reform. This statement condition optimization allows us to focus solely on the redistributive nature of OOP payments calculated according to a maximum threshold rule. The OOP maximum is defined as the threshold that protects the insured against 'catastrophic expenses' as, over and above that threshold, expenses would be covered at 100%. In this analysis, we chose to finance the safety net threshold scheme solely through the abolition of the ALD scheme. The CMU threshold rules are not altered. Where income is taken into account in the analysis, income level is taken as being above the CMU threshold.

This being the case, the different safety net threshold levels only change in form and nature. We thus propose analyzing three OOP-safety net threshold models.

- The **uniform threshold** (UT) applies a uniform OOP threshold to all of the insured regardless of their incomes. This can be compared to the guaranteed *stop loss* offered by certain private insurance companies in the United States (Cutler and Zeckhauser, 2000). In the framework of the French debate, the idea of a 'sickness deductible' was put forward by Simon[7] (2007):

$$Threshold_{UT} = \alpha_{UT} \qquad \forall Inc_{cu}$$

- The **income-related threshold** (IRT) fixes an individual OOP threshold calculated according to gross annual income by consumption unit. The rule of proportionality is written as follows:

$$Threshold_{IRT} = \alpha_{IRT}\left(Inc_{cu} - Threshold_{cmu}\right)$$

- The **income-related threshold with an increasing marginal effect** (IRTM) is based on the preceding rule but marginally increases the proportionality coefficient by calculating OOP thresholds by income bracket: wealthier individuals will have a marginally higher OOP threshold before being eligible for 100% coverage:

If income is below 1,200 €: $Threshold^1_{IRTM} = \alpha_{IRTM}\left(Inc_{cu} - Threshold_{cmu}\right)$

If income is between 1,200 and 1,800 €: $Threshold^2_{IRTM} = Threshold^1_{IRTM} + 2\alpha_{IRTM}\left(Inc_{cu} - 1{,}200\right)$

If income is between 1,800 and 2,400 €: $Threshold^3_{IRTM} = Threshold^2_{IRTM} + 3\alpha_{IRTM}\left(Inc_{cu} - 1{,}800\right)$

If income is over 2,400 €: $Threshold^4_{IRTM} = Threshold^3_{IRTM} + 4\alpha_{IRTM}\left(Inc_{cu} - 2{,}400\right)$

$$Threshold_{IRTM} = \sum_{i=1}^{4} Threshold^i_{IRTM}$$

7 The proposition made by Simon (2007) was more ambitious in that it was based on the assumption that the current reimbursement system (health insurance reimbursement + copayment) would be replaced by a fixed, uniform deductible. In all of our simulations, we maintained the current system to observe the effect of abolishing the ALD scheme exclusively. The 'Simon' simulation might be envisaged in the future.

The income-related maximum threshold is very similar to the system of Maximum Billing (MAB) that was introduced in Belgium in 2002 (Schokkaert *et al.,* 2008)

Threshold coefficients α_{UT}, α_{IRT} and α_{IRTM} are calculated to guarantee the neutrality of the different reforms with regards to the Compulsory Health Care Insurance scheme.

The three OOP maximum models are each based on a different logic. The UT assumes that all individuals are treated identically regardless of income. Thus, it respects the principle of uniformity underlying the 1945 solidarity pact, ensuring that all individuals have an identical 'maximum risk' protecting them from excessive OOP payments. The UT hypothesis, however, fails to take into account individuals' ability to pay: the financial participation related to income demanded from individuals with more modest incomes is greater than for those with higher incomes. The OPP threshold proposed by the UT model will not protect lower income individuals from catastrophic OOP payments in relation to their income. The IRT and IRTM models differ in the fact that thresholds are calculated taking income levels into account. For these two models, the copayment threshold increases according to income level, but for the IRTM, this increase is non-linear[8] (it will be lower for the lower income brackets and higher for the higher incomes than in the case of the IRT model).

To take health status into account, as is the case in Germany (Busse and Riesberg, 2004), we equally simulate threshold rules that distinguish the ALD from the non-ALD population (here, we use the indicator 'being covered by ALD' as a health status proxy). Each rule will therefore include a variant taking into account the ALD status of the insured. The threshold or coefficient of proportionality will be two times lower for the population on ALD. Although it may seem surprising to use the ALD criterion in establishing the OOP maximum rule when the ALD scheme is assumed to have been abolished, the idea is not to reinstate the ALD scheme but rather to use it as a medical criterion permitting the health status of the most chronically ill to be taken into account.

2.2. Interest of microsimulation models in health policy issues

Microsimulation models have proved efficient in analyses measuring the effects of administrative or fiscal reforms on individual agents: a case that applies to the projected OOP threshold reform. Microsimulation is a method of investigation based on a representative sample of microeconomic units. The microsimulation method in its application to economic and social policies was originally defined from the end of the 1950's by Orcutt (1957). His aim was to study the evolution of a system: to study the impact of a new reform by using the characteristics of these microeconomic units. The microsimulation model thus stems from a database of individuals that aggregates the results obtained for each of the units in order to study the system as a whole. In general, one can distinguish between two main types of microsimulation models: static and dynamic[9]. The static model, the type used in this analysis, uses a cross-section database and a date *t*. Static models are essentially used to measure the immediate or short-term

8 Mathematically, the second derivative of the income-related IRT threshold is equal to zero, whereas, for the IRTM threshold, it has a positive value.

9 The dynamic models use cross-section or longitudinal data, taking into account the demographic evolutions of the 'micro-units.' The characteristics of each individual are updated on each timeline on the basis of assumed evolution (e.g., matrices, state transition equations and institutional rules). The number of rules thus evolves through time, taking into account marriages, births and deaths. Dynamic models are essentially developed in the framework of long-term public policy (e.g., pension reform and detailed demographic models).

impacts of fiscal or social reform. New reforms can thus be simulated to measure the effects of policy on income distribution at the individual level and estimate the impact at the microeconomic level. These models are frequently used in Anglo-Saxon countries as an aid to policy-makers (for a more general presentation, see Gupta and Harding, 2007).

One of the areas in which microsimulation models have been applied is public health policy (Breuil-Grenier, 1999). In France, unfortunately, even if a number of models demonstrated an interest in using this method to unravel the complexities of the health system (Lachaud, Largeton and Rochaix, 1998), these were temporary, study-specific rather than permanent models. The ARAMMIS model was created by IRDES to fill this gap. Specifically, one of our aims is to create a microsimulation model that is permanent, easy to handle and that can take into account several decision variables so as to simulate a diversity of possible reforms.

We chose to build an exogenous, static microsimulation model. The model is static, as it allows us to evaluate the reform by characterizing the distribution of the financial burden before and after its implementation in a given year without modifying the population structure. It is exogenous in that it assumes that individual behavior remains unchanged in the face of the new reform. Moral hazard is not controlled. Nevertheless, similar to Keeler Newhouse and Phelps (1977), we simply assume that "demand (...) are likely to be insensitive to the size of the deductible above certain range" and that individual behavior remains unchanged.

2.3. Database

Our work base was constructed using 2006 data from the Health and Social Protection Survey (ESPS) database (socio-economic data) and the Permanent Sample of Socially Insured (EPAS: data on medical consumption). The EPAS data were used at the non-aggregated level (in other words, at the level of each unit of consumption for each individual), so as to be able to recalculate the reimbursement and OOP payment variables on the hypothetical suppression of ALD-related exonerations. For each insured, the new simulated data essentially concern the amount reimbursed, copayments, charges exceeding statutory fees and OOP payments. After having combined EPAS and ESPS data, we isolated agents eligible for CMU and those not having consumed health care. Our final database was made up of a sample of 6,960 individuals.

Our study is limited to ambulatory services and standard charges not exceeding statutory fees. The modes of reimbursement and patients' financial contributions differ considerably according to whether they concern office-based care or hospital care. Reimbursements for less costly medical procedures administered via office-based care are effectively limited. On the contrary, hospital care and, notably, care related to chronic illness and diseases requiring expensive treatments are relatively well-reimbursed in France, as in the other European countries. In addition, the hospital sector captures the highest expenditures but only concerns 10 to 15% of the insured, whereas 85% of the sample used ambulatory care services. Creating an OOP maximum rule on the basis of cumulated total expenditures would have the effect of raising the OOP threshold and would carry the risk of penalizing insured agents that do not consume hospital services. On that basis, ambulatory care would practically no longer be reimbursed. This type of risk selection might challenge the general acceptability of the system as a whole. In view of this, we thus concentrated on disciplines within the ambulatory sector, such as medical procedures practiced by GPs, medical auxiliaries, biological procedures, prescribed drugs or health-related transport.

In addition, the analysis of patient OOP payments excludes charges exceeding statutory fees. In this way, we remain within the Social Security framework that does not reimburse charges exceeding statutory fees. Taking these additional fees into account in the threshold rule can equally have the effect of generating moral hazard: patients may be less inclined to control their health expenditures, and GPs may be tempted to increase their fees.

3. Evaluating reforms: from 'who are the winners and losers?' to the redistributive characteristics of the compulsory health care insurance scheme

To analyze the possible effects of this reform, our analysis is developed in three phases. In the first phase, we present the overall results obtained for the different scenarios tested. In a second phase, we identify the winners and the losers, and finally, we observe the redistributive effects on the health insurance system in terms of equity.

3.1. Initial observations

We initially concentrated on the distribution characteristics of current OOP payments. The current average OOP payment amounts to 223€, the maximum to 3,607€, and with equal standard deviation, 254€ (Table 1), which suggests an excessively broad dispersion of OOP payments. In addition, the average OOP payment is constant according to revenue deciles (Figure 1). The financial participation related to income, or the OOP payment-to-income ratio, thus decreases according to revenue (Figure 2). It is approximately three times higher for individuals in the first decile in relation to individuals in the third decile. Current OOP payments are low for the majority of the population and extremely high for a small percentage (Figure 3). OOP payments are therefore concentrated among a small number of individuals: 40% of OOP payments weigh on 10% of the population.

The first descriptive results enable us to obtain criteria permitting comparisons between the current situation and the potential situation for a given OOP threshold (Tables 1 and 2). The coefficients enabling us to calculate OOP threshold values are the following: α_{UT} =544, α_{IRT} = 0.092, α_{IRTM} =0.078. When the ALD criterion is taken into account, the coefficients for 'non-ALD' individuals are the following: α_{IRT} = 804, α_{UT} = 0.138, α_{IRTM} =0.114. They are two times lower than for individuals with ALD. As expected, the OOP threshold coefficients will be higher for 'non-ALD' individuals when the ALD criterion is taken into account. It produces a compensation effect from non-ALD to ALD.

These coefficients allow us to calculate absolute and relative values for the different OOP maximum thresholds (Table 1-bis). Consequently, the absolute value for the uniform threshold (UT) does not depend on income, whereas its relative value decreases according to income level. Wealthier households would therefore have relatively lower OOP payments than individuals with more modest incomes. Contrary to the uniform threshold, absolute values for the IRT and IRTM models increase with income level. For thresholds calculated according to income level, the absolute and relative values for the IRTM model will be lower for low-income households than the IRT model. Inversely, for higher income households, the relative and absolute values for the IRTM will be higher than for the IRT model.

The average OOP payment for each OOP maximum model being very close to 223€, the condition of equilibrium, or neutral effect on the insurance system, is validated. In effect, average losses and gains are equal to zero for each of the different safety net models; the Compulsory Health Care Insurance neither gains nor loses. Concerning the other descriptive statistics, the OOP maximum is equal to the UT threshold, whereas the maxima can be higher for income-related models (IRT = 3,638€ and IRTM = 4,504€). The standard deviations also change considerably according to the safety net model. Heterogeneity is reduced with the UT and IRT models, whereas it tends to increase with the IRTM.

Whatever the OOP maximum model, the proportion of winners and losers is relatively low, at between 20 and 25% [10]. A greater number of insured will be in a neutral position on the implementation of the Uniform Threshold; the OOP maximum is relatively high and the majority of individuals will never reach the threshold. The percentage of individuals impacted increases if income is taken into account in the safety net threshold definition, with the percentage of winners becoming higher than the percentage of losers (UT: 9.6% winners and 10.9% losers; IRTM: 14.1% winners and 10.1% losers). If one concentrates on the population with ALD, the percentage of neutrals is negligible regardless of the reforms envisaged. Individuals in ALD are essentially losers, but 15 to 27% are winners. OOP payments increase on average by 62 € for the UT and by 232 € for the IRTM, taking ALD into account.

To better analyze the redistribution factor, we define I1 as the redistribution average and I2 as the standard deviation of redistributions as follows:

$$I_1 = \frac{1}{n}\sum_i \left| OOP_{current} - OOP_{reform} \right|$$

$$I_2 = \sqrt{\frac{1}{n}\sum_i \left(OOP_{current} - OOP_{reform} \right)^2}$$

I1 reveals that the redistribution average is clearly higher for the income-related threshold models. The same applies for *I2*: redistribution is higher with 'ALD.' According to the *I1* and *I2* indicators, the redistribution of OOP payments is higher among ALD than non-ALD individuals when safety net thresholds are related to income.

OOP payment distribution according to income decile changes for the IRT and IRTM models, whereas the curve remains close to that of current OOP payments for the UT; in other words, it remains constant for each income decile (Figures 1-4). For the income-related safety net models, OOP payments increase according to income decile: OOP payments for poorer individuals will be lower than the current level and respectively higher for wealthier individuals (Figure 1). Therefore, the financial participation related to income curve for income-related safety net thresholds tends to flatten and form a 'bell' curve, contrary to the financial participation related to income curve for the UT, which remains unchanged in relation to the current financial participation related to income. The differences in financial participation related to income between income deciles are less for income-related health OOP maximum rules.

10 According to the hypotheses retained, the losers can only be individuals on ALD. This does not, however, mean that all individuals on ALD are losers.

3.2. Who loses? Who gains? How much?

These initial results incite us to look in more detail at the determinants of gaining or losing with the reforms implemented and the amounts transferred.

In a first phase, we estimated the probability of being a winner or a loser using a logistic regression model (Table 2). For the three safety net threshold models, estimates show that the effect of age, being female and having supplementary health coverage increases the probability of gaining, whereas being on ALD with a poor health status has a negative effect on the probability of gaining. There is a non-linear effect of age on OOP payment levels. In addition, results clearly demonstrate the differences that distinguish the UT, IRT and IRTM models concerning the income effect. This effect is neutral for the UT and significantly non-linear for the IRT and IRTM. Furthermore, the single fact of being on ALD has a significantly positive effect on the probability of being on the losing side. As for the income effect, it becomes significantly positive for the IRT and IRTM: individuals will have a higher probability of being losers if their income is high and the OOP maximum threshold is related to income.

In a second phase, we used a linear regression model to estimate the amounts gained and lost (Table 3). For the UT, the gains are higher if the individual is young, female and has supplementary health insurance. For the IRT and IRTM, the income effect is significant and higher for the IRTM model. The ALD status is significantly negative for both these models: an individual on ALD will gain less than a non-ALD. Health status is significant only for the IRTM; the effect of health status is negative and increasing. Consequently, an individual gains less, the poorer his/her health status. In terms of amounts lost, the estimated coefficient for the ALD status becomes positive and extremely high for all three safety net models and the losses higher for individuals on ALD. For the IRT and IRTM, a positive income effect is added and shows that losses are all the greater, the higher an individual's income.

3.3. Analysis of equity and redistributivity

The analysis in terms of equity is complementary to the initial descriptive analyses. One of the motivations behind these OOP safety net threshold analyses is to find a better redistributive equity and better risk coverage for the health insurance system. To achieve this, we use three different methods: the Kakwani index, ALJ decomposition of the redistributive effect and second-order stochastic dominance.

The Kakwani index

The oldest way of measuring equity uses the difference between the Gini indices before and after the introduction of a reform or tax to measure the redistribution effect (Musgrave and Thin, 1948). This effect is defined as a lowering of the Gini coefficient. Kakwani (1977) demonstrated that this method explains the redistributive effect without measuring its progressivity. It fails to distinguish between the effect of a change in the average tax rate and its level of progressivity concerning income distribution. The Kakwani index is the difference between the concentration curve for OOP payments (C_{OOP}) and the concentration curve for income (C_{Inc}). To measure the impact of a reform, we calculate the difference between the Kakwani index before and after the reform as follows:

$$\Pi_{OOP_{current}} - \Pi_{OOP_{reform}} = \left(C_{OOP_{Current}} - C_{Inc}\right) - \left(C_{OOP_{reform}} - C_{Inc}\right) = C_{OOP_{current}} - C_{OOP_{reform}}$$

The Kakwani index measures the proportionality gap between a tax system and taxpayers' ability to pay. Wagstaff *et al.* (1999) used this index to quantify the progressivity or regressivity of a health system. They demonstrate that the redistribution effect of the health insurance system in the Netherlands transfers income from the poor to the rich, whereas in Great Britain or the United States, it is transferred from the rich to the poor.

The Kakwani index calculated for the current situation is negative (Table 4). The reimbursement system is thus regressive or 'pro-rich' in that the distribution of OOP burden in relation to income favors the wealthiest (Wagstaff *et al.*, 1999). In other words, the poorest individuals have a greater OOP burden proportional to their income than the wealthiest individuals. The Kakwani index calculated after the reform changes according to the safety net threshold model tested and varies from -0.262 for the UT to -0.103 for the IRTM[11]. The regressivity of the system is accentuated with a uniform threshold (UT), but the effect diminishes when income inequalities are taken into account. The IRT and IRTM models redistribute the OOP burden in a way that is more favorable to low-income earners, contrary to the uniform threshold, which has a regressive redistribution effect in favor of the rich. If the ALD criterion is taken into account, the system characteristics (progressive or regressive) are unaltered.

The graphic analyses of cumulative OOP payments and income concentration curves equally confirm our results (Figure 5). The curve for current OOP payments concentration superimposes on the bisecting line. The situation is egalitarian without being equitable, in that individuals have the same OOP burden regardless of their income level. The OOP curve with a uniform threshold superimposes the current OOP payments curve. The OOP payments are, in effect, not dependent on income. On the contrary, with the IRT and IRTM models, the concentration curves remain, for the most part, above the income curve but remain close. The system remains regressive but becomes marginally more equitable.

Moreover, for 20% of the population with the lowest incomes, the cumulated sum of OOP payments is proportionally lower than the cumulated sum of their incomes (Figure 5). The income-related threshold rules favor the lowest income population for whom the system becomes progressive.

AJL Analysis

One of Kakwani's hypotheses, however, is that individuals with equal incomes are faced with the same tax. The reality is, however, far more complex. Aronson, Johnson and Lambert (1994) demonstrate that the differences in concentration indices before and after a reform can be written in the following manner (the AJL decomposition):

$$RE = V - H - R = \left(\frac{g}{1-g}\right)K - H - R$$

where V stands for vertical equity, H for horizontal equity, and R for the reranking effect. The vertical effect can also be decomposed with g, the average tax rate, and K, the Kakwani progressivity index that measures the extent of income distortion before financing the tax.

11 The closer the coefficient is to 0, the more the system will be redistributive.

Concerning the analysis of health insurance systems, *V* measures the vertical effect of redistribution. It depends on progressivity but also on the average rate *g* that corresponds to the percentage of income devoted to average health expenditures. The higher the average rate, the greater the redistribution effect. The vertical effect shows how households with different incomes are affected by the reimbursement method. The horizontal effect measures the inequality generated among households with the same income, whereas reranking quantifies the change in OOP payments distribution occasioned by the reform (Zhong, 2009).

The hypothesis underlying the income-related OOP threshold modifies the distribution of the OOP burden such that it takes into consideration inequalities stemming from income distribution. Consequently, bringing the distribution of the OOP burden closer to a vertical equity situation, this distribution must be the most unequal. It is thus necessary to obtain the greatest possible vertical effect[12] (because *V* is negative). From the point of view of vertical equity in health, the 'non-equal' must be treated differently. Individuals with different incomes should not benefit from the same reimbursement levels and thus should have a different OOP burden.

The horizontal effect measures equity between groups of individuals with equal incomes[13]. H is measured as the weighted sum of Gini indices of income diminished by OOP on sub-populations with equal incomes. It is expressed as follows:

$$H = \sum_{j} \beta_j G^{j}_{OOP_{reform}}$$

where $G^{j}_{OOP\ reform}$ represents the Gini index of income diminished by OOP payments according to the different threshold models for a group of individuals β_j with the equal incomes, and is the product of the percentage of the population in group *k* and OOP payments proportional to income after the introduction of the associated threshold model. By construction, the *H* component is defined as being non-negative. Horizontal equity can thus only reduce the redistribution effect but not increase it. Individuals with similar financial resources should have the same health insurance benefits. The horizontal effect is an indicator that reflects the way in which close-equal individuals are treated. In the attempt to improve equity, *H* must have the highest possible value.

The *R* component captures the reranking effect occasioned by changes incurred when OOP payments distribution is taken before and after implementation of the reform. It is measured by:

$$R = G_{OOP_{reform}} - C_{OOP_{reform}}$$

where $G_{OOP\ reform}$ represents the income concentration index diminished by OOP payments, and $C_{OOP\ reform}$ the concentration index for OOP payments after the introduction of an OOP threshold, calculated by classifying individuals by equal income sub-populations and OOP payments' levels within each sub-population group. The *R* component cannot be negative. It is related to the Atkinson-Plotnick reranking measure (Atkinson, 1980 and Plotnick, 1981). If the desired objective is to redistribute the OOP

12 This reasoning is the opposite to that used in analyzing income tax effects on income, for which the significant vertical effect means that the income curve after tax is more egalitarian and therefore more equitable in this particular case.

13 One important question is: are horizontal inequities truly inequitable? Indeed, if we think the differences in OOP payments due to differences in health status vs differences in health preferences or if the differences in OOP payments due to no health care needs vs. postponement of health care consumption or unmet needs, distributional consequences and policy implications will not be the same. One solution will be to introduce in our model the level of health care use.

burden to make it more equitable, it is necessary to maximize this indicator. To calculate *R*, it is thus necessary to define income intervals. The bandwidth determines the magnitude of the horizontal and reranking effects (van de Ven, Creedy and Lambert, 2001 and Bliger, 2008). The wider the bandwidths, the lesser the horizontal effect (due to the size of population sub-groups), and the greater the reranking effect (due to the higher number of population sub-groups). It is for this reason that we have calculated this decomposition with four different bandwidths[14].

The current redistribution effect (RE) is negative (Table 4). This means that the redistribution effect related to the system of calculating OOP payments according to income favors the higher income group (Van Doorslaer *et al.,* 1999). If one looks at the current distribution between V, H and R calculated from income intervals represented by centiles, the vertical effect represents 66% of the redistribution, the horizontal effect 12% and the reranking effect 27% (for bandwidths equal to 100).

Concerning the distribution impact after introducing the OOP thresholds, the redistribution effect (RE) for the UT model is close to the current situation. On the contrary, for the income-related health OOP threshold, IRT and IRTM, the redistribution values increase but remain negative. Moreover, the vertical equity (V), horizontal equity (H), and the reranking effect (R) change according to the OOP threshold model being tested. In comparison with the current situation, V and R decrease with the UT. With the IRT and IRTM, V and R increase. This confirms that the situation becomes more regressive with the UT and less regressive, and thus more equitable, with the income-related thresholds. Regardless of the threshold model, values relating to horizontal equity are relatively stable, which reflects low iniquity within population classes with equal income. Individuals with similar incomes pay the same amount of OOP payments.

The analysis of distribution between vertical equity (%V = V / RE), horizontal equity (%H = - H / RE) and the reranking effect (%R = - R / RE) in percentages of redistribution confirm these results[15]. In effect, compared with the current situation, the percentage of V increases and the percentage of R decreases in the UT model, whereas for the IRT and the IRTM, the percentage of V decreases and the percentage of R increases. There is an inversion of progressivity between the percentage of the vertical effect and the percentage of the reranking effect. An increase in the percentage of V is synonymous with a more regressive system, which means that OOP payments distribution will be less redistributive. As the percentage of H remains relatively stable, if the percentage of V increases, then the percentage of R will diminish and consequently lower the reranking effect.

The analysis of the redistribution effects of the different threshold models on the Kakwani index and ALJ decomposition reveals that the consequences in terms of redistribution will not be identical, according to the type of threshold model chosen. The UT will tend towards greater inequality and, as a result, further dissociate OOP payments from income. Inversely, the IRT and IRTM models give a more unequal redistribution but in favor of poorer individuals, which, in this context, would make the health insurance benefits system more equitable.

14 Ten intervals; 696 individuals on average per interval, 50 intervals; 139 individuals on average per interval, 100 intervals; 70 individuals on average per interval and, 250 intervals; 28 individual on average per interval.

15 Evolutions in terms of level and percentage of V will be different because we are in a regressive distribution system.

Second order stochastic dominance

The final criterion to better characterize the system does not measure equity but rather the notion of individuals' risk aversion in relation to insurance. Second-order stochastic dominance is used to measure the preferences of the 'risk-phobic' insured when faced with a change in the reimbursement system (Geoffard and De Lagasnerie, 2009). Using the 'veil of ignorance' hypothesis, whereby individuals ignore their health status, second-order stochastic dominance asserts that individuals with risk aversion will prefer one form of OOP payments distribution to another if OOP payments distributions have the same average and if the Lorenz curves associated with the two types of distribution only bisect once (Rothschild and Stiglitz, 1970). Therefore, if a reform reduces risks (in the second-order stochastic dominance sense), all of the agents with risk aversion should prefer it.

The Lorenz curves obtained from the UT stochastically dominate the current distribution pattern at second order (Figure 6 and Table 4). We confirm this graphic analysis by using the Kolmogorov-Smirnov test. This is not the case for income-related thresholds. Individuals with risk aversion will then prefer the uniform threshold solution because the maximum OOP burden remains relatively low and thus protects them from catastrophic risks. This confirms the descriptive analyses showing that the standard deviation for the lowest OOP payments was obtained with the UT model (Table 1).

Conclusion

The aim of this work is to measure the redistributive effect of an integral reform of the reimbursement rules for health care costs. The idea is to test the replacement of the current 100% reimbursement system for patients with long-term illnesses with an OOP maximum threshold to limit catastrophic out-of-pocket payments. Different safety net models, either based on a uniform threshold or an income-related threshold, are proposed. The results are obtained using an exogenous, static microsimulation model. It is thus assumed that individual behavior does not change. This hypothesis may seem far-fetched, but it enables a first round observation of OOP payments' transfers without making other hypotheses concerning behavior. It would be possible to measure the sensitivity of our results by taking into account modifications in behavior.

With the ARAMMIS static microsimulation model, IRDES armed itself with a powerful, permanent analysis tool that enables a better understanding of the effects of extremely specific reforms. The simulations presented are not aimed at finding the 'right reform' but rather at describing reform impacts and, in so doing, providing policy-makers with an objective viewpoint. The model is in the construction phase in that we aim to complete it with additional modules concerning hospitals, supplementary insurance and contributions.

Our results only concern health insurance reimbursements and do not take individuals' statutory income-related contributions into account. The notion of equity discussed here is also only partial. In a future development of this study, we will also model social security contributions so as to study the equity of the system as a whole. The aim in this paper being to study the evolution of reimbursement rules, the only variables required were those on the 'expenses' side, that is, the modes of covering expenditures, as the 'resources' side is invariant. In addition, our results do not take into account OOP payment coverage for CMU beneficiaries, which, by its very nature, favors the poorest members of the population. It thus strongly modifies the redistributive characteristics of the health expenditure reimbursement system.

Initial results indicate that all the envisaged scenarios lead to an increase in OOP from 62€ to 232€ per year for patients on ALD. All of the estimations were carried out using identical budgetary constraints. Naturally, there is a change in OOP distribution, but not all patients on ALD would be losers. According to the different safety net models retained, from 15% to 27% of ALD beneficiaries would be winners, namely, patients currently paying high OOP payments. In effect, the heterogeneity of OOP is greater among ALD beneficiaries than non-ALD beneficiaries. These first results indicate that the characteristics of winners and losers are highly dependent on the OOP threshold module. An income-related threshold, for example, would favor lower income groups, whereas, with a uniform OOP threshold, income has no importance in the determination of winners and losers.

The effects of these two main reform concepts, uniform or income-related OOP-safety net thresholds, currently being broached in the public debate are not identical and lead to contrary conclusions. In reducing the risk of being faced with a very high OOP burden, uniform thresholds level out the heterogeneity of situations and appear to suit individuals with high risk aversion. Inversely, income-related thresholds increase the heterogeneity of OOP burdens but have a less regressive redistributive effect - moving from an egalitarian system to a more equitable system.

Implementing reforms such as these would inevitably raise a number of questions: an OOP threshold for individuals or households? An OOP payment threshold concerning ambulatory care only or the totality of expenditures (ambulatory + hospital care)? Would dental and optical expenditures be included? What role should be played by supplementary health insurance? All of these questions need to be studied in detail because, as we have demonstrated, 'the devil is in the details!'

The different health systems throughout the world partially reflect the way individuals perceive the notion of social justice. The 'political' choice concerning the way OOP payments are calculated will, in the same way, reflect what French society considers to be socially acceptable and fair in terms of health insurance (Rawls, 1971). In that context, French society will have to resolve the dilemma between equality and equity: at what point does the search for absolute equality become inequitable?

Tab. 1: Descriptive statistics of OOP maximum

	Current	*UT*		*IRT*		*IRTM*	
		-	*with ALD*	-	*with ALD*	-	*with ALD*
Population as a whole							
Average OOP	223	223	223	223	223	223	223
Standard-deviation of OOP	254	186	198	247	238	282	268
Maximum	3607	544	804	3638	2734	4504	3983
OOP maximum value		544	804	0,092	0,138	0,078	0,114
Average win or loss		0	0	0	0	0	0
% of gainers		9,64	6,14	12,51	9,76	14,05	11,62
% of losers		10,87	9,72	10,41	9,73	10,13	9,47
% of neutral		79,49	84,14	77,08	80,51	75,82	78,91
I1		257	224	291	269	305	288
I2		367	342	438	408	502	477
Population on ALD							
Average OOP	294	453	356	499	425	526	458
Standard-deviation of OOP	336	149	96	388	326	527	472
Maximum	3581	544	402	3637	2734	4504	3983
OOP maximum value			402		0,069		0,057
Average win or loss		-159	-62	-206	-132	-232	-164
% of gainers		15,33	25,06	18,88	25,06	20,93	26,88
% of losers		81,81	72,19	78,38	72,42	76,31	70,59
% of neutral		2,86	2,74	2,54	2.51	2,74	2,51
I1		267	226	333	291	368	333
I2		361	332	491	432	607	547

Tab. 1-bis: Threshold value for each OOP maximum

				Taking into account the Ald criterion					
				Without ALD			With ALD		
	UT	*IRT*	*IRTM*	*UT*	*IRT*	*IRTM*	*UT*	*IRT*	*IRTM*
Threshold coefficient (α)	544	0.092	0.078	804	0.138	0.114	402	0.069	0.057
Absolute value of threshold									
Annual inc per CU= 12 000	544	444	376	804	666	550	402	333	275
24 000	544	1548	2252	804	2322	3291	402	1161	1646
36 000	544	2652	5623	804	3978	8219	402	1989	4109
Relative value of threshold									
Annual inc per CU = 12 000	4,5%	3,7%	3,1%	6,7%	5,5%	4,6%	3,4%	2,8%	2,3%
24 000	2,3%	6,5%	9,4%	3,4%	9,7%	13,7%	1,7%	4,8%	6,9%
36 000	1,5%	7,4%	15,6%	2,2%	11,0%	22,8%	1,1%	5,5%	11,4%

Fig. 1: OOP payments according to income decile

- *taking ALD beneficiaries into account*

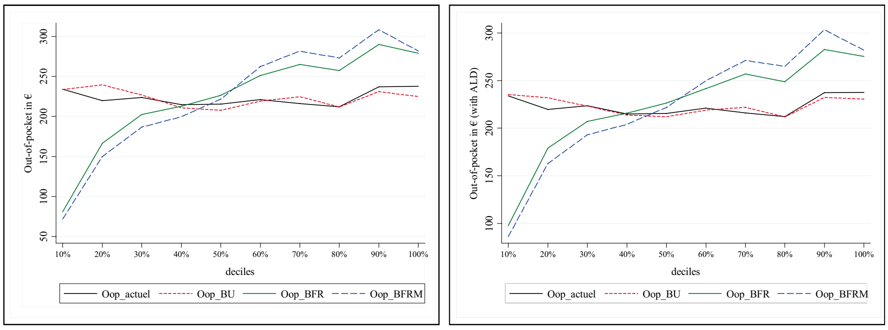


Fig. 2: OPP payments related to income according to income decile

- *taking ALD beneficiaries into account*

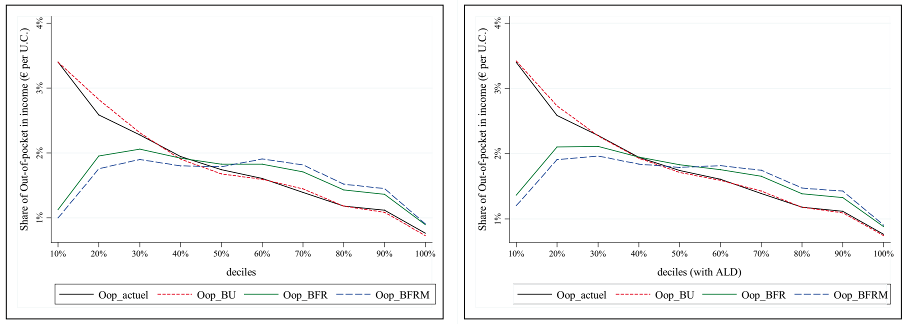
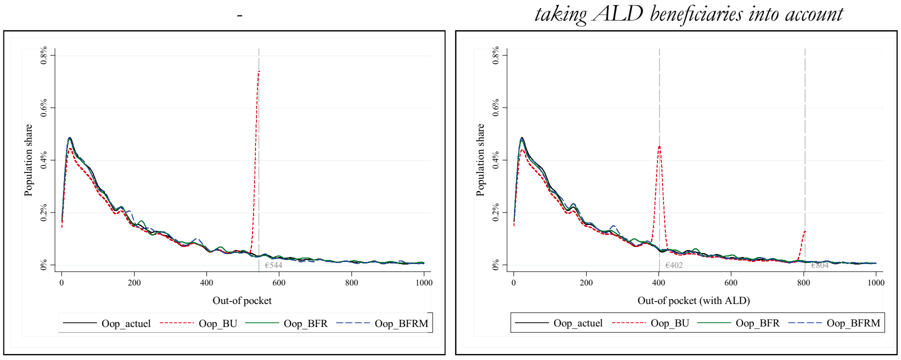


Fig. 3: OOP payments distribution

- *taking ALD beneficiaries into account*



Tab. 2: Analysis of the probability of being a winner or a loser

	Winners						Losers					
	UT		IRT		IRTM		UT		IRT		IRTM	
	-	with ALD	-	with ALD	-	with ALD	-	with ALD	-	with ALD	-	with ALD
Age (*10²)												
Age	-3,319 **	-2,740 *	-1,823	-0,896	-2,733 **	-1,604	1,081	1,876	1,391	1,758	1,970	1,548
age²	12,324 **	9,661 **	9,175 **	5,294	10,884 **	7,247 **	-0,799	-2,320	-2,633	-2,838	-3,065	-2,538
age³	-8,220 **	-6,041 **	-6,248 **	-2,941	-7,074 **	-4,209 *	-0,078	0,480	1,652	1,205	1,296	0,986
Income per CU (K€)												
Income	0,064	0,026	-8,447 **	-9,133 **	-8,954 **	-9,285 **	-0,294	-0,397	2,474 **	2,136 **	2,848 **	2,699 **
income²	-0,028	0,005	2,771 **	3,141 **	2,794 **	3,032 **	0,062	0,130	-0,645 **	-0,544 **	-0,738 **	-0,689 **
income³	0,004	0,000	-0,275 **	-0,321 **	-0,262 **	-0,295 **	-0,004	-0,016	0,043 **	0,036 **	0,049 **	0,046 **
female	0,217 **	0,319 **	0,259 **	0,208 **	0,297 **	0,268 **	0,001	-0,073	-0,091	-0,067	-0,117	-0,096
Health status												
Nsp	-0,378 **	-0,227 *	-0,306 **	-0,173	-0,174	-0,177	-0,036	0,030	0,153	-0,033	0,074	-0,041
Very poor	-0,946 **	-0,633 **	-0,691 **	-0,509 **	-0,667 **	-0,502 **	-0,445 **	-0,505 **	-0,377 *	-0,538 **	-0,389 *	-0,626 **
mediocre	-0,669 **	-0,437 **	-0,459 **	-0,340 **	-0,408 **	-0,248 *	0,116	0,081	0,235	0,112	0,226	0,061
good	-0,037	0,013	0,003	0,083	0,044	0,205	0,071	0,087	0,254 *	0,066	0,203	-0,002
Ald	-0,360 **	0,688 **	-0,405 **	0,445 **	-0,430 **	0,334 **	3,292 **	2,963 **	3,505 **	3,256 **	3,567 **	3,329 **
Household structure												
single	0,062	0,154	-0,065	0,053	0,087	-0,054	-0,008	0,187	0,489 **	0,368 *	0,271	0,424 **
Single parent	0,091	0,072	0,067	0,104	0,126 *	0,092	-0,023	0,004	-0,057	-0,117	-0,151	-0,133
couple	-0,047	-0,113	0,071	0,044	0,048	0,061	-0,209	-0,034	-0,205	-0,098	-0,112	-0,083
Type of supplementary												
Mutual	-0,310 **	-0,230 **	-0,210 **	-0,071	-0,253 **	-0,226 **	0,245 *	0,210 *	0,152	0,174	0,180	0,241 *
Provident Society	-0,118 **	0,035	-0,097	-0,042	-0,038	-0,094	0,055	-0,055	0,020	-0,011	-0,026	0,015
Private insurance	-0,160 **	0,091	-0,145	0,031	-0,087	-0,064	0,020	-0,175	-0,037	-0,096	-0,094	-0,035
Education level												
Nsp	-0,035	0,051	0,119	0,110	0,097	0,101	0,044	0,131	0,131	0,081	0,137	0,002
No schooling	-0,092	-0,127	-0,125	-0,158	-0,192	-0,191	-0,246	0,069	-0,004	-0,074	0,151	0,024
Primary	-0,072	-0,017	-0,093	-0,036	-0,123	-0,171	-0,138	-0,033	0,066	-0,007	0,138	0,048
Lower secondary	-0,084	0,047	-0,004	-0,072	-0,044	-0,130	-0,049	0,019	-0,016	0,034	-0,026	0,046
Upper secondary	-0,047	-0,059	-0,055	-0,101	-0,072	-0,143	-0,222	-0,029	-0,061	-0,054	-0,015	-0,016
Cons	-1,320 **	-2,317 **	4,595 **	4,432 **	5,138 **	4,867 **	-2,392 **	-2,290 **	-5,049 **	-4,627 **	-5,477 **	-5,126 **
Nb obs	6960	6960	6960	6960	6960	6960	6960	6960	6960	6960	6960	6960
Log, Like	-1838	-1223	-1466	-1189	-1473	-1284	-648	-764	-620	-701	-614	-679

Tab. 3: Analysis if differences in OOP payments between winners and losers

	Winners						Losers					
	UT		IRT		IRTM		UT		IRT		IRTM	
	-	with ALD	-	with ALD	-	with ALD	-	with ALD	-	with ALD	-	with ALD
Age (*10²)												
Age	9,629 **	25,771 **	1,370	-2,062	0,236	-0,214	-1,176	-1,304	-2,018	-3,326	-4,206	-3,535
age²	-14,940	-42,455 **	2,783	12,692 *	5,688	7,251	3,913	4,743	4,879	6,354	8,482	6,901
age³	8,119	23,363 **	-2,727	-10,240 **	-4,921	-6,237	-2,826	-3,667	-2,982	-3,454	-4,586	-3,616
Income per CU (K€)												
Income	0,185	0,161	2,427 *	-0,266	4,100 **	2,145 *	-0,244	0,137	2,898 **	3,468 **	3,654 **	3,683 **
income²	-0,047	0,042	-1,939 **	-0,787	-3,303 **	-2,304 **	0,088	-0,090	-0,866 **	-1,022 **	-1,114 **	-1,082 **
income³	0,003	-0,005	0,248 **	0,118	0,448 **	0,324 **	-0,009	0,017	0,078 **	0,091 **	0,101 **	0,096 **
Female	0,269 **	-0,220	0,019	0,042	0,019	0,006	-0,200 **	-0,103	-0,254 **	-0,233 **	-0,154	-0,133
Health status												
Nsp	-0,501 *	-0,686 **	-0,509 **	-0,514 *	-0,731 **	-0,454 *	-0,119	-0,118	-0,296 *	-0,154	-0,382 **	-0,115
Very poor	0,284	0,583	-0,270	-0,188	-0,545 **	-0,547 **	-1,195 **	-0,970 **	-1,384 **	-1,365 **	-1,655 **	-1,501 **
mediocre	-0,258	-0,779 **	-0,348	-0,314	-0,473 **	-0,605 **	-0,431 **	-0,257 *	-0,785 **	-0,646 **	-0,934 **	-0,695 **
good	-0,100	-0,323	-0,120	-0,221	-0,223	-0,260	-0,161	-0,103	-0,422 **	-0,268 *	-0,502 **	-0,255
Ald	0,010	0,054	-0,436 **	0,020	-0,435 **	-0,125	4,234 **	4,001 **	4,148 **	3,898 **	4,162 **	4,002 **
Household structure												
single	0,370	0,856 *	0,267	0,325	0,119	0,433	-0,007	0,092	-0,012	-0,199	-0,025	-0,181
Single parent	0,030	0,067	0,073	0,017	0,007	0,052	0,103	0,060	-0,016	0,085	0,036	0,078
couple	-0,016	1,242 **	0,184	0,217	0,092	0,246	0,396 **	0,360 *	0,463 **	0,409 *	0,447 **	0,550 **
Type of supplementary ins												
Mutual	0,541 **	0,965 **	0,271	0,250	0,131	0,279	0,098	0,081	0,043	0,143	0,018	-0,067
Provident Society	0,220	0,103	0,114	0,129	0,024	0,209	-0,162	-0,239 **	-0,190	-0,049	-0,201	-0,186
Private insurance	0,321	0,244	0,241	0,252	0,228	0,290	-0,210	-0,067	-0,289 *	-0,079	-0,224	-0,209
Education level												
Nsp	0,615	1,620 **	0,330	0,210	0,052	0,035	0,544	0,644	0,336	0,570	0,415	0,438
No schooling	-0,289	0,778	-0,122	-0,158	-0,120	-0,280	0,068	0,117	-0,089	0,079	-0,360	-0,110
Primary	0,246	0,383	0,116	0,247	-0,020	0,074	0,220	0,329 **	0,191	0,184	0,143	0,107
Lower secondary	0,349 *	0,436	0,105	0,352	0,028	0,135	0,072	0,155	0,165	0,240	0,142	0,172
Upper secondary	0,324	0,511	0,179	0,463	0,013	0,135	0,124	0,188	0,115	0,127	0,015	0,043
cons	1,930 **	-0,454	3,188 **	4,473 **	3,123 **	3,740 **	1,488 **	0,926	-0,466	-0,893	-0,738	-1,125
Nb obs	671	427	871	679	978	809	757	677	725	677	705	659
Log, Like	-1247	-787	-1570	-1252	-1717	-1458	-1138	-1015	-1174	-1093	-1139	-1063

Tab. 4: Analysis of redistribution equity

	Current	UT		IRT		IRTM	
		-	with ALD	-	with ALD	-	with ALD
Equity Analysis							
Kakwani index before the reform	-0,250						
Kakwani index after the reform		-0,262	-0,258	-0,112	-0,132	-0,085	-0,103
Effect of the reform		0,011	0,007	-0,138	-0,118	-0,166	-0,148
Conclusion (from regressif (Reg) to)		more Reg	more Reg	less Reg	less Reg	less Reg	less Reg
Redistribution analysis							
bandwidth = 10							
RE (=V-H-R)	-0,066	-0,060	-0,061	-0,043	-0,045	-0,045	-0,046
V	-0,044	-0,045	-0,044	-0,027	-0,030	-0,023	-0,025
V%	*66,036*	*74,886*	*73,314*	*63,226*	*65,517*	*52,298*	*55,300*
H	0,019	0,014	0,015	0,010	0,011	0,010	0,011
%H	*29,158*	*23,263*	*24,450*	*22,628*	*24,621*	*23,001*	*24,902*
R	0,003	0,001	0,001	0,006	0,004	0,011	0,009
%R	*4,806*	*1,851*	*2,236*	*14,146*	*9,863*	*24,701*	*19,798*
bandwidth = 50							
RE (=V-H-R)	-0,066	-0,060	-0,061	-0,043	-0,045	-0,045	-0,046
V	-0,044	-0,046	-0,046	-0,020	-0,024	-0,015	-0,018
V%	*67,244*	*77,312*	*75,330*	*46,288*	*52,244*	*34,059*	*40,295*
H	0,008	0,006	0,007	0,007	0,007	0,007	0,007
%H	*11,529*	*10,621*	*10,853*	*15,475*	*15,230*	*15,144*	*15,183*
R	0,014	0,007	0,008	0,017	0,015	0,023	0,020
%R	*21,227*	*12,067*	*13,817*	*38,238*	*32,525*	*50,797*	*44,523*
bandwidth = 100							
RE (=V-H-R)	-0,066	-0,060	-0,061	-0,043	-0,045	-0,045	-0,046
V	-0,044	-0,046	-0,045	-0,020	-0,023	-0,015	-0,018
V%	*66,410*	*76,576*	*74,601*	*45,251*	*51,198*	*33,192*	*39,390*
H	0,004	0,004	0,004	0,004	0,004	0,004	0,004
%H	*6,711*	*6,329*	*6,437*	*9,278*	*9,059*	*9,074*	*9,031*
R	0,018	0,010	0,011	0,020	0,018	0,026	0,024
%R	*26,879*	*17,095*	*18,962*	*45,471*	*39,743*	*57,734*	*51,579*
bandwidth = 250							
RE (=V-H-R)	-0,066	-0,060	-0,061	-0,043	-0,045	-0,045	-0,046
V	-0,044	-0,046	-0,045	-0,020	-0,023	-0,015	-0,018
V%	*66,725*	*77,013*	*74,962*	*45,964*	*51,724*	*33,916*	*39,957*
H	0,002	0,002	0,002	0,002	0,002	0,002	0,002
%H	*2,949*	*2,786*	*2,839*	*4,213*	*4,091*	*4,140*	*4,098*
R	0,020	0,012	0,013	0,022	0,020	0,028	0,026
%R	*30,326*	*20,201*	*22,198*	*49,822*	*44,185*	*61,943*	*55,945*
2nd order stochastic dominance							
Kolmogorov–Smirnov Test							
Conclusion		*SD (2)*	*SD (2)*	--	--	--	--

Fig. 4 : Lorenz curve for cumulative OOP payments

- *taking ALD beneficiaries into account*

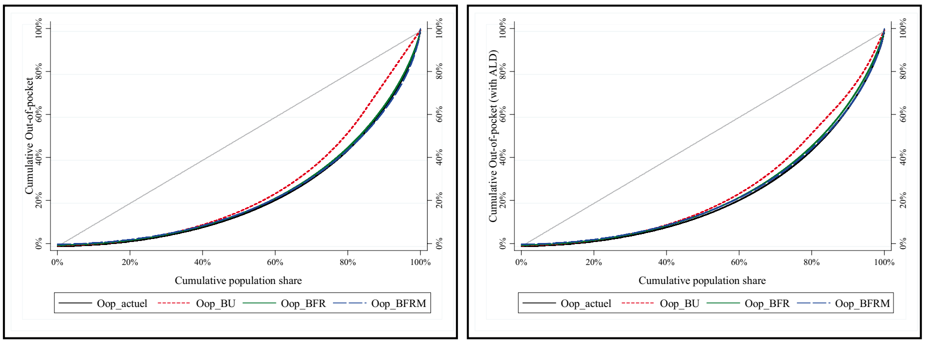


Fig. 5 : Concentration curve for cumulative OOP payments

- *taking ALD beneficiaries into account*

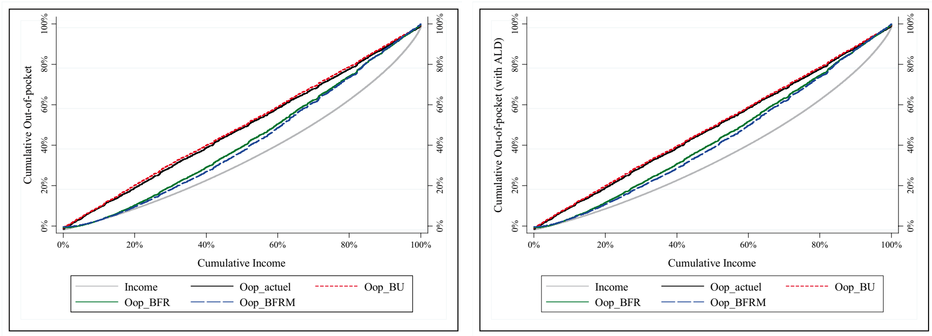
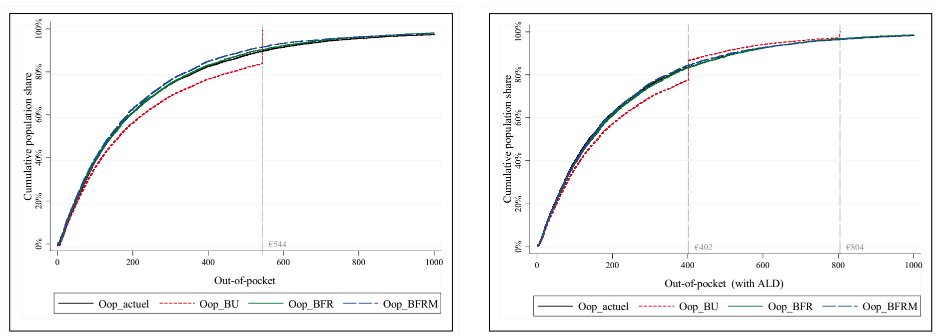


Fig. 6 : Cumulated distribution of OOP payments

- *taking ALD beneficiaries into account*



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Out-of-Pocket Maximum Rules under a Compulsory Health Care Insurance Scheme: A Choice between Equality and Equity

Thierry Debrand (Irdes), Christine Sorasith (Irdes)

Using the microsimulation model ARAMMIS, this study attempts to measure the impacts of introducing an out-of-pocket (OOP) maximum threshold, or a safety net threshold, on consumer copayments for health care financed by the abolition of the Long-term Illness Regime (ALD) in France. The analysis is based on a comparison of different safety net threshold rules and their redistributive effects on patients' OOP payments.

We attach particular importance to indicators that bring to light changes in OOP payment levels and measure their impact on the equity of OOP distribution. The first section outlines the French National Health System to provide a better understanding of the stakes involved in reforming the health care reimbursement rules under the Compulsory Health Care Insurance scheme. In the second section, we describe the hypotheses retained, the database and the microsimulation model. The final section presents key findings, measuring the impact of the reform at both individual and system levels.

Bouclier sanitaire : choisir entre égalité et équité
Une analyse à partir du modèle ARAMMIS

Thierry Debrand (Irdes), Christine Sorasith (Irdes)

Cet article cherche à mesurer, à l'aide du modèle d'Analyse des réformes de l'Assurance maladie par micro-simulation statique (ARAMMIS), les effets de la mise en place d'un bouclier sanitaire financé par la suppression du régime des affections de longue durée (ALD). Notre étude repose sur la comparaison des conséquences redistributives de différentes règles de boucliers sur les restes à charge des patients dans le secteur ambulatoire en France. Nous attachons une importance particulière aux indicateurs permettant de mettre en évidence les modifications des restes à charge et de mesurer l'évolution du système en termes d'équité. Nous présentons, dans une première partie, le cadre général du système de santé en France pour mieux comprendre le contexte et les enjeux d'une refonte du mode de remboursement lié à l'Assurance maladie obligatoire. Dans une deuxième partie, nous décrivons les hypothèses retenues, la base de données et le modèle de micro-simulation. Enfin, nous consacrons la dernière partie à la présentation des principaux résultats mesurant l'impact de la réforme tant au niveau des individus qu'au niveau du système.

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