The Political Sustainability of a Basic Income Scheme and Social Health Insurance*

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Abstract

This paper studies within a two-stage framework the political economy of a basic income and social health insurance scheme. Individuals differ in income and the probability of falling ill. At the second stage society votes on the payroll taxes of a basic income and a social health insurance scheme. We find that when the size of both welfare schemes is open for debate, the basic income scheme completely crowds out social health insurance. At the first constitutional stage we determine which welfare scheme society agrees to implement behind the veil of ignorance. Depending on the amount of health care expenditure and the inequalities in income and risk, society sets up an institutional framework for a social health insurance scheme only.

JEL-**Classification:** D7, H1, H2, I3

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1 Introduction

A basic income (hereafter BI) is a government-provided cash payment that is paid unconditionally to all citizens on an individual basis without a means test or work requirement. It is a lifelong, guaranteed payment which, as is postulated by most proponents, should be large enough to satisfy an individual's basic needs. Various synonyms for a BI have entered the political discussion, for example, state bonus, social dividend, guaranteed income, citizen's wage, citizenship income, existence income, or universal grant. Other similar policy measures that all share the idea of providing a "guaranteed income" to every citizen have been revisited, for instance, Milton Friedman's negative income tax (Friedman, 1962), or Tobin's demogrant (Tobin, Pechman and Mieszkowski, 1967).[1]

The philosopher and political economist Philippe Van Parijs is one of the most prominent advocates of a BI scheme of our time.[2] He argues that a BI is an effective and equitable solution to poverty, which not only promotes individual freedom but also leaves the beneficial aspects of a market economy in place (Van Parijs, 2004). In January 2014, the European Citizens Initiative collected 285,042 statements of support for a basic scheme within the European Union.[3] Even though this number of signatures is too low to prompt the European Commission to examine the initiative carefully and arrange for a public hearing in the European Parliament, the initiative shows that the idea of a basic income is part of an ongoing and lively debate on the future of the welfare state. And it was only recently, in June 2016, that a referendum was held about the introduction of a BI in Switzerland, but a majority of 78% voted against its introduction. So until now no country has ever introduced a full basic income scheme.[4]

At present, in many developed countries the institutional framework is such that income redistribution is attained through social insurance schemes, in particular through social health insurance (hereafter SHI). SHI entitles citizens to health benefits when sick. The first scheme was introduced in Germany in 1883 as part of Bismarck's social insurance legislation. Since then, many countries have adopted similar schemes. They are typically financed by income-related contributions and thereby not only redistribute from those with a good health status to those with poor health status, but also from high-income to low-income earners. By combining these two dimensions of redistribution, SHI receives political support from two groups, those with poor health status and those with low income. As individuals with poor health status can be

[1]For instance, under the negative income tax system, each person with an income below a certain threshold would receive supplemental pay from the government instead of paying taxes. See http://www.basicincome.org for an overview of the different ideas.

[2]In the 1980s, supporters of such a scheme set up the Basic Income European Network (BIEN) which publishes a regular newsletter and organizes conferences every two years.

[3]For further information see http://basicincome2013.eu/en/index.html.

[4]Alaska has a *partial* basic income scheme. Since 1982 everyone who has been officially resident in Alaska for at least six months is considered to be a part owner of the state's oil resources and receives a uniform dividend (in 2013: $900) from the Alaska Permanent Fund every year; see http://www.apfc.org.

expected to be in a minority, support by the financially poor can be crucial for the existence of SHI if public provision is not exclusive (see Kifmann, 2005; and Nuscheler and Roeder, 2013 for an application to long-term care).

Most advocates of the basic income scheme regard it as complementary to social health insurance (see, *e.g.*, Atkinson, 1996a; and Van Parijs, 1992) while others envision it as a substitution. From a political economy point of view, however, the crucial question is whether both income-redistributing systems can receive political support, or if society opts to rely solely on an SHI, or solely on a BI scheme. This is our first research question. Our second research question goes one step further. Building on the political support analysis, we examine whether it is in society's interest to preclude one of the schemes in the first place. Here, we follow Atkinson's (1996b) proposal that studying political support for the introduction of a basic income or a social insurance scheme calls for the analysis of two stages of decision making. Finally we raise the question if the implementation of a BI can be optimal from a normative point of view, while the voters support solely SHI.

In the first "constitutional" stage, society votes on whether an SHI and/or a BI scheme should exist. In the second stage, this choice is followed by specification of the size of the prevailing scheme(s) in the political process. Individuals differ in the two most important dimensions when it comes to the design of the two welfare schemes, namely income and health risk. At the constitutional stage individuals anticipate the possible voting outcomes at the second stage, but they are assumed to adjudicate as if they were behind a "veil of ignorance" about their own preferences. In other words, the decision on which welfare scheme(s) will be implemented is made in a state of uncertainty. Individuals do not yet know their income and risk type, but have common knowledge of the distribution of types and thus know the probability of becoming a specific type. We first consider MaxiMin preferences and assume that individuals will unanimously agree on the choice which maximizes the utility of the worst-off individuals in society, namely, the low-income and high-risk agents.[5] Second, we consider the scenario where individuals maximize their expected utility at the constitutional stage.

The approach of studying the design of welfare schemes within this two-stage framework has a long tradition; see *e.g.*, Laffont (1996); Atkinson (1996b); Boyer and Laffont (1998); Casamatta, Cremer and Pestieau (2000). Like Casamatta *et al.* (2000), who study the redistributive design of social insurance systems, we use the constitutional approach to capture the difference between the basic design of welfare state institutions and the decisions made within this framework. At the constitutional stage, decisions are made with a long-term perspective that includes fundamental decisions about the welfare institutions. At this stage, it is not yet clear whether individuals will be net payers into or receivers from the welfare state. The size of

[5]These preferences also reflect the Difference Principle of Rawls (1971). Analyzing the introduction of a BI scheme by applying Rawl's Difference Principle is also suggested by Van Parijs (1991).

welfare schemes, on the other hand, is a more frequently debated issue and is settled through a continuing political process. At this second stage individuals have learned their income and risk type and know whether they will be net payers into or beneficiaries of the welfare scheme(s) in place. The continuing political process is thus governed by the concrete interests of members of society, which may differ from their objectives at the constitutional stage.

In the second stage political process, individuals vote on the flat income tax rate which finances the basic income scheme and/or on the SHI contribution rate financing the level of public health care benefits. Atkinson (1996b) suggests assessing the political feasibility of a BI scheme by the median voter model. However, as is well known, the median voter theorem may not apply in multi-dimensional issue spaces since preferences may not be single-peaked. To tackle this problem, we invoke Shepsle's (1979) concept of structure-induced equilibria in which individuals vote simultaneously but separately on each system. This allows us to extend the median voter approach to a two-dimensional policy space. Specifically, we identify a median voter for each issue. A political equilibrium is defined by the mutual best response of each median voter to the other median voter's preferred policy.

The key finding for our first research question is that when both welfare schemes are open for debate, the BI scheme completely crowds out SHI. In the second stage voting game, only the BI scheme prevails. Its size is determined by the median voter's income relative to average income. This result is in line with Meltzer and Richard (1981), who show that in democracies, more unequal income distributions induce wider redistribution policies. For our second research question, we find that society may want to abandon a BI scheme at the constitutional stage and instead rely solely on SHI. This result depends on the inequality in health and income and on the extent of health care expenditure. The intuition is that SHI can be desirable from an *ex-ante* point of view because it not only redistributes from the rich to the poor but additionally from the healthy to the sick. Our paper thus provides a political economy explanation of why societies in developed countries rely on SHI schemes rather than on a BI scheme. Indeed, opponents of the BI initiative in Switzerland voiced the concern that the introduction of BI will undermine social insurance.[6] Finally, we show that it can be optimal on normative grounds to have both a SHI and BI, but in the political equilibrium only the SHI is implemented. This case arises if income inequality is relatively high compared to health inequality.

The paper is structured as follows. In Section 2, we present the model economy and the equilibrium concept. Section 3 first determines the median voters of the two policy issues at stake and then analyzes the political economic equilibrium. Decisions at the constitutional stage are analyzed in Section 4. In Section 5 we provide a numerical example. Finally, Section

[6]See the statement by Jean Christophe Schwaab, member of the Swiss National Council at http://www.srf.ch/news/schweiz/abstimmungen/abstimmungen-vom-5-6-2016/grundeinkommen/warum-viele-linke-gegen-ein-bedingungsloses-grundeinkommen-sind.

Table 1: Proportions of agents in society.

		Income		
		y_p	y_r	Σ
Health risk	π_l	θ_{pl}	θ_{rl}	>0.5
	π_h	θ_{ph}	θ_{rh}	<0.5
	Σ	>0.5	<0.5	1

6 provides some concluding remarks.

2 The Model Economy

2.1 The Setup

Individuals differ in two dimensions, namely in income $y_i \in \mathbb{R}^+$ and in the probability of falling ill $\pi_j \in (0, 1)$. They can either be poor or rich $i = p, r$ with $y_p < y_r$ and have either a low or a high probability of falling ill $j = l, h$ with $\pi_l < \pi_h$. Population size is normalized to one and the proportion of type-ij individuals is given by θ_{ij}. To ease notation, we write $\theta_i = \sum_j \theta_{ij}$ for the share of income type i and $\theta_j = \sum_i \theta_{ij}$ for the share of risk type j. In the following, we assume $\theta_p > 0.5$ implying that median income is below average income: $y^m = y_p < \bar{y} \equiv \theta_p y_p + \theta_r y_r$. Additionally, the share of l-types is larger in society, implying $\theta_l > 0.5$. Median risk is therefore below average risk: $\pi^m = \pi_l < \bar{\pi} \equiv \theta_l \pi_l + \theta_h \pi_h$.[7] None of the four groups comprises a majority in the population, *i.e.*, $\theta_{ij} \in [0, 0.5)\ \forall\ ij$. Table 1 summarizes.

Individuals derive utility from consumption of a numeraire commodity c. A BI scheme pays each individual a lump-sum transfer τ. These transfers are financed by a proportional tax t on each individual's income. If ill, individuals require treatment leading to medical expenditure $M \in \mathbb{R}^+$. The SHI insures a share $\alpha \in [0, 1]$ of health care expenditure. To finance social insurance, the contribution rate s is applied to each individual's income. The system is not exclusive and additional health insurance coverage can be bought in the private market at an actuarially fair price π_j per unit of coverage I. That is, insurance companies are able to observe each individual's risk type and premiums are given by $\pi_j I$.

[7] In a study of the potentially privately insured in the United States, Pauly and Herring (2007) find that the median expected health care expenses were US$ 1,461 whereas the average expected expenses were US$ 1,817 (1996-2002, in 2002 US$).

2.2 Individual Optimization

Individuals determine their consumption levels and insurance coverage by maximizing expected utility subject to their budget constraints in the good (superscript 'g') and bad (superscript 'b') health state

$$\max_{c_{ij}^g, c_{ij}^b, I_{ij}} \quad EU_{ij} = (1-\pi_j)u(c_{ij}^g) + \pi_j u(c_{ij}^b) \tag{1}$$

$$\text{s.t.} \quad c_{ij}^g = (1-t-s)y_i + \tau - \pi_j I_{ij} \tag{2}$$

$$c_{ij}^b = (1-t-s)y_i + \tau - \pi_j I_{ij} - M + I_{ij} + \alpha M, \tag{3}$$

where $u' > 0$, $u'' < 0$ and $\lim_{c\to 0} u'(c) = \infty$. As private insurance premiums are actuarially fair, individuals fully insure, *i.e.*, $I_{ij}^* = (1-\alpha)M \ \forall \ ij$; see Mossin (1968).[8] This implies that consumption levels are equalized across health states, $c_{ij}^g = c_{ij}^b \equiv c_{ij} \ \forall \ ij$. The utility of individual ij can then be written as

$$EU_{ij} = U_{ij} = u((1-t-s)y_i + \tau - \pi_j(1-\alpha)M) \quad \forall \ ij. \tag{4}$$

2.3 The Welfare Schemes

The BI lump-sum transfer τ is financed from taxing labor income at rate t while SHI coverage αM is financed from taxing labor income at rate s. Each welfare system is assumed to be individually balanced, so that its total expenditure has to be equal to the amount of collected taxes.[9] We make use of the same approach as Galasso and Profeta (2007) and Conde-Ruiz and Profeta (2007), in capturing the distortions due to income taxation by correcting the tax base with the distortionary factor $1-t-s$. This reduced form reflects the adverse impact of each transfer scheme on the labor supply decision. The budget constraints for the BI and the SHI scheme read as

$$t(1-t-s)\bar{y} = \tau, \tag{5}$$

$$s(1-t-s)\bar{y} = \alpha\bar{\pi}M. \tag{6}$$

Note that the lump sum transfer τ displays a Laffer curve relationship with respect to the income tax rate and depends negatively on the SHI contribution rate because the SHI contribution rate induces a distortion which contributes to decreasing the average income in the economy and thus reduces tax benefits. Analogously, the share of health care expenditure insured by the government is governed by a Laffer curve relationship with respect to the SHI contribution

[8] We assume that net income is always sufficiently high to finance insurance premiums $\pi_j I_{ij}^*$ implying $y_p > \pi_h M$.

[9] In most countries contributions to the social health insurance scheme are kept separate from other government mandated taxes and charges (see, Saltman, Busse and Figueras, 2004).

rate and depends negatively on the income tax rate. The maximum of each Laffer curve is at $t^{max}(s) = (1 - s)/2$ and $s^{max}(t) = (1 - t)/2$, respectively. Assuming that the share α of health care publicly provided cannot exceed one, the SHI contribution rate required to balance the budget (6) satisfies

$$s(t) \leq \hat{s}(t) \equiv \frac{1 - t - \sqrt{(1-t)^2 - 4\frac{\bar{\pi}M}{\bar{y}}}}{2}. \tag{7}$$

If $(1-t)^2 < 4\frac{\bar{\pi}M}{\bar{y}}$, the overall tax base is too small to finance all health care expenditure and the above constraint does not need to be considered. If $(1-t)^2 \geq 4\frac{\bar{\pi}M}{\bar{y}}$, we have

$$\frac{\partial \hat{s}(t)}{\partial t} = \frac{\hat{s}(t)}{\sqrt{(1-t)^2 - 4\bar{\pi}M/\bar{y}}} > 0. \tag{8}$$

For a higher tax rate, the SHI contribution rate must increase to cover all health care expenditure because the tax base is smaller. Constraint (7) is thus more likely to be relevant for smaller values of t.

The government budget constraints (5) and (6) imply that only two of the four policy instruments, (t, τ, s, α), can be freely set. We assume that society votes on the income tax rate t and on the SHI contribution rate s. The lump sum transfer τ and the share of health care expenditure insured by the government α are then residually determined through equations (5) and (6).

2.4 The Sequence of Events

We consider the following sequence of events:

(1) Constitutional stage

Behind the veil of ignorance individuals decide on whether to implement an SHI scheme and/or a BI scheme.

(2) Political Process

(2a) Individual income y_i and the probability of illness π_j are revealed.

(2b) Individuals vote on

- s if only SHI has been implemented
- t if only BI has been implemented
- s and t if both schemes have been implemented.

At stage (1) individuals anticipate the outcome of stage (2). We therefore solve this game by backward induction. In Section 3, we analyze stage (2) focusing on the case where individuals vote on both s and t. The two other cases follow from straightforward calculations. In Section 4, we take an *ex-ante* point of view and determine at the constitutional stage (1) which welfare scheme(s) society chooses to implement. Before proceeding, we first define the equilibrium notions for our economy.

2.5 The Economic Equilibrium

The economic equilibrium can be defined as follows:

Definition 1 (Economic equilibrium)
For a given income tax and social contribution rate $(t, s) \in [0, 0.5] \times [0, 0.5]$*, an economic equilibrium is an allocation* $\left\{c^g(y_i, \pi_j), c^b(y_i, \pi_j), I(y_i, \pi_j)\right\}_{i=p,r}^{j=l,h}$ *such that the following conditions hold:*

(i) the consumer problem is solved; i.e., agents maximize EU_{ij} *with respect to* c^g_{ij},c^b_{ij} *and* I_{ij} *subject to equations* (2) *and* (3)*;*

(ii) the government's budget constraints are balanced, i.e., equations (5) *and* (6) *are satisfied; and*

(iii) the private health insurance market and the market for the numeraire commodity are competitive and clear.

Substituting from (5) and (6) into (4), the utility level obtained in an economic equilibrium by a type-ij individual is given by the indirect utility function

$$V_{ij}(t, s) = u\big((1 - t - s)y_i + t(1 - t - s)\bar{y} - \pi_j M + \eta_j s(1 - t - s)\bar{y}\big) \qquad \forall\ ij, \tag{9}$$

where $\eta_j \equiv \pi_j/\bar{\pi}$ is the ratio of individual to average risk. The above indirect utility function can be used to express the preferences of an individual of type ij for the income tax rate t and the SHI contribution rate s in an economic equilibrium. Both policy variables are specified in the political process described in Section 3.

2.6 Structure-Induced Equilibrium

In the political process, individuals vote on the income tax rate, t, and/or the SHI contribution rate, s. We assume that agents vote sincerely and that every voter has zero mass. The latter implies that no individual vote can change the outcome. We follow Shepsle (1979) in analyzing structure-induced equilibria, in which agents vote simultaneously, but separately on the issues at stake. Specifically, the political system we adopt has the following characteristics:[10]

(i) Preferences of the electorate, *i.e.*, *pl*-, *ph*-, *rl*-, and *rh*-agents, are perfectly represented by the government which delegates policy issues to (perfectly representative) ministries: the Ministry of Health and the Ministry of Finance.

(ii) The Ministry of Health is responsible for SHI while the Ministry of Finance is responsible for income taxation. In the political process, the Ministry of Health proposes an SHI contribution rate for a *given* income tax rate $s(t)$ which the Ministry of Finance can either accept or reject. Similarly, the Ministry of Finance suggests an income tax rate for a *given* SHI contribution rate $t(s)$ which, in turn, the Ministry of Health can either accept or reject.

(iii) Both ministries thereby act in the interests of the median voter of the respective policy issue.

Within this political system, the proposals $t(s)$ and $s(t)$ can be thought of as the best responses (or reaction functions) of the ministries that are rooted in the preferences of the median voter on the issue at stake. Their intersection characterizes the structure-induced equilibrium of the voting game, where policy proposals of the ministries are mutual best responses to one another. Thus, the structure-induced equilibrium introduces issue-by-issue voting and thereby allows the application of the median voter approach in a two-dimensional issue space.

This equilibrium concept also nests the voting outcome for the case where only one welfare scheme is in place. The size of the BI and SHI scheme is then simply determined by $t(0)$ and $s(0)$, respectively.

3 Politico-Economic Equilibria

In this section, we analyze the voting game. First, we compute every voter's ideal income tax rate for a given SHI contribution rate, $t(s)$, and then the ideal SHI contribution rate for a given income tax rate, $s(t)$. For each value of s, we then identify the median voter over t, and for each value of t, we verify the median voter over s.

[10] The description of the structure-induced equilibrium closely follows Galasso (2008).

3.1 Voting on the Income Tax Rate

For a given social insurance rate, s, a type-ij individual chooses the preferred income tax rate $t_{ij}(s)$ by maximizing the indirect utility, equation (9), with respect to t:

$$\max_t \quad V_{ij}(t,s) \quad \text{s.t.} \quad t \geq 0.$$

The first order condition (FOC) of this problem is

$$\frac{\partial V_{ij}(t,s)}{\partial t} = u'(c_{ij})\left[-y_i + (1-2t^*-s)\bar{y} - \eta_j s\bar{y}\right] \leq 0, \quad t^* \geq 0, \quad t^* \frac{\partial V_{ij}(t,s)}{\partial t} = 0. \qquad (10)$$

The first expression in brackets represents the direct costs of higher income taxes which are increasing in income. The second term reflects the increase in the lump-sum transfer, while the last expression captures the adverse effect of higher income taxes on the SHI scheme. As the indirect utility function of a type-ij agent is concave in t,

$$\frac{\partial^2 V_{ij}(t,s)}{\partial t^2} = u''(c_{ij})\left[-y_i + (1-2t-s)\bar{y} - \eta_j s\bar{y}\right]^2 - u'(c_{ij})2\bar{y} < 0 \qquad \forall\ ij,$$

preferences are single-peaked. Solving equation (10) for the income tax rate yields

$$t^*_{ij}(s) = \max\left\{0; \frac{1-\omega_i-(1+\eta_j)s}{2}\right\}, \qquad (11)$$

where we define $\omega_i \equiv y_i/\bar{y}$ as the ratio of individual to average income. The following Lemma summarizes the main properties of $t^*_{ij}(s)$:

Lemma 1 (Properties: income tax rate)
The preferred income tax rate is zero for rich individuals, $t^*_{rl}(s) = t^*_{rh}(s) = 0\ \forall\ s$. Poor agents prefer positive income taxation when no SHI is in place, i.e., $t^*_{pj}(0) > 0$. As long as $t^*_{pj}(s) > 0$, the preferred income tax rate

(i) decreases in the SHI contribution rate, $\mathrm{d}t^*_{pj}(s)/\mathrm{d}s < 0$, and

(ii) decreases in the probability of falling ill, $\mathrm{d}t^*_{pj}(s)/\mathrm{d}\pi_j < 0$.

Unsurprisingly, rich agents oppose a positive income tax rate as they are net contributors to the welfare scheme. Poor agents, by contrast, gain from the income redistribution induced by the basic income tax scheme. With no SHI, these agents always vote for positive taxation. For larger values of s, poor agents have to weigh the negative effect of income taxation on the tax base of the welfare schemes against its positive redistributive effects. High-risk, low-income individuals value this negative effect more as they are not only net beneficiaries from a BI but

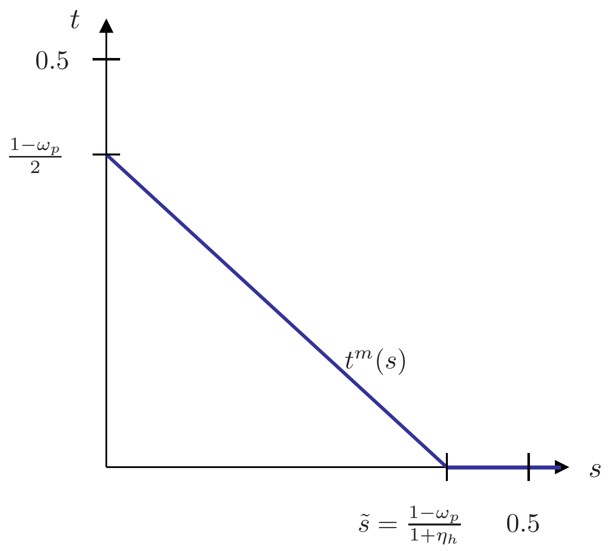

Figure 1: Median voter's preferred income tax rate.

also from an SHI. Therefore, they prefer a lower income tax rate for any given SHI contribution rate.

It is now straightforward to order every individual's vote over the proportional income tax for a given SHI contribution rate, and to identify the median voter's type. This is a type-ij agent who divides the electorate into halves.

Lemma 2 (Median voter: income tax rate)
The most preferred income tax rates can be ordered as follows: $t^*_{rl}(s) = t^*_{rh}(s) = 0 \leq t^*_{ph}(s) \leq t^*_{pl}(s)$*. Since the poor comprise a majority, the median voter is a poor high-risk type implying* $t^m(s) \equiv t^*_{ph}(s)$*.*

The median voter's income tax reaction function, $t^m(s)$, can be written as

$$t^m(s) = \max\left\{0, \frac{1 - \omega_p - (1 + \eta_h)s}{2}\right\}. \tag{12}$$

It is displayed in Figure 1. For no social insurance scheme, $s = 0$, equation (12) reduces to

$$t^m(0) = \frac{1 - \omega_p}{2} > 0 \tag{13}$$

as $\omega_p = y_p/\bar{y} < 1$. In other words, if no SHI scheme exists, the median voter always votes for positive income taxation. This is a poor agent who benefits from redistribution by voting for positive income taxation. Moreover, we find a critical level of the SHI rate $\tilde{s}$ which induces a zero income tax rate:

$$t^m(s) = 0 \quad \text{for} \quad s \geq \tilde{s} \equiv \frac{1-\omega_p}{1+\eta_h}. \tag{14}$$

If the SHI contribution rate increase above $\tilde{s}$, distortions induced by SHI are too large and a BI scheme becomes undesirable from the median voter's point of view.

3.2 Voting on the SHI Contribution Rate

For a given income tax rate, t, a type-ij individual chooses the most preferred SHI contribution rate $s_{ij}(t)$ by maximizing the indirect utility, equation (9), with respect to s. Here the requirement that health care expenditure cannot be refunded above 100 percent needs to be considered; see equation (7).[11] Thus, the optimization problem of a type-ij individual is:

$$\max_s \quad V_{ij}(t,s) \quad \text{s.t.} \quad 0 \leq s \leq \hat{s}(t).$$

The Kuhn-Tucker conditions of the above problem amount to

$$\frac{\partial V_{ij}(t,s)}{\partial s} \leq 0, \qquad s^* \geq 0, \qquad s^* \frac{\partial V_{ij}(t,s)}{\partial s} = 0, \tag{15}$$

$$\frac{\partial V_{ij}(t,s)}{\partial s} \geq 0, \quad s^* \leq \hat{s}(t), \quad (\hat{s}(t) - s^*)\frac{\partial V_{ij}(t,s)}{\partial s} = 0, \tag{16}$$

where

$$\frac{\partial V_{ij}(t,s)}{\partial s} = u'(c_{ij})\left[-y_i - t\bar{y} + \eta_j(1-t-2s^*)\bar{y}\right]. \tag{17}$$

As for income taxation, the first term in brackets reflects the direct costs of higher health insurance contribution rates. The second expression captures their adverse effect on the tax base of the BI scheme, while the last term represents the benefit of higher SHI coverage which increases with the probability of falling ill. The indirect utility function is concave in s,

$$\frac{\partial^2 V_{ij}(t,s)}{\partial s^2} = u''(c_{ij})\left(-y_i - t\bar{y} + \eta_j(1-t-2s)\bar{y}\right)^2 - u'(c_{ij})\eta_j 2\bar{y} < 0 \qquad \forall\ ij,$$

implying that preferences are single-peaked. We denote by $\check{s}_{ij}(t)$ the solution to equation $\partial V_{ij}(t,s)/\partial s = 0$. From (17) we obtain

$$\check{s}_{ij}(t) = \frac{\eta_j - \omega_i - (1+\eta_j)t}{2\eta_j}. \tag{18}$$

[11] For high values of t, this constraint may be irrelevant because the tax base is too small to finance all health care expenditure.

The preferred SHI contribution rate of a type-ij individual can then be written as

$$s_{ij}^*(t) = \max\left\{0; \min\left\{\check{s}_{ij}(t); \hat{s}(t)\right\}\right\}. \tag{19}$$

The following Lemma summarizes the main properties of $s_{ij}^*(t)$:

Lemma 3 (Properties: SHI contribution rate)
The most preferred SHI contribution rate is zero for rich low-risk individuals $s_{rl}^*(t) = 0$. *If* $s_{ij}^*(t) = \check{s}_{ij}(t) > 0$, *the preferred SHI contribution rate*

(i) decreases in income, $\mathrm{d}s_{ij}^*(t)/\mathrm{d}y_i < 0$,

(ii) decreases in the income tax rate, $\mathrm{d}s_{ij}^*(t)/\mathrm{d}t < 0$, *and*

(iii) increases in the probability of falling ill, $\mathrm{d}s_{ij}^*(t)/\mathrm{d}\pi_j > 0$.

When the restriction that only 100 percent of health care expenditure can be refunded (*i.e.*, $\alpha \leq 1$) is non-binding, the results can be interpreted as follows. As the social health care system incorporates an element of income redistribution in that high-income agents pay more into the SHI scheme than low-income individuals, rich individuals vote for a lower SHI contribution rate than poor individuals. Moreover, a higher income tax rate adversely affects the overall tax base and reduces the attractiveness of SHI. High-risk individuals prefer a higher SHI contribution rate, unlike their low-risk counterparts, as they have to pay higher premiums in the private market while the SHI scheme redistributes from high- to low-risk agents.

With Lemma 3, the preferred SHI contribution rate can be ranked across agents and the median voter can be identified.

Lemma 4 (Median voter: SHI contribution rate)
The preferred SHI contribution rates for a given income tax rate, $s_{ij}^*(t)$, *can be ranked according to* $s_{rl}^*(t) = 0 \leq s_{pl}^*(t), s_{rh}^*(t) \leq s_{ph}^*(t)$. *Since neither high-risk nor rich agents form a majority, the median voter is a poor low-risk type.*

The median voter's reaction function over the SHI contribution rate for a given income tax rate $s^m(t)$ is thus given by

$$s^m(t) = \max\left\{0; \min\left\{\check{s}_{pl}(t); \hat{s}(t)\right\}\right\}. \tag{20}$$

Noting that $\check{s}'_{pl}(t) < 0$ and $\hat{s}'(t) > 0$ (see equation (8)), a sufficient condition for $\check{s}_{pl}(t) \leq \hat{s}(t)$ is

$$\check{s}_{pl}(0) = \frac{\eta_l - \omega_p}{2\eta_l} \leq \hat{s}(0) = \frac{1 - \sqrt{1 - 4\frac{\bar{\pi}M}{\bar{y}}}}{2}. \tag{21}$$

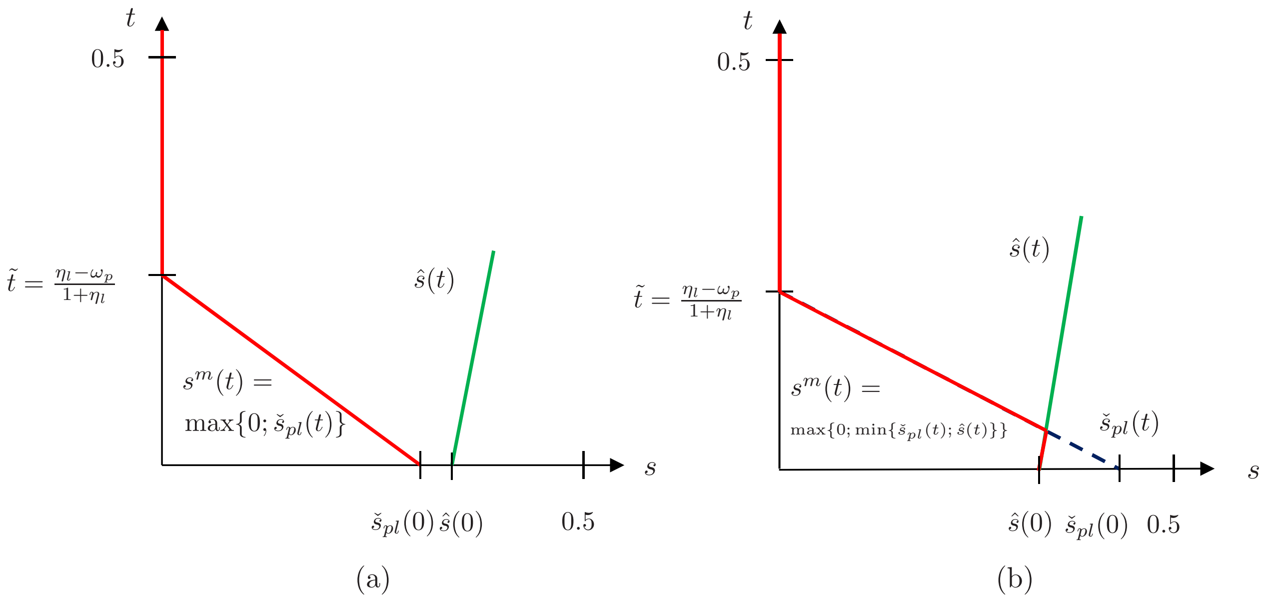

Figure 2: Median voter's preferred SHI contribution rate.

This is shown in Figure 2(a) (note that the axes are reversed). If $\hat{s}(0) < \check{s}_{pl}(0)$, the median voter's preferred SHI contribution rate has a kink. This is illustrated in Figure 2(b). For low values of t, the median voter desires more redistribution than possible through SHI. Such a scenario is more likely if health care expenditure $\bar{\pi}M$ is small compared to average income $\bar{y}$.

In Figure 2(a), the preferred SHI contribution rate for no income taxation, $t = 0$, equation (20) reduces to

$$s^m(0) = \check{s}_{pl}(0) = \frac{\eta_l - \omega_p}{2\eta_l}. \tag{22}$$

The above equation is positive if $\eta_l > \omega_p$. $\eta_l = \pi_l/\bar{\pi} < 1$ is a measure for the inequality in illness. The closer it is to one, the smaller the inequality in illness (for a given share of risk types). Likewise, $\omega_p = y_p/\bar{y} < 1$ measures the inequality in income. The smaller ω_p, the larger the income equality. The median voter thus prefers a positive SHI contribution rate only if the inequality in illness is smaller than the inequality in income. Being in the lower income class, the median voter benefits from income redistribution through SHI. The extent decreases in ω_p, *i.e.*, in the median voter's income relative to average income. On the other hand, the median voter is a low-risk agent who cross-subsidizes high-risk agents via SHI. This negative effect decreases in η_l and therefore decreases in the own probability of needing health care relative to the average risk. Only, if the former (positive) effect outweighs the latter (negative) effect, does the median voter vote for SHI.

In Figure 2(b), we obtain for the preferred SHI contribution rate and no income taxation, $t = 0$,

$$s^m(0) = \hat{s}(0) = \frac{1 - \sqrt{1 - 4\frac{\bar{\pi}M}{\bar{y}}}}{2}. \tag{23}$$

In this case, the SHI system covers 100 percent of health care expenditure in the absence of a BI scheme.

In both figures, we find a critical level of the income tax rate $\tilde{t}$ above which the SHI contribution rate becomes zero:

$$s^m(t) = 0 \quad \text{for} \quad t > \tilde{t} \equiv \frac{\eta_l - \omega_p}{1 + \eta_l}. \tag{24}$$

3.3 Equilibrium Outcomes

In Sections 3.1 and 3.2, we analyzed the voters' decisions on the income tax rate and the SHI contribution rate. Both median voters were found to have low income, but the decisive voter over the income tax rate is a high-risk agent, whereas the one over the SHI contribution rate is a low-risk agent.

If the institutional framework is such that only one welfare scheme is in place, equation (12) determines the size of the BI scheme for $s = 0$, and equation (20) determines the size of the SHI scheme for $t = 0$. The corresponding equilibrium values are given by

$$t^I = t^m(0) = (1 - \omega_p)/2 \tag{25}$$

and

$$s^{II} = s^m(0) = \max\left\{0; \min\left\{\check{s}_{pl}(0); \hat{s}(0)\right\}\right\}. \tag{26}$$

When both welfare schemes are open for debate, equations (12) and (20) can be interpreted as reaction functions: for a given SHI contribution rate, equation (12) identifies the income tax rate chosen by the median voter ph; and for a given income tax rate, equation (20) identifies the SHI contribution rate chosen by the median voter pl. The structure-induced equilibrium outcomes of this voting game correspond to the points at which these two reaction functions cross. In the following, we will specify this structure-induced equilibrium.

If $\eta_l \leq \omega_p$, SHI receives no support. The equilibrium is $t^I = t^m(0) = (1 - \omega_p)/2$ and $s^I = 0$. The case of $\eta_l > \omega_p$ is displayed in Figure 3. Note that $t^m(0) \geq \tilde{t}$, *i.e.*, the reaction function $t^m(s)$ hits the t-axis above $\tilde{t}$, the critical level of the income tax rate above which the SHI

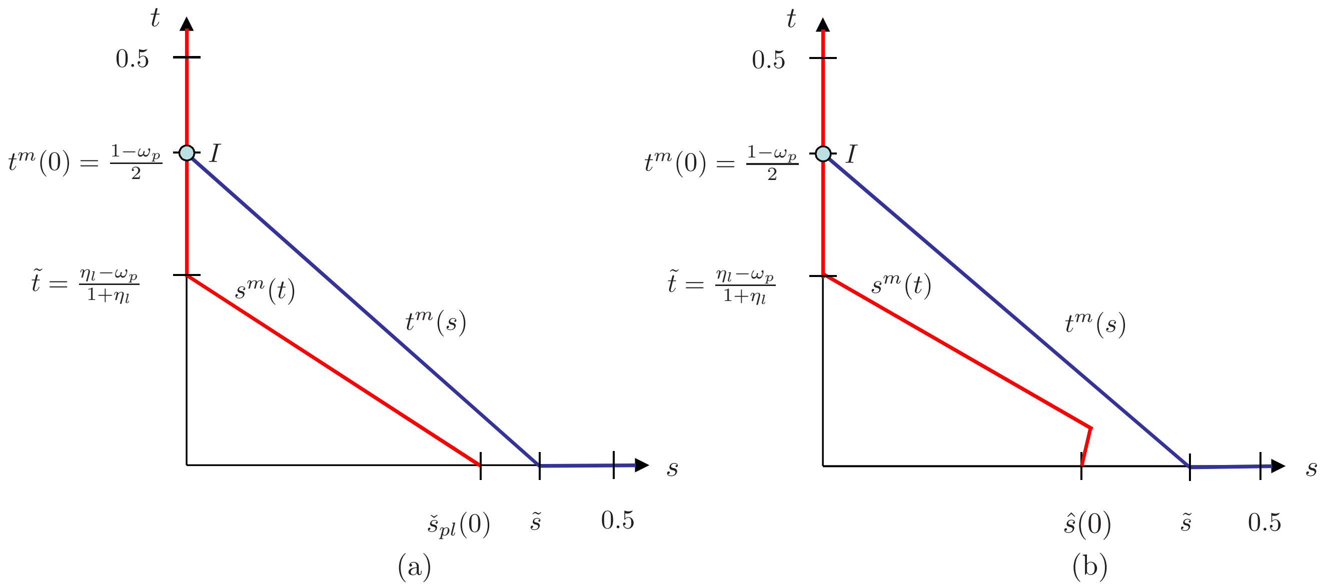

Figure 3: Political equilibria.

contribution rate becomes zero.[12] First, we consider the case in which the reaction function for the SHI contribution rate $s^m(t)$ does not display a kink, as in Figure 3(a). From (14) and (22), we obtain

$$\check{s}_{pl}(0) < \tilde{s} \quad \Leftrightarrow \quad \frac{\eta_l - \omega_p}{2\eta_l} < \frac{1-\omega_p}{1+\eta_h} \quad \Leftrightarrow \quad \omega_p(2\eta_l - 1 - \eta_h) < \eta_l(1-\eta_h). \tag{27}$$

The last inequality holds because $\omega_p < \eta_l$ and $2\eta_l - 1 - \eta_h < 1 - \eta_h$ since $\eta_l < 1$. The $t^m(s)$ function thus hits the s-axis to the right of $\check{s}_{pl}(0)$ implying that the two functions cross only once. The equilibrium is unique and is again characterized by

$$t^I = \frac{1-\omega_p}{2} \quad \text{and} \quad s^I = 0. \tag{28}$$

In words, only a BI scheme prevails. Figure 3(a) provides an illustration.

When the reaction function $s^m(t)$ for the SHI contribution rate displays a kink as in Figure 3(b), the restriction that only 100 percent of health care expenditure can be refunded is binding for low levels of t. But since the reaction function $t^m(s)$ is always above the the function $\check{s}_{pl}(t)$, this has no consequences for the political equilibrium, implying that the unique equilibrium remains t^I and s^I. The following proposition summarizes our results.

[12]The function $t(a) = (a - \omega_p)/(1 + a)$ is increasing in a.

Proposition 1 (Political equilibrium)

(i) If the institutional framework for only a BI scheme is in place, while the SHI scheme is abandoned at the constitutional stage ($s = 0$)*, the BI scheme's size is determined by*

$$t^I = t^m(0) = (1 - \omega_p)/2.$$

(ii) If the institutional setting for only an SHI scheme is in place, while the BI scheme is abandoned at the constitutional stage ($t = 0$)*, the SHI scheme's size is determined by*

$$s^{II} = s^m(0) = \max\left\{0; \min\left\{\check{s}_{pl}(0); \hat{s}(0)\right\}\right\}.$$

with $s^{II} > 0$ *if and only if* $\eta_l > \omega_p$*.*

(iii) If the size of both welfare schemes is open for debate in the second stage, the SHI scheme finds no political support and only a BI scheme prevails. Specifically, the size of each welfare scheme is

$$t^I = \frac{1 - \omega_p}{2} \quad \text{and} \quad s^I = 0.$$

Thus, once a BI scheme is open for debate in addition to SHI, the BI scheme completely crowds out SHI. The intuition for this result is that the median voter determining the SHI contribution rate is a poor low-risk agent who has only limited interest in SHI. Poor high-risk individuals are pivotal only for the BI scheme. Given their low income, they prefer a high level of BI. This level is so high that in the political equilibrium, poor low-risk agents have no more interest in SHI.

4 Constitutional Stage

Our results raise the question whether society should abandon a BI in the first place and set up the institutional framework for an SHI scheme only. We follow the suggestion by Atkinson (1996) and use a constitutional analysis to analyze this question in greater detail. Concretely, we assume that constitutional rules are made on an *ex ante* basis before individuals know their income and risk type. They only have imperfect signals concerning their position in society in that they know that the share θ_{ij} which will turn out to be of type-ij. Utility levels are evaluated at the second-stage voting equilibrium. We first consider MaxiMin preferences and assume that individuals will unanimously agree on the choice which maximizes the utility of the worst-off individuals in society, namely, the low-income and high-risk agents. This can be considered to be the case when individuals have a high-degree of risk-aversion concerning their position in society. Then, we consider the scenario where, behind the veil of ignorance, individuals maximize expected utility.[13]

In the second stage voting game we found that in a political equilibrium BI and SHI cannot coexist. The choice at the constitutional stage thus pins down to:

(i) setting up the institutional framework for solely a BI scheme with $t^I = (1 - \omega_p/2)$,

(ii) implementing solely an SHI which comes with $s^{II} = \max\left\{0; \min\left\{\check{s}_{pl}(0); \hat{s}(0)\right\}\right\}$,

(iii) refraining from implementing a welfare scheme.

4.1 MaxiMin Preferences

Before proceeding with the constitutional choice, let us determine the optimal welfare design for the worst-off individuals – the high-risk poor – without any political constraints. The problem corresponds to

$$\max_{s,t} \quad V_{ph}(t,s) = u((1-t-s)y_p + t(1-t-s)\bar{y} - \pi_h M + \eta_h s(1-t-s)\bar{y}) \tag{29}$$

subject to the constraints $t \geq 0$ and $0 \leq s \leq \hat{s}(t)$. The solution is (see Appendix A.1.1 for details)

$$\begin{aligned} s^{\circ}_{ph} &= \min\left\{\check{s}_{ph}(0); \hat{s}(0)\right\} > 0 \quad \text{and} \quad t^{\circ}_{ph} = 0 \qquad \text{if} \quad \hat{s}(0) \geq \frac{1-\omega_p}{1+\eta_h}, \\ s^{\circ}_{ph} &= \hat{s}(t^{\circ}_{ph}) > 0 \quad \text{and} \quad t^{\circ}_{ph} > 0 \qquad \text{if} \quad \hat{s}(0) < \frac{1-\omega_p}{1+\eta_h}. \end{aligned}$$

Thus, an SHI is always optimal for *ph*-individuals. Whether a BI scheme on top is optimal depends on $\hat{s}(0)$, the SHI contribution rate which covers all health care expenditure in the absence of a BI scheme. If $\hat{s}(0)$ is large, then type-*ph* individuals' utility is maximized if only an SHI system is in place. Otherwise, if $\hat{s}(0)$ is small, *i.e.*, if coverage of all health care expenditure requires only a small SHI system, then SHI covers all health care expenditure, and a BI system exists on top. The SHI scheme has the advantage that it redistributes income in both dimensions relevant for *ph*-individuals. Thus, from a normative perspective additional income redistribution via a BI can be optimal only if all health care expenditure is covered by SHI.

In a political equilibrium, SHI will only be implemented if BI is ruled out at the constitutional stage. In this case, the SHI contribution rate is governed by the preferences of *pl*-individuals, who prefer a lower rate than *ph*-individuals. Nevertheless, low-income high-risk agents may be

[13] Alternatively, one can think of a benevolent social planner who determines the sort of rigid constitutional setting by maximizing utility of the worst-off or utilitarian welfare. The political decisions about the size of the welfare scheme(s), on the other hand, are more frequently debated and reflect the interest of the median voter (for a discussion see also Casamatta *et al.* 2000)

better off with a smaller SHI contribution rate rather than without an SHI system. So, it could well be that, given that utility is evaluated at t^I and s^{II}, the utility of the doubly disadvantaged is maximized if ssolely an SHI scheme is implemented at the constitutional stage.

To begin with, we focus on the case of $s^{II} = \check{s}_{pl}(0)$ implying that health care is only partially covered in the political equilibrium without BI. Then $s^{II} = (\eta_l - \omega_p)/2\eta_l$ and the indirect utility of type-ph agents is given by

$$V_{ph}^{II} = u\left(\left(1 - \frac{\eta_l - \omega_p}{2\eta_l}\right)\left(y_p + \frac{\eta_l - \omega_p}{2}\frac{\eta_h}{\eta_l}\bar{y}\right) - \pi_h M\right). \tag{30}$$

In equilibrium I with only a BI scheme, we have $t^I = (1 - \omega_p)/2$. Using (9), the indirect utility of a type-ph agent amounts to

$$V_{ph}^{I} = u\left(\left(1 - \frac{1 - \omega_p}{2}\right)\left(y_p + \frac{1 - \omega_p}{2}\bar{y}\right) - \pi_h M\right). \tag{31}$$

We have $s^{II} \leq t^I$, *i.e.*, the level of income redistribution is lower in equilibrium II than in equilibrium I.[14] Since, however, ph-types benefit from the cross-subsidization inherent in SHI, $V_{ph}^{II} \geq V_{ph}^{I}$ is possible. In Appendix A.1.2, we show that

$$V_{ph}^{II} \gtreqless V_{ph}^{I} \quad \Leftrightarrow \quad \frac{\eta_l^2 \eta_h(\eta_h - 1)}{(\eta_h - \eta_l)^2 + \eta_l^2(\eta_h - 1)} \gtreqless \omega_p^2. \tag{32}$$

The left-hand side of the above condition is positive. Thus, for small values of ω_p, we have $V_{ph}^{II} > V_{ph}^{I}$ and an SHI scheme welfare dominates a BI scheme at the constitutional stage. This is most evident for $\omega_p = 0$ when the poor earn no income at all. In this case, the median voter prefers to maximize contributions into the welfare schemes, implying $t^I = 0.5$ and $s^{II} = 0.5$ at the second stage voting game. Even though both welfare schemes are of equal size, type-ph individuals benefit (in expectation) more from SHI than from a lump-sum transfer as the SHI scheme additionally redistributes income to high-risk individuals.

For higher values of ω_p, both t^I and s^{II} are smaller but the reduction is larger for s^{II}. Thus, there is a trade-off between income redistribution and subsidized coverage of health care expenditure for ph-types. In the extreme case $\omega_p \geq \eta_l$, we find $t^I > 0$ and $s^{II} = 0$. Then, the BI is superior since the SHI scheme finds no political support in the second stage voting game. In sum, higher income inequality as measured by a lower ω_p tends to favor an SHI scheme. Similarly, a high value of η_l makes the solution with only an SHI scheme more attractive since it increases $s^{II} = (\eta_l - \omega_p)/2\eta_l$ and brings it closer to the preferred level of ph-individuals.

Next, we turn our attention to the case of $s^{II} = \hat{s}(0)$ in which health care expenditure is

[14] Note that $s^{II}(\eta_l = 1) = t^I$. Since $\frac{\partial s^{II}}{\partial \eta_l} > 0$ and $\eta_l < 1$, it follows that $s^{II} < t^I$.

fully covered in equilibrium II. Again, we compare the equilibrium, in which only a BI scheme exists (equilibrium I), with the solution, where solely an SHI scheme is in place (equilibrium II). In Appendix (A.1.3), we show that

$$V_{ph}^{II} \gtreqless V_{ph}^{I} \quad \Leftrightarrow \quad 2\omega_p \sqrt{1 - 4\frac{\bar{\pi} M}{\bar{y}}} \gtreqless 1 - 4\frac{\pi_h M}{\bar{y}} + \omega_p^2. \tag{33}$$

Whether SHI dominates a BI scheme now mainly depends on the amount of health care expenditure compared to average income. If health care expenditure is relatively small compared to average income, a BI scheme is superior to SHI since redistribution inherent in the SHI scheme is then relatively weak. A high health risk, by contrast, increases the appeal of the SHI solution since the BI scheme comes with relatively expensive private health insurance premiums. If $\omega_p = 0$, a sufficient condition for the dominance of SHI is $M > \bar{y}/(4\pi_h)$.

Finally, we need to consider whether no scheme finds political support at the constitutional stage. For MaxiMin preferences, however, this case can be discarded. Since the BI scheme follows the preferences of the worst-off in society, implemented such a scheme with t^I always dominates the situation in the absence of a welfare scheme.

The following proposition provides a summary of our results.

Proposition 2 (Constitutional stage)
With MaxiMin preferences, a welfare scheme will be implemented at the constitutional stage. The following results obtain:

(i) *If $\check{s}_{pl}(0) = 0$ ($\Leftrightarrow \eta_l < \omega_p$), SHI finds no political support in the second stage voting game. A BI scheme is implemented at the constitutional stage.*

(ii) *If $0 < \check{s}_{pl}(0) < \hat{s}(0)$ implying that the restriction that health care expenditure cannot be refunded above 100 percent is non-binding ($\alpha < 0$), a BI scheme is implemented at the constitutional stage if*

$$\frac{\eta_l^2 \eta_h (\eta_h - 1)}{(\eta_h - \eta_l)^2 + \eta_l^2(\eta_h - 1)} < \omega_p^2.$$

Otherwise, the institutional framework for an SHI scheme is set up.

(iii) *If $\hat{s}(0) < \check{s}_{pl}(0)$ implying that the restriction that health care expenditure cannot be refunded above 100 percent is binding ($\alpha = 1$), a BI scheme is implemented at the constitutional stage if*

$$2\omega_p \sqrt{1 - 4\frac{\bar{\pi} M}{\bar{y}}} \leq 1 - 4\frac{\pi_h M}{\bar{y}} + \omega_p^2.$$

Otherwise, the institutional framework for an SHI scheme is set up.

In Section 5, we provide a numerical example which illustrates for which parameters constellations *(i)*, *(ii)*, or *(iii)* in Proposition 2 arise.

4.2 Expected Utility

We now examine the constitutional choice of BI or SHI when individuals maximize their expected utility.[15] SHI will be implemented if

$$\sum_{ij} \theta_{ij} V_{ij}^{II} \geq \sum_{ij} \theta_{ij} V_{ij}^{I}. \tag{34}$$

Now also marginal utilities and the share of each possible type play a direct role. The larger the probability of becoming a *ph*-type, the closer the solution will be to the one with Maximin preferences. The redistributive benefits of the SHI may now also accrue to type-rh and pl individuals. The former profit from its inherent redistribution from low-risk to high-risk individuals if $s_{rh}^* > 0$ while the latter benefit from its inherent income redistribution if $s_{pl}^* > 0$. We thus expect that the implementation of a SHI will be beneficial for a larger set of income and risk inequalities than for MaxiMin preferences. Our numerical example reveals that this intuition is indeed true.

A further consideration is that it is not guaranteed anymore that the introduction of a welfare scheme is attractive at the constitutional stage. The BI scheme follows the preferences of *ph*-types while the SHI scheme is determined by the preferences of *pl*-types. Expected utility, however, considers the preferences of all types. In particular, if the redistributive benefits of the welfare schemes are low, the distortions caused by the schemes (see equations (5) and (6)) may dominate. This case arises in our numerical example.

5 Numerical Illustration

The simulation is based on $u(c) = \ln(c)$, $M = 1$ and on the parameter values displayed in Table 2.

5.1 MaxiMin Preferences

For all possible (π_h, y_p)-combinations, we compute the utility of a poor high-risk agent at t^I and s^{II}, and calculate where V_{ph} is highest. Figure 4 illustrates our results (the red curve and entries will be discussed in Section 5.3 below).

[15] In Appendix A.2 we show that from a normative perspective a BI can not be optimal on top of SHI as long as $\alpha < 1$ and $\text{Cov}(u'(c_{ij}), \pi_j) > 0$.

Table 2: Parameter values

		Income		
		y_p=2	$y_r \in [2,8]$	Σ
Health risk	π_l=0.2	$\theta_{pl} = 0.42$	$\theta_{rl} = 0.28$	0.7
	$\pi_h \in [0.2, 0.8]$	$\theta_{ph} = 0.18$	$\theta_{rh} = 0.12$	0.3
	Σ	0.6	0.4	1

In the upper left corner, all individuals are identical with $\pi_h = \pi_l$ and $y_r = y_p$ and accordingly $\eta_l = \omega_p = 1$. Here, utilities with a BI and an SHI scheme coincide as $t^I = s^{II} = 0$. We then successively increase y_r (decrease ω_p) along the x-axis and increase π_h (decrease η_l) down the y-axis while keeping all other parameters constant.

We can identify three areas:

- In the lower-left triangle the BI scheme is superior to SHI. We have either $\eta_l \leq \omega_p$ which implies $s^{II} = 0$ or $\eta_l > \omega_p$ with a low value of s^{II}. t^I is always positive since $\omega_p < 1$. This situation corresponds to constellations *(i)* or *(ii)* above, with a BI dominating an SHI scheme.

- In the upper-right triangle, on the other hand, η_l is large compared to ω_p. The SHI rate s^{II} is positive but the restriction that only up to 100 percent of health care expenditure is publicly financed is binding. This imposes an upper bound on the redistributive benefits of SHI. A BI scheme dominates an SHI scheme in these cases as well. This situation corresponds to constellation *(iii)* above, with a BI scheme dominating SHI.

- Within the gray area between the lower left and upper right corner, the utility of the worst-off individuals is maximized if solely an SHI scheme is in place. For these parameter constellations, a positive SHI rate is supported in the political equilibrium. Additionally, the SHI contribution rate is large enough that the targeting advantage inherent in SHI outweighs the benefits of the larger size of the BI scheme. In these cases, society commits at the constitutional stage to implement solely an SHI system and to abandon a BI scheme. For $\alpha < 1$, this situation corresponds to constellation *(ii)*, for $\alpha = 1$ to constellation *(iii)* above, with an SHI scheme dominating a BI.

5.2 Expected Utility

When individuals maximize their expected utility at the first voting stage, we can identify the same three areas but of different sizes. As argued above SHI will be implemented for a

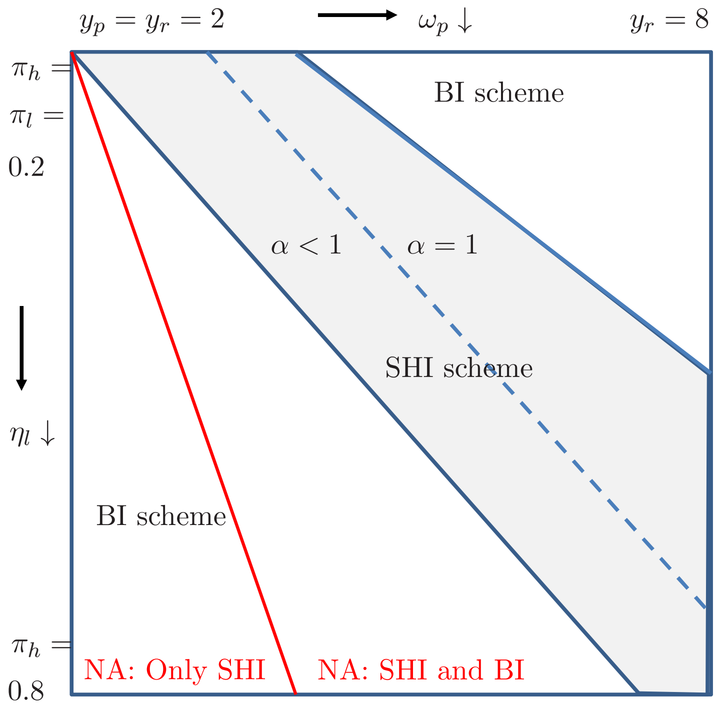

Figure 4: A numerical illustration.

larger share of risk and income combinations than for MaxiMin preferences. Only SHI provides insurance against becoming a low-income and/or a high-risk individual. This can be valuable for *pl* and *rh*-types as well.

A difference to Figure 4 is that the lower-left triangle can now be subdivided into two zones. Remember that within this area the inequality in risk is larger than in income implying a social health contribution rate equal to zero. In the right triangular a BI scheme is implemented at the constitutional stage, while in the left trapazoid society neither implements the institutional framework for BI, nor for SHI. The intuition behind this result can be easily understood. When average utility instead of the utility of the worst-off individual counts, then also efficiency losses that come with income taxation are taken into consideration. For small income inequalities these losses outweigh the BI's redistributive benefits.

5.3 Normative and Constitutional Analysis Compared

In Section 4, we have shown that on purely normative grounds, either only a SHI or a combination of SHI and BI is optimal. The latter case arises if income distribution via SHI is too small even if all health expenditure is covered. In Figures 4 and 5, these two cases are separated by the red curve. To the left of the red curve, only SHI is optimal according to the normative analysis (NA), to the right a BI scheme on top is optimal. Higher income inequality thus calls for a BI

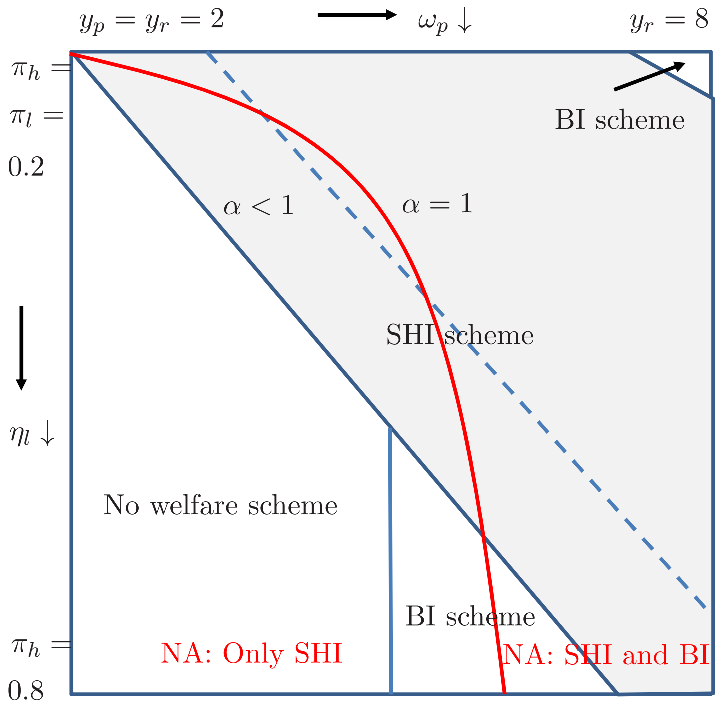

Figure 5: A numerical illustration.

on top as does lower health inequality.

An interesting question whether the implementation of a BI can be optimal from a normative point of view, while voters support only SHI. In both Figures, this is possible if income inequality is relatively high compared to health inequality. The reason is that at the constitutional level only one system can effectively be implemented. Here it can be optimal to concentrate on SHI. A further result is that a pure BI scheme can be optimal even though the normative analysis yields only a SHI. This is explained by the limitation that in some cases it is impossible to implement SHI. Here, a BI can at least achieve some redistribution. In the utilitarian case, it is also possible that no welfare scheme is optimal. Finally, it is possible that only a BI is chosen in the constitutional analysis while the normative analysis calls for both systems. This case obtains if income inequality is much larger than health inequality and the income redistribution by SHI is insufficient.

In general, the optimal system can hardly ever be implemented considering the political process. In Figure 4 with MaxiMin preferences, this is never the case. In Figure 5, this is only possible in few cases, in particular, on the red curve in the area where full SHI is optimal. Otherwise, either a different system is implemented or the level of SHI differs from the optimal normative level.

6 Conclusion

This paper studied how society votes on the payroll taxes of a basic income and a social health insurance scheme. Individuals differ in their income and in their probability of falling ill. We applied the concept of structure-induced equilibria by Shepsle (1979), in which agents vote simultaneously, but separately on the issues at stake. Our major finding is that once the institutional framework is such that both welfare schemes are open for debate, only the BI scheme finds political support. SHI is fully crowded out. At the constitutional stage in which society chooses behind a veil of ignorance whether an SHI and/or a BI scheme should exist, society might well unanimously agree to implement solely the institutional framework for SHI and to refrain from implementing a BI scheme. Individuals have an interest in insurance against becoming a high-risk and low-productivity type and only the SHI scheme can provide both forms of insurance. We have shown that this is all the more so, the larger the extent of overall health care expenditure compared to average income, and the lower health inequality compared to income inequality. Our paper thus provides a political economy explanation of why developed countries rather rely on SHI schemes and not on a BI scheme. Indeed, in the discussion prior to the BI referendum in Switzerland an important concern has been that the introduction of BI will undermine social insurance. Furthermore, we found that it seems unlikely that the optimal combination of SHI and BI from a normative point of view can be implemented considering the political process. In particular, even though a BI is in principle desirable, society may opt only for SHI.

We assumed that individuals can buy full private health insurance coverage at an actuarial fair price. Private health insurance markets may, however, suffer from adverse selection which translates into actuarial unfair premiums and incomplete insurance coverage. This makes an SHI insurance scheme more attractive (see, *e.g.*, Boadway *et al.* 2006). Furthermore, we assumed that both welfare schemes have the same effect on the tax base. This neglects additional income effects on labor supply by a BI scheme. Specifically, the provision of a BI may reduce the attractiveness of additional earnings and individuals may withdraw from the labor market. These possible adverse labor supply effects would also favor an SHI scheme at the constitutional stage. Since no country has ever introduced a BI scheme, it is difficult to assess how citizens would change their labor supply in response to a BI. Marx and Peeters (2008) proposed the study of lottery winners who had won a periodically unconditional lifelong income (€1000 per month) to gather empirical information on the labor supply effects of introducing a BI. The results of a pilot study with Belgian "Win for Life" winners point to no extreme consequences of introducing a BI. They found very few changes with regard to quitting work, reducing working time or becoming self-employed.[16]

[16] However, this study has its limitations. In particular, the sample size was rather small (84 winners participated in the survey) and the study only measured short-term effects, but no long-term effects.

Appendix

A.1 MaxiMin Preferences

A.1.1 Optimal Solution for ph-Type

The solution to problem (29) is given by the intersection of the reaction functions for ph-types, $t^*_{ph}(s)$ and $s^*_{ph}(t)$, which we derived in Section 3 (see equations (11 and (19)):

$$\begin{aligned} t^*_{ph}(s) &= \max\left\{0; \frac{1-\omega_p-(1+\eta_h)s}{2}\right\} \\ s^*_{ph}(t) &= \max\left\{0; \min\left\{\frac{\eta_h-\omega_p-(1+\eta_h)t}{2\eta_h}; \hat{s}(t)\right\}\right\}. \end{aligned}$$

First, we consider $\hat{s}(0) \geq \tilde{s} = (1-\omega_p)/(1+\eta_h)$. Then, $t^*_{ph}(0) = (1-\omega_p)/2$ and $s^*_{ph}(0) = (\eta_h-\omega_p)/(2\eta_h)$. Additionally, $t^*_{ph}(s) = 0$ implies $\tilde{s}_{ph} = (1-\omega_p)/(1+\eta_h)$, $s^*_{ph}(t) = 0$ yields $\tilde{t}_{ph} = (\eta_h-\omega_p)/(1+\eta_h)$. We have $t^*_{ph}(0) < \tilde{t}_{ph}$ and $s^*_{ph}(0) > \tilde{s}$. Thus, $s^*_{ph}(t)$ is always above $t^*_{ph}(s)$ and the solution is given by

$$t^\circ_{ph} = 0 \quad \text{and} \quad s^\circ_{ph} = \min\{\check{s}_{ph}(0); \hat{s}(0)\} \quad \text{if} \quad \tilde{s} \leq \hat{s}(0).$$

If $\hat{s}(0) < \tilde{s} = (1-\omega_p)/(1+\eta_h)$, the reaction functions cross. The optimal solution is given by

$$t^\circ_{ph} > 0 \quad \text{and} \quad s^\circ_{ph} = \hat{s}(t^\circ_{ph}) > 0$$

and corresponds to the intersection of

$$\hat{s}(t) \equiv \frac{1-t-\sqrt{(1-t)^2-4\frac{\bar{\pi}M}{\bar{y}}}}{2} \quad \text{and} \quad t^*_{ph}(s) = \frac{1-\omega_p-(1+\eta_h)s}{2}.$$

These two equations can be simplified to

$$\hat{s}(t) = \frac{1-t-\sqrt{(1-t)^2-c}}{2} \quad \text{and} \quad t^*_{ph}(s) = a - bs$$

where $a = \frac{1-\omega_p}{2}$, $b = \frac{(1+\eta_h)}{2}$ and $c = 4\frac{\bar{\pi}M}{\bar{y}}$. Thus,

$$\hat{s} = \frac{1-a+b\hat{s}-\sqrt{(1-a+b\hat{s})^2-c}}{2}$$

Rearranging and simplifying notation, we can write

$$\begin{aligned}2s &= 1-a+bs-\sqrt{(1-a+bs)^2-c}\\ (1-a+(b-2)s)^2 &= (1-a+bs)^2-c\\ (1-a)^2+2(1-a)(b-2)s+(b-2)^2s^2 &= (1-a)^2+2(1-a)bs+b^2s^2-c\\ -4(1-a)s+(b^2-4b+4)s^2 &= b^2s^2-c\\ 4(1-b)s^2-4(1-a)s+c &= 0\end{aligned}$$

The solution of the above quadratic equation is given by

$$s_{1/2} = \frac{1-a\pm\sqrt{(1-a)^2-(1-b)c}}{2(1-b)}$$

Substituting in yields

$$\hat{s}^{o}_{ph} = \frac{1+\omega_p-\sqrt{(1-\omega_p)^2-2(1-\eta_h)4\frac{\bar{\pi}M}{\bar{y}}}}{2(1-\eta_h)}$$

Since denominator is negative, the negative solution applies. For t^{o}_{ph}, we obtain

$$\hat{t}^{o}_{ph} = \frac{1-\omega_p}{2} - \frac{1-\eta_h^2}{2}\left(1+\omega_p-\sqrt{(1-\omega_p)^2-2(1-\eta_h)4\frac{\bar{\pi}M}{\bar{y}}}\right).$$

A.1.2 Constitutional Stage: $\alpha < 1$

We first derive the SHI contribution rate $\bar{s}$ which makes ph-individuals indifferent between SHI and the BI scheme. From $V^{I}_{ph} = V_{ph}(s=\bar{s}, t=0)$, we obtain

$$\left(1-\frac{1-\omega_p}{2}\right)y_p + \frac{1-\omega_p}{2}\left(1-\frac{1-\omega_p}{2}\right)\bar{y} - \pi_h M = (1-\bar{s})y_p + \eta_h\bar{s}(1-\bar{s})\bar{y} - \pi_h M.$$

The above equation reduces to the following quadratic equation

$$4\eta_h\bar{s}^2 - 4(\eta_h-\omega_p)\bar{s} + (1-\omega_p)^2 = 0$$

of which the solutions are given by

$$\bar{s}_{1/2} = \frac{\eta_h-\omega_p\pm\sqrt{(\eta_h-\omega_p^2)(\eta_h-1)}}{2\eta_h}.$$

The SHI rate must be smaller than t^I to equalize utilities (because of the targeting advantage inherent in the SHI scheme). Thus, the relevant solution is

$$\bar{s} \equiv \bar{s}_1 = \frac{\eta_h - \omega_p - \sqrt{(\eta_h - \omega_p^2)(\eta_h - 1)}}{2\eta_h}.$$

As $\partial V_{ph}/\partial s > 0$ for $s \leq (\eta_h - \omega_p)/(2\eta_h)$, we have

$$V_{ph}^{II} \lesseqgtr V_{ph}(s = \bar{s}, t = 0) = V_{ph}^{I} \quad \Leftrightarrow \quad s^{II} \lesseqgtr \bar{s} \quad \Leftrightarrow \quad \frac{\eta_l^2 \eta_h(\eta_h - 1)}{(\eta_h - \eta_l)^2 + \eta_l^2(\eta_h - 1)} \lesseqgtr \omega_p^2.$$

A.1.3 Constitutional Stage: $\alpha = 1$

When $\alpha = 1$, then the SHI rate is given by $s^{II} = \hat{s}(0) = \left(1 - \sqrt{1 - 4\bar{\pi}M/\bar{y}}\right)/2$. We have $V_{ph}^{II} \geq V_{ph}^{I}$ if

$$\begin{aligned}
(1 - s^{II})y_p &\geq \left(1 - \frac{1 - \omega_p}{2}\right) y_p + \frac{1 - \omega_p}{2}\left(1 - \frac{1 - \omega_p}{2}\right)\bar{y} - \pi_h M \\
-4s^{II} &\geq \omega_p(1 - \omega_p)^2 - 4\frac{\pi_h M}{\bar{y}} \\
2\omega_p\sqrt{1 - 4\frac{\bar{\pi}M}{\bar{y}}} &\geq 1 - 4\frac{\pi_h M}{\bar{y}} + \omega_p^2.
\end{aligned}$$

A.2 Expected Utility

With a utilitarian welfare function, the optimal t and s solve

$$\max_{s,t} \quad W(s,t) = \sum_{ij} \theta_{ij} V_{ij}(t,s) \quad \text{s.t.} \quad 0 \leq t \quad \text{and} \quad 0 \leq s \leq \hat{s}(t). \tag{A.1}$$

The derivatives with respect to t and s are given by

$$\frac{\partial W}{\partial t} = \sum_{ij} \theta_{ij} u'(c_{ij})(-y_i + (1 - 2t - s)\bar{y} - \eta_j s\bar{y}), \tag{A.2}$$

$$\frac{\partial W}{\partial s} = \sum_{ij} \theta_{ij} u'(c_{ij})(-y_i + (1 - t - 2s)\eta_j\bar{y} - t\bar{y}). \tag{A.3}$$

Assuming an interior solution for s (i.e. $\alpha < 1$), we can write equation (A.2) as

$$\frac{\partial W}{\partial t} = \sum_{ij} \theta_{ij} u'(c_{ij})(-(1 - t - 2s)\eta_j\bar{y} + (1 - t - s)\bar{y} - \eta_j s\bar{y}) \tag{A.4}$$

$$= -(1 - t - s)\bar{y}\,\text{Cov}(u'(c_{ij}), \pi_j). \tag{A.5}$$

If $\mathrm{Cov}(u'(c_{ij}), \pi_j) > 0$ (a sufficient assumption is that income and risk are not positively correlated), no BI scheme on top of SHI is optimal as long as the solution for s is interior.

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