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KATJA BENDER

HEALTH FINANCING MECHANISMS, ACCESS TO
HEALTH AND ECONOMIC GROWTH

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Dr. Katja Bender

**HEALTH FINANCING MECHANISMS, ACCESS TO
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Abstract

The paper analyzes the comparative effects of alternative health financing mechanisms on economic growth within a two-sector-model with human capital. The transitional growth effects of a social insurance system are stronger than those of an out-of-pocket-payment system. A private health insurance system ranks 'in between'. If physical capital relative to health is abundant, investments in health have stronger growth effects, which points to the relevance of health investments in particular for developing countries. The relative advantage of a health financing system in the long-run depends on the relative amount of investment in health within each system.

Keywords: economic growth, health, health financing, human capital, social insurance

JEL Codes: E24, I15, H51, O11, O41

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1 INTRODUCTION

Good health is an important component of individual well-being. At the macroeconomic level health is also considered to positively contribute to economic growth. The impact of health on economic growth has been explored by both, theoretical (for example Barro 1996, Van Zon and Muysken 2001; Van Zon and Muysken 2005; Leung and Wang 2010) and empirical studies (for example Rivera and Currais 1999; Bloom, Canning and Sevilla 2004; Gyimah-Brempong and Wilson 2004; Aghion, Howitt, and Murtin 2010). Although the positive impact is widely acknowledged, the results of empirical studies seem to suggest that the positive effect is stronger among poor countries, whereas for rich countries the empirical evidence is mixed (Hartwig 2010: 315).

Obviously, health services are not provided without costs. Countries differ not only with regard to the amount of resources invested in health, but also with regard to the institutional mechanisms in place for financing domestic health systems. The central distinguishing factors of a countries health financing system is the extent to which it is either based on payments at points of services delivery or pre-payments (WHO 2000, WHO 2010). Out-of pocket payments or direct payments for health care are payments which are directly made at points of service delivery. The main pre-payment mechanisms include privately provided voluntary health insurance, social health insurance, or tax-based health financing.

Up to now, the discussion on the link between health financing mechanisms and economic growth has primarily focused on the link between health financing mechanisms, savings and capital accumulation within the framework of the 'precautionary saving hypothesis': By reducing uncertainty insurance mechanisms discourage savings as no or less precautionary savings are required. Thus, insurance inhibits economic growth as the decrease in uncertainty hinders capital accumulation. Contrary, the presence of out-of-pocket-payments is said to stimulate economic growth by increasing savings and promoting capital accumulation. Support for the precautionary saving hypothesis within the context of health financing is for example found in Kotlikoff (1989), Palumbo (1999), Chou, Liu and Hammitt (2001), Chou, Liu and Huang (2004), and Hau (2005). The effects are substantial in scope. For example the simulation results of Kotlikoff (1989) show, that the introduction of a private health insurance decreases household savings by 12%. This rises up to 80% in the case of a public social security system. It is further argued, that asset-based and means-tested social insurance programs discourage savings even more as the asset-test eligibility requirement of these programs acts as an implicit tax on wealth and may provide an incentive for households to spend down assets in order to become eligible for the program (Hubbard, Skinner and Zeldes 1995, Gruber and Yelowitz 1999, Maynard and Qiu 2009). However, no empirical support for the precautionary savings hypothesis is found in Starr-McCluer (1998) and Guariglia and Rossi (2004). Starr-McCluer (1998) provide an analysis of household saving behavior in the US and came up with a contradicting result: Households covered by private health insurance save more than comparable households without insurance coverage (even when controlling for selectivity, i.e. heterogeneity among households in terms of risk aversion). Further, the difference in asset holdings decreases with increased

income levels. Guariglia and Rossi (2004) analyzing UK data derived as well the result that health insurance coverage increases the probability of savings.

Thus, the empirical evidence on the precautionary saving hypothesis within the context of health financing is mixed and inconclusive, although more evidence is available supporting the hypothesis. However, no distinction is made between different types of capital relevant for economic growth.¹ The focus on precautionary savings neglects the impact different health financing mechanisms could have on health system attainments once health-related human capital is considered as a factor of production as well. Although the effect of health on economic growth is addressed by a continuously growing body of research, only limited attention has been devoted to the analysis of health financing mechanisms within this context. Gong et al. (2010) consider health as a form of human capital, with the generation of health depending on consumption. They study the impact of consumption and income taxes on the long-run capital stock and consumption, with the first having negative impacts and the latter having ambiguous impacts. Within an overlapping generation model Bhattacharya and Qiao (2007) analyze the effects of public and private expenditures, when both inputs are complements. No attempt has yet been made to analyse the comparative growth effects of either out-of-pocket-payments or different types of pre-payment mechanisms, such as social insurance or private (actuarial fair) insurance. This paper draws on the positive relationship between health-related human capital and economic growth. It suggests an additional hypothesis by arguing, that different institutional mechanisms for financing health care impact differently on economic growth as they may facilitate or hinder access to needed health care services, thereby improving or decreasing health related human capital accumulation within a country. In this context, insurance mechanisms provide better access to health services than an out-of-pocket payment mechanism. The results derived differ strongly from the predictions drawn from the 'precautionary savings hypothesis'. Countries with better accessibility of health care services grow faster and have better health outcomes in the long-run. Thus, social insurance is more advantageous than an out-of-pocket payment system and a private health insurance system ranks 'in between' the two former systems. If physical capital relative to health is abundant (as in many lower income countries), investments in health have stronger positive effects on growth, which points to the relevance of health investments in particular for developing countries. However, accessibility of health care services does not matter for the long-run income level. The relative advantage of a health financing system in the long-run depends on the relative amount of investment in health within each system.

The remaining paper proceeds as follows: After presenting a typology of health financing mechanisms in section 2, stylized facts on health outcomes and health financing at

¹ In addition, all studies mentioned consider aggregate households savings only and do not analyze the composition of savings. Carmichael and Dissou (2000) argue that the composition of savings matters as well. They develop a theoretical model demonstrating, that although the introduction of a private (actuarial fair) health insurance reduces total savings, the impact on economic growth is not negative as the composition of savings shifts from liquid (less productive savings) to illiquid (more productive) savings. Further, it should be noted that available evidence is primarily focusing on micro-level data exploring the link between financing mechanisms and savings and not on the macroeconomic link between savings and growth.

different country income level are presented in section 3. Section 4 explores the link between health financing and access to health services in more detail and a simple two-sector-growth model with exogenous saving is presented in section 5 and 6. Section 7 concludes.

2 TYPOLOGY OF HEALTH FINANCING MECHANISMS

This paper distinguishes between three major types of health financing mechanisms: Out-of pocket payments (OOP) or direct payments for health care, which are directly made at points of service delivery, privately provided voluntary health insurance (PHI), financed by regular risk-related premium payments, and social health insurance (SHI). The term social insurance comprises both, social health insurance in its original sense, i.e. a mandatory public insurance financed by (usually) income related contributions and tax-based health financing. These health financing mechanisms not only differ with regard to the financing source, but also with regard to the extent of risk pooling and income redistribution involved (see table 1).

Tab. 1: Characterization of health financing mechanisms

	Financing source	Risk pooling/ Risk transfer	Income redistribution
Social health insurance	income related contributions or taxes	yes	yes
Private health insurance	regular premium paid out of current income	yes	no
Out-of-pocket payments	(liquid) savings	no	no

All pre-payment mechanisms involve risk pooling. Risk pooling transfers the risk faced by individuals to a larger group. Each member of the group pays a relatively small insurance premium, resulting in a guaranteed loss of income, but in doing so the risk of incurring a larger loss is avoided. Risk-pooling mechanisms contribute to stabilising consumption by reducing uncertain expenditures by regular payments. Further, pre-payment mechanisms differ with respect to the amount of income redistribution involved. No redistributive effect is included in voluntary health insurance whereas social health insurance includes a redistributive element. Thus, coverage achieved by social health insurance is independent of individual incomes, whereas coverage achieved by private health insurance is depending on the ability to pay for risk-related premiums. Precisely what ‘ability to pay’ or ‘affordability’ means, is difficult to define, but in any case income matters.² Out-of-pocket-payments do not include any risk pooling nor are incomes

² Bundorf and Pauly (2006) find that depending on the definition of affordability private health insurance is not affordable to between one-quarter and three-quarters of the uninsured in the U.S. in 2000. Jones et al. (2006) for example show, that the probability of having supplementary insurance increases with better income and health. However, it should be noted, that apart from income other factors are important as well for the decision of joining a health insurance (for example risk aversion or simply being familiar with the product ‘insurance’).

redistributed. They are financed out of (liquid) savings or by selling assets. Coverage is dependent on income or assets available and thus determined by the ability to pay.

3 HEALTH OUTCOMES, HEALTH FINANCING AND INCOME LEVELS – STYLIZED FACTS

It is a well known fact that people in lower income countries have lower health outcomes than people in higher income countries (see table 2). This holds irrespective of the indicator applied: People in countries at lower income levels have a lower life expectancy and share a higher burden of disease.

Tab. 2: Health outcomes by country income groups

	Life expectancy at birth (years), 2009	Healthy life expectancy (years), 2009	Share in total annual incidence (in %), 2004 ³	Population as share of total world population, in %
High income countries	80	70	4	15
Upper middle income countries	71	61	6	9
Lower middle income countries	68	61	37	38
Low income countries	57	49	53	38

Source: WHO Global Health Observatory

A similar pattern is displayed when considering health financing (see table 3): Lower income countries spend less on health – both in absolute and in relative terms and rely more on private expenditures with a considerable share being financed by out-of-pocket payments.

Variations within country groups exist. For example, in high-income countries such as Singapore and the USA 58.9% resp. 51.4% of health expenditures are financed by private sources. Private health expenditures in Thailand, a lower middle income country, account for only 24.2%. Further, lower middle income countries such as Vietnam and lower income countries such as Ghana have introduced reforms within recent years aiming at extending coverage of social health insurance. But as implementation of health financing reforms is rather a long-term process, no substantial effect at national level is yet discernible.

³ The data refer to the estimated incidence due to communicable diseases, maternal and perinatal conditions and nutritional deficiencies.

Tab. 3: Health financing by country income groups

2009	Per capita total expenditure on health at average exchange rates (US\$)	Total expenditure on health a % of GDP	Private expenditure on health as % of total health expenditure	Government expenditure on health as % of total health expenditure	Social security expenditure on health as a percentage of government expenditure on health	Out-of-pocket expenditure as a percentage of total expenditure on health
High income countries	3062	8,01	26,78	71,22	38,99	19,81
Upper middle income countries	474	6,76	37,93	61,15	32,53	28,36
Lower middle income countries	138	6,37	42,23	57,77	16,35	35,59
Low income countries	32	5,69	57,50	42,50	3,71	43,47

Source: WHO Global Health Observatory

4 HEALTH FINANCING MECHANISMS, ACCESS TO HEALTH SERVICES AND ECONOMIC GROWTH

Here it is argued, that the institutional mechanisms for financing health care impact on economic growth as they increase or decrease access to needed health care services, thereby improving or decreasing health related human capital accumulation within a country. The economic literature tend to emphasize the problem of ‘moral hazard’, i.e. insurance induced ‘over-utilization’ of health services with marginal benefits lower than marginal costs, but it seldom acknowledges the fact, that insurance via risk-pooling might in the first place enable the utilization of needed health care services.⁴

Nyman (1999, 2003) suggests that health insurance is not only demanded to avoid financial risk, but also as it provides a mechanisms for gaining access to health care. He draws on empirical studies which show that people actually prefer the risk of a large loss to incurring smaller, but certain losses. In the light of these studies, demand for health insurance is not driven by risk aversion. Rather, as Nyman (1999, 2003) points out, health insurance transfers contributions from individuals who remain healthy to those who become sick. Thus, households pay health insurance contributions as a claim on additional income if they become ill.

One important feature of health insurance is that in this way it increases health care utilization by providing access to needed health services which otherwise would be unaffordable: Income or time might not be sufficient to save sufficient funds for treatment. Lending institutions might be reluctant to provide loans for health care given a limited repay capacity or lack of collaterals. Therefore, an individual might not be able to finance a complete treatment or even unable to access any treatment at all. Even if an individual was able to acquire the financial means required by either borrowing or selling assets, the time needed to obtain the funds may cause a delay in accessing health care which in turn induces a deterioration of the health status.

In the light of the access motive, out-of-pocket payments discourage access to health services and decrease capital accumulation, whereas insurance mechanisms encourage access to health services and capital accumulation.⁵ Compared to the literature on precautionary savings the impact of health financing mechanisms on economic growth is thus reversed with respect to either insurance or out-of-pocket payments.

Available empirical evidence on the link between health financing mechanism, health care utilization and health outcomes is scarce, but available results seem to point in the same direction providing empirical support for the postulated link between health

4 The World Health Report 2010 is entirely devoted to health financing and stresses the importance of prepayment mechanisms (WHO 2010).

5 It should be noted, that access to health services is not determined by financial access only. Other factors such as education, cultural beliefs, or geographical accessibility are relevant as well.

financing mechanism and health care utilization.⁶ Carrin et al. (2004) examine the impact of the degree of risk sharing on several health system goals in the 192 WHO-countries and conclude that the degree of risk sharing positive contributes to health status as measured by the disability-adjusted life-expectancy. Pagán, Puig and Soldo (2007) analyze the relationship between health insurance coverage and the use of preventive health-care services. The results suggest, that the insured are in a relatively better position than the non-insured to detect chronic diseases and have them treated promptly in a relatively earlier stage. Jones et al. (2006) measure the impact of supplementary private health insurance on the use of specialists in five European countries, which allow supplementary coverage. They correct for potential endogeneity, i.e. that the decision to buy health insurance is influenced by risk selection. Their results show that being insured increases the probability of specialist visits in these countries. Wagstaff and Pradhan (2005) show, that the introduction of the Vietnam health insurance had positive impacts on health outcomes and health care utilization. O'Donnell et al. (2008) estimate the distributional incidence of health care financing in 13 Asian countries. They find that in countries mostly relying on OOPs higher-income groups pay more than lower income groups, but also consume more health services. As health care needs differ between income groups, with poor people having greater health care needs, for example due to lower nutritional intake or living under less hygienic living conditions, they conclude, that the poor simply cannot afford to pay and go without treatment. Thus, OOPs have a stronger impact on utilization of health services by lower income groups than by higher income groups and induce or reinforce existing inequalities. As high-income groups use health services at levels comparable to health service utilization in high-income countries, the relative low health care utilization by a large share of the population (low income groups) implies lower average outcomes of health care utilization in low-income countries than in high income countries. Based on a review of 25 studies analyzing the impact of introducing, removing, increasing or decreasing direct payments on health care utilization in low- and middle income settings Lagarde and Palmer (2008) find, that removing or decreasing direct payments is related to increasing the utilization of curative health service. Considering the impact on quality, they report that increases in direct payments might be linked to increases in quality. However, they explicitly stress that the quality of available evidence is rather low.

6 More evidence is available on the link between health financing mechanisms and poverty. Either because a lack of access reduces an individual health status and thus the ability to work and earn income or because seeking treatment and having to pay direct payments pushes households into poverty or reinforces existing poverty (see for example Wagstaff 2007, or Baeza and Packard 2006). In a study on private bankruptcies Himmelstein (2009) finds that health care debt is the most important cause for private bankruptcies in the US. Leive and Xu (2008) do not focus on the link between health financing an health, but explore how people cope with out-of-pocket payments in 15 African countries. They find that borrowing or selling assets are the most common strategies specifically for (more expensive) inpatient care. Other studies have shown that these coping strategies do not fully protect consumption and that spending on food or education is scarified in response to illness (see for example Dercon and Krishnan 2000, De Weerd and Dercon 2006, Gertler and Gruber 2002, and Wagstaff 2007). In addition, a potential link between health financing and educational attainments could be established as well: Either by lowering the health status and thereby lowering cognitive abilities of individuals or directly as direct payments might induce parents to take children out of school in case of sickness of the breadwinner so that children can contribute to earning the household's income.

5 THE MODEL

This paper provides a simple model with two sectors: a final good sector and a health sector. The saving rate is exogenous. The model is related to the model presented by Muysken et al. (2003), who developed a two-sector growth model including health. However, they did not distinguish between different health financing mechanisms. The major objective of this paper is to demonstrate how health financing mechanisms impact on economic growth via human capital accumulation if access to health services and not uncertainty/ certainty is the crucial aspect to be considered. The following model analyzes three different types of health financing regimes: social insurance, out-of-pocket payments resp. direct payments and voluntary private insurance. It explores two channels by which different health financing mechanisms might impact on economic growth: differences in terms of resource generation and differences in terms of access to health services.

5.1 Final good sector

Final goods are produced under conditions of perfect competition. Human capital in the form of health is a production factor for the production of final goods. The final output is produced with the production factors physical capital K and health capital $H=hL$, with h denoting a health related productivity factor and L denoting the working population. The production process follows a Cobb-Douglas production function:

$$(1) \quad Y = K^\alpha H^{1-\alpha} = K^\alpha (hL)^{1-\alpha} \quad 0 < \alpha < 1$$

Dividing by L gives the production function in per capita terms:

$$(2) \quad y = k^\alpha h^{1-\alpha}$$

5.2 Physical capital accumulation

To concentrate on the access effect, population growth effects are not considered and the population growth rate is set at $n=0$. Further, the depreciation rate of physical capital is assumed to be 0 as well: $\delta_K=0$.

Physical capital accumulation is determined by the size of savings which equal total income Y minus expenditures for consumption C and health X .

Total health expenditures X_{SI} in the *social insurance system* must equal tax revenues or social insurance contributions, the size of both depending on the (exogenous) tax rate resp. the social security contribution rate ν and total income Y :

$$(3) \quad X_{SI} = G = \nu Y,$$

which gives the following equation of motion

$$(4) \quad \dot{K}_{SI} = (1-\nu)Y - C = (1-\nu)K^\alpha H^{1-\alpha} - C$$

or in per-capita terms

$$(5) \quad \dot{k}_{SI} = (1 - \nu)k^\alpha h^{1-\alpha} - c$$

Total health expenditures X_{OOP} in the *out-of-pocket payment system* must equal the sum of these direct payments dp by individual households

$$(6) \quad X_{OOP} = \sum_{i=1}^{i=L} dp_i = dpL,$$

The equation of motion in the private system then is

$$(7) \quad \dot{K}_{OOP} = Y - C - dpL = K^\alpha H^{1-\alpha} - C - dpL$$

or in per-capita terms:

$$(8) \quad \dot{k}_{OOP} = k^\alpha h^{1-\alpha} - c - dp$$

Contributing to a private health insurance however is a voluntary decision. In section 2 it has been outlined, that coverage achieved by private health insurance is depending among others on the ability to pay for risk-related premiums. Thus, a health financing system relying on private health insurance instead of social health insurance is ultimately a mixed health financing system covering part of health expenditures by insurance contributions and the remaining share by direct payments and the share of the population covered by private health insurance λ is not necessarily complete: $\lambda \leq 1$.

Total health expenditures X_{PHI} in the private health insurance system then equal the sum of premiums p paid by insured plus direct payments dp of the non insured, with λ representing the coverage rate of private health insurance (share of population covered by private health insurance):

$$(9) \quad X_{PHI} = \lambda \sum_{i=1}^{i=L} p + (1 - \lambda) \sum_{i=1}^{i=L} dp_i = \lambda pL + (1 - \lambda) dpL$$

As this model treats the saving decision by individual households as exogenous (and thus the decision to invest in health as well) no distinction is made between p and dp , i.e. it is assumed that average premium per household over the life cycle equal average direct payments per household. Thus, the above equation reduces to

$$(10) \quad X_{PHI} = \sum_{i=1}^{i=L} dp_i = dpL$$

and the equation of motion for k is equivalent to

$$(11) \quad \dot{k}_{PHI} = \dot{k}_{OOP} = k^\alpha h^{1-\alpha} - c - dp$$

5.3 Health sector

The generation of 'health' is influenced by the size of investments and by the accessibility of health systems. Due to the reasons outlined above, the accessibility of health services within the social insurance is higher than within the system financed by out-of-pocket payments. Health capital accumulation is determined by the following equation of motion:

$$(12) \quad \dot{H} = X - \delta H$$

or in per-capita terms:

$$(13) \quad \dot{h} = x - \delta h$$

The accumulation of health capital increases with the size of total health investment X . For easier tractability, H is assumed to be linear in X (constant marginal returns), but one could also (more realistically) assume a production elasticity $\beta < 1$ (decreasing returns to scale). The depreciation rate δ can be interpreted as a component of the total morbidity resp. incidence rate within a country, i.e. the percentage of people being ill within a given time period. In the absence of any health expenditures health capital decreases at the constant rate δ . The depreciation factor δ captures the access factor. The crucial assumption now is that the depreciation rate in the *social insurance system* δ_1 is smaller than the depreciation rate in the *out-of-pocket payment system* δ_2 :

$$(14) \quad \delta_1 < \delta_2$$

In so far as out-of-pocket payments deter access to health systems periods of sickness might be more severe or last longer due to either a delay in access or to not being able to access sufficient treatment or even no treatment at all.

The equations of motion for the social insurance system then is

$$(15) \quad \dot{h}_{SI} = vk^\alpha h^{1-\alpha} - \delta_1 h .$$

For the private system it is

$$(16) \quad \dot{h}_{OOP} = dp - \delta_2 h .$$

Accessibility of the health services with *voluntary health insurance* is in between the two former systems: Being insured facilitates access to health services similar to the social insurance system. The average accessibility of health services is therefore influenced by the coverage rate of private health insurance.

The equation of motion for h in the private health insurance system differs in so far as the share of population covered by insurance λ faces the same access factor than in the social insurance system δ_1 , whereas the remaining share $(1 - \lambda)$ faces the access factor δ_2 :

$$(17) \quad \dot{h}_{PHI} = \lambda(dp - \delta_1 h) + (1 - \lambda)(dp - \delta_2 h) = dp + \lambda(\delta_2 - \delta_1)h - \delta_2 h.$$

6 RESULTS

6.1 Transitional growth rates:

The transitional growth rate of income g_y is determined by the growth rates g_k and g_h :

$$(18) \quad g_y = \alpha g_k + (1 - \alpha) g_h$$

Inserting the growth rates g_k and g_h for the different health financing systems *in* g_y gives the respective growth rates of per-capita income, which are presented in table 4.⁷ Considering the access factor, it can easily be seen, that countries with better access to health care grow faster (*ceteris paribus*). In all systems g_y is decreasing in δ . As $\delta_1 < \delta_2$ the transitional growth rate in countries with health systems financed by out-of-pocket payments is lower than in countries with health system financed by social insurance systems. The difference between the out-of pocket-payment system resp. the social insurance system and the private health insurance system is determined by the coverage rate λ . The higher λ , the higher g_y . As long as $0 < \lambda < 1$ it follows that $g_y^{SI} > g_y^{PHI} > g_y^{OOP}$. Only if $\lambda=1$, then $g_y^{SI} = g_y^{PHI}$ and only if $\lambda=0$, then $g_y^{PHI} = g_y^{OOP}$.

Tab. 4: Transitional growth rates in different health financing systems

Social insurance	$g_y^{SI} = \alpha \left[(1 - \nu) \left(\frac{h}{k} \right)^{1-\alpha} - \frac{c}{k} \right] + (1 - \alpha) \left[\nu \left(\frac{k}{h} \right)^\alpha - \delta_1 \right]$
Out-of-pocket payments	$g_y^{OOP} = \alpha \left[\left(\frac{h}{k} \right)^{1-\alpha} - \frac{c}{k} - \frac{dp}{k} \right] + (1 - \alpha) \left[\frac{dp}{h} - \delta_2 \right]$
Private health insurance	$g_y^{PHI} = \alpha \left[\left(\frac{h}{k} \right)^{1-\alpha} - \frac{c}{k} - \frac{dp}{k} \right] + (1 - \alpha) \left[\frac{dp}{h} + \lambda(\delta_2 - \delta_1) - \delta_2 \right]$

Apart from the access factor, health financing systems differ with respect to how resources for health are generated. Within the social insurance system the human capital induced growth effect (2nd term in g_y^{SI}) is relatively stronger (weaker) than the physical capital induced growth effect (1st term in g_y^{SI}) in countries where physical capital relative to human capital is abundant (scarce). This result suggests that the transitional growth effects of a social insurance system are higher in lower income countries than in higher income countries. A higher tax or contribution rate ν supports this growth effect in lower

7 The growth rates g_k and g_h are derived by simply dividing the equations of motion for k and h by k resp. h .

income countries, whereas it has the opposite effect in higher income countries. Within the out-of-pocket payments system and within the private insurance system similar results are found: Higher health care expenditures tend to stimulate (reduce) economic growth in relatively physical capital rich countries (human capital rich countries).

To determine the relative advantage of the three health financing systems the amount of health care expenditures generated in the two privately financed systems matters. However, these are determined by the preferences of private households, which are exogenous in this model, but a preliminary conclusion can already be drawn at this stage: If time preferences, i.e. the preference for immediate consumption are high, consumption is relatively high and savings are relatively low. As time preferences decrease with increasing income or wealth, time preferences in lower income countries are higher than in higher income countries. Thus, also from the perspective of health resource generation an out-of-pocket system seems to be less adequate for low income countries.

6.2 Steady state values

The long-run steady state values of h and k are determined by setting the equations of motion equal to zero and solving for h and k . The following table presents the steady-state values for k , h , and y in the different systems:

Tab. 5: Steady state values in different health financing systems

	Social health insurance system	Out-of pocket payments	Private health insurance
h^*	$h_1^* = \left(\frac{\delta_1}{\nu}\right)^{-1} \left(\frac{1}{1-\nu} c\right)$	$h_2^* = \frac{dp}{\delta_2}$	$h_3^* = \frac{dp}{\delta_2 - \lambda(\delta_2 - \delta_1)}$
k^*	$k_1^* = \left(\frac{\delta_1}{\nu}\right)^{\frac{1-\alpha}{\alpha}} \frac{1}{1-\nu} c$	$k_2^* = \left(\frac{\delta_2}{dp}\right)^{\frac{1-\alpha}{\alpha}} (c + dp)^{\frac{1}{\alpha}}$	$k_3^* = \left(\frac{\delta_2 - \lambda(\delta_2 - \delta_1)}{dp}\right)^{\frac{1-\alpha}{\alpha}} (c + dp)^{\frac{1}{\alpha}}$
y^*	$y_1^* = \frac{1}{1-\nu} c$	$y_2^* = c + dp$	$y_3^* = c + dp$

The access factor has a positive impact on the steady state health level. The steady-state values of h in the social insurance system increase as expected in the tax rate ν and decrease in δ_1 . Similar results hold for the system with out-of-pocket payments and the

private health insurance system, where h increases with total health expenditures and decreases in δ_2 . Thus, for an identical level of health expenditures $h_{shp}^* > h_{PHI}^* > h_{oop}^*$.

The steady state values for k^* in all systems increase with higher δ . The impact of the tax rate ν on k^* is ambiguous: The first term $\left(\frac{\delta_1}{\nu}\right)^{\frac{1-\alpha}{\alpha}}$ decreases in ν with $\frac{1}{1-\nu}c$ increases in ν .

This captures two different effects: A higher ν tends to decrease k as fewer resources are available for investing in physical capital (1st term). If the partial production elasticity of k , i.e. α , is rather large ($\alpha \rightarrow 1$) the effect is relatively small, if it is rather small ($\alpha \rightarrow 0$) it is relatively large. However, a higher ν enables more health capital accumulation, which enables a higher y and therefore increases the potential to invest in physical capital (2nd term). Similar results hold for the system with out-of-pocket payments and the private health insurance system,

The steady state value y^* in the social insurance system at a given level of consumption increases with the tax rate ν . This is not surprising as in the steady state no investments in k are required anymore as $\delta k=0$. Again, similar results hold for the system with out-of-pocket payments resp. private health insurance system. Somewhat more surprisingly is, that in both systems the depreciation factor for health capital does not impact on the steady state value of y^* . One can therefore conclude, that *ceteris paribus* access to health services is important for the transitional growth rate, i.e. countries with better access grow faster, but that it is not important for the long term economic growth.

Comparing the steady state values shows that $y_1^* > y_2^*, y_3^*$ if $\frac{\nu}{1-\nu} > \frac{x}{c}$ and $y_1^* < y_2^*, y_3^*$ if otherwise. That means the relative advantageous of either the social protection or the out-of-pocket system resp. private health insurance system depends on the relative amount of health expenditures invested within each system. Similar to the transitional growth rates, individual preferences matter and for the reasons mentioned above, the social insurance system seems to be more advantageous in lower income countries.

7 CONCLUSIONS

Up to now, the discussion on the link between alternative health financing mechanisms and economic growth has focused on 'precautionary saving hypothesis' predicting a negative relationship between (social or private) health insurance and economic growth resp. a positive relationship between out-of-pocket payments and economic growth. However, the focus on precautionary savings neglects the impact different health financing mechanisms could have on health system attainments once human health capital is considered as a factor of production as well. Health financing mechanism impact on the accumulation of human capital via the 'access factor': Countries with better accessibility of health care services grow faster and have better health outcomes in the long-run. Thus, social insurance is more advantageous than an out-of-pocket payment system and a private health insurance system ranks 'in between' the two former systems. However, the accessibility of health care services does not matter for the long-run income level.

Further, health financing mechanisms differ in terms of resource generation. Investments in health have stronger (weaker) effects on the transitional growth rate in relatively physical capital rich countries (human capital rich countries). This does not only point to the relevance of health investment for developing countries, but might also offer an explanation for the ambiguous empirical results on the impact of health on economic growth in higher income countries.

The relative advantage of a health financing system depends on the relative amount of investment in health within each system. However, these are determined by the preferences of private households, which are exogenous in this model. As a next step, the model should therefore be extended to a two-sector model with endogenous saving rates. A preliminary conclusion can already be drawn at this stage: If time preferences, i.e. the preference for immediate consumption are high, consumption is relatively high and savings are relatively low. As time preferences decrease with increasing income or wealth, time preferences in lower income countries are higher than in higher income countries. Thus, also from the perspective of health resource generation an out-of-pocket system seems to be less adequate for low income countries.

APPENDIX

Steady state values in the social insurance system

The equations of motion are given by:

$$A.1 \quad \dot{k}_{SP} = (1-\nu)k^\alpha h^{1-\alpha} - c$$

$$A.2 \quad \dot{h}_{SP} = \nu k^\alpha h^{1-\alpha} - \delta_1 h$$

Setting A.1 and A. 2 equal 0 and solving for h and k gives:

$$\dot{k} = 0$$

$$\dot{k} = (1-\nu)k^\alpha h^{1-\alpha} - c = 0$$

$$\Leftrightarrow k = \left(\frac{1}{1-\nu} c \right)^{\frac{1}{\alpha}} h^{\frac{\alpha-1}{\alpha}}$$

$$\dot{h} = 0$$

$$\dot{h} = \nu k^\alpha h^{1-\alpha} - \delta_1 h = 0$$

$$\Leftrightarrow h = \left(\frac{\delta_1}{\nu} \right)^{\frac{1}{\alpha}} k$$

Solving this system of two equations gives the steady state values of k^* and h^* :

$$A.3 \quad h^* = \left(\frac{\delta_1}{\nu} \right)^{-1} \left(\frac{1}{1-\nu} c \right)$$

$$A.4 \quad k^* = \left(\frac{\delta_1}{\nu} \right)^{\frac{1-\alpha}{\alpha}} \frac{1}{1-\nu} c$$

Inserting h^* and k^* in the production function gives the steady state value y^* :

$$A.5 \quad y^* = \frac{1}{1-\nu} c$$

Steady state values in the system with out-of-pocket payments

The equations of motion are given by:

$$A.6 \quad \dot{k}_{OOP} = k^\alpha h^{1-\alpha} - c - dp$$

$$A.7 \quad \dot{h} = dp - \delta_2 h$$

Setting A.6 and A.7 equal to 0 and solving for h and k gives:

$$\dot{k} = 0$$

$$\dot{k} = k^\alpha h^{1-\alpha} - c - dp = 0$$

$$\Leftrightarrow k = (c + dp)^{\frac{1}{\alpha}} h^{\frac{\alpha-1}{\alpha}}$$

$$\dot{h} = 0$$

$$\dot{h} = dp - \delta_2 h = 0$$

$$\Leftrightarrow h = \frac{dp}{\delta_2}$$

Solving this system of two equations gives the steady state values of k^* and h^* :

$$A.8 \quad h^* = \frac{dp}{\delta_2}$$

$$A.9 \quad k^* = (c + dp)^{\frac{1}{\alpha}} \left(\frac{dp}{\delta_2} \right)^{\frac{\alpha-1}{\alpha}}$$

Inserting h^* and k^* in the production function gives the steady state value y^* :

$$A.9 \quad y_2^* = c + dp$$

Steady state values in the private health insurance system

$$A.10 \quad \dot{k}_{PHI} = k^\alpha h^{1-\alpha} - c - dp$$

$$A.11 \quad \dot{h}_{PHI} = \lambda(dp - \delta_1 h) + (1 - \lambda)(dp - \delta_2 h) = dp + \lambda(\delta_2 - \delta_1)h - \delta_2 h.$$

Setting A.10 and A.11 equal to 0 and solving for h and k gives:

$$\dot{k} = 0$$

$$\dot{k} = k^\alpha h^{1-\alpha} - c - dp = 0$$

$$\Leftrightarrow k = (c + dp)^{\frac{1}{\alpha}} h^{\frac{\alpha-1}{\alpha}}$$

$$\dot{h} = 0$$

$$\dot{h} = \lambda(dp - \delta_1 h) + (1 - \lambda)(dp - \delta_2 h) = dp + \lambda(\delta_2 - \delta_1)h - \delta_2 h = 0$$

$$\Leftrightarrow h = \frac{dp}{\delta_2 - \lambda(\delta_2 - \delta_1)}$$

Solving this system of two equations gives the steady state values of k^* and h^* :

$$A.12 \quad h^* = \frac{dp}{\delta_2 - \lambda(\delta_2 - \delta_1)}$$

$$A.13 \quad k^* = \left(\frac{\delta_2 - \lambda(\delta_2 - \delta_1)}{dp} \right)^{\frac{1-\alpha}{\alpha}} (c + dp)^{\frac{1}{\alpha}}$$

Inserting h^* and k^* in the production function gives the steady state value y^* :

$$A.14 \quad y_3^* = c + dp$$

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