WHO SHOULD FINANCE CLIMATE CHANGE MITIGATION?

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Abstract: The paper surveys a social consequence of mitigation and adaptation to climate change, namely, funding of mitigation and adaptation finances. The focus is on the dilemmas of sharing burden of costs between public and private actors of the market. The financial ethic problem is highlighted by items of economics. The impact of uncertainty and the marginal return of actors will be analyzed as factors of propensity participation in funding.

Keywords: public finances, climate change, present value, marginal return

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Introduction

The challenge of global climate change can be viewed from many aspects of sciences. It is not simply a natural science problem if we accept the human responsibility as one of the causing factors. Thus, mitigation and adaptation has social consequences, among others, funding of mitigation and adaptation finances. This study examines the dilemmas of sharing burden of costs between public and private actors of the market. The ethic question of social burden-sharing will be surveyed by economics items. The impact of uncertainty and the marginal return of actors will be analyzed as factors of propensity participation in funding.

1. Role of uncertainty in sharing of burdens

What is the likelihood of climate change in a continent, a country, a county or a city/village level? If there are more scenarios, what are the effective mitigation and adaptation actions? What is the critical mass or scale of action? Will the actors wait for each other to act? Who should act first? Should the state intervene, motivate, initiate? And so on. If such uncertain probabilities are accumulated (namely multiplied), finally the likelihood of effective actions can be low. (see fig. 1)

Figure 1. Increasing uncertainty in climate change (CC)
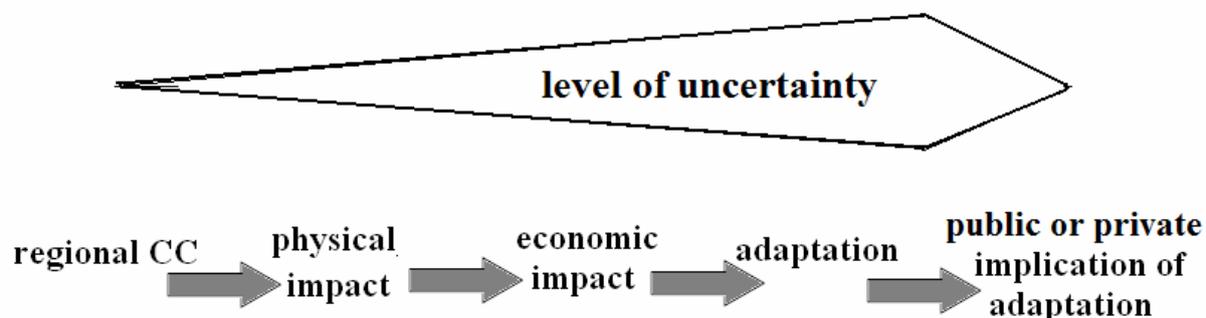
Source: Simplified adaptation from Stern (2007) and O'Hara (2009)

Heller (2003:19) refers to the IPCC (2001) projections on expectable change of temperature in 100 years term horizon, which forecasts 1.9 – 5.8 Celsius (3 – 10 Fahrenheit) gradual warming by the concentration of greenhouse gases in the atmosphere. The uncertainty of temperature change can be illustrated in a fan chart of probable further future expectations.

Besides high uncertainty, the economic actors should agree in the distribution of financing between public and private players. The economic motivation for participation can be established, if the participants can get at least so much benefit from mitigation and adaptation actions as much cost they invest. Nevertheless, there are private actors (or maybe even state actors in the international relations), who are not able to finance themselves the adaptation. Thus, the public decision makers must determine the extent of equity toward poor economic actors. (CEPS & ZEW 2010) This aspect raises the equity vs. efficiency trade-off dilemma, whether the fiscal resources should be used for subsidizing rich or poor actors (by direct spending or tax refunding). To resolve the dilemma, the economic theory knows the utilitarian approach and the Rawls approach. In case of climate change mitigation, the specific carbon emission per household of different social groups can guide the balancing between equity and efficiency. However, equity is not just a dilemma in social class dimension, but in geographical view, too. Which are the populated and industrial areas deserving protection against higher sea level or other natural damages? See the bad practice case of New Orleans in 2005. How well developed hurricane warning system has it done worth to be financed? How big efforts and how quickly has it done worth to save people right after the catastrophe? Or see the Dutch agricultural lands under the sea level. How far should they be protected? Do these lands produce enough income to protect them from the sea?

The policy making – in relation to market motivation – must decide another dilemma between short-term profit and long-term supply what can be called supply security dilemma. (CEPS & ZEW 2010) In which territories should the state sustain the supply of energy, food, transportation, safe water and sewage system, pipelines? The prices and the (in)elasticity of the (network) service markets, the intensity of destructive competition[2], will decide the short-term profit. When the profit is negative, the state may force the service companies to supply – or maybe not.

In case of climate change, the likelihood of irreversibility is important determinant. Although an early mitigation action can look like unworthy because of high uncertainty and low probability of occurrence of damages far before the forecasted warming or disasters, an overdue mitigation can not reverse the natural, environmental changes. In this case, only adaptation remains as option. (CEPS & ZEW 2010) The economics of decision theory suppose to use the net present value (NPV) to choose the more worthy option. In climate change relation, the comparable options are the NPV of an earlier mitigation or the NPV of a later adaptation.

To estimate the fiscal costs, the market capacity, propensity and perfection is preferable to be examined. It should be estimated, how far can the government levy the burden of adaptation on the private sector (solvency, marginal proactive propensity etc.), and can the market manage the risk to have demand and supply to meet and avoid the market failures. In climate disasters, first of all, the insurance sector should be helped to be able to manage the risk as far as possible.

To treat the impacts of climate change, it is possible to mitigate, what – according to Heller (2003:25) – means much effort *devoted to reducing emissions of greenhouse gases*. If mitigation is too late, or it is too expensive for preventing a not too likely event, the adaptation to new/changed circumstances can be another response. According to Heller (2003:23), the extent and cost of adaptation is regional or country specific, as it depends on the intensity of climate change, the embodiment of environmental or geographic changes, and the side effects on economy and physical assets. Heller thinks the followings:

Although much of the burden of relocating resources and financing new investment will undoubtedly fall on the private sector, it is unlikely that the public sector will remain unscathed, especially in countries, such as many developing countries, where the net economic impact of climate change is expected to negative. Areas of potential public sector involvement include outlays on infrastructure (...), other public goods in the areas of disease prevention and agricultural extension and research (...), and subsidies (to facilitate the resettlement of population). Heller (2003:23)

As the significant warming is forecasted for century long, the public fiscal intervention is far more necessary in case of produced capital stocks, buildings, physical infrastructure with lifetime over 50. Especially, if unexpected or unlikely, radically destructive disasters or abrupt changes cause high scale of short-term cost.

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[2] Destructive competition: In such service markets, (1) where the fix cost (exit cost) is high, (2) the competition is intensive and presses the price to low level and (3) the demand is very volatile (some times much, some times few), the three characteristics together cause frequent bankruptcy what endangers the supply security.

Autonomous adaptation as driver of fiscal impacts represents the cooperative, initiative and supportive propensity of the private sector individuals. The actual occurrence of autonomous adaptation is the result of private utility-maximization objectives and their assessment of risks. The cross-border effects as impact drivers include two types of cost factors. One is the residual costs from actions in another country, the other type is the aid transfers for developing countries to adapt to climate change, or technology transfer to mitigate. Fiscal capacity as determinant of scale of spending for mitigation and adaptation shall be understood in dynamic approach. Not only the given balance of revenues and expenditure matters, but the potential changes of them do, too.

Generally, the cost impact of the drivers can be reduced by technological (R&D) investments, supranational provision and assistance, internationally integrated financial and technological resources, expansion of insurance market, regulation of land and water use, information provision for awareness, direct fiscal incentives to help individual actors for autonomous mitigation, review of state liabilities. (CEPS & ZEW 2010:59-62)

As mentioned above, fiscal impacts can be derived from the economic impacts which are preferable to be anticipated by the economic actors. Such general impacts are the average temperature in the seasons, along with an expected rise in temperature extremes; precipitation patterns; snow cover; water systems – particularly river flows (flood and drought risks) and groundwater levels; and coastal regions – with sea level rise and flood risks.

2. Individual and social return of mitigation

Through the recognition of indebtedness of highly developed (and climate sensitive) countries, the climate dilemmas of public finances can be worded. The first dilemma is the following: As there is no satisfying room for issuing more debt to cover the fiscal climate adaptation, the two options for fiscal policy are the redistribution among the items of taxes and spending or levy as much cost as possible on the private sector through perfect markets, like a sophisticated insurance sector. However, the two horns of the dilemma demand challenging balancing. If the private sector with limited time horizon got no fiscal (public) impulse at all, the private perception on net present value of adaptation will be considered to be negative, as individuals of the private sector can not optimize for the endless future, or more then a few generation. In the contrary case, getting excessive fiscal subsidies, the community of individuals of the private sector will expect any adaptation from the state, thus remain passive.

The second dilemma rooted also in the limited room for issuing debt. The fiscal decision makers are forced by indebtedness to select among private actors, and create preference lists. Who should be compensated for damages, and who not? If rising sea level swallows coastal real estates, should the owners get subsidies, and how much? If productivity of agricultural lands were ruined by desertification, should the state bother with ensuring alternative income for rural workers and entrepreneurs? Should the ski parks get public or EU subsidies for snow guns if climate warming means too high temperature for snowing? etc.

The increasing green tax burden, bond issue and funding for mitigation and adaptation raises the dilemma whether does it worth to increase the fiscal crowding-out effect in the capital markets or not. This effect is very regional market specific because of the interest rate elasticity and marginal propensity of saving and investment. Of course, less investment can mean less carbon emitting production growth, but also slower technological development in carbon reduction, too.

According to Heller (2003), state must be ready to anticipate market reactions driven by short-sighted interest. Private sector's propensity for funding or resource saving can determine crucially the effectiveness and scope of public policy actions for adaptation. The governments must think about market side effects of the structure of realizing the long-term sustainability. Will the market help or weaken certain stimulating or restricting actions? What will be, for example, the effect of lower or higher risk premium on private savings and investments? E.g., it is well known about debt crisis impacts, that when the direct danger of collapse get milder the private interest groups get less devoted to public finances reforms, so, the politicians will ease the previous restrictions and deteriorate the previously improved fiscal balance or balancing program.

The items mentioned in the followings and serving the green adaptation causes structural changes in public finances. This aspect supposes to treat the green reform, also, as a structural fiscal reform together with balancing. The simplest way to move toward fiscal balance is, when the incomes grow faster than the expenditures in absolute share. Thus, at once, the collapse of economic growth dynamics can be avoided.

That means, the absolute growth of tax burden should be lower than the GDP-growth, and comparing even to tax increase, the growth of public expenditures should be much lower. However, this demands the public green spending not to be automatic, because the rigid expenditure types insensitive for business cycles will make the adjustment of spending unmanageable to the governmental solvency. Nevertheless, the tax

incomes can not be decreased until the expenditures will not decline at least in the same scale. Besides, the expansion possibility of state debt means also limit in the play of tax reduction. (Tomkiewitz 2005)

The green reform basically is making an attempt to increase the net present value achievable through the fiscal policy, explained with the instruments of cost-benefit analysis is the following:

max PV {benefit of society – cost of society}

However, this cost-benefit analysis is fairly complex, that is why the results must be treated carefully to avoid misleading understandings. First of all, it is hard to measure any side effects of public expenditures and absorption. During the estimation of benefits the experts must face the comparison problem, how commensurable are the individuals' subjective utility. Wildawsky (1997) guess, the appraisal methods used in practice are very uncertain – at least in case of public services. The net present value calculation is uncertain in dynamics, as the costs can vary in the future. (Kutasi 2006)

In the timing of start-up of the actions, there is an important factor, namely, when it does worth to mitigate or adapt. This can be simply described by the net present value (NPV) calculation. Just as generally, the aim of an economic actor is to maximize the net marginal benefit of the action. (CEPS&ZEW, 2010)

$$F = \max\{MB - MC\} \hspace{4cm} (1)$$

Until MB > MC, namely marginal benefit is bigger than marginal cost, there is no motivation to start or extend the adaptation. For planning of timing of adaptation or mitigation to climate change, this maximization should be dynamic, so the optimum NPV of adaptation cost and climate damage is looked for. (Rubas et al., 2006)

$$NPV \text{ (climate change)} = PV(\text{adaptation cost}) - PV(\text{climate damage}) \hspace{1cm} (2)$$

According to the model of Hasson et al. (2010) with all-or-nothing trade-off between the preventive mitigation and the reactive adaptation, the timing depends on the expected payoff for having and having not a disaster.

The return from mitigation is larger if all players mitigate, but there is still risk of a climate change disaster.

That is why the social dilemma is described by the marginal per capita return (MPCR) for mitigation (m) and adaptation (a) in the followings:

$$MPCR_m < MPCR_a < n * MPCR_m , \hspace{1cm} (3) \hspace{1cm} \text{where n is the total number of actors.}$$

The relation between MPCR values expresses, that because of the exogenous chance for disaster, the cost is too much, if every one mitigated, since it can not prevent absolute surely the disaster. That is why it is expectable, that, depending on the above mentioned factors, there will be some actors, who will and should not mitigate, if the community/society want to pay the optimum cost for prevention. (Hasson et al. 2010)

Conclusion

We reviewed factors of participation propensity of market actors in climate change context. We used the instruments of economics. The cost-benefit factors of propensity got identified and detailed. Also, dilemmas of sharing burden of costs between public and private actors of the market got explained. The reviewed formulas can be a base of modeling the behaviour of market actors.

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