An empirical analysis of public expenditures to promote energy efficiency and renewable energy in Switzerland

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The Swiss energy law as well as Switzerland's ratification of the Kyoto protocol make significant reductions of CO$_2$ and other greenhouse gas emissions necessary (Amstalden et al. 2007). A possible way to achieve the targeted greenhouse gas emissions reductions is through a wider diffusion of renewable energies and enhanced energy efficiency. It is no secret that energy analysts are concerned with the very low level of investment in energy efficient technologies. Governments around the world frequently made attempts to correct these distortions (market failures). Energy taxes, building standards as well as financial incentives (subsidies, tax credits, subsidized loans) are used in the attempt to correct the present market failures. The improvement of energy efficiency of buildings as well as the residential use of renewable energies (eg. solar collectors for hot water generation) have high energy and emission saving potential, since operating of buildings (heating, cooling, hot water generation, lighting) accounts for almost 50% of the total energy consumption in Switzerland (Siller et al. 2007).

The objective of this study is to examine the Swiss Cantonal Subsidy Program (Förderprogram) for renewable energy and enhanced energy efficiency. The programs of the various cantons show a considerable variation in the amount endowed. The data were collected from the Swiss Statistics Office (BFS), the Swiss Federal Energy Office (BFE) and the Swiss Finance Department (EFD). This thesis contains two independent parts. The first part aims to explain the subsidies based on the median voter model. The second part aims to assess the efficacy of the Swiss Subsidy Program. We assume that higher subsidies attract higher investment. This assumption is then tested with a multiple regression model.
The median voter model is a model designed to aggregate the people's preferences for a public good or service under the majority-voting rule. This means the demand of the median voter reflects the aggregated individual demands of the whole population under the majority-voting rule. If the median voter model were adequate to model public demand, it would be a powerful tool to observe public decision-making. Instead of analyzing the complex political process, we could only maximize the utility of the decisive median voter (Inman 1978). The output level finally chosen is the median of the quantities demanded. The median quantity defeats all other quantities provided that voters have single peaked preferences, vote sincere and not strategically and can be ordered in a continuum from low to high demanders of the specific public output. A multiple regression model is used to test the median voter theorem empirically. In order to apply the median voter model empirically, an additional assumption has to be made. The median quantity demanded equals the quantity demanded by the person with the median income. Exactly this assumption is source of substantial attack to the models empirical applicability and usefulness to describe public decision-making. Empirical evidence of the superiority of median distributions over other distribution (like mean, 25 Percentile, 75 Percentile etc.) is missing. Further, the use of multiple regression models cannot rule out the possibility of multiple fallacy. This means that the output level finally chosen is at a multiple (eg. 1/3 or 4) of the level desired by the person with the median income. The multiple can easily be captured in the intercept $a_0$ of the multiple regression model. Because there are no prior restricting conditions on the intercept $a_0$, we do not know if the output level is at the level desired by the median person or at a multiple of it (Romer and Rosenthal 1978).

The results of our research suggest that the cantonal expenses (subsidies) for renewable energies and enhanced energy efficiency cannot be explained by the median voter's demand. The median person's income and its corresponding tax share cannot explain the variation of expenditures across the cantons' subsidy programs. However, this result might be due to data limitation and our approximation of median voter's characteristics especially concerning tax share and income. A better specification of the income and tax share variables in further research may increase the models' ability to explain the observed variation in subsidies among the Swiss cantons. Demographics and political attitude can explain a substantial part of the variation in the subsidies among the
cantons. Part of the variation can be explained by the respective canton's population size. Less populated cantons seem to spend significantly more in per capita terms than higher populated cantons. Cantons with a majority of rural populations seem to have lower expenditures than those with a greater urbanization. In a rural canton the majority of the population lives in rural environment while in an urban canton the majority of the population lives in an urban environment. Further the political attitude can explain a major part of the variation in the subsidies granted by the cantons. The share of green parties in the cantonal parliaments as well as the direct vote of the electorate on a similar topic both have a high positive impact on subsidies in the regression model.

Concerning the investment model, only subsidies and average income seem to be able to explain private investments. In the regression model, private investment seems to be explainable by the average income and the subsidies granted by the respective canton. The elasticity of private investment with respect to subsidies is 1.16. However, we cannot reject the null hypothesis that subsidies fail to attract additional investments by private parties receiving those subsidies (elasticity equal to one). This result could be however explained by considerable variations of private investments across cantons. Finally, it should be noted that this is a first attempt to analyze energy subsidies in Switzerland. This study has some limitations regarding the data and econometric modeling. Therefore, reported results and any generalization thereof should be considered with caution. In particular we suggest the usage of random and fixed effects model for further research. Thereby the researcher could partly control for unobserved characteristics of the cantons that may affect the results.

References


