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EFFECTS OF THE AUSTRIAN SUBSIDY SCHEME FOR SMALL SCALE PV-SYSTEMS: EMPIRICAL FINDINGS AND SUGGESTIONS FOR IMPROVEMENTS

1 - Energiepolitik
Michael HARTNER[1(1)], Reinhard HAAS[(1)]
[(1)]Energy Economics Group, Institut für Energiesysteme und Elektrische Antriebe, TU Wien

Motivation und zentrale Fragestellung

In this paper we present empirical evidence on the effects of the support scheme for small scale PV-systems on the development of system prices and the creation of a competitive PV-market in Austria. PV-systems for households up to 5 kWpeak are subsidised with investment grants. We will show that the design of the subsidy influences the prices on the market and that it is very likely that prices would be lower using other instruments. Furthermore it will be shown that the design of the subsidy leads to inefficiencies with respect to the goal of subsidising PV-systems for households in Austria. We will finally show, that an auction based subsidy scheme could be an appropriate tool to improve efficiency and to establish competitive PV-markets for households.

Methodische Vorgangsweise

The analysis is based on data for PV-system prices and subsidies of more than 7000 PV-systems up to 5 kWpeak that were installed from 2008 to 2011. All those investments were subsidised through direct investment grants by the federal government and additional subsidies of the nine Austrian districts.[2] To estimate the effects of the subsidy scheme, the empirical distribution of prices was analysed. Additionally, a linear regression model was used to quantify the influence of relevant parameters on the price. Those include the size, the time of construction and the federal state in which the plant was built. The model is as follows:

$$\ln(P) = C + \alpha \cdot \ln(Cap) + \gamma \cdot t + \beta_1 D_1 + \beta_2 D_2 + \ldots\ldots + \beta_n D_n$$

P……. price of PV-system [€/kWpeak]
C…… constant
α…… coefficient for the impact of PV system size
Cap.. capacity of the PV system [kWpeak]
γ……. coefficient for the impact of construction time
t……. time of construction measured as difference to first system installed in days [d]
β_i….. coefficient for the impact of dummy variables
D_i…. 8 dummy variables for the location and 2 for the construction type of the PV-systems

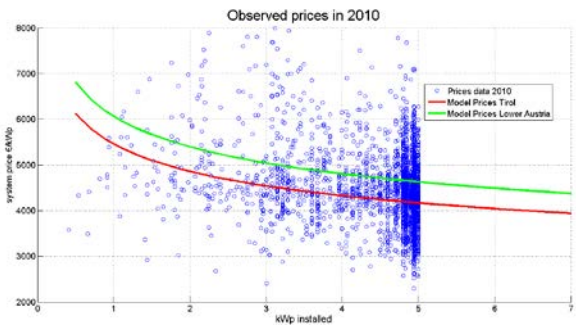

Figure 1: System price vs. system size. Regression model and empirical data in 2010

Additionally, standard economic theory was applied to evaluate the efficiency of the support scheme in general and to show potential improvements through an auction based system.

Ergebnisse und Schlussfolgerungen

- Figure 1 one shows the distribution of specific prices [€/kW] for subsidised PV-systems in 2010. As expected the model shows that specific prices decline for larger system. The figure also reveals that investors might have been willing to install lager systems, which was restricted by the subsidy scheme.[3] It can be argued that without restricting the size of the system, average system prices would have been lower.
- The regression model reveals that there are substantial differences in prices within the 9 districts of Austria, that where represented with dummy variables in the model. There is strong evidence that the

[1] Gusshausstrasse 25-29/370-3, Tel.: +43 1 58801 370379, E-mail: hartner@eeg.tuwien.ac.at
[2] we use the term district as a translation for the Austrian term "Bundesland"
[3] The size for PV-systems to be subsidised was restricted to 5 kW_{peak}

subsidy scheme has influenced the prices for PV-systems in Austria. Figure 2 shows the distribution of prices for PV-systems in 2010 in two regions. Additionally to the investment grant given by the federal state the districts provided additional subsidies. The federal subsidy was 1300 € per kW_{peak} or a maximum of 30% of investment costs. The combined amount of subsidies given by the federal state and the district was limited to 2400 €/kWp and 50% of investment costs. It can be observed that there was a tendency for prices to be set at the point where the maximum subsidy could just be obtained. The limit for the price to obtain the maximum subsidy per kW_{peak} are 4333 €/kW_{peak} considering only the federal subsidy and 4800 €/kW_{peak} considering both federal and an additional subsidies given by one of Austria's 9 districts.[4] In both districts there is an accumulation of prices around 4333 €/kWp.

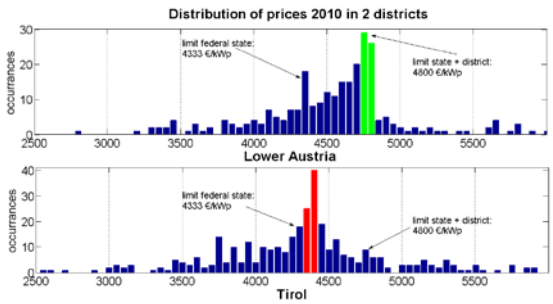

Figure 2: Distribution of prices in 2 Austrian regions with different subsidy schemes. Higher subsidies in Lower Austria result into higher prices.

This is true for all observed years and districts, indicating that sellers try to skim the full amount of subsidy which leads to higher market prices in general. Figure 2 shows that prices in the district of Lower Austria, who gave away higher subsidies,[5] accumulated around the limit 4800€ for combined state and district subsidies. In Tirol where an additional subsidy of only 500€/kW_{peak} was given the prices gathered around the original 4333€ limit. Evidence like that can be found for different districts and years, revealing the influence of the subsidy scheme on PV-prices.

- Concerning the efficiency of the study in terms of $€_{subsidised}$ per $kW_{installed}$ it can be argued that a fixed investment grant bears inherent inefficiencies as the willingness to pay of households is not utilised. (See figure 3) It is important to note that those considerations apply to situations where the total budget for subsidies is limited as it was the case in Austria. Additionally to the inherent inefficiencies there is strong evidence that the subsidies where too high in the sense that the applications for subsidies exceeded the total budget for the given years (demand exceeded supply of subsidies). This leads to the situation illustrated in Figure 3 (left) where more PV-systems could have been subsidised if the investment grants had been lower. However, even if the optimal subsidy level in a fixed-grant system could be found[6], we would argue that an auction based system (right) could enhance the efficiency of the subsidy scheme. Designing the allocation of subsidies as a pay as bid auction, where the lowest bids for subsidies are served first until the budget for a given period is exhausted can be a substantial improvement of the subsidy scheme. More on this can be found in the full paper of this conference contribution.

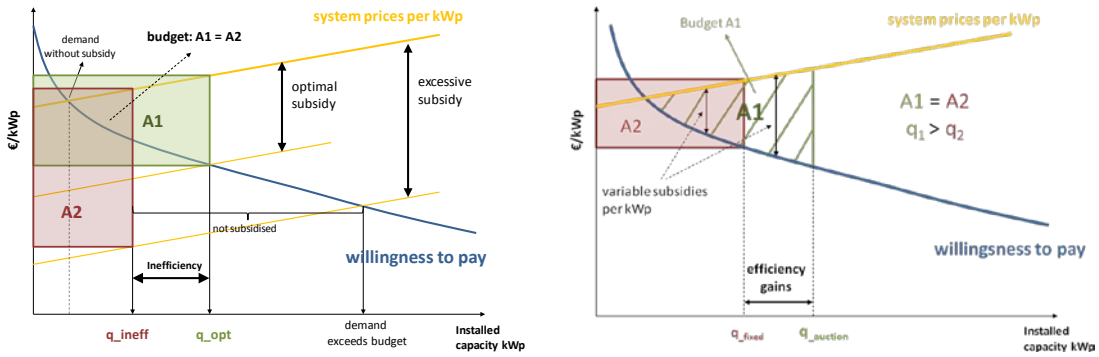

Figure 3: fixed subsidy (left) vs. auction based system (right)

Literatur

[1] Haas R. et al (2004): "How to promote renewable energy systems successfully and effectively", Energy Policy 32, page 833-839, Elsevier

[2] Butler L., Neuhoff K. (2008): "Comparison of feed-in tariff, quota and auction mechanisms to support wind power development", Renewable Energy 33, page 1854-1867, Elsevier

[4] limit for federal subsidy alone: $\frac{1300€}{0.3} = 4333€$, limit for combined federal + district subsidies: $\frac{2400€}{0.5} = 4800€$,

[5] The district of Lower Austria provided subsidies of up to 2400 €/kW_{peak}

[6] which is unlikely given that neither the willingness to pay nor the future system prices are known ex ante.