

THE DISTRIBUTION OF INCOME IN THE SWISS HYDRO POWER SECTOR AND OPTIONS FOR REFORM

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Overview

Representing around 60% of Switzerland's electricity production, hydro power is the most important electricity source in the country. For the last few years, hydro power plants in Switzerland have had to face lower return prospects due to falling prices in electricity wholesale markets - a result of lower fossil fuel and CO₂ prices, as well as increasing shares of renewables in neighbouring markets. That is why the Swiss government has developed a so-called market premium model to support existing hydro power plants which is planned to be introduced shortly and stay in place for a five year period. By way of this mechanism, hydro power plants which sell electricity below generation costs are subsidised. The subsidies will be financed through a network surcharge on the electricity price paid by consumers. Given that the owners of pump storage hydro power plants have made relatively large profits in the past, from selling electricity at high peak prices and pumping water up at times of low prices, this intervention has led to some public debate on the distributional implications of the subsidies.

Historically, there have been special arrangements to ensure a fair distribution of profits gained from hydro power between mountain cantons, where the hydro power plants are situated and lowland cantons, which are majority owners of the large utilities operating the plants. By way of these arrangements, owners of the power plants pay a form of water levy ("Wasserzins") to the cantons and communities where the power plants are situated. This levy based on the gross capacity of the plant and estimated using the gradient and the amount of water that can be used for electricity generation as defined in the concession. Given that the profits of the plant owners depend on current market prices and generation, there is therefore a disconnect between the variable profits of hydro power plant owners and fixed water levies. Therefore, a reform of the system of water levies is discussed as part of a longer-term solution to the profitability of hydro power in Switzerland (Betz et al., 2016).

Besides the income from water levies, cantons where hydro power plants are situated receive income from taxes on profit, capital and property. The majority of this tax income is distributed to cantons, a smaller share to communities and some of the profit tax income to the federal government. In addition, a concession is paid to the cantons - some cantons have delegated it to communities - where the hydro power is located, which has a long life-time.

Several studies have investigated the distribution of income from the operation of hydro power plants including effects on cantons and communities. The most comprehensive study and the one most closely related to our work was carried out by Banfi et al. (2004). However, it does not take into account the substantially increased capacity of pumped storage plants in Switzerland (e.g. Nant de Drance 6 x 150 MW and Linthal 4 x 250 MW) as well as the establishment of electricity utilities after the partial liberalisation of the Swiss electricity market in 2009. In addition, there is background research available on water levies in Switzerland (Meister 2014) as well as on the cost structure and efficiency of Swiss hydro power plants (CEPE 2014). However, there is little research publicly available investigating the distributional aspects of the operation of hydro power plants in more recent years and in particular looking at support policies for these power plants as envisaged for the future. The present paper aims to close this gap and determine distributional impacts of different reform options at the level of cantons. To this end, we show which cantons are the main recipients of profits from hydropower production in the past and today (2007-now) and compare them to those cantons which are the main recipients of water levies and taxes related to the operation of hydro plants. Based on this information a simulation tool is developed which allows estimating the impact of different interventions (e.g. introduction of different level of subsidies or changes to the system of water levies) at the cantonal level.

Methods

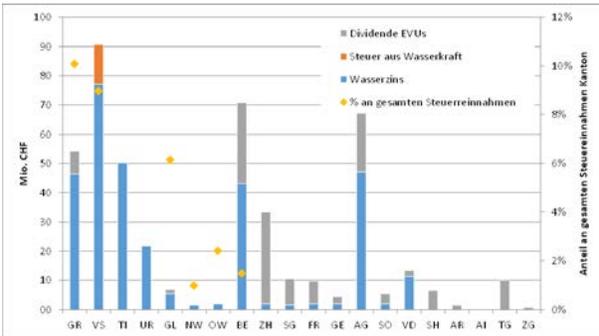
We have developed a rich data set tracking cantonal income from the operation of Swiss hydro power plants over time, which comprises income from water levies, taxes and fixed dividends paid to cantons and communities that host hydro power plants. In addition, each hydro power plant's ownership has been identified over time as well as the ownership structure of the large utilities and their subsidiaries. Based on this information, the dividend that is paid from utilities to cantons is estimated. Given the intransparency in reporting in the public sector (Fuchs et al., 2016), estimating the money flows on a cantonal level is not trivial.

To understand the implications of different intervention options, we use this data set to simulate changes to the money flows that can be expected as a result of the intervention at hand. Since this simulation is static and does not take any dynamics and secondary effects into account, it is most suited for short-run predictions.

Results

Our preliminary results show that the income of cantons related to the operation of hydropower varies a lot and that water levies comprise a high share of overall cantonal income for mountain cantons where a lot of hydro capacity is installed, such as Grisons (GR), Vaud (VS), Ticino (TI), Bern (BE) and Aargau (AR). (see Figure 1, which shows preliminary results for 2011). We also find that dividends to cantons from large utilities have decreased steadily over time and that today only the cantons of Bern and Fribourg (FR) have some income from their utility shares in BKW (Figure 2), since this utility still own distribution networks and directly serves customers paying higher prices.

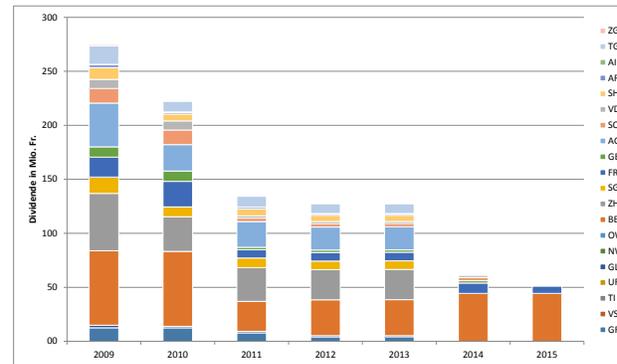
Figure 1. Water levies, tax income and dividends in 2011



Sources: Annual reports of cantons, Derungs (2016), Fuchs et al. (2016), Repower (2016), SAK (2016), own calculation

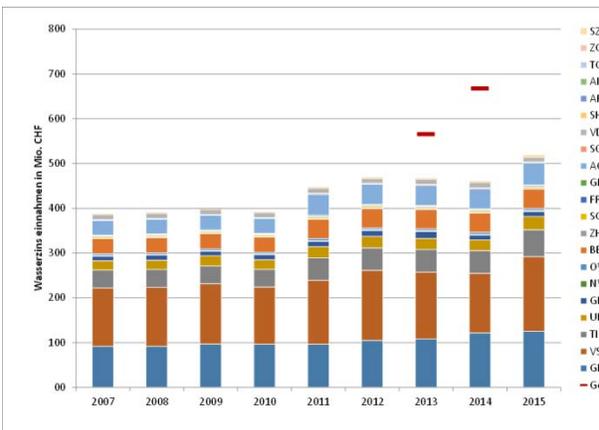
Note: Taxes from hydro power only shown for VS

Figure 2: Dividends of large utilities to cantons



Sources: Derungs (2016), Fuchs et al. (2016), Repower (2016), SAK (2016), own calculation

Figure 3. Income from water levies cantons and communities



Sources: Annual reports of cantons; BWG (2002); Plaz (2012)

At the same time, the income from water levies to cantons has risen steadily up until today (Figure 3). The results highlight the complicated environment in which decisions related to the support of hydro power plants are made and the distributional implication they carry.

Conclusions

Our results highlight the importance of taking into account distributional effects when political decisions related to the support of hydro power plants are made. Depending on the income stream that the different interventions target (e.g. direct subsidy vs. a change to the system of water levies), they can be expected to lead to very different distributional outcomes between mountain and lowland cantons.

Future research could investigate how cantons spend the money derived from hydro profits and water levies. Finally, it may be interesting to leave the level of cantons and take a look at effects at the household level.

References

- Banfi, S., Filippini, M., Luchsinger, C. and Müller, A. (2004) Bedeutung der Wasserzins in der Schweiz und Möglichkeiten einer Flexibilisierung, vdf Hochschulverlag, Zürich.
- Betz, R., Cludius, J., Filippini, M., Frauendorfer, K., Geissmann, T., Hettich, P. and Weigt, H. (2016) Wasserkraft: Wiederherstellung der Wettbewerbsfähigkeit. http://www.sccer-crest.ch/fileadmin/FILES/Publications/White_Paper_Wasserkraft_Homepage.pdf (Accessed 22 July 2016).
- CEPE (2014) Kostenstruktur und Kosteneffizienz der Schweizer Wasserkraft. Im Auftrag des Bundesamtes für Energie BFE (Accessed 3 November 2015).
- Fuchs, S., Gut, M., Bergmann, A., Nagel, G., Schuler, C., Streiff, G. and Trinkler, G. (2016) Rechnungslegung und Eigentümerrolle von öffentlich-rechtlichen Körperschaften (ÖRK) bei Energieversorgungsunternehmen (EVU) (Accessed 22 July 2016).
- Meister, U. (2014) Wasserzinsen als Fremdkörper im Strommarkt. <http://www.avenir-suisse.ch/40401/wasserzinsen-als-fremdkoerper-im-strommarkt/> (Accessed 3 November 2015).
- Plaz, P. (2012) Wem gehört die Energieproduktion und wer verdient daran? Referat anlässlich der Fachtagung: «Energiewende – Chance für Berggebiete und ländliche Räume» Disentis, 31. August 2012 (Accessed 23 July 2016).