EFFICIENCY VS POWER PRICES TO MAINTAIN COMPETITIVENESS?

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Overview

One key element of the EU's energy strategy framework is to strengthen the EU's competitiveness through affordable energy prices. However, increasing the share of renewable energy sources and decreassing emission of green house gases might in the short-term entail rising energy prices. In many EU member states the costs of promoting renewable energy sources or technologies in the power sector are passed on to final electricity consumers via a levies or taxes on top of the electricity prices. These taxes and levies lead to rising retail prices of electricity, i.e. electricity costs of industries and households. To limit the burden for energy-intensive industries and retain their international competitiveness, governments have set up certain special equalisation schemes and rebates. These so called privileges keep the electricity price at a competitive level for privileged consumers but increase the burden for non-privileged consumers. For example, without the special equalisation scheme in Germany, electricity prices for non-privileged consumers would have been about 1.6 ct/kWh lower in 2014 (Ecofys and Fraunhofer ISI, 2015). This tremendous shift between privileged and non privileged consumers entails a relief of privileged consumers amounting to about 5 billion € for the RE-levy, to about 10 billion when including exemptions for all other levies and taxes on electricity in 2014 (Breitschopf et al., 2016). This shift of burden has initiated intense discussions on the fairness and potential impact of privileges on the economy as well as the incentive to invest in energy efficiency. This paper contributes to the discussion by analysing how strongly non-privileged electricity prices affect the competitiveness of energy intensive industries and to what extent increases in efficiency compensate impacts on competitiveness.

Methods

This analysis relies an a multi-level and multi-method approach. The multi-level approach refers to competitiveness. As (Demailly and Quirion, 2006) state, competitiveness is a commonly used but unclear term. It refers to a country, sector or firm level (Reinaud, 2008; Dechezleprêtre and Sato, 2014). At the firm level, a competitive firm is able to produce at lower costs (Dechezleprêtre and Sato, 2014) or better quality and is able to gain or maintain its market shares. Analogous, a competitive sector is able to maintain profits and market shares (Demailly and Quirion, 2006). A country's competitiveness is measured by several indices e.g. the World Economic Forum's Global Competitiveness Report indices and includes inter alias economic growth and security. In this study we look at energy intensive industries and analys the impact of prices on firms and sectors. Firms compete through product prices and characteristics, i.e. quality and preferences. Competition on the basis of prices occurs for homogeneous products, while competition between firms or sectors encompasses a variety of factors. So we include the product level, i.e. select one homogenous and comparable product.

To capture the impact of electricty prices on competititvenes, we use a multi-method approach, i.g. apply different metrics, indicators and models. According to Sato et al., (2007), we focus on the short-time dimension to depict the impact on firms' competitiveness. I.e our analysis is based on earnings before interest rates, taxes, depreciation and appreciation (Demailly and Quirion, 2006). In the style of (Latruffe, 2010) we rely on strategic managment measures of competitiveness and compare selected products costs with product prices at the product level. To anaylse the impact of rising electricity costs at the sector level three modules are linked: an input-output price model, trade model and input-output quantity model. Electricity price changes are made exogenous and fed into the input-output module (e.g. see Lee et al., 1977). As a result we receive price changes of all downstream industrial products. In a second step, the price changes are used as impules for the trade modul, which is based on Armington elasticities (Armington, 1969). It shows to what extend exports and domestic demand is changing due to these price changes. These quantiative changes in demand are fed into a quantity input-output model to depict the impact of electricity price increases in the energy intensive industries on upstream industries. The effect of efficiency investments is demonstrated at the product and firm level.

Results

Figure 1 shows the share of electricity cost per product (here: wire rod) and the respective product market price. The electricity costs are based on an energy efficient and less efficient production of wire rod in an EAF, an electricity price without and with exemptions (of about 6 cents/kWh). Material and labour costs are derived from a selected case. The share of electricity costs in the product price is around 9% and approximately 17% for privileged and non-privileged production respectively and declines to 14% under an efficient, non-privileged production. The findings underpin that rising electricity prices for steal producers (EAF) endanger in the long-run production if steal prices and energy efficiency remain at this level. However, electricity prices are one factor among many others (product prices, other input costs) determining competitiveness. With respect to the firm level we use a cash-flow model. The annual financial and environmental reports of selected energy intensive producers serve as inputs.The firms' sensitivity regarding electricity costs (price and quantity) is depicted by return (EBITDA) on turn-over. In line with Porter (1990), the different cases clearly show that price sensitivity depends on a firm's business structure and strategy (e.g. efficiency investments) and its relation to up- and downstream industries. Increases in efficiency cannot compensate the abolishment of exemptions (see Figure 1) while electricity system efficiency reveals a larger potential. At the sectoral level, our analyses report product price changes between 3% and 4.5%, and demand changes of 3%-15% in energy intensive branches, while value added in the energy intensive industries and their upstream industries declines by about 4% to 18%.

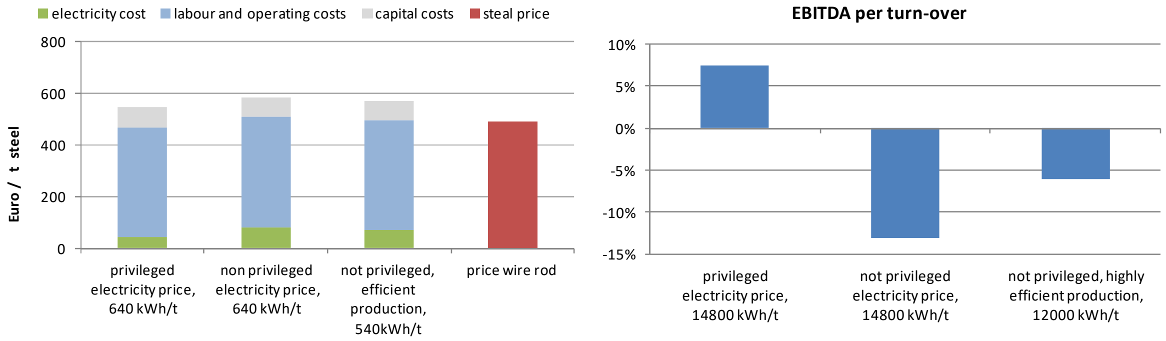

Figure 1: Left: product price and costs of EAF; Right: return (EBITDA) on turn-over of an aluminium producer
Source: Data based on environmental and annual reports of companies in the steel and auminium industry (2013/14). Notice: not all operating costs, e.g. for equipment and additional material, are included here.

Conclusions

Domestic electricity prices might be a decesive factor, if all other costs and product prices are priced globally. How strongly an increase in electricity prices affects the competitiveness of energy intensive industries depends inter alia on the degree of cooperation in product development with downstream industries. Strong ties between firms make a change in supplier costly. Further, under a high degree of vertial or horizontal integration, energy intensive processes can be shifted to low cost locations. Diversifications or processing of co-products, e.g. trade with certificates or electricity generation, entail additional revenues or co-benefits, while product differentiation provide additional margins. Because the share of energy intensive inputs varies highly between the different products, the impact on sectors varies as well. Whether a declining production of these products leads to an overall economic slow-down or provides new impulses for innovations or developments of new processes cannot be shown with this approach. But increases in energy efficiency are not sufficient to compensate price increases. Thus, large efforts, i.e. radical changes in processes and products are required to maintain competitiveness.

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