Regional competitive opportunities, fossil fuel cost changes and the role of decarbonization

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In this paper we analyze the competitive opportunities and threats to industries in different regions of fossil fuel cost changes and how decarbonization may affect these opportunities and threats. The last few years, during but also after COVID-19 pandemic waves and lockdowns, large fluctuations in energy prices are observed. Global political changes, like the war in Ukraine, are expected to also induce large shocks to fossil fuel prices. Meanwhile, decarbonization efforts and the resulting change in the energy system will affect international trade patterns in energy: less fossil fuels are required and renewable energy can be produced locally, reducing dependency (Scholten et al., 2020). This affects regional economies in particular as these may not have their own fossil fuel supply locally. The increasing need for regions and countries to decarbonize implies that energy demand and supply should fundamentally change. Various studies have tried to investigate the regional economic effects of this impending transition as increasingly policy makers are concerned about the distributional aspects of such climate policies. For example, Alves Dias et al. (2018) and Kapetaki et al. (2020) study EU coal regions and employment effects of phasing out coal mining. Here, we are concerned with the competitive position of regions and how such a transition could change this position - potentially providing a region with more opportunities. Instead of focusing directly on energy markets, energy demand and supply changes, we investigate the global value chain and the indirect use of energy within those chains.

Thus, this papers investigates two research questions: first, which industries in what regions are most sensitive in terms of their competitive position to changes in fossil fuel prices, such as gas, coal and oil, for example due to world-wide shocks like COVID-19. Second, and more interestingly, we consider how possible future changes in the electricity mix and energy usage that are the result of climate policy and decarbonization strategies may affect the regional competitive opportunities and threats of changes in fossil fuel prices. The first follows previous work of Miernyk (1976) and Polenske (1979), applying a similar method to investigate the cost pass-through of energy through the supply chain using an input-output price model. The second research question makes use of an adaptation of the model where we introduce marginal effects on the technological coefficients, to further investigate this sensitivity. To investigate the effects of these fossil cost changes, we use the measure of revealed competition developed in Los et al. (2016) combined with value chain analysis using marginal prices as used in Thissen et al. (2020). We extend this approach by introducing marginal prices on technological change and substitution between energy types, thereby creating the possibility of analyzing the effect of decarbonization strategies on the competitive opportunities and threats. Such an approach gives the opportunity to derive more general conclusions than those that rely on a few specific ad hoc scenarios. Meanwhile, decarbonization may present opportunities for various regions and industries to decrease this sensitivity, which can result in policy recommendations that support decarbonizing faster to reduce the regional sensitivity of possibly world-wide global energy price shocks.

As stated above, a Leontief input-output price model based on multi-regional input-output tables on an EU NUTS 2 level from Thissen et al. (2018) is used. In addition, we make use of various data sources, such as IEA energy data and BACI trade data, to disaggregate the energy sector in the supply and use tables. This way, we construct a multi-regional input-output table including detail on fossil fuel usage across sectors and regions, which is still consistent with national level Eurostat FIGARO tables. Various regional level data sources are used to be consistent with regional energy

supply. This provides us with a new regional input-output table through which we can trace the fossil energy sources through the value chain.

Studying the Netherlands, first results indicate that the competitive position of the low-technology industry sector is most sensitive to fossil energy price shocks. As expected, fossil energy price increases in the own sector has the largest negative effect on regional price competitiveness. An increase in the fossil energy price in other sectors in the EU has a negative effect on the competitiveness of this sector in most Dutch regions, whereas this is not the case for non-EU price increases. This suggest that outside of the EU, increases in fossil prices result in higher prices for competitors but not for the Dutch regions, increasing the regional price competitiveness. When input prices down-stream, within the EU, increase, this affects the regional price competitiveness negatively.