



The Productivity Puzzle in Network Industries: Evidence from the Energy Sector

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Increases in factor productivity is one of the most important sources of economic growth and rising living standards. During the last couple of decades, there has been increasing attention paid to the apparent productivity puzzle which relates to the phenomenon whereby productivity - total factor productivity (TFP) and labour productivity- in almost all advanced economies is flatlining (and in some cases, failing, even pre-COVID-19), after experiencing a long period of steady growth. This trend has become more evident since the Global Financial Crisis of 2008 since when the TFP performance of many OECD countries has been extremely poor.

Our paper follows the renewed interest in the productivity puzzle and offers a threefold contribution to the literature. First, we examine the productivity puzzle in the electricity and gas sectors by taking advantage of the new EU KLEM database which contains disaggregated energy sector data. We explore the sector TFP growth trends, in a growth accounting framework, prior and after the global financial crisis, while paralleling this trend in the TFP growth patterns of the total economy for OECD countries. We also evaluate the contribution of inputs (capital and labour) to the growth of valued added. Second, we focus on examining the relationship between the level of TFP in the electricity and gas sectors and the degree of energy market reform and competition. We provide analysis based on sector-specific aggregate and dis-aggregated regulation indices. Third, we present an investigation of the effect of



climate policies on the productivity level of the total economy and the energy sector. We analyse separately the impact of two types of climate policies: carbon pricing mechanisms and feed-in-tariffs for renewable energy. To our knowledge, this is the first attempt at identifying the relationship between climate policies and the level of TFP either at the economy level or in the energy sector. Our analyses cover a sample of OECD countries over the period 1995-2016.

We find that there is a substantial productivity puzzle for the electricity and gas sectors specifically. TFP growth is lower in electricity and gas than in the economy as a whole and falls post-financial crisis. TFP levels can only be weakly explained by changes to the competitive environment of the energy sector. However, more importantly we find evidence that energy and climate policy has negatively and significantly reduced energy sector productivity, at the same time as increasing capital input to the sector. Further, we find that the strength of energy and climate policy is positively correlated with slower overall TFP.

The results of our analysis have important policy implications. First, the productivity puzzle does exist in the energy network sectors, particularly in electricity and gas. If anything there is more of a productivity puzzle in the electricity and gas sectors than in the whole economy. We clearly show that in spite of large amounts of capital being put into these sectors, TFP has fallen. This is worthy of further study. Second, the productivity puzzle at the whole economy level in OECD countries would seem to at least be partly due to more ambitious environmental policy. Hence environmental policies need to pay more attention to their impact on productivity both within the electricity and gas sectors but also across the whole economy. Third, we do not find evidence for ‘green growth’ arising from more stringent and more input intensive environmental and renewables policies. Such policies bring welfare benefits in terms of a cleaner environment but they do not show up in current measures of TFP. Advocates for ‘green growth’ strategies need to better measure and articulate the welfare benefits of such strategies.

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