Could the renewable energy transition promote the long-term and sustainable economic development of lagging-behind regions?

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Renewable energy sources are becoming increasingly important in the energy mix of advanced economies, accounting for about 40% of the electricity produced both in the US and in the EU in 2022, led by wind and solar generating almost a quarter of total electricity produced (EIA, 2023; Eurostat, 2023). Investing in the renewable energy transition would not only help developed countries to achieve net zero goals, but could also drive economic growth, both nationwide and at the local level, potentially addressing regional disparities in economic activity within

countries (Grillitsch and Hansen, 2019; Coenen et al., 2021).

In fact, the generation of renewable energy relies on smaller scale, decentralised, and spatially dispersed plants, which need to be located where the exploited natural resources are located. This is in contrast to the traditional energy production system characterised by few large plants located near to where demand is, and by the transportation of fuel from where it is located to where it is needed. This creates a location advantage for places where abundant green energy natural resources are located, which are mostly rural and peripheral areas, as the natural conditions favourable for renewable energy are usually constraints for urban development (e.g. solar in arid areas, wind and tidal in remote coastal locations, hydro in mountainous regions, etc.) (Jenniches, 2018).

As a consequence, the renewable energy sector is increasingly viewed as a potential source of economic development for peripheral, rural and lagging-behind places which are often relying on mature and declining industries (Munday et al., 2011; Mauritzen, 2020; Shoeib et al., 2021; Brunner and Schwegman, 2022). Renewable energy investment could affect the local economy through several channels: paying rents and royalties (Munday et al., 2011; Castleberry and Greene, 2017), generating tax income for local authorities (Brunner and Schwegman, 2022), creating new jobs directly involved with the construction and management of renewable energy plants (Leknes and Modalsli, 2020; Costa and Veiga, 2021}, and indirectly by generating local demand for manufacturing production of renewable energy components (Gilbert et al., 2023; IPPR, 2024) and other localised services (Shoeib et al., 2021).

In a research project funded by the RSA we investigate the local economic development impact of renewable energy investment, considering the effect of investment in offshore wind farms capacity on the economic development of local onshore coastal communities in the UK. We focus on the case of offshore wind energy in the UK for several reasons. First, because offshore wind is the first source of renewable energy in the UK, making it one of the global leaders in the world in this technology. Offshore wind generates around 36% of the total electricity produced in the UK, starting from the first small farms installed in the early 2000s, and booming to 1.3 gigawatts (GW) by 2010, 15 GW in 2022, with a projection of producing half of the UK's electricity by 2030 (ONS, 2021). This is a worldwide trend, with China surpassing the UK as the world leader in 2022 with 30 GW of installed capacity, and the US planning to reach 30 GW of offshore wind

energy capacity by 2030 (Global Wind Energy Council, 2023). Secondly, the UK is characterised by large, persistent and widening spatial economic disparities across places, driven by London's outstanding role as a highly productive global city, while a large number of regions are lagging behind with low productivity and high unemployment levels, making the UK one of the most spatially unequal countries in the OECD (Martin et al., 2016; McCann, 2020; Overman and Xu, 2022). Offshore wind farms are currently mostly located off the shore of some of the most deprived areas in the country, with significant potential economic benefits for some of these places (Curran et al., 2022). Despite being owned and built by foreign-owned companies, these farms could still create large economic development opportunities for workers and independent small businesses in these areas, in particular during the 20-25 years of the operations and maintenance stages (Glasson et al., 2022).

Using granular data on the location, characteristics, production capacity and generation of all offshore wind farms in the UK, we develop an econometric analysis modelling the suitability of offshore locations for wind farms based on the exogenous natural characteristics needed for the installation of turbines (such as water depth, wind speed, distance to shorelines, etc.). We then link offshore wind farms with information on the economic performance of onshore local labour markets, based on the location of ports and other infrastructures servicing these farms, in order to estimate the causal effect of investment in offshore wind energy on local economic development.

Our findings suggest a positive effect of offshore wind energy investment on the local economy of remote deprived communities. In fact, increasing installed capacity by the size of an average offshore wind farm generates a 10% growth in employment and a 20% increase in firm entry in industries operating nearby the infrastructure servicing these farms. This effect is mainly driven by industries related to the offshore wind energy sector, and in particular by high-productivity services, given the limited manufacturing capacity in this sector in the UK, but not as much by local demand services. In addition, investment in offshore wind energy have beneficial impacts for deprived areas where they are usually located, but not for the most deprived areas, suggesting that a minimum level of economic development is needed for the local community to ripe the benefits of this investment. Investment in renewable energy brings long-term benefits for local communities, and are not only temporary shocks linked to the construction

periods, as operations and maintenance activities and the emergence of agglomeration economies in these areas promote industrial clustering and long-term economic development.

The intertwining of net zero and place-based policies could promote sustainable and long-term positive effects for the economic development of left-behind regions, in particular, if a stable, planned and long-term commitment is made by Governments towards investment in renewable energy farms projects in the future, following their pledge to increase renewable energy generation to achieve net-zero. These effects could go beyond the simple flow of investments and jobs for the construction of the green energy infrastructure, as the development of new comparative advantages in these sectors would create incentives for firms and high-skilled workers to permanently relocate to remote areas where the natural resources are located, creating clustering of green energy firms which could exploit benefits from agglomerating together.

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