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The hidden winners of renewable energy promotion: Insights into sector-specific wage differentials

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HIGHLIGHTS

- Renewable energy (RE) firms pay considerably more than their non-RE sector peers.
- In manufacturing and energy supply, firm attributes explain mainly the wage gap.
- In installation, planning and project management one third remains unexplained.
- This unexplained rest represents a 'RE wage premium' of around 10 percent.
- The employees in both sectors are the 'hidden winners' of RE promotion.

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ABSTRACT

In light of Germany's energy system transformation, this paper examines differences in employment structures and wage differentials between renewable energy establishments and their sector peers. To do so, we have developed a novel data set by linking company-level information from the German Renewable Energy Federation with administrative establishment-level data from the Institute for Employment Research. Descriptive evidence shows significant differences in wages and several other characteristics between renewable energy establishments and their sector peers. Our estimates give evidence that human capital and other establishment-level characteristics mostly explain the wage differential among manufacturers and energy providers. However, we find a persistent 'renewable energy wage premium' of more than ten percent in construction/installation activities and architectural/engineering services. We interpret this premium as a positive indirect effect of the promotion of renewable energies for the benefit of employees in renewable energy establishments within these two sectors.

1. Introduction

Public promotion has played – and still plays – an important role in stimulating supply and demand in the renewable energy (RE) market. With regard to the large allocation of feed-in tariffs and subsidies for the development of RE sources, there is a broad public interest in the economic impact of these promotion activities. Whereas the quantitative development of the RE supply is monitored on a broad level (for example, see International Energy Agency (IEA) and International Renewable Energy Agency (IRENA), 2015), there is little data concerning the actors within the RE product markets. For the evaluation of quantitative employment effects of RE products and services almost only macroeconomic data are available, which can merely provide rough estimates (Lambert and Silva, 2012). There is even less evidence regarding the quality of jobs in this sector. An important question is whether workers within RE value chains also benefit from the promotion of RE sources in terms of wages. To fill this gap, we tackle the following research questions: Is there a difference in wages between RE establishments and others? If so, what are the determinants for this wage differential and how do they differ among sectors? Do those wage differentials merely reflect differences in

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establishment characteristics or do they reflect other external influences, such as the promotion of RE sources?

Due to Germany's role as one of the RE pioneers, the insights into RE establishment characteristics, RE wage differentials and potential indirect effects of RE promotion are also highly relevant at the international level. For example, more than 65 states have introduced feed-in tariff systems, often based on or developed from Germany's feed-in tariff model (IEA/IRENA, 2015). Therefore, some of the phenomena presented below may also be observable in other regions of the world.

In the following paragraphs, we provide some background information about RE development in Germany, which might directly or indirectly influence RE employment. More details can be found in the relevant literature, e.g. Bruns et al. (2011).

The global struggle to mitigate climate change has led to a growing and dynamic RE market. Germany in particular has seen a boom of renewables supported by fixed feed-in tariffs and many further instruments of public promotion. Within the European Union (EU), especially in Germany, the promotion of RE sources has quite a long history. Initial research funding activities started in the 1970s, while joint efforts to foster RE on a larger scale began in the 1990s (IEA/IRENA, 2015; Bruns et al., 2011). According to the IEA/IRENA Global Renewable Energy Policies and Measures Database (IEA/IRENA, 2015), there were seventeen European and six German RE promotion policies and measures active in the year 2009,[1] e.g., the European Directive on the Taxation of Energy Products and Electricity, Germany's feed-in tariff system and the German Market Incentive Program. Bruns et al. (2011, pp. 57 et seq.) note that the different stages of Germany's feed-in tariff system have been *'key policy measures'* in the development of the RE market. In light of the Fukushima nuclear catastrophe in 2011, Germany's federal government decided to accelerate the transition towards a sustainable, nuclear-free and low-carbon energy system. One of the key targets of the German energy transition efforts, which are most relevant for the work in hand, is the expansion of the share of RE of total energy consumption. In this context, RE not only covers the electricity supply but also the heat and fuel supplies. The increase of the RE share in Germany's gross final energy consumption is shown in Fig. A.1 in the Appendix.

In conjunction with an increase in exports of RE products and services, there has been a substantial growth in turnover and gross employment (Lehr et al., 2015; O'Sullivan et al., 2014; Lehr et al., 2012; Blazejczak et al., 2011; Lehr et al., 2011b). Several studies observe similar positive developments in other countries and regions, for example, in the USA (Haerer and Pratson, 2015; Sommers, 2013), Canada (Böhringer et al., 2012), China and India (Poschen et al., 2012; Arora et al., 2010) and Europe (Ragwitz et al., 2009; Blanco and Rodrigues, 2009). However, total RE employment decreased in Germany in 2013 for the first time, particularly because of the crisis of the solar technology market (O'Sullivan et al., 2014). Parallel to the RE development in general, the public debate about the quality of the RE jobs has intensified. The height of wages is here one of the most controversial dimensions of RE job quality. There is, to our knowledge, no comparative analysis of RE wages available so far. As mentioned above, the paper in hand contributes to fill this research gap.

The remainder of the paper is organized as follows: the next section gives insights into the methods applied, including the theoretical background, our data and sample selection as well as our estimation approach. Section 3 presents and discusses our results and ends with a consideration of several possible political impacts. Section 4 concludes and summarizes both our findings and their political impacts.

2. Methods

2.1. Theoretical background and hypotheses

In the following subsection, we identify the commonly acknowledged determinants of wages at the establishment-level.[2] We distinguish between determinants of wages in terms of human capital characteristics and other structural characteristics. Furthermore, we connect these wage determinants with literature about the specific situation of RE establishments.

There is a considerable body of literature offering overviews of wage determinants, e.g., Akerman et al., 2013; Lane et al., 2007; Willis, 1987. According to the neoclassical theory of human capital, the stock of competencies and knowledge of an employee influences wages strongly (Mincer, 1974; Becker, 1994). In RE establishments, medium skilled workers cover the highest share of the labor force, whereas high skilled workers also represent a relatively high share (International Labour Office (ILO) and European Commission (EC), 2011; German Federal Environmental Ministry, 2012). Those studies also show that the skill level of the staff depends on the specific technology of RE (e.g., solar energy: high skill level; biomass: low skill level) and the function within the value chain (e.g., research and development: high skill level; production in partially automated processes: medium skill level). Furthermore, these studies observe a high amount of training activities in RE-related companies. Connecting the neoclassical theory of human capital with the empirical findings of above average skills in RE establishments, we expect RE establishments to pay higher wages than non-RE establishments.

The shortage of skilled labor is another driver of higher wages (see Horbach (2014) and Bennett and McGuinness (2009)). Partial skill shortages exist in some RE segments, whereas the degree of the shortage depends on the specific RE technology and the business life cycle (International Renewable Energy Agency (IRENA), 2013; ILO/EC, 2011). Based on the IAB establishment panel, approximately twelve percent of establishments in the technology field of 'Climate protection, renewable energies, energy saving' reported in 2012 that they had a lack of personnel compared to approximately seven percent of all establishments (Horbach, 2014). This should also lead to higher wages in RE establishments compared to non-RE establishments.

Women on average still earn less than men, as is amply documented in the gender wage gap literature (e.g., Hirsch et al., 2010; Ransom and Oaxaca, 2010). The relatively low share of women in RE companies (ILO/EC, 2011: 24 percent; Staiß et al. 2006: 17 percent) thus might be another reason for higher wages in this field compared to non-RE companies.

The lower wage per hour in part-time employment is often connected to the gender pay gap but is also observed for men (e.g., Gornick and Jacobs, 1996). The ILO (2011) reports a higher share of full-time workers in RE companies, which should also contribute to above average wages for RE employees.

According to findings of Seike (2010) and others, younger employees earn less, on average, than comparable older workers. In

[1] An overview of over 40 RE promotion activities in Germany since 1985 is available at the IEA/IRENA Global Renewable Energy Policies and Measures Database: www.iea.org/policiesandmeasures/renewableenergy, Advanced Search > Submenu 'Country' > Choose 'Germany'

[2] We mostly use the term 'establishment' because our data consider production sites and single plants (see Section 2.2 for more details). We use the term 'company' when we discuss the entire legal entity, which may consist of several establishments. The focus on the establishment-level allows us to analyze effects closer to the production process. Finally, there is also the term 'firm', which is often used in the literature but is less specific. We only use firm when it is explicitly used in the literature.