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The economic impact of energy saving retrofits of residential and public buildings in Croatia

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HIGHLIGHTS

- Estimate of the overall socioeconomic impact of energy saving renovation measures on national economy.
- Energy efficient renovation if not subsidised is not financially viable from the owner perspective.
- Total social benefits are higher than social costs due to positive externalities.
- Impact of subsidies on public deficit is neutral even in the short run.

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ABSTRACT

The purpose of this paper is to estimunate the impact of energy saving investment in residential and public buildings in Croatia for the period 2015–2020. The aim is to assess the overall socio-economic impact of energy saving renovation measures defined in Croatian strategic documents in terms of the direct, indirect and induced growth of gross value added, employment and government revenues. An estimate of the avoided costs of air pollution is also included. The overall economic impact assessment is based on an input-output methodology. From the point of view of individual investors, the benefits in terms of reduced future expenses related to energy products are usually below energy efficient renovation investment costs, making an investment financially viable only if government support is provided. If the benefits for society as a whole are included, energy efficient renovation could be assessed as viable even in the short-run. Energy saving retrofits of residential and public buildings positively contribute to economic growth, employment and protection of the environment. Because of economic growth, the tax revenues induced by these investments could compensate for government expenditures, and the overall impact on the public deficit is expected to be neutral even in the short-run.

1. Introduction

The sustainable use of energy and its implications for climate change has become one of the central topics of European politics. As much as 40% of total energy consumption and 36% of CO_2 emissions are accounted for by buildings in EU countries (European Commission, 2015). In Croatia, energy consumption in buildings is even larger due to the fact that most buildings in Croatia were built without adequate insulation. The Europe 2020 strategy for smart, sustainable and inclusive growth clearly states that achieving the objectives of increasing the use of renewable energy sources and energy efficiency by 20% by 2020 could create over 1 million new jobs in the EU. This undoubtedly confirms the general EU belief that energy efficiency projects have positive effects on the economy, and energy renovation projects represent an important tool for achieving Europe 2020 strategy priorities. In line with other European countries, Croatia is also implementing measures to reduce energy consumption. Besides energy renovation, some researches investigate the public attitudes towards photovoltaic systems and advantages of solar energy production (Tsantopoulos et al., 2014, Tampakis et al., 2013). Novak (2015) propose transition to new Sustainable Energy System which depends on energy from sun and could be enable usage of existing buildings infrastructure with minimum needs for adaption.

Most of the previous literature has stressed that energy efficient investments have a relatively high return on investment.

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However, this research was related mainly to the effects of energy renovation in more developed countries. There is much less research dealing with the effects of energy renovation in post-transition countries such as Croatia. These countries have different levels of development, prices and labour productivity than developed countries. In addition, buildings in post-transition countries are on average more energy inefficient, as measured by household specific energy consumption, than those in the EU-27 (Ürge-Vorsatz et al., 2010). Thus, it could be expected that investments in energy efficiency could have different effects in post-transition countries than in developed ones. The main aim of this research is to evaluate the effects of investment in energy efficiency in buildings in a less developed country and specifically a country with a pronounced problem of a rising elderly population which is not interested in such investment and cannot afford to finance it.

The purpose of this paper is to analyse and measure the impact of energy renovation investments in public and residential buildings. Special attention is paid to analysing conditions in which financial support from the government for saving renovation projects is necessary. Thus, we estimate the net present value of investments in energy efficiency renovation. In addition, we use an input-output methodology to estimate the impact of energy retrofit programmes on the private and government sector, as well as on achieving the general EU goal of reducing air pollutant emissions.

The paper consists of six sections. After the introduction, we proceed with a literature review. The third section has a brief overview of the building stock, energy consumption and specific economic conditions in Croatia. The methodology and data sources are described in the fourth section. In this section, we also estimate planned investments in energy renovation programmes. The fifth chapter is devoted to an assessment of the economic impact of investments from the perspective of private owners as well as from that of the government, and to a discussion of the results. The last section gives an overview of the main conclusions.

2. Literature review

Over half of the building stock in the EU was built before 1970, and up to 3% of it is renovated each year (Meijer et al., 2012). Thus, an empirical evaluation of the impact of investment in the energy renovation of buildings has gained a lot of attention in the literature in recent years. The majority of the literature confirms the existence of a positive impact of energy efficient renovation programmes on energy consumption and the environment, as well as on a variety of socio-economic processes. The implementation of energy efficiency measures can enhance job creation, energy savings and energy security, reduce air pollution and poverty, and also lead to multiple benefits for house owners and energy providers (Ryan and Campbell, 2014). One of the most comprehensive pieces of research in this area is that of Copenhagen Economics (2012), which shows that in addition to benefits in terms of energy savings and a decrease in energy dependence, investments in energy renovation encourage economic activity. They stimulate job creation, but also contribute to the improvement of household standards in financial terms, as well as in terms of health and quality of life in a broader sense. Depending on the size and scope of energy efficient investments in the renovation of buildings, Copenhagen Economics (2012) estimate that such investments could stimulate gross domestic product (GDP) growth in the EU by 1.2–2.3% annually. The positive effects are particularly pronounced in periods of economic crisis. Negative effects on GDP could be expected only in the short-term (Tuominen et al., 2013).

From the macroeconomic perspective, investment in energy renovation represents additional demand and an opportunity for domestic producers to increase economic activity. This relates mainly to entrepreneurs who produce goods or provide services for energy renewal, meaning entrepreneurs who are engaged in construction, but also in process and project design and construction supervision. In addition to the direct effects of energy renovation on production, gross value added (GVA) and the employment of entrepreneurs directly involved in projects, companies engaged in the production of goods and services used as intermediate consumption, such as construction materials, transport, craft services and similar should also benefit from the implementation of energy renovation programmes. These indirect effects are defined as an increase in the gross output, GVA and employment of all businesses involved in the production chain, i.e. the enterprises that produce intermediate products for the needs of a direct contractor, and their intensity is spread throughout the economy, depending on the value added chain. In addition to direct and indirect effects, the literature also discusses the induced effects resulting from higher personal consumption arising from the growth of household income generated by an increase in income due to realised savings and rising employment.

The ex-post analysis of energy efficiency retrofit programmes in the United Kingdom presented by Hamilton et al. (2013) shows that energy efficiency interventions decrease energy demand, while the analysis of Webber et al. (2015) reveals the link between income areas and the predicted level of impact in ex-ante estimates. However, it has to be noted that there is evidence of the existence of a rebound effect of investments, the change in behaviour arising from improved energy efficiency, which could diminish part of all the benefits. The rebound effect reflects the increase in demand for energy that is a result of the implementation of energy efficiency measures and policies or certain technological interventions (Maxwell et al., 2011). Such consequences of energy efficiency improvements can be observed at the microeconomic and macroeconomic level. Although there are still no accurate estimates of the impact of rebound effects, Copenhagen Economics (2012) in their estimate apply a rebound effect of between 10% and 30%, while Burman et al. (2014) stress the results of research in Austria showing that the rebound effect can be between 20% and 30% in space heating.

The literature also generally confirms the existence of a positive impact of energy renovation of buildings on public finances. This should even be the case in certain conditions where part of the cost has to be covered by the state, due to the fact that these costs are offset by an increase in tax and other revenues, as well as a drop in other types of expenses (Rosenow et al., 2014; Kuckshinrichs et al., 2010). Curtin's (2012) analysis of government support schemes in Ireland shows that support targeted on deeper energy efficiency measures is effective. The profitability of energy efficient retrofit investments and the necessity of government support in making these investments attractive from the house owner's perspective depend on future energy prices (Amstalden et al., 2007) and are hard to estimate. Net revenue gains in the EU could reach up to €40 billion in 2020 due to a decrease in government subsidies and energy spending, a rise in tax revenues, and a drop in public expenses caused by the improved health condition in populations (Copenhagen Economics, 2012). A part of these expected impacts should result from additional job creation caused by energy renovations. The largest positive effect can be expected in construction, community, social and personal services and manufacturing, while electricity, gas and water supply will record a drop in the number of employees (Ürge-Vorsatz et al., 2010; Markaki et al., 2013).

It has to be stressed that most studies dealing with the effects