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An empirical comparison of voluntary and mandatory building energy performance disclosure outcomes

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HIGHLIGHTS

- A theoretical model of building energy disclosure policy effectiveness is proposed.
- Mandatory disclosure adopters reduce consumption similar to voluntary adopters.
- Mandatory building energy disclosure in Australia has been effective.
- Early adopters creating a market for energy retrofits is a likely reason for success.

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ABSTRACT

In 2010, the federal Australian government mandated the disclosure of energy performance ratings in advertisements for sale or lease of large commercial office properties. Prior to 2010, participation in the rating scheme was voluntary. This study first develops a theoretical model of mandatory disclosure policy effectiveness. Then, with a dataset of all ratings since inception of the voluntary regime in 1999, it tests the expectation that initial voluntary adopters have a greater tendency towards environmental stewardship and are more likely to manage and invest in environmental performance improvements, potentially dampening the effectiveness of mandatory disclosure policy. However, multiple statistical models of certification are unable to reject the null hypothesis that there is no difference in energy efficiency outcomes between the mandatory and voluntary adopters at equivalent stages. For urban policymakers, the extrapolation of voluntary adopter performance appears to be a good – perhaps even conservative – estimation of mandatory energy performance disclosure outcomes.

1. Introduction

The context of climate change and greenhouse gas mitigation provides a scope for urban policymakers to intervene in the energy performance of existing buildings. The United Nations Environment Programme (2007) estimates that buildings generate 30–40% of global greenhouse gas emissions, mostly as a by-product of operational energy consumption (Levine et al., 2007). Because buildings are built to last for a very long time, the replacement rate is very low (Holness, 2008; Kok et al., 2012b). Models of future building stock energy performance show a strong sensitivity to assumptions behind investment in existing stock performance (Coffey et al., 2009). Consensus on the need to rapidly mitigate greenhouse gas emissions in order to avoid the negative consequences of a warming planet means that existing buildings must be involved in mitigation efforts. A conservative initial target for the urban built environment is provided by Pacala and Socolow (2004), who suggest a 50-year target of 25% reduction in emissions from 2004 levels.

The limitation of private energy efficiency initiatives is best seen in recent studies that narrate how energy efficiency is a niche product in the market for urban office space. Chegut et al. (2014) find that as the market share of energy efficient buildings increase, the private incentive of capital and rent premiums generated from these assets decreases. Kok et al., (2012b) describe a slowdown in the once rapid growth seen in private energy efficiency certifications in the United States market for new and existing buildings. Even after this rapid growth period, the market share of privately-labelled stock is less than 10% of the total commercial stock in the United States. Hence government intervention is seen as a means to rapidly increase adoption of energy efficiency.

One policy intervention being considered for increasing operational energy efficiency in existing buildings is mandatory disclosure of operational energy consumption in any lease or sale

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advertisement (Kontokosta, 2013). This is an indirect "market-based policy" in that it relies on the market to price energy efficiency, creating an incentive for private investment in greenhouse gas mitigation. Governments do not set a statutory minimum in a market-based policy so the outcome of mandatory energy performance disclosure is unknown and relies on the willingness of consumers to pay for energy efficiency in a competitive market. Some argue that a market-based policy approach is preferred because traditional top-down regulation, while effective, is costly, rigid, inefficient, and adversarial (Borck and Coglianese, 2009).

Typically, the required information in a mandatory disclosure is previously available for use on a voluntary basis; in other words, the government simply mandates that the market must participate in what was once a voluntary scheme. This study is the first systematic comparison of energy performance outcomes resulting from voluntary certification (i.e. a "no action" scenario for policymakers) and mandatory certification. It enables urban policymakers considering mandatory disclosure to forecast an outcome based on existing data available from voluntary schemes. Specifically, this paper investigates outcomes in Australia, which is one of the first governments to test the policy of mandatory energy consumption disclosure in the urban built environment.

2. Mandatory energy performance disclosure: history and theory

The Australian Capital Territory (ACT) was one of the earliest to experiment with mandatory disclosure of energy consumption potential in the built environment as a means to influence private housing development. Since 1999, sales advertisements for detached residential houses are required to display an Energy Efficiency Rating (EER) that simulates the cost of energy used to heat and cool the dwelling in a typical year. Because performance is simulated, this type of rating is commonly referred to as an "intrinsic" rating, or an energy consumption estimate based on standardised operating conditions. Actual consumption data is not collected for an intrinsic rating. Research on the outcomes of this early attempt at mandatory disclosure in the ACT is limited to a government-sponsored statistical model showing that house sale prices in 2005 and 2006 are positively correlated with EER scores in a hedonic price model (Soriano, 2008).

Closely resembling the ACT regulation, European Union Directive 2002/91/EC mandated in 2002 that all member states make an Energy Performance Certificate (EPC) available to interested parties during the sale or lease of commercial and residential property. The European directive relaxes the ACT restriction on building type but in practice, EU states implemented the directive in stages starting with detached residential and gradually expanding into different commercial building sectors. Despite the word "performance" in the title, an EPC is also an intrinsic rating, just like the ACT EER.

Research on the outcomes of the European directive concentrates on the relationship between market prices and EPC rating, but also on the process of implementation by member states. Kok and Jennen (2012) found that EPC ratings above a government threshold for energy efficiency garnered higher rents in Dutch office buildings. Fuerst et al. (2013) found similar evidence in the UK, but raised questions over the cause when observing that only newer buildings received premiums. Andaloro et al. (2010) have criticised the slow implementation of the directive among EU members, while Fuerst and McAllister (2011) comment on shortcomings with EPC availability to prospective buyers or lessees. As of yet, there is no study looking at the efficacy of an EPC to reduce measured energy consumption of existing buildings in-use.

In 2010, the federal Australian government became the first to mandate consumption rating disclosure, although the mandate is restricted to large commercial office buildings greater than 2000 m^2. Unlike intrinsic ratings, "consumption ratings" are based on measured energy performance audited to a common standard. The Building Energy Efficiency Disclosure (BEED) Act was enacted in early 2010 with effect from November 2010, and as a result, large office buildings must disclose a National Australian Built Environment Rating System (NABERS) Energy rating conspicuously in advertising materials for lease or sale. Similar mandatory disclosure laws using consumption ratings have since been enacted at the local and state level in the United States; for example, Kontokosta (2013) discusses the plan for mandatory performance disclosure in New York City.

Prior to the mandate in Australia, NABERS Energy was available as a voluntary certification tool. Gabe (2016) reported that, on average, owners participating in NABERS Energy audits for approximately five years met the Pacala and Socolow (2004) target of 25% reduction in greenhouse gas emissions. The question pursued in this research is the variance in energy efficiency outcomes between voluntary adopters and outcomes from later mandatory adopters forced into the auditing process by government policy.

One can hypothesise that mandatory adopters are disinterested in energy efficiency and thus mandatory disclosure policies could have less effect on energy efficiency outcomes than would be expected if one projects outcomes using the voluntary cohort performance. Building owners forced to disclose via mandatory disclosure have implicit success in the market outside of a disclosure regime and thus less likely to see value in operational energy efficiency investment. The question facing these owners is whether perceived societal costs of disclosing poor energy ratings exceed the value in continuing business as usual. Since voluntary disclosure would occur in the absence of policy intervention, policy outcomes are dependent on owners forced to disclose.

A simple theoretical model is used to illustrate this hypothesis. First, consider the total change in urban energy consumption within a private market and the option to participate in a voluntary energy efficiency initiative:

$$\Delta = P_V\Delta_V + (1-P_V)\Delta_S \quad (1)$$

Δ: Average change in energy consumption per building over the whole stock, Δ_V: Average change in energy consumption per building for a voluntary adopter, Δ_S: Average change in energy consumption per building for a non-participant,[1] P_V: Fraction of the market participating in voluntary initiative, Conditions: $0 < P_V < 1$; $\Delta_V < \Delta_S$.

This model is adopted from Borck and Coglianese (2009), who devise a similar equation to estimate the effectiveness of voluntary certification schemes. Note that Δ is a variable measuring change in energy consumption. Negative values indicate energy consumption savings, so the more negative Δ becomes, the greater the energy efficiency outcome.

Next, the total change in urban energy consumption within this market if the government decides to implement mandatory disclosure adds the contribution of those forced into participation:

$$\Delta = P_M\Delta_M + P_V\Delta_V + (1-P_M - P_V)\Delta_S \quad (2)$$

Δ_M: Average change in energy consumption per building for a mandatory adopter, P_M: Fraction of the market forced into

[1] One might assume this variable takes the value of zero, but non-participants may also reduce energy consumption as a result of "spillover effects", or the positive benefits of innovation by participants that spills over into the general market. Borck and Coglianese (2009) review the literature on spillover effects and find they are difficult to measure but qualitatively exist. Simcoe and Toffel (2013) present an example of a study that concludes spillover effects of building energy efficiency as a result of public sector procurement policies are non-zero.