Transaction Costs of Energy Efficiency in Buildings – An Overview

By Bernadett Kiss and Luis Mundaca*

Transaction costs (TCs) are costs not directly involved in the production of goods or services, but unavoidable and often unforeseeable costs that emerge from contracting activities that are essential for the trade of such goods and services (Coase, 1960). In the field of technology change, TCs are often referred to as unmeasured costs that prevent the adoption of new technologies. TCs are often understood as costs occurring ex ante to the arrangement and implementation of technologies and ex post in relation to the monitoring and enforcement of contracts (Matthews, 1986). TCs can act as a critical market barrier by making new technologies seem more expensive than conventional ones. Transaction costs are surrounded by high conceptual and methodological complexity.

Energy efficient technologies in the building sector, which can be ostensibly hindered by TCs, are of high importance in terms of climate change mitigation. The building sector accounts for approximately 31% of global final energy use and 33% of energy-related CO_2 emissions (Ürge-Vorsatz, D., Eyre, N., Graham, P., Harvey, D., Hertwich, E., Jiang, Y., et al., 2012). There is, however, a huge potential to improve building energy performance and, consequently, reduce CO_2 emissions. In the EU, the full cost-effective energy saving potential of 27% by 2020 lies in the residential sector (EC, 2007)[1]. On a global scale, it is estimated that efficient technologies can deliver a 30% cost-effective GHG-emission reduction by 2020 (Levine, M., Ürge-Vorsatz, D., Blok, K., Geng, L., Harvey, D., Lang, S., et al., 2007). However, in order to tap this potential, TCs need to be better understood and ultimately reduced.

What is known about the nature (origin) and scale (order of magnitude) of TCs in energy efficiency projects?

When it comes to the *nature* of TCs, multiple sources have been identified. Transaction costs of implementing energy efficiency arise throughout the entire life-cycle of projects: in the planning, implementation and monitoring phase. TCs can be conceptually categorized as the cost of a) search for information (due diligence), b) negotiation, c) approval and certification, d) monitoring and verification and e) trading (Mundaca, Mansoz & Neij, 2011). TCs in the building sector mostly arise as a result of project formulation, search for partners and/or feasible technical and financial solutions, contract negotiations and monitoring the performance of the installed equipment (Kiss, 2012). These TCs can hinder the implementation of energy efficient technologies, for instance, preventing real estate developers from entering the energy efficiency market (Lee & Yik, 2002).

Regarding the *scale* of TCs, several studies have attempted to provide empirical estimates for the building sector. For instance, and as a proportion of investment costs, TCs for lightning technologies are estimated to be 10%, for improved cavity wall insulation 30%, and in the range of 20%-40% for energy efficiency measures carried out by ESCOs in the residential sector (Mundaca, 2007; EastonConsulting et al., 1999). In Sweden, TCs in the building sector are estimated to be 20% of the investment costs (Ürge-Vorsatz, D., Eyre, N., Graham, P., Harvey, D., Hertwich, E., Jiang, Y., et al., 2012). TCs are sometimes also expressed in monetary terms or work load (time) (Björkqvist & Wene, 1993). In any case, all estimates of TCs are subject to uncertainty amongst others due to the performance of the technology, accountability, reliability and accuracy of data sources and the methods of monitoring and quantifying TCs.

The source and the scale of TCs are influenced by a number of factors. There may be internal causes associated to the implementation and operation of energy efficient technologies. The project type and size, technology performance, monitoring activities, and the number of involved participants can determine the specific origins and corresponding scale. For instance, Lutzenhiser (1992) shows that the high number of participants involved in the choice of household technology increased the complexity of transactions and thus related unobserved costs. There can also be external circumstances associated to the implementation and operation of efficient technologies that can trigger the nature and order of magnitude of TCs. For example, contract type, availability and quality of information and resources, policy framework and the presence of trust among involved participants. Finally, methodological factors can also frame or drive the identification of TCs and resulting economic estimates. They are mostly related to conceptual choices, approaches used for quantifying TCs, attributability (who bears these costs), availability and quality of data, and data collection methods. Depending on the variety of factors determining TCs, one can argue that uncertainty is an intrinsic aspect of transaction cost analysis for efficient technologies in the building sector.

* Bernadett Kiss and Luis Mundaca are with the International Institute for Industrial Environmental Economics at Lund University, Lund, Sweden. Ms. Kiss may be reached at bernadett.kiss@iiiee.lu.edu
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The building sector, in specific, is a complex sector including multiple participants and multiple transactions resulting in very high TCs in itself. Implementing energy efficient technologies in this sector, further increases the already high and often not encountered TCs. Despite uncertainties, some strategies and policies have shown to have the potential to reduce TCs for improving energy efficiency in buildings. At the managerial level, for instance, procedure standardizing, full life-cycle cost accounting and learning via project bundling are worth exploring. These strategies can reduce costs of search for information and monitoring and verification. From a policy perspective, clear and simple legal frameworks promoting efficient technologies in the building sector can also be an option. This can include streamlined procedures for baseline settings and requirements for monitoring and verification, coupled with testing, extensive information provision and education of building professionals. Despite the academic debate, whether TCs are market failures or not and thus whether policy intervention is required to reduce them or not, there is a high-potential in public policy intervention to reduce TCs in the building sector.

Footnote

[1] Heating energy saving potential in case of high performance retrofitting is in the range of 70-92% (Ürge-Vorsatz, D., Eyre, N., Graham, P., Harvey, D., Hertwich, E., Jiang, Y., et al., 2012).

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