



# The determinants for adoption of energy supply contracting: Empirical evidence from the Swiss market

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## ABSTRACT

Energy supply contracting, the outsourcing of energy-related services, is considered a promising tool to induce investment in energy efficiency and renewable technologies. Yet, some energy contracting markets grow slowly and some segments remain untapped. In order to assess whether the potential is underexploited and policy support is needed, the determinants of energy supply contracting adoption are analyzed using a dataset of 2003 accepted and rejected contracts offered in the Swiss market. The results show that the advantages of risk sharing and economies of scale brought by contracting, as well as trust in the supplier and the technology, are important determinants of the client's choice. A large number of decision-makers, inducing higher expected transaction costs, negatively impacts the likelihood of adoption. Less specific contracts involving residential or new buildings are more likely to be signed. Policy intervention is needed to reduce the entailed transaction costs, by clarifying the regulatory framework regarding tenants and subsidizing the costs of facilitators. Trust may be enhanced by the government's information campaigns on renewable technologies and certifications of the suppliers. This paper provides guidelines on how to adapt the business model to better exploit the market.

## 1. Introduction

Energy service contracting is considered as a market-based instrument that fosters investments in renewable and efficient energy services and combines business opportunities with social benefits. These contracts have been shown to result in important energy savings (Soroye and Nilsson, 2010; Goldman and Larsen, 2012) and investment in innovative renewable energy systems (Bleyl, 2011). They have also generated massive revenues for contractors. In 2011, the aggregate revenues were estimated to \$5 billion in the US (Gilligan, 2011), and to 1.2 billion Euros in Germany in 2009 (Eikmeier et al., 2009). Despite these advantages, the potential of energy service contracting does not seem to be fully exploited, a problem referred to as the *Energy Service Gap* (Backlund and Thollander, 2011). First, the transaction costs incurred by these types of contracts imply that they are mostly relevant beyond a certain scale and targeted at specific market segments, leaving out small energy consumers (Backlund and Thollander, 2011) and SMEs (Pätäri et al., 2016). Second, stagnation has been observed on some mature markets such as in the US (Stuart et al., 2016). The existence of an *Energy Service Gap* is challenged by some authors who claim that “low hanging fruits” have already been harvested in most countries (Marino et al., 2010; Goldman et al., 2005).

This study questions the reality of the *Energy Service Gap* in

Switzerland. This requires an investigation into energy service contracting adoption and underlying barriers and drivers. If the possibilities to grow further and target new market segments exist but are not exploited, one should review the barriers that are hampering such an expansion and identify the policy instruments required to achieve it. Conversely, if barriers are nonexistent or unbinding, one could conclude that Energy Service Companies (ESCOs) have already exploited the existing market niches. In this case, other instruments, such as new business models or public policies, should be used to promote the deployment of renewable technologies and energy efficiency.

While most studies about ESCOs rely on interviews of experts, this study focuses on the client's point of view. The results are based on a micro-econometric analysis of 2003 rejected and accepted energy supply contracts proposed by two of the largest Swiss ESCOs over the period 1996–2011. The Swiss ESCO market has seldom been analyzed in the literature. Despite strong financial institutions, credit-worthy private and public institutions, the market is experiencing a slow growth in Switzerland. This study provides quantitative evidence that economies of scale and risk sharing are indeed advantages of energy supply contracting. These projects include innovative renewable technologies. The potential is however underexploited because of the expected transaction costs involved. While the results show that trust in the technology and the ESCO can mitigate part of these costs, other

Abbreviation: ESC, Energy Supply Contracting; EPC, Energy Performance Contracting; ESCO, Energy Service Company  
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solutions, such as facilitators (Bleyl et al., 2012), are needed to reach untapped potential. Policy intervention may be required to reduce the entailed transaction costs, by subsidizing the costs of facilitators or clarifying the regulatory framework regarding the transfer of costs to the tenants. Adapting the ESCO's business model may also lead to an improved exploitation of the market potential. ESCOs should consider the underlying trade-offs when targeting clients and could propose other forms of remuneration, such as on-bill financing (Nolden and Sorrell, 2016). They may also apply safeguard contractual clauses to reduce the risk of the client's bankruptcy or relocation.

The paper proceeds as follows. In the next section, I present the theoretical and empirical background as well as the hypotheses that will be tested empirically. The research context, data description and the econometric model are developed in Section 3. Descriptive statistics and estimation results are presented in Section 4. Section 5 presents robustness checks and limitations while Section 6 discusses the policy implications and concludes.

## 2. Background and hypotheses development

Energy service contracting consists in the outsourcing of energy-related services to a contractor, an Energy Service Company (ESCO), through long term contracts. Two main types of energy contracting exist: Energy Supply Contracting (ESC) and Energy Performance Contracting (EPC) (Sorrell, 2005). ESC usually covers the financing, operation and maintenance of the energy equipment, while the contractor exerts no or little control over the demand for final energy services. EPC differs from ESC in that the contractor has a financial incentive to reduce energy costs. In both types of contract, the client can share some of the risk, overcome her lack of technical knowledge or limited access to capital, and benefit from economies of scale and incentives from the ESCO to maintain performance over contractual time. As a result, energy contracting has been considered a promising market-based instrument to overcome barriers to energy efficiency (especially through EPC) and renewable energy investments (especially through ESC) (Sorrell, 2007; Yik and Lee, 2004; Soroye and Nilsson, 2010). Several authors developed a theoretical framework to the viability of energy contracting. Yik and Lee (2004) and Li et al. (2014) provide models for EPC viability and design based on net present values of future savings. Sorrell (2007) relies on transaction cost economics to assess energy service contracts' viability. He argues that energy service contracting represents a shift from vertical integration to a market-based organization and thus can reasonably be related to a 'make-or-buy' decision. Several empirical studies are built on Sorrell's framework (e.g. Nolden et al., 2016; Polzin et al., 2016b). The present study follows Sorrell's idea to ground the determinants of ESC adoption into the theory of the firm, but differ slightly from his framework. First, because the data are collected at the project level, it enables me to explore the channels through which the determinants specified by Sorrell can affect the customer's decision. These channels cover the technology specificity, the age, the type and the energy consumption of the building, the trust in the ESCO or in the technology, the contract duration and the number of decision-makers. Second, this study adds risk as a new determinant of the customer's decision. Because energy service contracts involve operating costs sharing and long contractual periods, risk is likely to play a major role in the customer's choice. Conversely, while energy cost savings potential and competitiveness of the energy service market are likely to play a role (Sorrell, 2007), the data of this study do not allow to empirically assess their impact. The following subsections present the theoretical concepts that will be empirically tested in this study.

### 2.1. Transaction costs economics

Transaction costs economics (Williamson, 1971; Lyons, 1996; Gibbons, 2005; Tadelis and Williamson, 2013) favors an interpretation

of the energy service provision's choice as a trade-off between reducing production costs through energy contracting or mitigating transaction costs through self-investment. The ESC supplier typically bears the costs of design, installation, operation and maintenance of the equipment. This provides an incentive for the ESCO to minimize the overall production costs over the contract duration. The client also benefits from economies of scale and specialization resulting from the ESCO's expertise and ability to design and supervise numerous projects (Nolden et al., 2016). This, however, must be outweighed by the fact that the contract is also assumed to increase transaction costs, as compared to self-investment. Transaction costs consist in search costs, bargaining, renegotiation and litigation costs, potential legal expenses and all the costs related to a modification of the technology or a transfer to another client or supplier. The disturbances in ESC could typically be technical problems, financial issues on either the client's or the supplier's side or a change in the client's behavior. The viability of an ESC project from a client's point of view is determined by her expectations regarding the magnitude and the probability of occurrence of transaction costs as compared to the expected gains in production costs. Several elements are assumed to have an impact on this trade-off. They are described in the following subsections.

#### 2.1.1. Asset specificity

Transaction costs might arise if it is costly to replace a contractor (or a client) when disturbances occur. In some cases, the project involves asset specificity, which increases the expected transaction costs when coupled with uncertainty.<sup>1</sup> Specificity in energy service contracting may relate to the physical asset, the human asset or the site (Sorrell, 2007). Physical asset specificity refers to the level of specialized equipment and the related importance of auditing and designing effort incurred before the implementation. Human asset specificity represents the degree of expertise and knowledge required to design the installation. If these forms of specificities are significant, they necessitate from the contractor an important investment, which will be lost if the contract is prematurely terminated by the client. This may result in an incentive for the ESCO to choose generic technologies in order to minimize the investment made before the client signs the contract (Backlund and Thollander, 2011). This may explain why EPC projects typically involve simple and well-established technologies, such as LED, voltage optimization and building controls. More comprehensive retrofits such as envelope enhancement or innovative technologies are however less frequent (Bleyl, 2011; Nolden and Sorrell, 2016). When clients ask for "cutting-edge" technologies, the ESCOs are likely to contract without any performance guarantee (Hansen, 2006). This may however not apply to ESC projects, which often involve innovative technologies, such as combined heat and power systems (Bleyl, 2011). Nevertheless, once a specific technology is implemented and if the supplier does not deliver on its mandate, it may be costly for the client to find another supplier with the adequate level of expertise to take over. This results in bilateral dependency between the two parties and higher expected transaction costs. This is captured by the first hypothesis:

**H1a. The more specific and uncommon the technology, the lower the probability of opting for ESC.**

The equipment specialization demanded by the client may be dictated by her preferences or stem from particularities of the building (e.g. interior layout, proximity and access to potential energy sources such as groundwater for heat pumps). Technological constraints are typically weaker when the building and the energy equipment are designed at the same time. New buildings offer a larger flexibility for the integration of renewable energy technologies (IEA-RETD, 2013). With

<sup>1</sup> See Tadelis and Williamson (2013) for a theoretical background on the impact of specificity and Sorrell (2007) for a discussion of the concept applied to energy service contracting.

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