Journal of Purchasing & Supply Management ∎ (∎∎∎∎) ∎∎∎–∎∎∎

Contents lists available at ScienceDirect

Journal of Purchasing & Supply Management

journal homepage: www.elsevier.com/locate/pursup

Supply market uncertainty: Exploring consequences and responses with in sustainability transitions

Louise Knight*, Alexandra Pfeiffer, James Scott

Aston University, Aston Triangle, Birmingham B4 7ET, UK

ARTICLE INFO

Keywords:
Supply risk
Market evolution
Bioenergy
Market failure
Market bottleneck
Market making
Market shaping
Innovation adoption

ABSTRACT

Often it is commercial, not technological, factors which hinder the adoption of potentially valuable innovations. In energy policy, much attention is given to analysing and incentivising consumer demand for renewable energy, but new technologies may also need new supply markets, to provide products and services to build, operate and maintain the innovative technology. This paper addresses the impact of supply constraints on the long-term viability of sustainability related innovations, using the case of bioenergy from organic waste. Uncertainties in the pricing and availability of feedstock (i.e. waste) may generate market deadlock and deter potential investors. We draw on prior research to conceptualise the problem, and identify what steps might be taken to address it. We propose a research agenda aimed at purchasing and supply scholars and centred on the need to understand better the interplay between market evolution and supply uncertainty and 'market shaping' – how stakeholders can legitimately influence supply market evolution – to support the adoption of sustainability related innovation.

1. Introduction

Firms and policy makers make great efforts to encourage demand for innovations which yield environmental and social benefits. Purchasing and supply management (PSM) experts support these endeavours in various ways including sustainable procurement (Meehan and Bryde, 2011), green/sustainable supply chain management (Seuring and Müller, 2008), and using public procurement to promote innovation (Rolfstam, 2012). These initiatives all have a vital role to play in helping organisations meet their sustainability related objectives. This article argues that there is however an important gap in PSM research – a gap that is broadly relevant to many situations involving innovation but is particularly important to sustainability. We show how supply-side market failure can constrain or even block the take-up of sustainability related innovations, and that this important topic has, to date, been largely neglected in scholarly work in PSM. Based on an extensive review of the literature and informed by practical examples – in particular on the example of 'bioenergy from organic residues' (BfOR), one aspect of the renewable energy 'sustainability transition' (Markard et al., 2012) – we propose a research agenda for supply market research. The issues discussed are acute in BfOR but not exclusive to this field, so the agenda is of wider relevance.

In the BfOR sector, uncertainty about price and availability of 'residual biomass feedstock' – organic waste such as agricultural by-products or household rubbish – is often a critical factor in deterring investment in individual BfOR projects (Scott et al., 2013). At the collective level, a vicious cycle may emerge and block or constrain innovation adoption: uncertainties in feedstock supply dampen, or prevent, the development of demand, which in turn means that waste producers do not regard bioenergy plants as a market of potential buyers, and do not enter that market. Over time and across the system of potential vendors and buyers, buy-side and supply-side uncertainties are mutually reinforcing, potentially leading to a form of market failure, which may block BfOR adoption ('market deadlock'), or slow adoption ('market bottleneck'). These operate as a barrier to the transformative change that is needed for the transition to renewable energy. Though supply market deadlock/bottleneck and buying firms' responses are clearly supply management related, an initial review of the literature demonstrated a lack of relevant PSM research. The aim of this article is therefore to address two questions in the context of sustainable transitions:

- how does supply uncertainty constrain innovation adoption?
- what measures can be taken to address supply uncertainty when it constrains innovation adoption?

The article is organised as follows. Section 2 describes the process of the extensive, exploratory literature review, and how the BfOR example and other relevant examples were used to

* Corresponding author. Tel.: +44 1212043605.
E-mail addresses: l.knight2@aston.ac.uk (L. Knight), pfeifame@aston.ac.uk (A. Pfeiffer), j.scott2@aston.ac.uk (J. Scott).

http://dx.doi.org/10.1016/j.pursup.2015.04.002
1478-4092/© 2015 Published by Elsevier Ltd.

inform the analysis, working back and forth between practical cases and conceptual knowledge. Section 3 describes the case of 'distributed bioenergy from organic residues' (BfOR), which provides an example to illustrate and inform the analysis of literature related to the two research questions; it is not formal, primary research. Section 4 presents key findings related to the first question, which serves to elucidate the nature of the problem. Section 5 is focused on what measures might be taken to address it. We conclude by presenting a proposed research agenda and discussing its implications in terms of research process (theory and method), with implications for policy and practice.

The focal topic of this article lies at the intersection of research in three fields, PSM, innovation and sustainability. Most research at the intersection of PSM and sustainability focuses on environmentally and ethically sound supply chain practices (Pagell and Shevchenko, 2014), and most research at the intersection of PSM and innovation focuses on purchasing and supply issues related to bringing new products to market. By contrast, here we link established PSM themes to the field of sustainability related transitions (Markard et al., 2012; Frantzeskaki et al., 2011).

This article makes three contributions. First, it elaborates the concept of market deadlock/bottleneck in relation to supply uncertainty, linking public policy and innovation studies to the field of purchasing and supply management (Section 4). The second contribution is to elaborate firm level, market taking (Spulber, 1996) responses to market bottlenecks, that is strategies firms adopt to mitigate supply risk and uncertainty which presume the firm cannot influence the market (Section 5.1). The third contribution is to elaborate market shaping strategies and activities to address bottlenecks and deadlocks (Section 5.2). The second contribution can be seen as incremental to the PSM field, extending supply risk and uncertainty research to a new field. The first and third are more novel; 'market' as a level and unit of analysis is relatively neglected, even within the field of marketing (Storbacka and Nenonen, 2011a), and is often not defined explicitly (Geroski, 1998; Biggart and Delbridge, 2004). Overall, we find that there is an urgent need for PSM research to better understand the impact of supply uncertainty on innovation adoption particularly in the context of sustainable transitions, and suggest ways in which supply management might help to address this barrier to transformational change.

2. Method

This article is rooted in a practical problem encountered by bioenergy experts. Through formal interviews and informal discussions with bioenergy experts, an initial statement of the problem was elaborated. Then a multi-phase, extensive and iterative search of business and management literature was conducted, as set out in Table 1. Stage 1 provided a small body of the literature which helped to elaborate the problem, but provided little on how it might be addressed. We therefore turned to the literature on innovation and supply (stage 2), and then pursued key themes emerging from stage 2.

The diversity of focal topics, perspectives, methods and disciplines within the set of articles reviewed here limits the value of the typical 'gap-spotting' approach to reviewing the literature and identifying areas for future research (e.g. Neely et al., 1995; Roehrich et al., 2014). Rather, our approach to reading the core texts has been guided by advice from Alvesson and Sandberg (2011) who advocate "problematisation as a methodology for identifying and challenging assumptions" and identifying interesting avenues for new research. Making sense of the literature was an exploratory and iterative process, involving problem statements and thought trials (e.g. Weick, 1989; Cornelissen, 2006). We related insights from prior research to the BfOR situation and other cases (see Table 2), considering for example the potential consequences of widespread adoption of various sourcing strategies (see Section 5.1). Rigour was achieved by pursuing themes persistently and consistently with the goal of achieving saturation, systematically checking for further work which might either extend or complement the insights generated or provide disconfirmatory evidence, or till new articles were found to be out of scope/relevance. We use empirical material from BfOR and reported cases with knowledge from prior research in a dialogic approach (Alvesson and Kärreman, 2007). BfOR is not a primary case study, but a rich example presented using the academic literature and building on extensive, direct experience in the sector by one of the authors (Scott). Next, we describe the BfOR sector and key barriers and drivers of change which relate to supply.

3. Bioenergy from organic residues

BfOR technologies have the potential to improve the overall environmental sustainability of economies and societies by simultaneously generating energy with lower environmental impacts compared to fossil fuel sourced energy, and reducing the negative environmental impact of waste management activities (Kothari et al., 2010; Iakovou et al., 2010). The waste hierarchy concept for resource management indicates that reuse and recycling of material are better than converting materials to energy (recovery), and that recovery is preferable to disposal (Grosso et al., 2010; Schmidt et al., 2007). Therefore the BfOR industry focuses on residual materials that cannot be economically recycled. BfOR is distinct from energy from waste (EfW) as EfW projects and technologies are designed to handle mixed waste materials usually with high plastic contents, mainly through incineration. The industries do however overlap with respect to actors and technologies.

Examples of biogenic wastes are food waste from the food retail supply chain, straw and husks from agricultural processes, sewage sludge and the residual fraction remaining after municipal waste is processed through a recycling plant. Different types of feedstock are more or less suitable for different conversion technologies. Each feedstock has different technical and legislative challenges for project developers to overcome. Energy in this context means either heat or power, or both produced in a combined heat and power (CHP) plant (Gold and Seuring, 2011; Kaltschmitt et al., 2009)

Waste producers include municipalities and actors within agricultural, food, drink and forestry supply chains. Waste merchants or intermediaries including recycling companies, haulage companies, warehousing and general logistics firms. Aggregation and sorting activities are also common in some parts of the organics recycling industry, especially waste wood. BfOR plant operators include large scale utilities and multi-national engineering firms with consortium finance backing. At the small scale, BfOR can be community run organic waste management projects, biomass boilers or small scale CHP schemes. Usually projects will have a developer from the beginning who takes most of the at-risk development work. Once planning permission is granted the project is effectively live and is often then sold to a larger development firm with a greater liquidity to complete the actual build and commissioning. Sometimes projects will also change hands post commissioning to a more risk averse operator, typically a utility.[1]

Whilst 'advanced biomass conversion technologies' such as pyrolysis and gasification of residual wastes (Arena, 2012;

[1] This summary is based on extensive interaction with various BfOR stakeholders, and literature such as WGBU (2008), Kaltschmitt et al. (2009), Gold and Seuring (2011) and Gold (2011).

Please cite this article as: Knight, L., et al., Supply market uncertainty: Exploring consequences and responses with in sustainability transitions. Journal of Purchasing and Supply Management (2015), http://dx.doi.org/10.1016/j.pursup.2015.04.002