

Why Can't We All Just Get Along? A Reconciliation of Economic and Innovation Diffusion Perspectives of Market Transformation

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ABSTRACT

Market transformation has emerged as a central policy objective for future publicly-funded energy efficiency programs. This emergence has raised numerous questions relating to methods for measuring the performance of market transformation programs. The conceptual framework for addressing these questions, particularly in California, has centered on concepts of market barriers, market effects, and sustainability. However, a recurrent criticism of this framework is that it overlooks the importance of information flow, communication channels, and social structure in the market transformation process. This paper attempts to fill this gap by integrating the market transformation concepts laid out in *A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs* (commissioned by the California DSM Measurement Advisory Committee) and the theoretical framework that has emerged from innovation diffusion research.

Background

The *Scoping Study* was in many ways a ground-breaking document when it was written in July 1996. It provided an important contribution to the market transformation debate by clarifying the relationship between the conceptual framework provided by economics and the notion of market transformation based on experience and observation. The operational implications of this framework are described in further detail in *Proposed Recommendations on Program Classification, Cost Effectiveness, Capability of Transforming Markets, and Market Assessment and Evaluation (Recommendations)*, prepared for the California Board for Energy Efficiency by the *Scoping Study* authors. For purposes of this paper, the *Scoping Study* and *Recommendations* taken together are treated as the *Scoping Study* framework.

A recurrent criticism of this framework is that it underestimates the importance of information flow, communication channels, and social structure in the market transformation process. This paper attempts to fill this gap by integrating the market transformation framework from the *Scoping Study* and research into diffusion of innovations. In doing so, it addresses the following issues:

- The role of economic theory in making policy decisions and resource allocation
- The relationship between market barriers and diffusion-limiting factors
- Market structure, communication channels, and information flow
- The pattern of market transformation over time
- Diffusion of innovation as a basis for assessing the sustainability of market effects

Summary of the Two Frameworks

Scoping Study

The conceptual framework put forward in the *Scoping Study* shows a strong (though not exclusive) economics influence. It begins with the premise that the level of investment in or practice of

energy efficiency is less than would appear to be cost beneficial and that the gap between actual and cost-beneficial levels is due to one or more market barriers. The market barriers hypothesized roughly correspond to market failures or breakdowns in neo-classical economic assumptions discussed in the broader economic literature. From this perspective, proper design of a market transformation program entails identification of these market barriers and development of a strategy to reduce or eliminate them. Evaluation of such a program entails measurement of proximate indicators of changes in market barriers; i.e., market effects. The *Scoping Study* provides the following definitions and concepts:

- **Market Barrier:** "Any characteristic of the market for an energy-related product, service, or practice that helps to explain the gap between the actual level of investment in or practice of energy efficiency and an increased level that would appear to be cost beneficial" (p. 7). Eto, Prahl, and Schlegel specify that the cost-benefit test should be from a consumer's or society's point of view.
- **Market Intervention:** "A deliberate effort by government or utilities to reduce market barriers and thereby change the level of investment in (or practice of) energy efficiency... A net beneficial outcome requires that the increase in the adoption, procurement, or practice of energy efficiency is not offset by other losses..." (pp. 8-9).
- **Market Effect:** "A change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficient products, services, or practices and is casually related to market intervention(s)... If there is no observable market effect, then... the relevant market barriers have not been reduced to a noticeable degree" (p. 9). Market effects are interactive and can be transient or lasting.
- **Market Transformation:** "A reduction in market barriers resulting from a market intervention, as evidenced by a set of market effects, that last after the intervention has been withdrawn, reduced, or changed" (p. 10).

Elements of the *Scoping Study* framework are discussed in more detail in the context of comparisons with diffusion of innovation theory below.

Diffusion of Innovation

Everett Rogers provides perhaps the most comprehensive review and synthesis of diffusion of innovation research in his book *Diffusion of Innovations* (1995). Diffusion of innovations is the process by which new ideas are communicated through certain channels over time among the members of a social system. This definition emphasizes the importance of four elements: the innovation, communication channels, a social system, and time. As a theory of communications, diffusion of innovation theory examines both mass media and interpersonal communication channels. Members of a social system rely on different channels to varying degrees.

Rogers' overview focuses primarily on the qualitative aspects of diffusion of innovation research. Key topics touched on include the history of diffusion research, the innovation-decision process, attributes of innovations and their rate of adoption, innovativeness and adopter categories, diffusion networks, the change agent, and innovations in organizations.

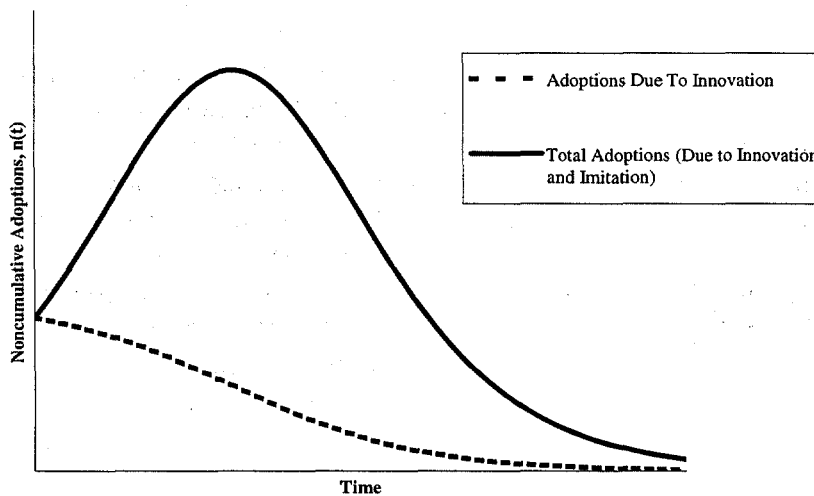
In addition to a large body of qualitative research into the role of communications in the diffusion of innovations, this research tradition also includes a substantial body of quantitative research. For the most part, quantitative modeling efforts focus on modeling the rate of adoption over time. The quantitative research largely builds on the modeling approach put forward by Frank Bass in 1969. The basic Bass first-purchase diffusion model describes potential adopters of an innovation as falling into two groups—one that is influenced by mass media (including program promotional

activities) and one that is influenced by word of mouth. The assumptions of the Bass model can be expressed mathematically as:

$$n(t) = \frac{dN(t)}{dt} = p[m - N(t)] + \frac{q}{m} N(t)[m - N(t)]$$

In this equation, $n(t)$ is the number of adopters at time t ; $N(t)$ is the cumulative number of adopters at time t ; and m is the potential number of ultimate adopters, that is, the market potential. The first component of the equation, $p[m - N(t)]$, represents adoptions by those people who are not influenced in the timing of their adoption by the number of people who already have adopted the innovation. Rather, these people are likely to be motivated to adopt by program messages or mass media. Thus Bass referred to p as the "coefficient of innovation." The second term, $(q/m)N(t)[m - N(t)]$, represents adoptions by people who are influenced by the number of previous adopters. These people will tend to adopt an innovation only after hearing positive endorsements from friends or colleagues. Thus Bass referred to q as the "coefficient of imitation." The functional form of the above equation is illustrated in the following figure.

Figure 1. Adoptions Due to Innovation and Imitation in the Bass Model¹



Considerable research has been conducted into diffusion models since Bass first formulated the above model in 1969. In addition to confirming the explanatory and forecasting power of the basic model, researchers have examined and tested numerous methods for extending the model to a variety of market scenarios; relaxing the requirements that the coefficients q , p , and m be constant; and analyzing the relationships between the model coefficients and market factors such as product attributes, price, buyer attributes, advertising, and market interventions. Elements of diffusion of innovation theory are discussed in more detail in the context of comparisons with the *Scoping Study* framework below.

¹ Adapted from Mahajan, et al. (1990)

Comparison of the Two Frameworks

Policy-Making and Resource Allocation

An important function of the *Scoping Study* framework is to provide direction to policy makers in making resource allocation decisions. The framework is conceived in a context in which energy efficiency is recognized as an important and valid social objective. While economics is not necessarily the only legitimate basis for public policy decisions, the objective of improving energy efficiency can be succinctly stated in economic terms: the goal is to maximize net social benefits by capturing social benefits from energy efficiency that exceed the social costs of obtaining them.² Given this objective, the *Scoping Study* attempts to address whether and how social benefits from energy efficiency can be maximized while minimizing social costs. The *Scoping Study* explores the feasibility of designing programs to achieve these social benefits in lasting ways through market transformation. *Recommendations* elaborates on the practical steps necessary to plan, implement, and evaluate market transformation programs.

Because of this resource allocation function, the theme of economic efficiency is evident throughout the *Scoping Study* and *Recommendations*. Economic efficiency is the basis for the definition of the term "market barrier," which, in turn, is the basis for the definition of the term "market transformation." *Recommendations* proposes a set of guidelines for determining the cost-effectiveness of public goods charge (PGC) funded programs. Prospective estimates of cost-effectiveness are to be used to screen potential programs for inclusion in the portfolio of PGC-funded programs. Retrospective estimates of cost effectiveness are to be used to prepare reports to the Public Utilities Commission (and ultimately the legislature) on PGC-fund performance.

Clearly, for the *Scoping Study* framework to be useful, it must serve both descriptive and prescriptive applications. It is designed to help understand the function of markets and to guide public sector resource allocation decisions that are intended to affect the function of those markets. Diffusion of innovation, by comparison, while well-suited to describing the function of markets, is not well suited to provide resource allocation guidance. This is not to say that diffusion of innovation has no prescriptive role. On the contrary, the detailed understanding of markets it offers provides a basis for assessing the likely consequences of different interventions and designing an intervention strategy that best achieves the stated ends. But it does not provide the tools for determining the economic efficiency of those ends.

The strengths and limitations of diffusion of innovation theory as a prescriptive tool for market interventions are perhaps best illustrated with an example, adapted from Feldman (1995a, 1995b)³. "A well-known food processor recently developed a high-quality frozen food entrée to be sold in supermarkets and convenience stores. The channel objectives for this manager were clearly stated. 'We want this product to be no more than a ten-minute drive from 75 percent of the full-time working women in the United States. We plan to reach this goal within 12 months of our product roll-out.'"

Diffusion of innovation theory provides an ideal set of tools for assessing whether the thresholds of ten-minute drive times for 75 percent of working women will accomplish desired sales objectives or whether alternate interventions would better serve. From the perspective of the food

² See the *Adopted Policy Rules for Energy Efficiency Activities*, as adopted by the California Public Utility Commission in R.94-04-031.

³ Feldman uses this example as part of his argument for the importance of measuring proximate indicators of market effects.

processor, this prescriptive function may be all that is needed. The frozen food company does not need to concern itself with determining the socially optimum levels of frozen food purchases. The company goal simply is to increase sales. The only strategy ruled out by this goal is the strategy of doing nothing. In contrast, prudent design of a market transformation program will always start by determining whether any intervention is justified; doing nothing is (or should be) a viable choice to the policy maker responsible for allocating public funds.

Furthermore, while the food processing company has an interest in determining the most cost-effective marketing strategy, it does not have a mandate to do so. If marketing costs outweigh the profits from increased sales, then the company will lose money. Long-term continuation of such a trend will drive the company to bankruptcy. Thus, market dynamics will enforce cost-effectiveness, even if the company does not. In contrast, no such market mechanism exists for a publicly funded program. For this reason, administrators of a market transformation program have an obligation to the public to demonstrate that program expenditures are actually an efficient allocation of resources. Because of these differences, diffusion of innovation theory may be well-suited to prescribing private-sector market activities while falling short of public policy makers' needs. The *Scoping Study* framework squarely addresses those needs from a public policy making perspective.

Market Barriers and Factors That Affect Diffusion Rates

The concept of market barriers is the core of the *Scoping Study* framework. As the definition makes clear, the notion of market barriers addresses the different ways in which the function of actual markets may deviate from the maximally efficient ideal, as envisioned by neo-classical economics. The *Scoping Study* develops a typology of market barriers that draws heavily from both neo-classical economics and more recent research into transaction-cost economics. However, the *Scoping Study* notes that the barriers list is empirical rather than reflective of a consistent conceptual framework. The *Scoping Study* lists the following market barriers:

- **Information or search costs:** the costs of identifying energy-efficient products or services or of learning about energy-efficient practices.
- **Performance uncertainties:** the difficulties consumers face in evaluating claims about future benefits.
- **Asymmetric information and opportunism:** the difficulties consumers face in evaluating the veracity, reliability, and applicability of claims made by sales personnel for a particular energy-efficient product or service.
- **Hassle or transaction costs:** the indirect costs of acquiring energy efficiency.
- **Hidden costs:** unexpected costs associated with reliance on or operation of energy-efficient products or services.
- **Access to financing:** the difficulties associated with the lending industry's historic inability to account for the unique features of loans for energy savings projects, as distinct from the other factors affecting the evaluation of a borrower's credit-worthiness.
- **Bounded rationality:** the behavior of an individual during the decision-making that may seem inconsistent with an individual's goals.
- **Organization practices or custom:** organization behavior or systems of practice that discourage or inhibit cost-effective energy-efficiency decisions.
- **Misplaced or split incentives:** institutional relationships which mean that the incentives of an agent charged with purchasing energy efficiency are not aligned with those of the persons who would benefit from the purchase.

- **Product or service unavailability:** the adequacy of supply.
- **Externalities:** costs that are associated with transactions, but which are not reflected in the price paid in the transaction.
- **Nonexternality mispricing:** other factors that move prices away from marginal cost.
- **Inseparability of product features:** the difficulties consumers sometimes face in acquiring desirable energy-efficiency features in products without also acquiring (and paying for) additional undesirable features that increase the total cost of a product beyond what the consumer would be willing to pay for just the added energy-efficiency features alone.
- **Irreversibility:** once a decision to purchase an energy-efficient product or service is made, it is often difficult to revise it in light of future information because aspects of the decision are irreversible.

While not discussed here, the *Scoping Study* indicates important relationships among barriers and identifies areas in which they overlap.

By comparison, diffusion of innovation theory has not produced a consensus set of barriers to diffusion, perhaps because the theory is less focused on explaining divergences between actual and ideal conditions and more focused on simply describing and understanding the observed processes. Nevertheless, diffusion of innovation research has identified a number of factors that influence the rate of diffusion to varying degrees. Everett (1995) identifies three main elements that effect the rate of diffusion over time: the nature of the innovation, the communication channels, and the underlying social system.

The Nature of the Innovation. The perceived attributes of the innovation have been identified as an important explanation of the rate of adoption of an innovation. Rogers credits five innovation attributes with explaining 49 to 87 percent of the variance in the rate of adoption of innovations. Salient attributes can be grouped into five general categories:

- **Relative advantage:** the degree to which an innovation is perceived as being better than the idea it supersedes.
- **Compatibility:** the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters.
- **Complexity:** the degree to which an innovation is perceived as relatively difficult to understand and use.
- **Trialability:** the degree to which an innovation may be experimented with on a limited basis.
- **Observability:** the degree to which the results of an innovation are visible to others.

Trialability and observability are related to the *Scoping Study* barriers of Performance Uncertainty and Irreversibility. Trialability relates to the potential adopter's ability to assess performance claims through first-hand experience. It also relates to the ability to change one's mind. Observability relates to the ability to assess performance claims by observing someone else's experience; that is, through second-hand experience. Product complexity is a contributing factor in the barrier Information or Search Costs in that increasing complexity raises the information costs associated with adoption. The closest market barrier analogs to compatibility would be Bounded Rationality (at the individual level) and Organizational Practices (the analogous barrier at the organizational level). The main difference is that the diffusion of innovation conception encompasses the entire spectrum of social values and the social meanings attached to innovations. It also avoids the normative implication that compatibility issues are associated with irrational behavior (not the intent of the *Scoping Study* authors but a common interpretation among practitioners). Finally, the notion of relative advantage does not have a direct analog with the market barrier typologies because it does not

constitute a barrier in the sense of being a deviation between actual and ideal. Even in an ideal market scenario an innovation that offered no relative advantage over alternative technologies and practices would not be adopted. The exclusion of relative advantage from a typology of market barriers is appropriate; however, excluding it from a market transformation framework is not, for doing so invites one to attribute low observed adoption rates to imagined barriers rather than their true cause. A full understanding of market barriers must consider their market context, including the relative advantage of the innovation being considered.

The Nature of Communication Channels. Communication channels are the means by which messages get from one individual to another. Diffusion of innovation distinguishes between two types of communication: mass media and interpersonal. Mass media channels such as radio, television, and newspapers are often the most rapid and efficient means of transmitting messages. On the other hand, interpersonal channels, that is, direct exchange between two individuals, tend to be more effective in persuading an individual to accept a new idea. According to Rogers, diffusion investigations show that most people depend mainly on a subjective evaluation of an innovation that is conveyed to them from other individuals like themselves who have previously adopted the innovation. Interpersonal communication is considered to be the heart of the diffusion process.

The effectiveness of interpersonal communication depends on the degree of homophily among the communicating individuals, that is the extent to which they are similar in attributes such as beliefs, education, common interests, and social status. As Rogers explains, "in a free choice situation, when an individual can interact with any one of a number of other individuals, there is a strong tendency to select someone who is very similar... Communication between homophilous individuals is likely to have greater effects in terms of knowledge gain, attitude formation and change, and overt behavior change." Conversely, communication between heterophilous individuals is usually necessary for complete diffusion of an innovation and represents a distinctive barrier to diffusion. The *Scoping Study* barrier of Asymmetric Information and Opportunism can be seen as a special case of heterophilous communication.

The Nature of the Social Structure. Rogers defines a social system as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. A social system generally has a formal structure that differentiates roles, responsibilities, and behaviors of its members. It also tends to have an informal structure in the form of interpersonal networks linking subsets of the system's members. A social system is generally governed by a formal set of rules and an informal set of norms. These define a range of tolerable or expected behavior. A system's rules and norms provide stability and predictability. Thus they can be a barrier to change. The *Scoping Study* barriers most closely related to the role of social structure would be Bounded Rationality and Organization Practices or Custom.

Table 1 summarizes the correspondence between the *Scoping Study* market barriers and factors limiting the rate of diffusion of innovations, discussed above. This table illustrates the complementary nature of these two frameworks. Diffusion of innovation contributes a much more thorough understanding of the nature of communication channels, the role of social structure and norms, and the factors that drive the diffusion process as well as inhibit it. The *Scoping Study*, on the other hand, contributes a more detailed understanding of the economic factors that act as barriers, such as access to financing, split incentives, and externalities. Neither framework can be considered complete in itself but, taken together, the two frameworks show promise of providing a more comprehensive understanding of market transformation.

Table 1. Market Barriers and Diffusion-Limiting Factors

Scoping Study Market Barriers	Factors Limiting Rate of Diffusion
(no direct analog)	Lack of relative advantage
Information or search costs	Product characteristic: Complexity Lack of mass communication Lack of homophilous interpersonal communication
Performance uncertainties	Lack of product trialability Lack of product observability
Asymmetric information	Heterophilous interpersonal communication channels
Hassle or transaction costs	(no direct analog)
Hidden costs	(no direct analog)
Access to financing	(no direct analog)
Bounded rationality	Compatibility between product characteristics, social norms
Organization practices or custom	Compatibility between product characteristics, social norms
Misplaced or split incentives	(no direct analog)
Product or service unavailability	(no direct analog)
Externalities	(no direct analog)
Nonexternality mispricing	(no direct analog)
Inseparability of product features	(no direct analog)
Irreversibility	Lack of product trialability

Market Structure

While the *Scoping Study* framework and diffusion of innovation framework for describing market structure are not necessarily contradictory, the conceptual differences between the two can make their applications somewhat different. A large part of the difference between the two is simply emphasis. The two frameworks are notably different in their treatment of communication and information flows and supply- versus demand-side market dynamics. While the *Scoping Study* implicitly includes information about communication networks in the form of information barriers, its emphasis is closer to that of the neo-classical economic tradition, which conceptualizes each decision-maker as an isolated, perfectly rational, self-interested decision-maker who engages in economic transactions with other isolated, perfectly rational, self-interested decision-makers. Further evidence of this economic view of market structure is apparent in the features *Recommendations* lists as necessary to describe market structure:

- A summary of the specific technologies, services, or products being exchanged
- A summary of the major market participants and the nature of the transactions and other interactions between them, including both buyers, sellers, and intermediaries
- A description of the distribution chain—i.e., the variety of paths that a product follows on its way from a manufacturer to an end user
- A description of the geographic boundaries of the market
- A description of the circumstances and settings under which transactions tend to occur, including the sales practices and the market events that tend to result in transactions within the market

- Approximate estimates of the number of buyers, sellers, and intermediaries in the market, as well as an order of magnitude estimate of the total annual sales of relevant measures and services
- An analysis of efficient market share, or the percentage of the measures or services sold that meet appropriate energy-efficiency criteria

The list emphasizes tangibles and basic measures of economic activity. It also emphasizes quantification. Notably absent are items such as communication channels, information sources, social relationships, and the mechanisms whereby social systems attach meaning to the innovations being considered for adoption. The diffusion of innovation framework, on the other hand, emphasizes decision-makers as social beings who rely on their social and business interactions for clues on whether to adopt or avoid innovations. It thus accounts for social structure as an element of market structure.

While the *Scoping Study* under-emphasizes the role of communication and social structure in the market, its economic roots make it well-suited to understand the interaction between supply and demand. Since markets are fundamentally about the exchange of goods and services, an understanding of both supply and demand is crucial. For energy-efficient products, the *Scoping Study* emphasizes accumulating market intelligence on the entire distribution chain, from manufacturer to end user. It also recognizes the importance of supply-side barriers limiting product adoption in spite of strong demand.

Diffusion of innovation theory does not *a priori* exclude supply-side issues from its understanding of the market. Communication channels and social structures play a role in the supply side as well as the demand side of the market structure. Rogers acknowledges the importance of the supply side in his enumeration of steps in the innovation-development process: (1) recognizing a problem or need; (2) basic or applied research; (3) development; (4) commercialization; (5) diffusion and adoption; and (6) consequences. However, most diffusion of innovation research focuses on the demand side; that is, on the factors that drive adoption among end users given adequate supply. This demand-side focus is particularly pronounced among quantitative studies that attempt to model adoption rates over time. Simon and Sebastian (1987), in their discussion of possible origins of counter-intuitive diffusion model results, point out, "...the Bass diffusion model is solely concerned with the demand side. An empirically observed diffusion pattern may, however, be governed by bottlenecks on the supply side (production capacity, distribution, etc.), so that the 'natural' demand process is decelerated or retarded..."

Analysis of Change Over Time

Change over time is the essence of market transformation. Indeed, the *Scoping Study* definitions for market intervention, market effect, and market transformation, cited above, all include references to changes in market conditions over time. In the *Scoping Study* framework, the key to understanding changes is to observe market effects. Table 2-1 of the *Scoping Study* lists a number of market effects potentially attributable to energy-efficiency programs. Reliance on market effects is a sound strategy for assessing change retrospectively. However, before observed market effects can be used to assess changes prospectively, they must be linked to an underlying theory of market change processes. The *Scoping Study* acknowledges the importance of theory by advocating that researchers "articulate specific theories about what market effects and reductions in market barriers specific interventions are expected to have."

Diffusion of innovation, by providing insight into the processes that drive market changes, offers at least some of the theoretical basis called for in the *Scoping Study*. Its theory of communication provides a basis for predicting future adoption rates based on observation of past adoption without relying on simple linear extrapolation of historic trends. Nevertheless the insight should not be considered comprehensive. As already pointed out, diffusion of innovation research to date has focused primarily on demand-side issues to the exclusion of supply-side issues. Furthermore, most quantitative studies have been retrospective and have focused on successful innovations rather than failures.

Sustainability

The concept of sustainability is key to the definition of market transformation. Demonstration of sustainability is an essential step in justifying continued public funding for market transformation vis-vis other energy-efficiency policy objectives. However, a consensus operational definition of the term has yet to emerge. Furthermore, there appears to be a range of opinion about whether demonstrating it should be a priority. Among practitioners who treat the demonstration of sustainability as a priority, there is considerable variation in their approaches. This variation stems from the fact that direct observation of sustainability is a lagging indicator of program success. Practitioners have thus turned to indirect evidence of sustainability, such as economic feasibility, irreversibility, institutional change, and market penetration.

Diffusion of innovation offers promise in addressing the issue of sustainability in a way that is theoretically defensible. Its key contribution is the notion that interpersonal communication is the engine driving the diffusion of most, if not all, successful innovations. The research tradition has developed a body of empirical evidence supporting the thesis that the conditions under which the diffusion process becomes self-propagating, i.e., sustainable, can be understood and observed. Nevertheless, further empirical research needs to be conducted to fully realize the promise diffusion of innovation offers for energy-efficiency market transformation. As previously noted, most quantitative studies have been retrospective and have focused on successful innovations rather than failures. Thus we are still limited in our ability to estimate prospectively the likelihood of success for a particular innovation, the level of adoption needed to achieve sustainability, or the time required to reach that level.

Recommendations for Integration

In this case, at least, the choice between theoretical frameworks should not be considered an either/or proposition. Rather, researchers should strive to integrate the strengths of both perspectives to arrive at a more comprehensive and robust theory of market transformation. Integration is feasible because the differences between the two stem from differences of emphasis rather than from one perspective being right and another being wrong.

In integrating the two frameworks, researchers must recognize that both frameworks suffer from limitations in empirical testing and development. As pointed out above, diffusion of innovation research is thin in the areas of supply-side market dynamics, prospective analysis, and analysis of failed diffusions. Market research based on the *Scoping Study* is generally limited, extending back only three years. Specific recommendations for integrating the two frameworks include the following:

- **Policy Making and Resource Allocation.** As pointed out above, the *Scoping Study* framework was developed for the explicit purpose of guiding policy making and resource allocation in the

arena of public-purpose energy efficiency programs. This function dictates a market transformation framework that is grounded in economic theory. For this reason, an integrated framework for assessing PGC-funded market transformation should start with the *Scoping Study* as the basic framework and use diffusion of innovation theory to provide additional descriptive power.

- **Market Barriers and Factors That Affect Diffusion Rates.** Table 1 illustrates that the *Scoping Study* provides a more comprehensive view of market barriers. The *Scoping Study* market barrier typology should be retained. Diffusion of innovation should be used to better understand barriers of Information and Search Costs, Performance Uncertainties, Asymmetric Information and Opportunism, Bounded Rationality, and Organizational Practices or Custom. Furthermore, an integrated framework should emphasize the importance of understanding market barriers in the context of the diffusion process, paying particular attention to attributes of the innovation, communication channels, and the social structure.
- **Market Structure.** Both frameworks point to the critical importance of understanding market structure. An integrated framework should represent a blend of market structure elements from both frameworks. From the *Scoping Study* framework should come an emphasis on supply-side as well as demand-side market structure and on basic measures of economic activity. From diffusion of innovation should come a more complete understanding of communication channels, information sources, social relationships, and social meanings attached to innovations. Diffusion of innovation should be extended to better understand the behavior of supply-side market actors as well as demand-side market actors.
- **Analysis of Change Over Time.** Diffusion of innovation should be used to develop a more detailed understanding of how markets change over time. In particular, more longitudinal studies are needed that look at market transformation both prospectively and retrospectively. The goal should be to establish a more solid theoretical footing for market transformation and develop tools for forecasting likely market transformation outcomes.
- **Sustainability.** Development of a coherent theory of market change is required to establish an operational definition of sustainability.

Conclusion

While developing a set of conceptual recommendations for integrating the two frameworks is straightforward, carrying out the integration poses numerous methodological challenges, particularly in determining what to measure and how to measure it. Measurement issues will pose an enormous challenge, regardless of the theoretical framework applied. Adopting the proper framework is no guarantee that we will come up with the right answers but it can help us ask the right questions. Hopefully, a market transformation framework that integrates the best elements of the *Scoping Study* and diffusion of innovations will help us ask better questions.

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