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Refraining from Imitation: Professional Resistance and Limited Diffusion in a Financial Market

Stefan Jonsson
Department of Marketing and Strategy, Stockholm School of Economics, 113 83 Stockholm, Sweden, and
Department of Business Administration, Uppsala University, 751 05 Uppsala, Sweden, stefan.jonsson@hhs.se

Why do some practices not spread? Although this is an important question for both diffusion theorists and those interested in institutional change, we know surprisingly little about the limitations on diffusion because most diffusion studies sample on successful diffusion. I address the question of why some practices fail to spread by introducing the concept of a "deviance discount." A deviance discount is a systematic downgrading of the observed adoption performance of controversial practices, which limits the contagion of such practices. I test and find qualitative and quantitative support for my thesis in the product introduction behavior of Swedish mutual fund firms. My findings hold implications for diffusion theory and theories of endogenous institutional change.

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> To refrain from imitation is the best revenge. (Quote attributed to Marcus Aurelius, Roman Emperor, AD 121–180)

A central concern in organization theory is the conditions and effects of the spread of new ideas and practices. To address such questions, organization scholars routinely draw on the broad tradition of diffusion studies. Although empirically prolific (for an overview see Strang and Soule 1998), the tradition of diffusion studies is also limited in several ways (Katz 1999). Of particular importance to organization theory is the overwhelming focus on the study of successful diffusion processes, whereas almost no studies investigate failed or limited diffusion processes. Neglecting to study why some practices and ideas fail to spread is a case of sample selection bias (Berk 1983), and its consequences to organization theory are more wideranging than is commonly assumed (Denrell and Kovacs 2008).

The most frequently discussed consequence of neglecting to study limited diffusion processes is that it leads to a "proinnovation bias," i.e., a systematic underestimation of the difficulty by which most new practices spread (for a discussion, see Rogers 1995). Although seemingly innocuous, such proinnovation bias is troublesome to organization theory, and specifically for theories of institutional stability and change. The spread of practices that challenge existing institutions is an important source of endogenous institutional change (Clemens and Cook 1999, Greenwood and Hinings 1996) and if organization scholars routinely overestimate the chances that new things spread, it follows that they also underestimate the stability of the existing institutions and conversely overstate the chances of endogenous institutional change.

In contrast to earlier studies, I focus on the case of limited diffusion. Drawing on studies of tenuous diffusion (Chaves 1996, Fiss and Zajac 2004, Kraatz and Zajac 1996, Leblebici et al. 1991) and insights from technology-transfer and decision-making literature, I suggest a "deviance discount"—the undue discounting of prior observed adoption performance—as a key diffusion limiting mechanism. Through a quantitative analysis, I show how a deviance discount retards the diffusion of two controversial products in a financial market, whereas a third, technically identical but noncontroversial product spreads widely. In doing this I answer a frequently made but not often observed call to seriously engage in multiple-practice diffusion studies (Davis and Greve 1997, Strang and Soule 1998). Furthermore, by introducing an organizational mechanism that links professional adoption resistance to the limited diffusion of a practice, I contribute to linking micro level adoption decisions with aggregate diffusion outcomes (cf. Davis and Greve 1997). These insights into the dynamics of limited diffusion hold important implications to understanding the stability of institutions.

Why Do Some Things Not Spread?

To develop predictions about limited diffusion it is necessary to understand how and when initial resistance to adoption remains over time. A first step in understanding the durability of adoption resistance is to take stock of what we know of how adoption resistance erodes. Studies of tenuous diffusion frequently ascribe the erosion of adoption resistance to a process where earlier adopters "prove the worth" of an initially controversial practice or idea. With positive adoption information the incentives to adopt increase and may outweigh initial resistance, and with a sufficient number of prior adoptions

the practice can become legitimized and diffuse even more widely (Ahmadjian and Robinson 2001, Kraatz and Zajac 1996, Leblebici et al. 1991, Palmer and Barber 2001, Stearns and Allan 1996, Tolbert and Zucker 1983). Even where positive adoption effects are not visible, observing what other socially proximate organizations adopt can reduce the identity-discrepancy angst of adoption and thereby erode adoption resistance (Davis and Greve 1997, Fiss and Zajac 2004, Kraatz 1998, Rao et al. 2003). Because social contagion is at the core of both of these forms of resistance erosion, an understanding of what limits contagion is central to understanding how diffusion can fail. Network studies of diffusion show that poor spatial or temporal network cohesion can limit contagion (Abrahamson and Rosenkopf 1997, Greve et al. 2001, Kraatz 1998, Moody 2002, Strang and Tuma 1993). Contagion has also been argued to operate through processes of social comparison and theorized cultural similarity and not only through cohesive networks (Burt 1987, Chaves 1996, Strang and Meyer 1993). Hence, for contagion to fail, actors need to ignore earlier adoptions—either because they lack information or because the adoption seems irrelevant to them for status or cultural difference reasons.

Intraorganizational processes are also important to the failure of diffusion. Thus far, diffusion studies have, however, largely glossed over suborganizational heterogeneity to assume that organizations are as homogenous as individuals in their adoption decision. This is a curious simplification, given the long-standing attention in organization theory to the politics of organizational decision making (March 1961, Pfeffer and Salancik 1974). Recent diffusion-related literature has, however, highlighted the role of professional groups within organizations and shown that these can help erode (Boeker 1997, Goodstein et al. 1996, Greenwood et al. 2002, Kraatz and Moore 2002) or maintain organization-level adoption resistance (Ferlie et al. 2005, Marquis and Lounsbury 2007). While shifting the attention of diffusion research inside the organization, the internal focus of these studies downplays the institutional context of professional adoption resistance. Resistance, although it can be attractive to the individual professional, may not always be a legitimate action at an organizational or a societal level (Schneiberg and Clemens 2006). When a practice is considered legitimate at a higher societal level, individual or organization resistance can become more socially costly; practices that are privately disliked can thus spread in societies because they are difficult or illegitimate to object to in public (Chaves 1996, Kuran and Sunstein 1999, Schneiberg and Soule 2004).

For diffusion to fail, organization-level adoption resistance must be durable—either because of a lack of information of earlier adoptions or because such information is ignored. In the latter case, the social cost of ignoring adoption information can not be too high to the individual actor or else it would erode resistance. To date, no studies have systematically investigated how initial adoption resistance can remain over time. In the next section I introduce a "deviance discount" as a contagion limiting mechanism that is not contingent on limited actor cohesiveness and is an attractive resistance option at a private level.

Limited Contagion Through a Deviance Discount

At the core of the social contagion of earlier diffusion studies is the assumption that when a practice proves useful to earlier adopters, all potential adopters that observe this will correctly update their implicit cost-benefit calculation of adoption. Although this may accurately describe the case where the practice in question already has achieved a certain degree of legitimacy, organization studies are replete with findings that suggest that practices that lack social fit are not likely to be objectively evaluated. If the prior adoption information is not correctly evaluated, it follows that a practice can fail to spread regardless of the cohesiveness of networks and its actual usefulness.

A large and varied cognitively oriented organization literature shows that cognitive limitations and institutions can lead to a biased evaluation of new practices that deviate from extant norms. At the interorganizational level, studies of information sharing show that the perceived relevance of information is not a given, but negotiated and institutionalized (Heimer 1985, Lounsbury and Rao 2003, Rao 2001). What constitutes "relevant" adoption information is subject to institutionalized interorganizational understandings, and when something does not fit neatly with institutionalized understandings it is likely to be evaluated at a discount (Zuckerman 1999, Zuckerman 2004). For instance, as long as the unpopularity of Country and Western music was taken for granted within the music industry, information was collected and evaluated in a way that maintained this false presumption (Anand and Peterson 2000). Within the field of technology-transfer studies, a common finding is that of a "not invented here" syndrome, where the value of outside technologies is systematically downplayed and undervalued (see, for instance, Katz and Allen 1982, Kogut and Zander 1992, Szulanski 1996). At the level of groups and individuals a number of studies suggest that information from unfamiliar sources tends to be downgraded. The classic definition of "groupthink" includes the routine vilification of information that contradicts espoused in-group values (Janis 1989). Most tellingly, a number of studies show that stereotyped minority groups have to work harder than members of nonminority groups to receive equal evaluation of their work (Biernat and Kobrynowicz 1997, Fosci et al. 1994).

An overly negative evaluation of adoption performance of a new practice, however, need not be noncognizant and/or due to cognitive limitations, but can

be the outcome of wilful distortion for strategic and/or political reasons (March 1994, Pettigrew 1973, Pfeffer and Salancik 1974). When a practice runs counter to vested interests, adoption information may be distorted to maintain an existing power truce (Pettigrew 1973). Consequently, a core finding in strategic adoption studies is that adoption decisions often reflect the prevailing power structures within organizations, rather than the overall organizational efficiency (Boeker 1989, Dean and Sharfman 1993, Goodstein et al. 1996). Similarly, studies of the failure of incumbents to adopt new technologies relate this to past market success and, indirectly, also to extant organizational knowledge and power structures (Henderson and Clark 1990, Tripsas and Gavetti 2000).

A considerable and varied literature thus strongly suggests that information about prior adoption performance is not likely to be objectively evaluated, but that it can be subjected to a "deviance discount," when the practice deviates from extant norms or when it is perceived a threat to an existing political truce. Such a deviance discount is important to our understanding of how diffusion can fail for several reasons. First, it undermines the contagion effect of earlier adoptions and limits the crucial "proving of worth" resistance erosion mechanism, regardless of the actual usefulness of the practice because it may never be given a fair trial. Second, it is a diffusion limiting mechanism that is not dependent on network cohesion. Third, it is a resistance mechanism with low social costs to the individual; by discounting earlier adoption performance, resistance can be on "rational grounds" and the individual need not look the Luddite.

Deviance Discount in a Diffusion Model

To better theorize the diffusion effects of a deviance discount and to generate testable hypotheses, I make use of recent developments in sociological diffusion theory that enable diffusion analysis at the level of the organization rather than the aggregate diffusion pattern of a practice at the level of the economy or society (Abrahamson and Rosenkopf 1997, Strang and Tuma 1993, Van den Bulte and Lilien 2003). Using the terminology of Strang and Tuma (1993), the likelihood that a focal organization adopts a particular practice can be described as a function of the *propensity* of the organization to adopt the practice and the *contagion pressure* that it is subjected to by earlier adopters. The contagion pressure can further be disaggregated into the *susceptibility* to contagion influence of the focal organization (for instance, an organization with new leadership can be more susceptible to ideas of change), the *infectiousness* of the observed adopter (high-status adopters have been shown to be more influential adopters), and the *social proximity* of the focal organization to the observed adopter (close socially proximate organizations can be more influential).

Although internal resistance has long been thought to lessen the overall chance that an organization adopts a practice (Katz et al. 1963, Rogers 1995) there is little clarity as to its specific influence on a diffusion process. Institutional theorists have proposed that a poor fit with extant norms will primarily lower the *propensity* of organizations to adopt, i.e., not affect contagion aspects (Chaves 1996, Strang and Meyer 1993). Network theorists on the other hand point to a contagion effect where poor practice fit limits contagion by routing adoption influence through more constrained networks (Davis and Greve 1997, Palmer and Barber 2001). I argue that resistance, apart from any network effects, will manifest both in terms of lower propensity to adopt and, through a deviance discount, as a limitation on contagion. Drawing on insights from qualitative studies of professional groups (Ferlie et al. 2005, Greenwood et al. 2002), I expect a relationship between professional influence in the organization and organization-level resistance to adoption. My first hypothesis is, therefore, as follows:

HYPOTHESIS 1. *The more influential a resisting professional group is within an organization, the lower the* propensity *of the organization to introduce the deviant practice.*

Where there are organizations with sufficiently low resistance to adoption, i.e., a high propensity to adopt, there will be some adoptions. Aggregate diffusion failure then becomes contingent on the limited contagion effect of these initial adoptions. Apart from network effects (Davis and Greve 1997, Kraatz 1998), a deviance discount can limit the contagion pressures by prospective adopters devaluing earlier adoption information, rendering adoption less appealing to the focal organization. This lessens the *susceptibility* of a focal organization to earlier adoptions:

HYPOTHESIS 2. *For a deviant practice, prior adoption performance will be more negatively evaluated than for other comparable practices, lowering the* susceptibility *of the focal firm.*

This is a fairly general prediction, which suggests that all organizations equally discount deviant practices. If the resistance to adoption stems from a professional group that is differently represented across all organizations, the practice adoption performance should be discounted more steeply in organizations where the dissenting professional group is relatively stronger. Such differences in discounting should further mean that organizations with relatively strong dissenting groups become less susceptible than other organizations. A third hypothesis is, thus, as follows:

HYPOTHESIS 3. *The more organizationally influential the resisting group, the higher the deviance discount placed on earlier observed adoption performance and*

the lower the susceptibility *of the focal firm to earlier adoptions.*

Empirical Context

It is, for reasons of data availability, difficult to study what does not spread (Aldrich and Ruef 2007). Consequently, studies of limited diffusion have either investigated, quantitatively, practices that eventually do spread (Davis and Greve 1997, Kraatz and Zajac 1996) or qualitatively studied those that do not spread (Ferlie et al. 2005). Whereas the former studies focus on tenuous diffusion, findings from the latter do not easily relate to extant diffusion theory because of their contextual nature. By combining a qualitative approach to understand the context of practice deviance with quantitative analysis that replicates and extend standard diffusion models, I engage both camps. My research design is comparative as I contrast the diffusion processes of controversial practices with a limited spread with those of practices that do spread. By sampling from two differently successfully diffused populations, I avoid a bias in population sampling that is almost endemic in diffusion studies (cf. Denrell and Kovacs 2008).

A comparative diffusion research design requires other important diffusion influences, such as complexity of the practice and the spatial distribution of the adoption community to be held as constant as possible (Rogers 1995, Strang and Soule 1998). For this reason, the Swedish mutual fund industry provides an appropriate empirical setting for my study. Mutual funds are useful to study because there are no technical, economic, or legal restrictions on their adoption, which rules out capability based explanations of limited diffusion. Adoption is also easily distinguished from nonadoption, which simplifies questions of symbolic adoption (cf. Fiss and Zajac 2004, Westphal and Zajac 2001). Mutual fund firms are fairly simple organizations (Rao and Drazin 2002), populated by, essentially, a single professional group. The Swedish mutual fund industry is geographically concentrated, which helps control for spatial effects on diffusion (Greve 1996, Strang and Tuma 1993), and it is sufficiently small to allow a detailed industry understanding. Furthermore it is one of most well-developed markets for mutual funds in Europe, and it occupies a central position in the Swedish financial and welfare system (Cronquist and Thaler 2004, Lindbeck and Persson 2003). Last, but not least, the finance industry is populated by professionals trained to be dispassionate in investment decisions (Lounsbury 2002), which renders this industry a strong test of the effects of a deviance discount.

Spread of New Products in a Mutual Fund Industry

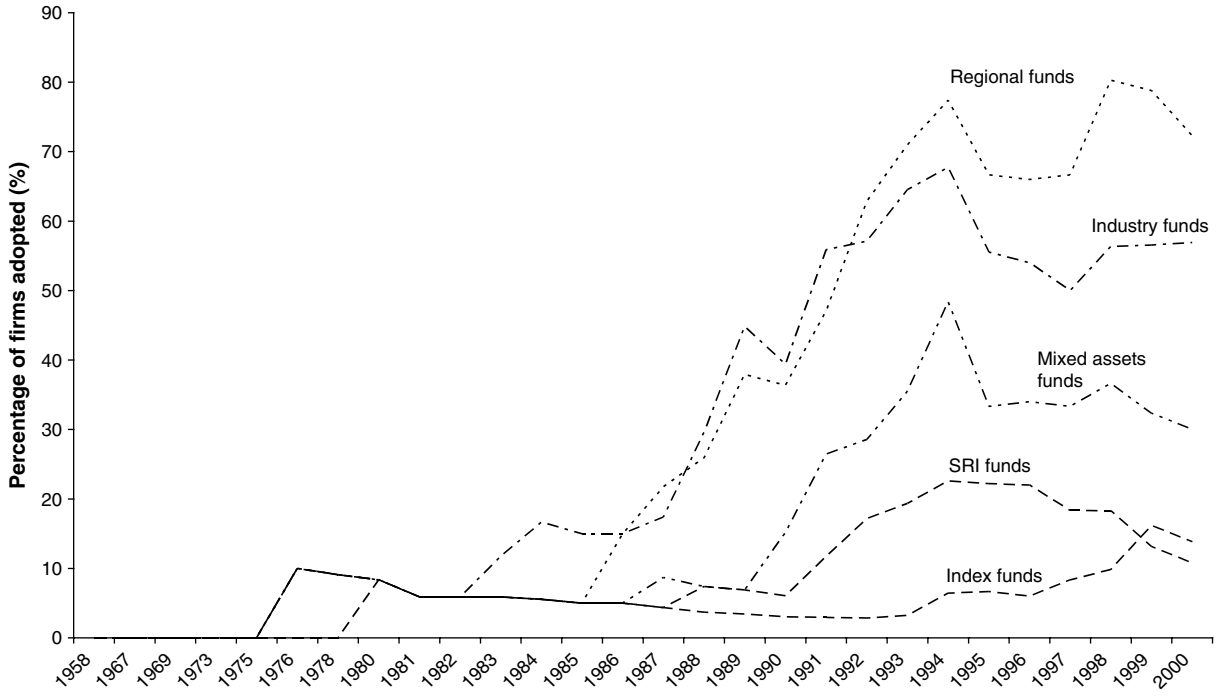
Competition, in various forms, shapes most diffusion processes (Bothner 2003, D'Aunno et al. 2000, DiMaggio and Powell 1983). Because mutual funds are simple and cheap to imitate, and because many customers prefer a wide portfolio to select from, the U.S. mutual fund markets are characterized by a rapid spread of new products (Khorana and Servaes 2003, Pozen 1998). After competition intensified in the early 1990s, this was also the case in Sweden, rendering a high baseline rate for product diffusion. Figure 1 charts the spread of five categories of mutual funds that were introduced after 1975.

Noteworthy are the similar diffusion patterns of regional, industry, and mixed asset funds. Introduced around 1975, they all spread rapidly throughout the industry from the late 1980s to the mid 1990s, when more than half of the firms had adopted (the decline in share of adopters in the mid 1990s is not because of abandonment, but is due to a rapid inflow of new firms). The index and socially responsible investment (SRI) funds display a different, significantly truncated diffusion trajectory. Their limited spread, against the backdrop of the high baseline for adoption, forms the empirical puzzle of this paper. To control for the time in the market of the product categories in the analysis, I selected mixed asset funds as the holdout category for comparison with the two lagging products (index and SRI).

Finance professionals are key to the operation of mutual fund firms (Lounsbury 2002, Rao and Drazin 2002) and thereby also to any adoption resistance. I therefore interviewed 24 fund executives, fund managers, and product developers from 15 firms as well as 10 industry experts and representatives of the Swedish Association of Mutual Fund Firms and the Swedish Society of Financial Analysts (SSFA) between 1997 and 2000. The interviews were open-ended discussions on the history of the industry, competition, and product innovation and imitation. Most interviews were conducted face to face, lasted between one and three hours, and were taped and transcribed directly afterwards. Thanks to the limited size of the Swedish mutual fund industry, I covered a significant part of the industry: the firms I interviewed in controlled 98% of the assets under management and represented half of the Swedish firms in existence in the year 2000. Where possible, I corroborated expressed professional attitudes through secondary sources, such as media reports and SSFA publications.

Finance professionals populate most levels of fund firms. At the lowest level they are the security analysts who advise the fund manager responsible for the investment decisions of a fund. Experienced analysts advance to become fund managers, and most fund managers have an analyst background. Some fund managers are then recruited to head mutual fund firms. Tracing the employment histories of all the CEOs in the Swedish fund industry shows that close to 75% of them have backgrounds as fund managers, and almost all the others have

Figure 1 Spread of Product Categories in the Swedish Mutual Fund Industry from 1958 to 2000



a general finance/banking background. These CEOs are also tightly networked; four out of 10 CEOs were educated at the same small elite business school in Sweden. Furthermore, Swedish finance professionals are organized in a professional organization—the SSFA—which provides professional training, certification, and upholds an ethical code of conduct in the finance sector.

During the interviews, a particularly salient professional belief voiced was the importance of "active asset management." Mutual funds can be actively managed; when a fund manager with the support of analysts select fund investments to "beat the market," or can be managed "passively," where the fund is invested exactly in the structure of an index, for instance the S&P 500. The latter management strategy obviates the need of investment analysis in managing the fund. Although the finance literature is divided on the relative merits of these fund management strategies (Elton et al. 2004, Frazzini and Lamont 2008, Kosowski et al. 2006, Malkiel 1995), a belief in the usefulness of active asset management remains at the core of the financial professional identity (Chevalier and Ellison 1998, Gruber 1996). Commenting on the strong belief in active asset management, the legendary investor Warren Buffet supposedly quipped that "the only ones left in the world who believe they can systematically beat the market are security analysts and the North Koreans."

With a similar educational background, a strong professional organization, and fairly frequent rotations across organizations, Swedish finance professionals to a large extent share fundamental assumptions of the mutual fund business, such as the presumed value of active asset management. The fit of a new product with professional norms of finance professionals is thus likely to determine the likelihood that a deviance discount is applied to a specific product. For instance, the mixed assets fund, where part of the fund is invested in equity and part in bonds, is a clearly actively managed fund and it was readily endorsed by all interviewed finance professionals as a useful and appropriate new product. Index and SRI funds, however, deviate from professional norms and met with skepticism and resistance. Drawing on interviews, I discuss the background and context of such resistance in the next two sections.

Against Norms

An index fund replicates the composition of a specific index (e.g. the S&P 500) and, because the asset composition of the fund changes only when the index is reweighted, there is no need for security analysts or an active fund manager. Considered a challenge to the very notion of active asset management, the adoption of such funds evoked strong feelings among finance professionals. When asked about the introduction of index funds, managers often referred to the fundamental difference in investment philosophy between actively and passively managed funds. As a CEO of a large mutual fund firm expressed it:

> No, we do not have Index funds. And I do not know if we are going to introduce them either, to be honest . . . somewhere you have to believe in what you are doing. If you believe in actively managed funds, you have to act it.

Another CEO concurred:

> I am one of those who, deep down, believes in actively managed funds . . . we [our firm] believe in [this] and invest in it. . . . What it is about, I think, is that we create better customer value through actively managed funds . . . we believe that we will reach our aim of, in the long run, beating the index . . . .

Even the Swedish media noted these attitudes as being widespread. *Affärsvärlden*, one of the largest business weeklies in Sweden, reported from a survey on why mutual fund firms do not offer index funds that the standard answer of the firms was:

> We do not sell Index funds because we believe that our active management will outperform the index. (*Affärsvärlden*, March 22, 2000)

This skepticism towards index funds was expressed in interviews carried out between 1997 and 2000. The very first index fund was, however, introduced in 1977, and the memoirs of the bank manager who introduced the index fund to Sweden shows that professional opinions have changed little since then. Recalling the resistance to the first index fund, he writes:

> It was natural that the equity specialists of the bank were not amused [at the introduction] . . . [it was similar to] the natural lack of enthusiasm—to put it mildly—of the professional [financial] establishment. (Wallander 1998, pp. 188–189, my translation)

Another reason why index funds lack popularity among fund managers and CEOs is their lower management fee compared with other funds. Any loss of revenue caused by lower fees can, however, be offset by utilizing economies of scale, so the index fund fee structure should not be of great economic concern (Khorana and Servaes 2003). From a technical point of view, the introduction of an index fund poses no significantly greater challenge than the introduction of an actively managed fund.

Diverging From Norms, a Bit

Another fund category widely considered deviant, but for different reasons, is the SRI fund. An SRI fund invests only in assets that conform to a set of ethical or environmental investment rules. Common rules include a ban on investing in firms that deal with tobacco, weapons, or liquor. The SRI fund is an actively managed fund, but SRI investment is often considered by analysts as "the domain of cranks . . . or loonies" (*Euromoney* 1999). Central to active asset management is the idea that investment should be made for maximum financial return, which is often perceived antithetical to ethical considerations (Norberg 2001). As one manager of a medium-sized mutual fund firm expressed it:

> I think that asset management should be done to earn money . . . . That is my view.

Another CEO put it more directly:

> My fundamental view is that it is very difficult to combine a sound asset management product with a good charitable objective.

Speculating on why other firms have not introduced SRI funds, a manager suggested:

> There are some colleagues who have chosen not to develop ethical products, partly because they do not believe in the idea but more importantly because it is . . . something that is not related to "sound asset management."

An SRI fund can seem technically more difficult to introduce because it draws on different analyst skills—evaluating the social responsibility dimension of a prospective investment. However, with external SRI screening firms that provide lists of sanctioned investments, the introduction of an SRI fund is as technically challenging as any other actively managed fund.

Against a backdrop of high incentives for rapid adoption of new products in the industry index and SRI funds were, for different reasons, seen with considerable reservation by financial professionals. Index funds challenged the core belief in active asset management and SRI funds introduced an ethical "limitation" on the ideal of profit-maximizing asset management. Because these products were considered to deviate from norms, I expect that both firm propensity and contagion should be lower for index and SRI funds. The next step is to test this empirically.

Method, Model, and Data

To test my hypotheses, I use a comprehensive set of event-history data, detailing the product introduction pattern for every firm and product in the Swedish mutual fund industry from 1959 to 2000. I model the hazard of adoption, i.e., the marginal likelihood of a firm adopting a product given that it has not yet adopted, as it deals with the problem of right censoring and offers a convenient way of including time-dependent variables (Blossfeld and Rohwer 1995, Strang 1990).

Sample

The population of potential adopters includes all mutual fund firms that operated in Sweden in the period between 1 January 1989 and 31 December 2000. Although I have product introduction data from 1959, covariate data is available from 1989, which provides a period of analysis of little over a decade. Although this is a limitation, it is not a serious problem to the analysis because there were few adoptions (less than 10% of index, SRI, or mixed asset products) prior to 1989, and these are all included in the analysis with zero weight as a sample correction scheme (cf. Greve et al. 2001). Because there are no technical or legal restrictions on adoption, all firms are

assumed to be at risk of introducing an index, SRI, or a mixed assets fund. In all, there were 31 SRI adoptions, 39 index adoptions, and 104 mixed assets fund adoptions in a total of 494 observed firm years.

Dependent Variable

Day, month, year, and category of product adoptions per firm were collected from The Swedish Financial Supervisory Authority. All new products are registered with this authority so the data set is a complete inventory detailing the exact timing of all products ever introduced in Sweden.

Model

To analyze the diffusion of mixed asset, index, and SRI funds, I use the heterogeneous diffusion model proposed by Strang and Tuma (1993) shown in earlier studies to be valuable for analyzing contagion among heterogeneous actors (Greve 1995, 1996; Myers 2000; Rao et al. 2000; Schneiberg and Soule 2004; Soule and Zylan 1997). Because a firm at any time is at risk of introducing any of the three product categories, but is unlikely to introduce several at a single point in time, I model the adoption as a competing risks model. The model specification is

$$r_{nj}(t) = \exp(\alpha' \mathbf{x}_n) + \exp(\beta' \mathbf{v}_n) \sum_{s \in S(t)} \exp(\gamma' W_s + \delta' \mathbf{z}_{\mathbf{n}s}),$$

where n is a mutual fund firm in the data set at risk of adopting a product j, and s is a mutual fund firm that has earlier adopted the focal product. $S(t)$ is the set of firms that have adopted the product at time t. $\mathbf{X}_n$ is a vector of variables describing firm n's propensity (rate of adoption not from contagion) and the contagion, which is divided into three vectors: a vector $\mathbf{V}_n$ of variables describing firm n's susceptibility to influence from earlier adopters, a vector $\mathbf{Z}_{ns}$ of variables describing the social proximity between firm n and s (earlier adopters), and the vector $\mathbf{W}_s$ of infectiousness variables. Vectors $\mathbf{X}$ and $\mathbf{V}$ have a unity first term allowing separate intercepts for the propensity and susceptibility effects. The hazard rate (r) is subscripted nj because it is the nth case entry into the jth product category allowing the simultaneous analysis of the diffusion of mixed asset, index, and SRI funds. Because I do not hypothesize infectiousness effects, and it is a very data-consuming estimation, I exclude the infectiousness effects in my analysis (cf. Greve 1998).

Variables can influence a diffusion process in multiple ways; for instance, the size of a firm may influence both its propensity as well as susceptibility to adopt, and may therefore need to be included in several vectors. Where reasonable, I assign variables to vectors on a theoretical basis, and otherwise I follow Greve et al. (1995) and use test runs to determine where a particular variable produces the best model fit. For sake of clarity I present the variables included in the model in the order they appear in the propensity, susceptibility, and social proximity vectors of the model. Unless specified otherwise, all time varying covariates are updated annually.

Propensity to Adopt (α)

Hypothesis 1 posits that internal resistance will reduce the propensity of the focal firm to adopt. As shown in my interviews, the financial professionals are central to the resistance to adopt index and SRI funds, which means that the relative analyst intensity of firms should predict the level of adoption resistance within the firm. I thus approximate adoption resistance by the strength of the financial professional collective of the focal firm, relative to other firms in the industry. The absolute number of finance professionals employed by a firm is, however, not an appropriate measure because some of the smaller investment boutiques that specialize in hedge fund management are analyst powerhouses, although the absolute number of finance professionals is low. I therefore calculate the *analyst intensity* of a firm as the ratio of equity analysts and fund managers to the number of equity funds marketed by a firm at a given point in time. Data for calculating the analyst intensity was coded from the annual member directory of the SSFA. Over 5,000 person-years of employment were coded for the period between 1990 and 2001, detailing the firm and position of employment of every financial analyst in the industry. Where necessary, this data was supplemented by information from annual reports and interviews, resulting in a reasonably complete employment history data set for all security analysts and mutual fund managers in the industry over the period of analysis.

It is, of course, not only the relative strength of the finance professionals of a firm that determines the propensity of the firm to adopt deviant new products. The position of a firm, defined as the visibility and exposure to field-level pressures for conformity, can influence the relative propensity of a firm to adopt a deviant practice (Leblebici et al. 1991). I use *firm size* to control for firm position (cf. Haveman 1993), measured as its logged market share (Rao and Drazin 2002). Market share is defined as the total asset stock under management divided by the total asset stock of the market (Khorana and Servaes 1999) and was coded from the industry newsletter *Fond och Bank*. The professional background of the CEO can also influence the firm's propensity to adopt new products (Fiss and Zajac 2004, Palmer and Barber 2001); having a CEO with a fund manager background could lower the propensity of the firm to adopt index or SRI funds. I therefore dummy coded the *CEO background* for all CEOs, whether they had an analyst background or not, using data drawn from industry newsletters, media reports, and interviews. Khorana and Servaes (1999) also show that

mutual fund firms over time saturate their product portfolio, which reduces their propensity to introduce any new product. Consequently, I control for the logged *age* of the firm (cf. Rao and Drazin 2002). The propensity of firms to introduce new practices can also be increased by resource competition (Baum and Mezias 1992, Swaminathan and Delacroix 1991), so I included a measure of *resource availability* in the market by dividing the net inflow of money into the mutual fund market (i.e., new savings) by the number of firms active in the market at the time (cf. Greve 1996). Gross domestic product-deflated annual savings data were compiled from the industry newsletter *Fond och Bank* and firm density was calculated from entry and exit data from The Swedish Financial Supervisory Authority. Because my diffusion analysis uses repeated events, I also control for the number of firm- and product-specific *prior adoptions* and the length of *last spell*, which is the time between two successive product introductions by one firm in one product category (Blossfeld and Rohwer 1995).

Susceptibility to Earlier Adoptions (β)

Hypothesis 2 predicts that the observed adoption performance of a deviant practice (index or SRI funds) will not drive contagion as strongly as the observed adoption performance of a nondeviant practice (mixed asset funds), all else equal. Measuring the observable adoption performance of earlier adoptions is difficult, so many diffusion studies simply omit estimating its influence on the diffusion process (Strang and Macy 2001). The mutual fund industry setting, however, offers a reasonable opportunity for capturing the performance of earlier adoptions. Because the question is whether or not prior adoption performance drives further contagion, it is the observable adoption performance that is of interest. Although the investment performance of a fund attracts investors (Wilcox 2003), it is the absolute size of a fund introduced by an earlier adopter that will provide positive or negative adoption performance information to a prospective adopter because the revenue of a firm is a percentage of the funds under management. Fund size is, furthermore, an easily observable fund feature because it is reported daily in the media, and industry experts claimed in interviews that an industry rule of thumb indicated the attractiveness of a fund if it could be expected to reach a size of about SEK 300 million. Because fund attractiveness to potential adopters is a threshold-like value, I proxy the observable adoption performance of earlier adoptions as the *average fund size* within each product category, rather than the average annual growth in fund size for the category. Fund size data were coded from annual reports and from the data provided by the rating firm Morningstar's (Sweden) database. Hypothesis 3 predicts that the stronger the internal resistance, the steeper the deviance discount, which suggests a negative interaction effect between internal resistance (*analyst intensity*) and the observed adoption performance (*average fund size*) variables.

I also include several nonhypothesis testing variables in the susceptibility vector. Firm position is proxied by *firm size*. Positive media coverage is expected to increase attention to earlier adoptions (Burns and Wholey 1993), so I coded *media attention* as the number of positive articles written about a product category, deflated by the total number of articles on equity funds written that year (Abrahamson and Fairchild 1999). Data were gathered from the full-text database Affärsdata, which contains all major Swedish business press material since 1980. Coding a 35% sample of all the available articles for tone (cf. Pollock and Rindova 2003) shows that media attention to the mutual fund products in this period is overwhelmingly positive. A raw article count is, however, highly correlated with the average fund size variable, presumably because a successful fund category becomes well publicized. To mitigate this correlation, I divided the article count by the average fund size of the focal product category to obtain a measure of media attention in relation to fund performance. *Resource availability* may also influence the susceptibility to earlier adoptions, so I included this variable in the susceptibility vector too.

Social Proximity (δ)

The heterogeneous diffusion model allows the distinction between the contagion influence of earlier adopters based on their proximity to the focal firm (Greve 1996, Strang and Tuma 1993). Slow adoption of deviant practices has been argued to result because such practices diffuse through closer networks than other practices, and I need to control for this in the analysis. In preruns I tried several definitions of tight firm networks, for instance, size similarity (Haveman 1993) or the CEO recruitment network (Kraatz and Moore 2002). The best fitting network turned out to be the *professional recruitment* network of a firm (cf. Galaskiewicz and Burt 1991), which is reasonable given the importance of professional attitudes to product adoption shown in the interviews. Utilizing my employment database, I created a list-like proximity vector for each firm (cf. Strang and Tuma 1993) from which personnel have been recruited for each time period. Note that specifying a close-knit recruitment network does not exclude contagion influence from non-network adopters from the model; it merely estimates differences in the influence of within-network adoptions compared with outside-network adoptions.

Descriptives

Table 1 shows the means, standard deviations, and Pearson's correlation coefficients for the data.

Potentially troublesome correlations for estimation of the heterogeneous diffusion model are those above 0.5 for variables in the same vector (Greve et al. 1995), and the only such correlations are between *firm size* and *firm age* in the propensity vector (correlated at 0.528) and

Table 1 Descriptive Data

	Mean	Std. dev.	2	3	4	5	6	7	8	9	10
1. Prior events (Adoptions)	1.178	2.639	0.065	0.248**	0.76**	0.246**	0.226**	0.211**	0.225**	0.104*	0.74**
2. Last spell (Months)	0.186	1.211		0.122**	0.2**	−0.038	−0.024	0.114*	−0.023	0.088	0.14**
3. Firm size (Logarithm of market share)	0.026	2.089			0.263**	−0.08	0.203**	0.528**	0.015	0.178**	0.25**
4. Av fund size/cat. (SEK 100 million[a, b])	1.464	2.95				0.26**	0.305**	0.125**	0.106*	0.079	0.95**
5. Resource avail. (SEK 100 million/firm[b])	0.808	0.907					0.177**	−0.07	0.264**	0.004	0.26**
6. Analyst intensity (financial professionals/ funds marketed)	0.908	0.511						0.037	−0.065	−0.086	0.4**
7. Firm age (Logarithm of years)	1.89	1.37							−0.051	0.261**	0.1**
8. Media attention[b]	1.342	2.783								−0.017	0.05
9. CEO background (dummy, fund manager = 1)	0.375	0.484									0
10. Analyst intensity$_{(t-1)}$ × average fund size$_{(t-1)}$	1.789	4.062									.

Note. $N = 494$.

[a]Deflated 1980 = 100; [b]Lagged by one year.

*Correlation significant at the 0.05 level (two-tailed); **correlation significant at the 0.01 level (two-tailed).

between *average fund size* and the interaction variable between *average fund size* and *analyst intensity*. Additional analyses (not reported here) indicate no serious estimation problems of including these variables in the same vector.

Analysis and Results

I estimated the model specified above using a version of RATE 3.0. Model 0 in Table 2 replicates a standard diffusion model without any deviance discount variables, and Model 1 is the full model. The models are nested, which allows for testing of model fit. Model 0 is a clear improvement over a baseline constant rate model without covariates and Model 1 represents a further significant improvement in model fit.

Results

The propensity part of the standard diffusion model (Model 0) provides little guidance as to why index and SRI funds fail to spread, whereas the mixed assets fund spreads widely. Differences across the estimated contagion processes are, however, more informative. *Media attention*, for instance, is the strongest driver of contagion for index and SRI funds, whereas it is insignificant for mixed Asset funds. Controversial new products are, thus, more dependent on external support to drive adoption, such as media, a finding in line with earlier studies (cf. Burns and Wholey 1993, Chaves 1996, Rao et al. 2003). The second important difference, that supports Hypothesis 2 is that prior adoption performance (*average fund size*) did not significantly influence contagion for index and SRI funds, whereas it is central in driving contagion of mixed asset funds. The standard diffusion model, hence, replicates a stylized finding where prior adopter performance is important to diffusion, but only in the case of noncontroversial mixed asset funds. The robust support for prior adoption performance found in earlier studies can thus be a result of the sampling strategies of these studies (cf. Denrell and Kovacs 2008).

Why did prior adoption performance (*average fund size*) not influence the contagion of index and SRI funds? There are two competing explanations. The first, which is often suggested by practitioners, is that neither index nor SRI funds provided any significant adoption benefits and, therefore, prior adoption performance did not matter to the further adoption of these products. The second explanation is that, because index and SRI funds were controversial with finance professionals, the prior adoption performance was interpreted at a deviance discount that led many firms to ignore previous adoption performance. I find support for the second explanation on two counts. First, when investigating the actual average adoption performance of firms that adopted any of the eight product categories, the adoption performance of index and SRI funds was on par with those of any other fund (results available on request). The average adopter of an index or SRI funds was in fact better off than an adopter of mixed asset funds in terms of fund size. Second, once the intensity of resistance to adoption is controlled for, the deviance discount disappears from the SRI fund (see below). This would not be the case if SRI funds actually did not perform. The analysis thus supports the existence of an overly negative evaluation,

Table 2 Diffusion Analysis

	Model 0						Model 1					
	Index		SRI		Mixed assets		Index		SRI		Mixed assets	
Propensity (α)												
Intercept	−3.4**	(1.43)	−17.5	(11.2)	−1.04**	(0.46)	−3.43**	(1.41)	−18.9	(309)	−1.06**	(0.46)
Prior adoption	1.21***	(0.21)	1.01***	(0.32)	0.67***	(0.04)	1.22***	(0.21)	0.51***	(0.18)	0.67***	(0.05)
Length last spell	−22.3	(47)	−5.6	(20.9)	0.38***	(0.04)	−19.5	(45)	−1.19	(3.15)	0.39***	(0.04)
Resource availability$_{(t-1)}$	2.24***	(0.8)	−5.23**	(2.15)	−1.71***	(0.32)	2.21***	(0.8)	−0.58	(0.67)	−1.67***	(0.32)
Firm age (ln years)	−0.99***	(0.23)	5.6	(3.74)	−0.39**	(0.17)	−1.02***	(0.23)	0.16	(1.43)	−0.4**	(0.17)
CEO background	−47.9	(143)	−0.03	(1.24)	−0.58*	(0.35)	−48.4	(290)	17.55	(309)	−0.53	(0.35)
Market share (ln)	0.62**	(0.3)	0.9	(0.57)	0.36***	(0.13)	0.61**	(0.29)	0.61	(0.92)	0.38***	(0.13)
Analyst intensity$_{(t-1)}$							−5.28***	(1.6)	−4.59*	(2.44)	0.135	(0.32)
Susceptibility(β)												
Intercept	−5.43***	(0.69)	−6.1***	(0.44)	−14.7***	(3.5)	−5.86***	(0.75)	−8.92***	(0.96)	−14.5***	(3.5)
Media attention$_{(t-1)}$	0.41***	(0.06)	0.29***	(0.04)	−0.15	(0.44)	0.46***	(0.07)	0.477***	(0.08)	−0.08	(0.42)
Resource availability	−1.25***	(0.27)	−0.27	(0.31)	2.58***	(0.8)	−1.45***	(0.3)	−0.83**	(0.37)	2.58***	(0.8)
Market share (ln)	−0.42***	(0.15)	0.4***	(0.14)	0.16**	(0.08)	−0.51***	(0.16)	0.185	(0.14)	−0.19**	(0.08)
Average fund size$_{(t-1)}$	0.19	(0.13)	0.000	(0.12)	0.98***	(0.26)	0.07	(0.24)	0.85**	(0.41)	0.98***	(0.27)
Analyst intensity$_{(t-1)}$ × average fund size$_{(t-1)}$							0.04	(0.22)	−0.93*	(0.47)	0.008	(0.06)
Social proximity (δ)												
Adoptions within recruitment network							2.47***	(0.5)	4.48***	(0.89)	−12.9	(102)
Model log likelihood			−38.8						−22			
Log likelihood test			731.99***[a]						32***[b]			
(d.f.)			(36)						(9)			

Notes. All significance test are two-tailed. Standard errors are in parentheses.
[a]Against baseline model, no covariates; [b]Against model 0.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

on the part of some firms, of the prior adoption performance of index and SRI funds.

In Model 1 I add three variables. First, to test Hypothesis 1, a measure of internal resistance to adoption—*analyst intensity*—is added to the propensity vector with the prediction that higher analyst intensity leads to lower adoption propensity for index and SRI funds. This prediction is supported because the coefficient for *analyst intensity* is negative and significant for both Index and SRI funds. *Analyst intensity* did not, however, influence the propensity to adopt the noncontroversial mixed assets fund, which is reasonable given degree of normative acceptance of the product among the analysts. The interpretation of a negative propensity effect as resulting from resistance by finance professionals is supported in the interviews. One manager recalled from the time of working in one of the larger banks the resistance to introducing index funds:

> their fund managers are too influential. They do not want it. They [fund managers] are influential here [in our firm] too but I know that at [a bank name] they would consider it a shame to introduce an index fund and it would directly insult their asset managers.

There is also a question of the endogeneity of the finding of a negative effect of analyst intensity on adoption propensity—did firms, for instance, drop analysts before adopting index funds? Some interviews suggest the opposite; firms that had a weak analyst base opted to introduce index funds as a way to avoid investment in finance professionals. This was, however, the case with a minority of the firms that introduced index funds and many firms held a portfolio of both index and actively managed funds. Index funds for these firms constituted an addition to the portfolio and not a new direction and in none of the interviews was I informed about any firm shedding analysts to introduce index funds. Firms that introduced index funds did, however, have to do internal work on the acceptance of this adoption, as described by the CEO of a firm that had introduced SRI funds early on:

> [the biggest problem of introduction] . . . it was the security analysts . . . . They were the most difficult to convince [to adopt SRI funds] . . . . We have worked hard on internal acceptance . . . . It has been a long process and I can only imagine how long it would be in other places—I have tried it with my earlier colleagues in [name of bank withheld for confidentiality].

My findings thus show that professional resistance can be differently strong across firms, depending on the relative influence of professionals, as well as differently strong across product categories. This resistance to deviant products is influential even when controlling for alternative contagion effects of practice deviance identified in earlier studies, which indicates that practice

deviance limits the propensity of firms to adopt as well as the contagion effects from earlier adoptions.

Second, to test Hypothesis 3, an interaction variable (*analyst intensity* ∗ *average fund size*) is added to the susceptibility vector. Hypothesis 3 is only supported for the SRI fund. The coefficient on the interaction term for SRI funds is as predicted negative; the higher the *analyst intensity*, the lower the contagion effect of prior adoption performance (*average fund size*). Further support for Hypotheses 2 and 3 is provided as the *average fund size* main effect turns significant and positive once the influence of the high resistance organizations are controlled for through the interaction term. Hypothesis 3 is not supported for the index funds. The coefficient of the interaction variable is not significant and the coefficient for the main effect of *average fund size* variable remains insignificant even in Model 1. The mixed support for Hypothesis 3 can possibly be understood if the deviance of the three products is seen as a continuum—from the noncontroversial mixed assets to the highly contested index funds. In the case of SRI funds, more controversial than mixed asset funds, the adoption performance is discounted but only by the most analyst-intensive firms. With respect to index funds, the most controversial fund, resistance was stronger across the board so even controlling for analyst intensity does not render the adoption performance variable significant.

Third, a nonhypothesis testing variable, capturing the tight *recruitment network* of the focal firm, is added to the social proximity vector. The positive and significant coefficient of this variable, in line with earlier studies, shows that an index or SRI adoption within the close recruitment network of a firm is significantly more influential than adoptions outside this network. Note that the null finding for the mixed asset funds does not mean that networks do not matter to the diffusion of this product category; it simply means that an adoption of a member of the recruitment network is no more or less influential than an adopter by any other participant in the industry. This finding is reasonable because the Swedish mutual fund industry is geographically concentrated—it is literally located within a few blocks in central Stockholm. Close networks thus need not be especially important carriers of general adoption information where this is freely available, but close networks may still legitimize adoption of a controversial product, such as index or SRI funds.

Conclusions, Implications, and Further Research

Information is interpreted and acted on in a social context, and information about practices that are considered deviant is often devalued. Drawing on these insights, I propose that deviant ideas and practices can fail to diffuse as prospective adopters interpret information from earlier adopters at a "deviance discount." A deviance discount is theoretically distinct from earlier explanations of failed diffusion because it can explain diffusion failure in cohesive networks and where the practice in question has a positive adoption value. As long as a practice is resisted by influential groups within a sufficient number organizations, diffusion will be limited because the contagion effect of any prior adoptions is weakened when prior adoption information is devalued. I demonstrate the working of a deviance discount in an analysis of the limited spread of index and socially responsible investment funds in the Swedish market for mutual funds. These findings hold important implications for diffusion theory as well as organization theory, and institutional theory in particular.

Institutional Theory and a Deviance Discount

Current understandings of institutional stability and the conditions of endogenous institutional change assume that a practice that challenges extant institutions can prove its worth and thereby spread and affect institutional change (Clemens and Cook 1999, Schneiberg 2005). This idea is most clearly expressed in the "paradox of institutional success" (Greenwood and Hinings 1996, Leblebici et al. 1991), which suggests that the institutionalization of practices contains the seed of deinstitutionalization and self-destruction, a compelling explanation of endogenous institutional change (Schneiberg 2005). Stated this way, endogenous institutional change seems a likely event. My findings suggest that professional interests, and the degree to which these can influence organizational decision making, are likely boundary conditions on endogenous institutional change. Deviance discounting, which limits chances of endogenous institutional change, should be more likely in populations of organizations that are uniprofessional rather than multiprofessional. In the case of the Swedish mutual fund industry, the institution of active asset management is not likely to be subverted through the spread of index funds as long as finance professionals hold a key role in evaluating the use of adopting and selling index funds. Multiple professions within an organization can, however, present problems of adoption because the decision process may become more complicated (Ferlie et al. 2005, Wayward and Boeker 1998). In all, this reasoning suggests the importance of paying attention to contestation and conflict in institutional change (Clemens and Cook 1999, Marquis and Lounsbury 2007). The relationship between intraorganizational professional heterogeneity and endogenous institutional change clearly contains a set of questions in need of further research.

Furthermore, the findings of a deviance discount provokes additional questions about the "proving of worth" mechanism commonly identified in earlier diffusion studies. A typical story is that a deviant practice is tried out by a marginal actor, and when adoption proves

beneficial the more central actors also adopt. This periphery-center or "trickle-up" diffusion (Abrahamson and Rosenkopf 1997, Rogers 1995) presumes that the practice and the initial adopting actors are sufficiently accepted that other actors are receptive to their adoption information. If the practice is deviant enough, even fairly obvious adoption benefits can be downplayed to maintain extant institutional arrangements. Similarly, if the marginal actors that are early adopters are considered *really* marginal, their adoption experience may be treated with a deviance discount that invalidates the observed results to potential adopters and thereby nullifies the "proving of worth" mechanism. With my focus on practice deviance, I have not considered the possible mediating role of the status of the adopting actor, but the possible deviance discount of adoption information at different levels is another promising area for future research.

Diffusion Theory Widened

With respect to diffusion theory, I contribute one of few studies of limited diffusion, as well as multiple-practice diffusion. Furthermore, I present empirical evidence of organization-level professional resistance to adoption and show that this affects both the propensity and contagion aspects of the diffusion process. My findings enrich diffusion theorizing through the inclusion of two core ideas from broader organization theory: that information is interpreted in a social and organizational context and that organizations are coalitions of groups, which affects the adoption decision. A "deviance discount" provides a novel explanation to how practices can fail to spread even when the practice is useful and networks are cohesive.

Thus, widening the theoretical lens of diffusion theory suggests further interesting research directions. First, these findings are clearly a call for more research into why and how practices and ideas fail to spread. Although I have argued the shortcomings of existing literature on the topic, my study is also limited in several important dimensions. It can be questioned just how strong professional resistance can be allowed to grow in an organizational setting; after all, it was not a matter of organizational life or death to adopt or not adopt index and SRI funds. If fund firms that did not adopt index or SRI funds went bankrupt, the social costs of professional resistance would probably have been higher (although economic historians show that plenty of organizations fail due to internal resistance to new practices). Clearly, more research is needed to understand how organization-level pressures form the micro environment in which resistance to adoption takes forms. Furthermore, the role of other actors outside the institutional field in the formation and sustainability of resistance is left largely untouched in this study. From interviews I know that the market share developments of index and SRI funds in the U.S. market served as argumentative resources for adoption advocates (cf. Rao et al. 2003). The question of how adoption and market information at different levels influences resistance and its impact on a diffusion process is, thus, another important area for further research (cf. Schneiberg and Soule 2004).

Second, it is important to take seriously the dynamics of the social costs of adoption resistance. In the few studies where resistance to adoption is considered, it is considered unproblematic until the point where it collapses under a bandwagon pressure for adoption. This builds on the premise of singular adoption pressures and benefits, which, in the case of the Swedish mutual fund industry, is clearly too simplistic. Whereas there was solid private resistance to adoption of index or SRI funds among most financial analysts on the grounds that they were not "proper" or "professional" products, it was in many cases difficult for the same fund managers to publicly resist adoption in an organizational context where there was increasing competitive pressure to market a broad product portfolio. An expedient way to reconcile public pressures for adoption with private reservations about the product was to construct the product as nonefficient to adopt—to distort the information about prior adoption performance so that index and SRI funds looked like poor products. If this was the case, it suggests an exiting area of research in the intersection of diffusion studies and negative impression management: how long can the fund managers keep convincing their CEOs that these are inferior products? What are strategies and pitfalls of negative impression management? On a more general note, this suggests that a serious investigation of how new ideas and practices are resisted needs to take into account the influence of institutionalized norms on the public as well as private action scripts (cf. Schneiberg and Clemens 2006).

Finally, the influence of adoption rhetoric and its decoupling from actual adoption experience (Abrahamson and Fairchild 1999, Strang 1997, Zbaracki 1998) is an important area of future research with respect to how practices can fail to diffuse. In most diffusion studies it is assumed that adopters want to be imitated as it can provide higher status—that is why firms willingly lend themselves as role models (Strang and Soule 1998). The reverse has also been argued, where organizations do not want to be imitated (Levitt and March 1988). In the latter case we could expect to see interesting case of the obverse of my findings; adoption benefits actively discounted or otherwise obfuscated not by potential adopters but by the earlier adopters. That is an interesting area for future research.

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