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Level and Time Effects of Recruitment Sources on Early Voluntary Turnover

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To better understand the effects of recruitment source on the level and timing of organizational departure, a turnover model incorporating dynamic predictors was examined. A large, longitudinal sample containing both stayers and leavers was analyzed with parametric survival models. Results indicate that the turnover hazard function for individuals recruited through personal recruitment sources was lower early in an employee's tenure than for individuals recruited through formal sources. Moreover, the peak of the turnover hazard was delayed significantly for such employees. However, the turnover rate differential due to the use of personal recruitment methods clearly diminished as tenure increased. Further, the recruitment source effect on the turnover hazard was partially mediated by job satisfaction. The pattern of results observed expands understanding of the unfolding model of turnover.

Keywords: recruitment source, voluntary turnover, unfolding model, survival methodology

As Hom, Roberson, and Ellis (2008) recently corroborated, voluntary turnover rates in organizations are highest during the first few years of an employee's tenure and then steadily decline. Given the significant organizational-level productivity and financial costs associated with voluntary turnover (e.g., Glebbeek & Bax, 2004; Kacmar, Andrews, Van Rooy, Steilberg, & Cerrone, 2006; Shaw, Gupta, & Delery, 2005) as well as the significant impact on the individuals who leave (Mitchell, Holtom, & Lee, 2001), researchers are rightly concerned with better understanding why people stay with or leave organizations—especially during the first 2 years of their tenure when turnover rates are generally highest.

One of the key issues researchers have sought to comprehend is the role of recruitment sources in the organizational attachment process. In a review article summarizing what is known about recruitment source research, Zottoli and Wanous (2000) noted that "the studies reviewed do not provide a clear consensus as to which explanation for recruitment source effectiveness is most credible" (p. 373). These authors went on to say, "Overall, there is much to be learned regarding the reasons for differential recruitment source effectiveness" (Zottoli & Wanous, 2000, p. 375). We believe that this lack of consensus stems, to some degree, from a lack of attention to temporal dynamics. Specifically, we believe that it is critical to define when the recruitment source will have the greatest impact on employee retention and turnover. Put differently, we believe that the effectiveness of informal sources may be superior in the near term but converge with formal sources in the long term in part because the initial information differential diminishes in importance and in part because the impact of other processes (e.g., job embeddedness) increases. Currently, the dominant paradigm implicitly assumes that relationships between predictors and turnover are linear and constant (T. H. Lee, Gerhart, Weller, & Trevor, 2008). In this article, we challenge that assumption, as we propose and test theory to explain when recruitment source effects on turnover are strongest.

Voluntary turnover is usually described as a deliberate, job dissatisfaction–initiated process that includes job search and subsequent expected utility deliberations (Hom & Kinicki, 2001; Mobley, 1982; Steel, 2002). However, the unfolding model (T. W. Lee & Mitchell, 1994) acknowledges that, in many cases, turnover instances follow rather impulsive paths that are not sufficiently explained by traditional models. To better understand turnover, researchers have argued that explicit consideration of time is needed (George & Jones, 2000; Mitchell & James, 2001). Despite the fact that turnover theorists "have been in the vanguard of building temporal theory. . . studies seldom have time incorporated into their designs" (Kammeyer-Mueller, Wanberg, Glomb, & Ahlburg, 2005, p. 644), and "little progress has been made in the empirical literature toward accommodating the temporal aspects of turnover" (Steel, 2002, p. 347).

The research reported in the present article makes three primary contributions. First, we used the unfolding model of voluntary

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turnover to develop temporally informed theory to explain how recruitment source differences influence turnover rates early in tenure. We also provide an explanation for the mixed results of prior recruitment source research. Second, we used a large-scale and non-U.S. data set with advanced survival modeling techniques to test this temporally informed theory. Third, we point to important managerial recommendations for increasing the average tenure of new hires.

Tenure–Turnover Relationship

At the earliest stages in an employee's tenure, turnover rates tend to be quite low. However, as information and experience are acquired by the employee (R. F. Morrison & Brantner, 1992), turnover rates start to increase, peaking in Years 1 and 2 of employment and then declining thereafter (Hom et al., 2008). Two theoretical perspectives provide complementary explanations as to why turnover rates tend to be low initially, then peak, and eventually decline. The attraction–selection–attrition model (Schneider, 1987) describes how applicants are drawn to firms where they perceive a good fit with corporate culture and values. Applicants who are perceived to fit best are then hired. Early on, entrants go through a "honeymoon period," characterized by high levels of job satisfaction and organizational commitment as well as low levels of turnover (Boswell, Boudreau, & Tichy, 2005; Hom & Griffeth, 1991). Over time, newcomers gradually learn whether they share the values of the institution and their work group, possess the skills required to complete critical tasks, and appreciate the intrinsic and extrinsic rewards derived from the job. Those who do not perceive a good fit will exit early in tenure when misfit is most readily apparent (Caldwell & O'Reilly, 1990). Over time, the rate of turnover is expected to decline, in part because those who fit poorly have already left (Jovanovic, 1979; Meitzen, 1986).

After organizational entry, other factors begin to exert influence. In addition to its focus on fit, job embeddedness theory posits that organizational entrants will develop links to people and projects over time that will serve to enmesh them in an organization and make turnover less likely. Further, they will accumulate more benefits as they spend more time in the organization and thus experience a growing sense of sacrifice when considering leaving (Mitchell, Holtom, Lee, Sablynski, & Erez, 2001). In a similar vein, March and Simon (1958) and labor economists (e.g., G. S. Becker, 1962) have argued that, as time goes by, more and more specific and nontransferable human capital is acquired, which increases turnover costs and makes quits less likely. In sum, theory suggests that the turnover hazard for employees should be low initially, then increase to a peak, and decrease thereafter (Farber, 1994). As such, an inverted U-type hazard function is expected.

> *Hypothesis 1:* The turnover hazard function has an inverted U-type shape (there is a non-monotonic relationship between tenure and the turnover hazard such that the turnover hazard increases after organizational entry, then peaks, and afterwards declines).

Recruitment Effects and the Unfolding Model of Turnover

Given that we have established the general shape of the turnover hazard function, we can now explore how the curve will differ depending on recruitment source. Prior to organizational entry, organizations and individuals engage in a two-sided search and selection process (Saks & Ashforth, 1997; Schwab, Rynes, & Aldag, 1987). Organizations attempt to attract the right candidates (Rynes & Barber, 1990). At the same time, individuals gather information about organizations and jobs. Because they cannot gain complete knowledge of all alternatives and their potential characteristics, they rely on imperfect signals. As Granovetter (1995) explained, personal or informal recruitment sources (referrals, social networks, rehires, etc.) will systematically provide better information than formal recruitment sources (newspapers, databases, employment agencies, etc.). In turn, better information is believed to translate into higher probability of obtaining employment and more positive post-hire outcomes, such as quality of employment, entry wage and subsequent wage profile, organization- and job-related attitudes, and lower voluntary turnover (Caldwell & O'Reilly, 1985; Saks, 1994; Schwab, 1982).

One theory that may be particularly useful in explaining differential effects of recruitment source on turnover early in tenure is the unfolding model (T. W. Lee & Mitchell, 1994). This theory posits that individuals typically follow one of four paths when they leave organizations. In Path 1, a shock triggers the enactment of a script or pre-existing action plan. The person leaves without considering job satisfaction or searching for another job. In Path 2, a shock causes an image violation that drives the person to quit without searching for alternatives. In Path 3, a shock initiates deliberations regarding the utility of the current job compared with alternatives. Limited job search and evaluation may take place in Path 3. Path 4 most resembles traditional turnover models (e.g., Mobley, 1982) where job dissatisfaction—rather than a shock—causes individuals to search for and evaluate alternatives.

Support for the core tenets of the unfolding model has been accumulating (T. W. Lee, Mitchell, Holtom, McDaniel, & Hill, 1999; T. W. Lee, Mitchell, Wise, & Fireman, 1996). In addition to the work of T. W. Lee and colleagues, a number of studies have replicated and extended the unfolding model in recent years (Donnelly & Quirin, 2006; T. H. Lee et al., 2008; Morrell, Loan-Clarke, Arnold, & Wilkinson, 2008; Morrell, Loan-Clarke, & Wilkinson, 2004). Whereas many quits appear to follow the traditional job dissatisfaction path (Path 4), it is clear from published research that as many, if not more, quits are triggered by factors other than job dissatisfaction. These triggers include both work-related and non–work-related shocks (Holtom, Mitchell, Lee, & Inderrieden, 2005) as well as pure impulse (Hulin, Roznowski, & Hachiya, 1985). In the paths that are initiated by shocks (Paths 1–3), the unfolding model assumes that the level of fit is acceptable up until the time a shock is experienced (T. W. Lee & Mitchell, 1994).

A shock to the system is theorized to be a distinguishable event that may lead a person to voluntarily quit. A shock is an event that generates information or provides meaning about a person's job and then is interpreted and integrated into the person's system of beliefs and images. Note that not all events are shocks. Unless an event triggers job-related behavioral scripts or deliberations that involve the prospect of leaving the job, it is not a shock (T. W. Lee & Mitchell, 1994). Evidence suggests that shocks, which initiate Paths 1, 2, and 3, are pervasive—exceeding 60% across multiple samples and studies (Donnelly & Quirin, 2006; Holtom et al, 2005; T. W. Lee et al., 1996; T. W. Lee et al., 1999; T. H. Lee et al., 2008; Morrell et al., 2004; Morrell et al., 2008). Moreover, recent

research suggests that nearly all employees experience shocks, though not all choose to leave in response (Griffeth, Hom, Allen, Morse, & Weinhardt, 2008; Kammeyer-Mueller et al., 2005). Many shocks are personal (e.g., becoming pregnant, getting accepted to graduate school, getting married) and others are organizational (e.g., experiencing mergers or acquisitions, being passed over for promotion, receiving an unsolicited job offer). Those that are personal in nature are more likely to be distributed randomly over a person's career (Holtom et al, 2005; T. H. Lee et al., 2008). In contrast, we believe that new employees who are going through a role transition (outsider to insider) are more likely to experience organizational shocks than are experienced employees (Miller & Jablin, 1991). For this reason, we believe that it is important to link the recruitment source literature with the unfolding model to better understand turnover early in a person's career.

Two distinguishing factors of Paths 1–3 are the frequent presence of image violations and the speed with which the paths unfold (e.g., they unfold faster on average than Path 4; T. W. Lee et al., 1999). Image violations occur when an individual's values, goals, and strategies for goal attainment do not fit with those of the employing organization or those implied by the shock. These image violations often stem from pre-entry ideas about an employer not meshing with post-entry reality or a lack of fit between the goals of the employee and the opportunities afforded by the job or organization. Such violations would likely result in relatively quicker quits.

To conceptually link the recruitment source effect to the unfolding model, we split the employment experience into four stages: (a) job search (a dynamic process that occurs prior to organizational entry), (b) organizational entry (a single, decisive point), (c) organizational membership (a dynamic process that occurs after organizational entry), and (d) exit (a decisive event that occurs at a specific point of time and may take on various forms, such as death, dismissal, or voluntary turnover).

Prior to organizational entry (Stage a), job seekers gather information about organizations and jobs from various sources. Search may be based on personal sources, such as referrals, social networks, in-house notices, and rehires, or on formal sources, such as newspaper ads, online databases, employment agencies, and school placement offices. Personal sources often provide inside information, whereas formal sources, such as employment agencies, rarely do (Granovetter, 1995; Zottoli & Wanous, 2000). Ullman (1966), in an influential early article, argued that "the friends of employees know more about the company in advance" (p. 31). Granovetter (1995) theorized that "information derived from . . . personal contacts . . . is less costly and of better quality than that obtained from impersonal sources" (p. 13). Schwab et al. (1987) also noted that applicants could gain the most intensive information through referrals or other informal sources. Empirical studies in which respondents were asked for the amount or quality of information they received from different sources support this picture (e.g., Breaugh & Starke, 2000).

Job entry (Stage b) marks the point of transition from outsider to insider. At this point, new recruits have different stocks of knowledge depending on their recruitment sources. Personal source users will have higher level or better quality information as compared with formal source users. This pre-entry information is critical because it results in a nonrandom distribution of potential fit, where personal and formal recruitment source users have systematically different and "inherent" probabilities to experience certain fit levels. These probabilities are inherent because they are fully determined prior to organizational entry.

After organizational entry (Stage c), individuals learn about their employers and jobs and gather knowledge that either supports or contradicts their pre-entry information. That is, newcomers collect information about the quality of the fit with the organization and job. Positive information signals good fit, whereas negative information signals bad fit. Negative information may be encountered as an initial role shock (T. W. Lee & Mitchell, 1994) or critical event (Kammeyer-Mueller et al., 2005). Such shocks may occur when newcomers experience interactions with others that signal a misfit between their desires and the actual types of leadership style, culture, or work climate in the organizations they have joined (Saks & Ashforth, 1997; Wanous, 1992). Because we expect newcomers from formal sources to have lower levels of entry information, such employees are likely to experience lower fit (Granovetter, 1986). In turn, low fit will lead to early and sometimes severe forms of role shocks (Miller & Jablin, 1991), which are a particular type of work-related shock, as described in the unfolding model. Put differently, formal recruitment source usage will, on average, result in more frequent and more extreme work-related shocks, which may directly translate into voluntary turnover (T. W. Lee & Mitchell, 1994).

It is important to note that this type of shock has a critical feature that distinguishes it from other types of shocks. Whereas most shocks can occur at any undetermined point of time in one's career (i.e., more or less randomly from the perspective of the individual), early role shocks induced by low levels of entry information occur at a very specific point in time, that is, just after organizational entry. This allows us to predict the timing of exits of recruits (Stage d) from different recruitment sources.

In Figure 1, we demonstrate graphically how the two types of recruitment sources might influence the turnover hazard function. We model two populations and three types of employment experiences (or spells). Short arrows following a bullet indicate shock-driven paths to turnover. Long arrows depict the standard, deliberate search and expected utility decision driven path to turnover. Dotted lines represent stayers. In the case where individuals never enter a turnover path, observations are right-censored at the end of the study window. We expect many individuals to follow the traditional path to turnover. These individual turnover processes start at random times and generally are time consuming. Other individuals, however, follow a shock-driven path to turnover. Note that many of the organizational shocks occur early in tenure (e.g., initial role shocks), whereas other types of shocks occur rather randomly throughout a person's career. Because of the relatively higher proportion of poor fits resulting from formal versus personal recruitment sources, the turnover hazard of the population charted in the top graph steeply increases to an early peak and then decreases. In contrast, among the population depicted in the bottom panel, relatively fewer individuals experience early role shock-induced quits. Because the populations have different rates of exit, the turnover hazard peaks later when personal recruitment sources are used. In sum, we believe that formal versus personal recruitment source use results in subgroups similar to the ones depicted in the top and bottom graphs of Figure 1, respectively. Thus, recruitment source will predict time differences in the peaks of turnover hazard functions.

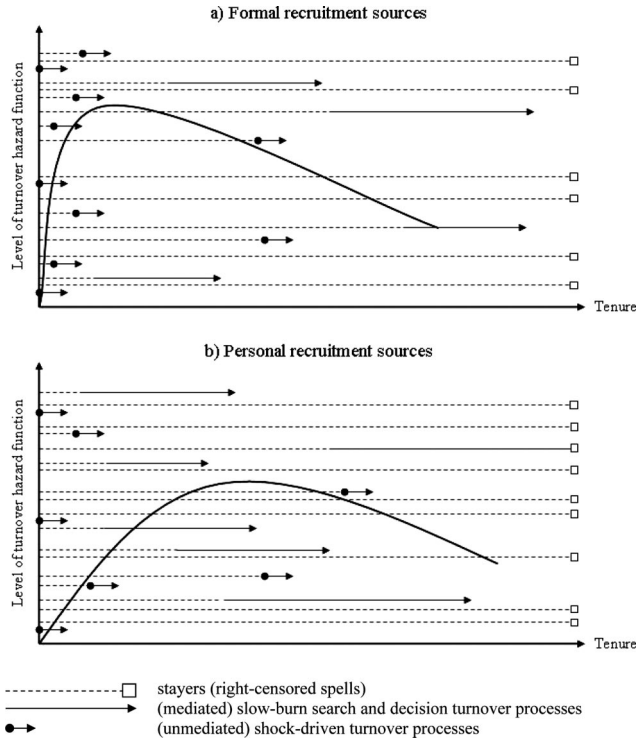

Figure 1. Paths to turnover and turnover hazards. Note that the vertical arrangement of spells does not indicate levels of turnover hazards. The vertical dimension refers to the hazard functions only, which may be interpreted as the aggregated quit risk information carried by the individual spells.

> *Hypothesis 2:* The use of personal recruitment sources is associated with a later peak of the turnover hazard than occurs with formal recruitment sources.

The recruitment source effect on the turnover hazard will vanish over time. In other words, early information differentials will gradually wear off (Vecchio, 1995). As Miller and Jablin (1991) noted, organizational entry is the most critical time for employees' learning. New "hires . . . are likely to experience considerably higher levels of role-related and career uncertainty when entering a new environment than at any other time during their organizational tenure . . . . When individuals are new to an organization, they may seek information in a far more deliberate manner than when they have grown accustomed to their roles and their organizational environments" (p. 94). Uncertainty is highest during early employment and results in intense information seeking. Over time, as people gain experience and knowledge about their jobs, the differences between newcomers from personal and those from formal sources gradually diminish.[1]

Moreover, after entry, other attachment processes commence and exert increasing influence on employee retention. For example, beyond the effect of fit, job embeddedness theory explains how new employees accumulate links to the job and to their communities (Mitchell et al., 2001). These connections to people and to institutions create interdependencies that may become increasingly difficult to sever over time. Normative pressures to stay grow (Maertz, Stevens, & Campion, 2003). As tenure increases, employees accumulate side bets, that is, investments outside the employment relationship that link individuals to their employers if alternative jobs are not available at similar costs (e.g., houses, community links, etc.; cf. Becker, 1960) and benefits that are linked to seniority (e.g., pensions, sabbaticals; Mitchell & Lee, 2001). The cumulative effect of fit, links, and sacrifice in both the organization and the community has been shown to reduce the likelihood of turnover (T. W. Lee, Mitchell, Sablynski, Burton, & Holtom, 2004; Mitchell et al., 2001). Perhaps even more importantly, whereas the level of job embeddedness is expected to grow over a person's tenure (Mitchell et al., 2001), there is also evidence that the effect of job embeddedness on retention increases with tenure (Holtom, Mitchell, Lee, & Tidd, 2006). In sum, as tenure increases, it is likely that recruitment source will diminish in importance as a predictor of turnover.

> *Hypothesis 3:* Tenure moderates the effect of personal (as compared with formal) recruitment sources on the level of the turnover hazard, such that the recruitment source effect decreases with tenure.

Whereas we have argued that shocks are an important link between recruitment source and early turnover, we note that the unfolding model (T. W. Lee & Mitchell, 1994) as well as other prominent models (e.g., Mobley, 1982) acknowledge the importance of job satisfaction in the turnover process. There are a number of connections between recruitment sources and job satisfaction. Saks (1994) and Saks and Ashforth (1997) showed that the use of personal job search sources was related to more positive work attitudes (job satisfaction) and higher job survival than the use of formal sources. Latham and Leddy (1987) found that referrals were superior to advertisements and direct applications in terms of generating subsequent job satisfaction. Social network theorists have argued that personal source users are able to draw on existing social networks that enable them to more quickly and easily acquire information necessary for socialization (Major, Kozlowski, Chao, & Gardner, 1995; E. W. Morrison, 2002). Kammeyer-Mueller and Wanberg (2003) showed that pre-entry knowledge was positively related to proximal work adjustment indicators, such as task mastery, role clarity, and workgroup integration, which influenced more distal factors such as organizational commitment. Job satisfaction and organizational commitment, in turn, are among the most prominent attitudinal predictors of voluntary turnover. A meta-analysis has reported average corrected correlations with turnover of −.19 for job satisfaction and −.23 for organizational commitment (Griffeth, Hom, & Gaertner, 2000).

In addition, Kammeyer-Mueller et al. (2005) found that leavers who had experienced critical events prior to leaving differed in terms of satisfaction from individuals who had gone through the traditional progression-of-withdrawal process. Griffeth et al. (2008) further explained that shocks or image violations may also

[1] In somewhat more technical terms, with bad-fitting jobs being terminated, the two subgroups adjust in terms of their predetermined probabilities to experience certain fit levels. Once the probability distribution is the same in the two subgroups, the recruitment effect is equalized.

reduce job satisfaction. Thus, we believe that parts of the recruitment effect on the turnover hazard will be mediated by job satisfaction (Paths a and b; Figure 2), whereas other parts will operate independently from satisfaction levels (Path c). In sum, we know that some turnover is likely to be job dissatisfaction initiated (T. W. Lee et al., 1999) and that job satisfaction itself is affected by recruitment source use. Testing for mediation would also add support for a key unfolding model premise: Some turnover is initiated through a nonaffective mechanism (e.g., shock, impulse, or image violation), whereas other turnover is mediated through affective mechanisms (e.g., job dissatisfaction).

> *Hypothesis 4:* The recruitment source effect on the turnover hazard will be partially mediated by job satisfaction (i.e., recruitment source will have both a direct and an indirect effect on the turnover hazard).

Method

Data and Sample

The study variables are taken from the German Socio Economic Panel Study (GSOEP). The GSOEP is a yearly panel that started in 1984. It is hosted by the German Institute for Economic Research. The Institute's homepage (http://www.diw.de) provides researchers with the survey questionnaires, working papers, statistical tools, and information in German and English. The panel is representative of the German resident population, and interviews are conducted face-to-face by employees of a social research institute. As summarized in Frick, Haisken-DeNew, Spieβ, and Wagner (2003), core questions asked every year include the following topics: (a) population and demography; (b) education, training, and qualification; (c) labor market and occupational dynamics; (d) earnings, income, and social security; (e) housing; (f) health; (g) household production; (h) basic orientation (preferences, values, etc.) and satisfaction; and (i) miscellaneous aspects of life.

We defined the population as employed individuals ages 18 to 65 years. The observation period was January 1993 to December 2001, starting 2 years after the German reunification (which took place in October 1990). We excluded left-censored observations, that is, job spells that were already in progress as of January 1993. The final data set covered a total of 9 years (108 months) and consisted of 2,706 individuals. As we allowed for repeated events, a total of 4,014 spells and 822 quits were observed. For multivariate analysis with time-dependent covariates, we divided the spells into smaller time units and thus into multiple data records (splits) for each spell. The final data set covers 2,706 individuals and 4,014 spells, which account for a total of 137,256 person-months (splits). The time unit of analysis is month, and time-varying values for covariates were assigned to the corresponding splits.

Measures

Turnover and tenure. Hire and turnover dates were collected through the interviews. Consistent with the theories of turnover described earlier, we focused only on voluntary turnover. Voluntary turnover events were coded 1 at the time they occurred, where tenure was measured in months. Respondents who were terminated involuntarily (e.g., were laid off or fired) were treated as censored observations. Respondents who had not quit by the final observation date had an unknown turnover date. These cases were also treated as censored observations.

Recruitment source use. Respondents were asked how they had found their current employment. Possible responses were the following: through the employment office, through a private employment agency, via an advertisement in the newspaper, by an advertisement on the Internet, through friends or relatives, by return to a former employer, other. Out of these options, we created a dummy variable, which was coded 1 for personal recruitment sources (friends, relatives, rehires) and 0 for formal sources (all other responses).

Job satisfaction. The GSOEP applies a single-item approach to measuring job satisfaction. In each panel wave, overall job satisfaction was captured on an 11-point rating scale ranging from 0 (*very dissatisfied*) to 10 (*very satisfied*). Single-item measures have been criticized for low reliability. However, studies have demonstrated satisfactory reliability and validity scores of single-item measures of overall job satisfaction (Wanous & Hudy, 2001; Wanous, Reichers, & Hudy, 1997). In the particular GSOEP case, Matiaske and Mellewigt (2001), in a study on the dynamics of job satisfaction, concluded from structural equation models that the GSOEP measure showed high construct validity.

Control variables. Previous turnover research has identified a broad range of important turnover predictors that need to be controlled for to rule out alternative explanations. Fortunately, a broad range of socioeconomic indicators are available with the GSOEP, which allowed us to robustly isolate the recruitment effect. The control variables are summarized in Table 1.

Analytical Techniques

We use two kinds of survival models. We estimated Cox regression models as suggested in the turnover literature to test

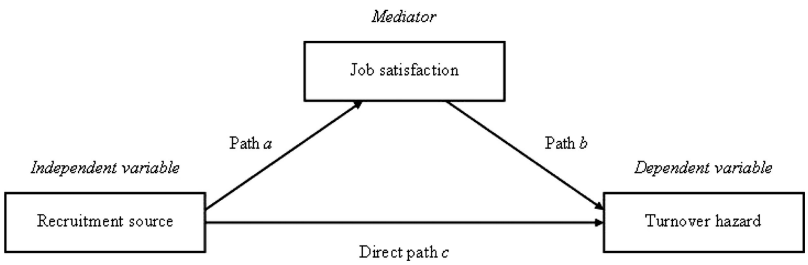

Figure 2. Direct and indirect effects of recruitment sources.

Table 1
Control Variables

Variable	Description
Age	Age has been consistently linked to turnover, with young employees showing the highest quit rates (Darden, Hampton, & Boatwright, 1987). Age was measured in months.
Education	Education is a source of individual movement capital and facilitates turnover (Trevor, 2001). Education was measured as the highest grade (total years of schooling) achieved by each panel year.
Promotions	Performance may influence turnover behavior (Salamin & Hom, 2005; Trevor, Gerhart, & Boudreau, 1997). Promotions have taken a salient role in the performance–turnover debate because they are visible signals of ability to alternative employers (Allen & Griffeth, 2001; Trevor et al., 1997). Promotions were counted at the times they occurred in a job.
Gender	Prior work on the unfolding model has found differences in the paths for men and women (Donnelly & Quirin, 2006). Further, in the German context, women usually do not quit for children-related reasons but tend to take a long-term parental leave. However, such observations are censored in our data and need to be controlled for. Gender was measured as a dummy variable (0 = male; 1 = female).
Nationality	To control for ethnic and national differences (Hom, Roberson, & Ellis, 2008), we created a dummy variable for nationality (0 = German, 1 = non-German).
Employment status	Full-time and part-time employed individuals are known to show differences in workforce participation (Hulin, Roznowski, & Hachiya, 1985). We thus created a time-dependent dummy control variable (0 = part time; 1 = full time).
Prior jobs[a]	To control for the employment history of the sample members, we counted the individuals' numbers of prior jobs registered during the observation window.
Prior quits[a]	We also counted the total number of prior quits as registered during the study window (Judge & Watanabe, 1995).
Pay level	Pay level consistently influences turnover (Gerhart & Rynes, 2003). We created the monthly pay level, corrected the measure for inflation, and translated it into Euro currency (for the years 1993 to 2000, the unit was the German Mark).
Relative pay ratio	We followed Trevor's (2001) advice and included a time-dependent variable to capture the relative pay ratio, calculated as each individual's pay level relative to the mean occupation pay level. The mean occupation pay level was calculated at the two-digit level of the ISCO-88 scheme as used in the GSOEP.
Region	The state of the labor market is a prominent predictor of turnover behavior (Gerhart, 1990; T. H. Lee et al., 2008; March & Simon, 1958; Trevor, 2001). The GSOEP differentiates East from West German subsamples (Spieβ & Pannenberg, 2003), and there is evidence of significant differences between the two labor markets (Andreβ, 1996). We therefore created a region dummy (0 = East Germany; 1 = West Germany).
Unemployment rates[b]	We used yearly regional unemployment rates for the 97 German planning regions "Raumordnungsregionen (ROR)" to control for labor market activity.
Population density	As a second measure, we calculated regional population density (inhabitants per square kilometer) in ROR to control for sparsely versus densely populated areas.
Calendar time	We used year dummies to control for business cycle effects (for all years from 1993 to 2001, reference year: 2000).

[a] Because we allowed multiple events for each survey participant, we included two control variables for employment history (Allison, 1984; Trevor, 2001). In addition, we used a robust estimator in the Cox regression models (Lin & Wei, 1989) that accounts for the clustered data structure (spells nested within individuals). ISCO-88 = International Standard Classification of Occupations (3rd version). [b] ROR (Raumordnungsregionen) are geographic aggregates larger than municipalities but smaller than administrative districts and states. They usually consist of a major city and its surroundings and are frequently used in comparative regional research in Germany. Data are provided by the BBR (Federal Office for Building and Regional Planning) and can be matched onto the GSOEP (German Socio Economic Panel Study) data via regional codes provided by the GSOEP research group.

Hypotheses 3 and 4 (Morita, Lee, & Mowday, 1993). The hazard function of the Cox model is given by $r(t, x) = h(t) \exp(\beta x)$, where $h(t)$ denotes the baseline hazard, x is a vector of (time-dependent) covariates, and β is a vector of regression coefficients (Blossfeld & Rohwer, 2002; Cox, 1972). Because the model is semi-parametric, it does not impose distributional assumptions on the data. The flexible form of the Cox model is desirable in many ways. However, because we are interested in the shape of the turnover hazard function (Hypothesis 1), the model does not inform us, because the baseline function $h(t)$ remains unspecified. Second, the Cox model is a proportional hazards model, which means that the (unspecified) hazard functions for subgroups of the observed population (i.e., for different covariate levels) have the same shape and peak. Thus, Cox regression does not account for temporal variations in the hazard functions conditional on covariate levels. Therefore, we decided to use a fully parametric approach to test Hypotheses 1 and 2 and applied a generalized log-logistic hazard model. This model was recently introduced to the turnover literature by T. H. Lee et al. (2008), who found that turnover functions differed for various types or destinations of voluntary leavers. The model is particularly flexible in that it allows researchers to model both monotonically declining as well as inverted U-type hazard functions (Brüderl & Diekmann, 1995). The hazard function of the model is given by the following formula (Brüderl, 1991; Brüderl & Diekmann, 1995):

$$r(t, x) = b\frac{p(\lambda t)^{p-1}}{1 + (\lambda t)^p}, \quad b, p, \lambda > 0$$

The model has three parameters: b controls for different levels of the hazard function, p controls for different shapes of the hazard function, and λ controls for the time of the hazard maximum. The model can be estimated with the Transition Data Analysis (TDA) software provided by Rohwer and Pötter (2002). TDA uses exponential link functions for the model parameters by which covariates can be entered into the model. For example, b is a function of type $\exp(\beta_0 + x(t)\beta)$, with β_0 as the constant, $x(t)$ as a vector of time-dependent covariates, and β as a vector of coefficients. If covariates are entered into the b parameter only, the model is a proportional hazards model, with $b = \exp(\beta_0 + x(t)\beta)$, $\lambda = \exp(\gamma_0)$, and $p = \exp(\pi_0)$, and estimates can be compared with those derived from the Cox model. By entering covariates into the parameters, the effects of level, time, and shape can be separated. If no covariates are specified, only constants are estimated.

Results

Table 2 reports descriptive statistics and correlations for all variables except year dummies. Descriptive statistics and correlations are based on the original variable metrics; in multivariate models all variables except dummies are standardized.[2]

Table 3 shows the log-logistic estimates, and Table 4 reports the results of the Cox models. For the log-logistic models, Model 1 is a null model without covariates (i.e., with parameter constants only). In Model 2, all variables except recruitment sources were added to the b parameter. In Model 3, recruitment source was added to both the b and λ parameters, and thus level and time effects were separated. For the Cox models, Model 1 contains control variables only. In Models 2 and 3, we added recruitment sources and job satisfaction, respectively. Model 4 captures recruitment and satisfaction effects simultaneously. In Model 5, we included the interaction of recruitment sources with tenure. Note that log-logistic Model 2 and Cox Model 3 are proportional hazard models, with identical covariate vectors.

The Cox Model 1 holds the complete set of control variables. In contrast to U.S. data (e.g., Trevor, 2001), and as expected, women had a lower turnover hazard than men in our sample. Whereas the total number of prior jobs did not influence the turnover hazard, we found a positive effect of prior quits on turnover (Judge & Watanabe, 1995). Age lowered the turnover hazard. Education served as a facilitator (individual movement capital) to mobility. A higher pay level lowered the turnover hazard, whereas a higher pay ratio indicated better labor market opportunities and worked in the opposite direction (Trevor, 2001). However, promotions were not statistically significant in this sample. High unemployment, and presumably a tight job market, lowered the turnover hazard (Gerhart, 1990; March & Simon, 1958). Similarly, the turnover hazard increased with population density. All covariate effects occurred in the expected direction, supporting the validity of our approach. In addition, all effects were robust independent of the job satisfaction and recruitment source effects added later.

Curvilinear Tenure–Turnover Relationship

To test Hypothesis 1, that the turnover hazard function has an inverted U-type shape, we examined the p-constant estimates in log-logistic Models 1 through 3 (see Table 3). If p is smaller than or equal to unity ($p \leq 1$), then the hazard function is monotonically decreasing; if p is significantly bigger than unity ($p > 1$), then the hazard function has an inverted U-type shape (Brüderl & Diekmann, 1995). Thus, by observing p, we could test Hypothesis 1. In Model 1, the shape parameter equaled $p = \exp(.48) = 1.62$, and the estimate was significantly bigger than unity ($p < .001$). Without controlling for covariate effects, the observed shape may be spurious because of unobserved heterogeneity (Blossfeld & Rohwer, 2002). However, we did not find significant changes in the p parameter across Models 1 through 3 independent of the set of covariates. Because parametric estimates may be biased under wrong distributional assumptions (i.e., faulty specifications of the shape of the hazard function), we conducted two more checks to confirm the result. If the inverted U-shape were spurious, it is very likely that coefficient estimates would also be biased. We thus compared the log-logistic Model 2 (Table 3) with the corresponding Cox Model 3 (see Table 4), which is not subject to distributional restrictions. All regression coefficients (except for the intercepts, which are picked up by the Cox model baseline hazard function) were virtually identical, thus indicating good model fit. Second, we performed a graphical check of pseudoresiduals, which also supported our assumptions (i.e., it showed a straight line through the origin, with slope -1; cf. Blossfeld & Rohwer, 2002). Thus, Hypothesis 1 received support.

Recruitment Effects and the Unfolding Model of Turnover

In log-logistic Model 3 (see Table 3), the recruitment source variable was added to both the b and λ parameters. This allowed us to test Hypothesis 2, which posited that the use of personal recruitment sources was associated with a later peak of the turnover hazard than was the use of formal recruitment sources. The recruitment effect on the level of the turnover hazard was negative, as expected ($\beta = -.27$), suggesting that hires from personal recruitment sources have a lower turnover risk. The time effect of personal recruitment sources on the turnover hazard was $\gamma = -.60$ and therefore consistent with Hypothesis 2. The hazard function for personal hires peaked later as compared with the curve of formal source users. The estimate mirrored an 83% temporal shift of the hazard function (a one-unit increase in an independent variable in the λ parameter translates into a shift of the time of the hazard maximum equal to $[\exp(-\gamma) - 1] \times 100\%$; Brüderl & Diekmann, 1995). Table 5 summarizes the log-logistic estimates. Relative to their level effect, recruitment sources have a stronger time effect on the voluntary turnover process: The time effect ratio was 16.97/9.27 = 1.83, whereas the level effect ratio was only .0099/.0076 = 1.30; the time effect was thus 1.83/1.30 = 1.4 times

[2] Note that with split survival data (multiple records per spell), descriptive statistics and correlations cannot be interpreted in a straightforward manner. Rather, means and correlations are biased by spell length (i.e., longer spells are overstated because they are represented by a higher number of splits). The low turnover mean ($M = 0.006$) is based on 822 quits in 137,256 person-months. However, the actual turnover rate is given by 822 quits in 4,014 spells (approximately 20%). Similarly, because month is the time unit of analysis, turnover hazards are quit propensities for a given month. Thus, seemingly low turnover hazards may translate into relatively high yearly quit rates.

Table 2
Means, Standard Deviations, and Correlations

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Region	.65	.48	—														
2. Nationality	.13	.33	.25	—													
3. Gender	.51	.50	.05	−.05	—												
4. Employment status	.78	.42	−.16	.03	−.44	—											
5. Prior jobs	.40	.73	−.05	−.05	−.05	.03	—										
6. Prior quit spells	.17	.44	.07	−.03	−.02	.01	.64	—									
7. Age[a]	423.24	118.16	−.15	−.10	.00	−.14	.02	−.05	—								
8. Education	11.96	2.47	−.12	−.23	−.07	.06	.02	.01	−.01	—							
9. Promotions	.02	.15	.05	.01	.01	.02	−.04	−.02	−.02	.09	—						
10. Pay level[b]	18.19	10.91	.17	−.01	−.41	.44	−.01	.03	−.02	.38	.11	—					
11. Pay ratio	1.00	.56	.14	−.02	−.33	.42	−.01	.03	−.02	.33	.09	.92	—				
12. Population density[c]	4.07	5.30	.13	.15	.04	−.05	−.02	.01	−.01	.01	.04	.06	.06	—			
13. Unemployment rate	11.90	4.76	−.80	−.24	−.04	.13	.04	−.08	.09	.12	−.03	−.14	−.12	−.05	—		
14. Job satisfaction	7.00	1.95	.06	.01	.01	.02	.02	.06	−.11	.05	.00	.09	.08	.00	−.04	—	
15. Personal recruitment source	.35	.48	−.03	.00	.00	−.06	.08	.07	.02	−.04	.01	−.07	−.07	.00	.01	.04	—
16. Voluntary turnover[d]	.006	.08	.02	.01	.00	−.01	.01	.02	−.02	−.01	.00	−.01	−.01	.01	−.02	−.03	.00

Note. $n = 137{,}256$ person-months or splits (4,014 spells, 822 events); year dummies excluded (full table available upon request from the first author); correlations with absolute values $r \geq .01$ are significant at $p \leq .05$; recruitment sources coded 1 for personal recruitment, and 0 for formal recruitment sources.
[a] In months. [b] In Euro/100 per month. [c] In inhabitants/100 km^2. [d] Based on 822 events in 137,256 person-months (compare Footnote 1).

as large as the level effect (Table 5). Figure 3 illustrates hazard and survival functions of formal and personal recruits (estimates are taken from Model 3, Table 3). As expected, the curve for personal hires was flatter and peaked later in comparison with the curve for formal hires (compare Figure 1). In sum, Hypothesis 2 was fully supported.

With Hypothesis 3, we explored whether tenure would moderate the effect of personal (as compared with formal) recruitment sources on the level of the turnover hazard such that the recruitment source effect would decrease with tenure. As can be seen in Table 4, the Cox models are reported hierarchically, from the least restricted (Model 1) to the most restricted (Model 5). In Model 5, we added the Recruitment Source × Tenure interaction. In line with Hypothesis 3, the recruitment effect decreased over time. As the time unit of analysis was a month, the recruitment effect was leveled after approximately .33/.0081 = 41 months (the four-digit interaction was $\beta = .0081$). The interaction was positive as expected, and Hypothesis 3 received support.

Hypothesis 4 posited that the recruitment source effect on the turnover hazard would be partially mediated by job satisfaction. To test this, we added the recruitment variable to Cox Model 2 (Table 4). Personal recruitment source had a negative coefficient of $\beta = -.18$, which means that personal recruitment lowered the turnover hazard by approximately $[\exp(-.18) - 1] \times 100 = 16\%$ (a one-unit increase in an independent variable in the *b* parameter shifts the turnover hazard level by $[\exp(\beta) - 1] \times 100\%$). When job satisfaction was also accounted for (Model 4), the effect size dropped to −.14. In both Model 2 and Model 4, the recruitment effect was significant, and we could thus confirm a direct effect on the turnover hazard. Because the recruitment effect was lower in the full model as compared with the reduced model, partial mediation existed, and the difference in coefficients indicated the amount of mediation (Alwin & Hauser, 1975).

Taken from Cox Models 2 and 4, the difference in the recruitment coefficients amounted to $-.1753 - (-.1439) = -.0314$. The direct effect of recruitment sources on turnover was −.1439 ($p < .05$), and the indirect effect was −.0314 ($p < .001$). Several methods have been suggested for deriving the confidence interval of the indirect effect. A well-known method, Sobel's (1982) test, uses the product of the Path a and b coefficients as the effect size (compare Figure 2), along with the path estimates and their standard errors, to calculate the confidence interval. However, the test has been criticized for a few reasons (e.g., Shrout & Bolger, 2002). Simulation studies suggest the value of alternative test statistics (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Following these suggestions, we calculated the Freedman and Schatzkin (1992) statistic, which uses the difference in coefficients as the effect size and defines the standard error of the indirect effect by

$$se_{(c-c')} = \sqrt{\sigma_c^2 + \sigma_{c'}^2 - 2\sigma_c\sigma_{c'}\sqrt{1 - \rho_{XI}^2}},$$

where c and c' are the direct recruitment effects in the reduced and full models, respectively; σ is the standard error of the path estimates; and ρ_{XI} is the correlation between the independent variable and the mediator. The test follows a *t* distribution, with $df = N - 2$. This procedure yielded an indirect recruitment effect

Table 3
Generalized Log-Logistic Models of Voluntary Turnover

Variable	Model 1		Model 2		Model 3	
	b	*SE*(*b*)	*b*	*SE*(*b*)	*b*	*SE*(*b*)
p parameter (shape)						
Constant	.48	.06*	.45	.06*	.50	.06*
b parameter (level)						
Constant	−4.57	.04*	−4.79	.17*	−4.65	.18*
Year dummies			yes		yes	
Region			.22	.13	.19	.13
Nationality			−.11	.11	−.10	.10
Gender			−.38	.08*	−.38	.08*
Employment status			.03	.11	.01	.11
Prior jobs			.01	.05	.01	.05
Prior quit spells			.11	.04*	.12	.04*
Age			−.31	.04*	−.31	.04*
Education			.10	.04*	.09	.04*
Promotions			−.20	.31	−.20	.31
Pay level			−.56	.11*	−.56	.11*
Pay ratio			.20	.09*	.21	.09*
Population density			.10	.03*	.10	.03*
Unemployment rate			−.28	.06*	−.28	.06*
Job satisfaction			−.37	.03*	−.36	.03*
Personal recruitment					−.27	.08*
λ parameter (time)						
Constant	−2.60	.14*	−2.80	.17*	−2.49	.16*
Personal recruitment					−.60	.17*
Log likelihood	−4,979.04		4,805.72		4,797.48	
Likelihood ratio (χ^2)	99.67*		346.65*		16.49*	

Note. n = 137,256 person-months or splits (4,014 spells, 822 events), with raw coefficients presented. All variables except dummies are standardized. All year dummies were nonsignificant ($p > .05$). The full table is available on request from Ingo Weller. Recruitment sources are coded 1 for personal recruitment and 0 for formal recruitment sources. Likelihood ratio tests: Model 1 in reference to the exponential null model; Model 2 in reference to Model 1; Model 3 in reference to Model 2; in each case, nested models had degrees of freedom equal to the number of additional parameters.
* $p \leq .05$ (two-tailed tests for control variables, one-tailed tests for hypothesized effects).

of $(c - c') = -.0314$ ($t = -11.27$), and Hypothesis 4 (partial mediation) was supported.[3]

Discussion

In response to calls to integrate the role of time in turnover theories (Holtom, Mitchell, Lee, & Eberly, 2008; Mitchell & James, 2001; Steel, 2002), this study examined the level and time effects of different recruitment sources on organizational tenure. Overall the results indicate that the turnover hazard function is lower early in an employee's tenure for individuals recruited through personal sources than for individuals recruited through formal sources. Moreover, the peak of the turnover hazard was delayed (from 9 months for employees recruited through formal sources to 17 months for those recruited through personal sources). However, the turnover rate differential due to the use of personal recruitment methods clearly diminished as tenure increased. The theoretical and practical implications of these findings are discussed below.

Theoretical Implications

Traditional theories have conceptualized turnover as a deliberate decision process during which dissatisfied individuals look for better alternatives and quit once a better option is at hand (Mobley, 1982). In contrast, the unfolding model assumes that dissatisfaction is not the only, and maybe not even the most important, driver of workplace quits. T. W. Lee and Mitchell (1994) instead argued that a shock may cause quits that are not mediated by affect. T. W. Lee et al. (1999) found that shock-induced paths unfold at a faster pace than do job dissatisfaction–initiated paths. With the present study, we contribute to the unfolding model literature by focusing on how the recruitment source may influence both the rate and timing of turnover—especially early in a person's tenure when turnover rates are highest.

[3] As a robustness check, we calculated three alternative test statistics for mediation also recommended by MacKinnon et al. (2002), and all of them were in support of Hypothesis 4. Following Baron and Kenny's (1986) definition of mediation (cf. Kenny, Kashy, & Bolger, 1998), we also estimated the recruitment source–job satisfaction effect, and found it to be $b = .0855$ ($p < .01$). This estimate is close to the expected effect size, which can be derived from the Cox models (Table 4) as $a = (c–c')/b$ or $a = -.0314/-.3637 = .0863$. Using the recruitment source–job satisfaction effect for Path a in Figure 2, we found that the Cox model estimate for Path b, and Sobel's (1982) method also yielded a significant indirect effect: $ab = -.0311$, $SE(ab) = .0116$, $z = -2.68^{**}$.

Table 4
Cox Models of Voluntary Turnover

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	b	*SE*(*b*)	*b*	*SE*(*b*)	*b*	*SE*(*b*)	*b*	*SE*(*b*)	*b*	*SE*(*b*)
Year dummies	yes		yes		yes		yes		yes	
Region	.16	.14	.15	.14	.22	.13	.21	.13	.20	.13
Nationality	−.12	.11	−.11	.11	−.11	.11	−.10	.11	−.10	.11
Gender	−.41	.08*	−.42	.08*	−.38	.08*	−.38	.08*	−.38	.08*
Employment status	.06	.12	.05	.12	.03	.11	.02	.11	.01	.11
Prior jobs	.02	.05	.02	.05	.01	.05	.01	.05	.01	.05
Prior quit spells	.09	.04*	.09	.04*	.12	.04*	.12	.04*	.12	.04*
Age	−.27	.04*	−.27	.04*	−.31	.04*	−.31	.04*	−.31	.04*
Education	.09	.04*	.09	.04*	.10	.04*	.10	.04*	.10	.04*
Promotions	−.16	.28	−.15	.28	−.20	.27	−.19	.27	−.21	.27
Pay level	−.62	.11*	−.63	.11*	−.56	.11*	−.56	.11*	−.56	.11*
Pay ratio	.21	.09*	.22	.09*	.20	.09*	.21	.09*	.21	.09*
Population density	.11	.03*	.11	.03*	.10	.03*	.10	.03*	.10	.03*
Unemployment rate	−.30	.07*	−.30	.07*	−.28	.06*	−.28	.06*	−.28	.07*
Personal recruitment			−.18	.07*			−.14	.07*	−.33	.12*
Job satisfaction					−.37	.03*	−.36	.03*	−.36	.03*
Personal Recruitment × Tenure									.01	.00*
Log likelihood	−6,242.047		−6,239.300		−6,176.279		6,174.444		6,172.339	
Likelihood ratio (χ^2)	214.98*		5.49*		131.54*		135.21*		4.21*	

Note. $n = 137{,}256$ person-months or splits (4,014 spells, 822 events), with raw coefficients and robust (person-clustered) standard errors (Lin & Wei, 1989) presented. All variables except dummies are standardized; all year dummies were nonsignificant ($p > .05$). The full table of data is available upon request from Ingo Weller. Recruitment sources were coded 1 for personal recruitment and 0 for formal recruitment sources. Likelihood ratio tests: Model 1 in reference to the null model; Models 2, 3, and 4 in reference to Model 1; Model 5 in reference to Model 4; nested models with degrees of freedom equal to the number of additional parameters.
* $p \leq .05$ (two-tailed tests for control variables, one-tailed tests for hypothesized effects).

In our analysis, the highest hazard level of newcomers from formal search sources was .0099, as opposed to personal source users, who faced a hazard maximum of .0076 (see Table 5). These numbers translate into a significant turnover rate differential: A turnover hazard of .0099 translates into a yearly turnover rate of approximately 12%, and a hazard of .0076 results in yearly turnover of 9%. This equals a rough multiplier of 9/12 = 0.75 (or 25% less turnover for personal as compared with formal recruitment sources).[4] Past research has concluded that personal recruitment sources are superior to formal sources based on the analysis of turnover rates (Zottoli & Wanous, 2000). However, a number of prior studies have reported just the opposite, most often when observing tenure, rather than turnover rates, as the outcome (Caldwell & Spivey, 1983). Indeed, we observed that whereas the turnover hazard for people recruited through personal recruiting sources was initially lower than for those recruited through formal sources, after approximately 24 months, that pattern was reversed (see top graph of Figure 3). Only by combining this analysis with the survival functions depicted in Figure 3 (bottom graph) does the full story emerge. Overall, the cumulative picture, as demonstrated by the survival functions after 5 years, suggests the superiority of personal recruitment sources. By examining both the level and timing of this effect, the present study helps to reconcile conflicting prior results.

A second implication is more technical in nature. Hypothesis 3 posited that tenure would negatively moderate the recruitment effect on the turnover hazard level. Our Cox model estimate showed that the recruitment effect would be equalized after 41 months, which appears to be a rather low effect size in terms of

Table 5
Level and Time Characteristics of Hazard Functions for Recruitment Sources

Parameter	Formal recruitment	Personal recruitment
Model parameter		
b (level)	0.0117	0.0090
p (shape)	1.6504	1.6504
λ (time)	0.0831	0.0454
Hazard maximum (level) $r(t_{max})$	0.0099	0.0076
Hazard maximum (time) t_{max}	9.27	16.97

Note. Parameters were calculated from mean values of covariates (i.e., zero for standardized variables). Dummies coded values for West German and full-time workers; coefficients are from Model 3 (Table 3); values were calculated as follows (Brüderl & Diekmann, 1995):

$$r(t_{max}) = b(p - 1)^{\frac{p-1}{p}}$$

$$t_{max} = \frac{1}{\lambda}(p - 1)^{\frac{1}{p}}$$

Time unit of analysis is month; a time-constant turnover hazard level of 0.0099 would thus translate into a yearly turnover rate of approximately 12%.

[4] We add that this ratio serves illustrative purposes only. Whereas in a proportional hazards model (whether Cox or log-logistic), the hazard ratio between subgroups is the same (i.e., the rates are proportional) at any time of the process, our model gives up the proportionality assumption. Thus, hazard ratios vary across given points of time of the process.

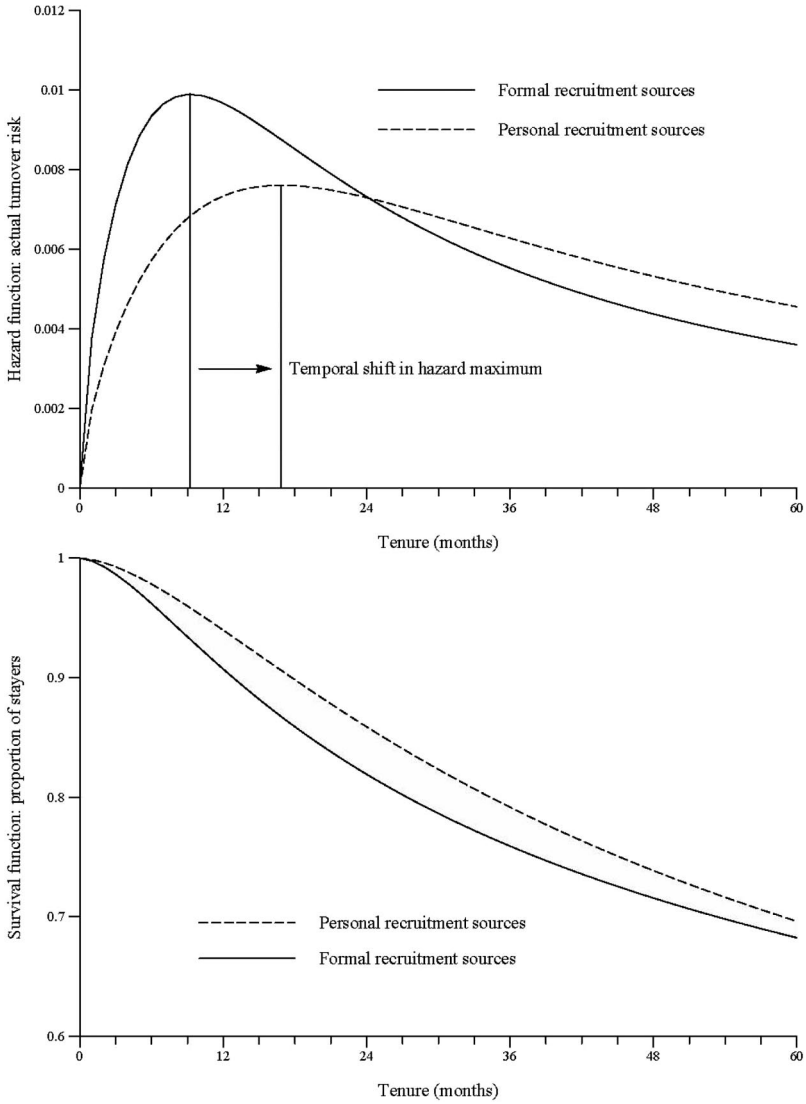

Figure 3. Hazard and survival functions for types of recruitment sources.

"practical significance" (Cohen, 1994; Kirk, 1996). Although the Recruitment Source × Tenure interaction releases the proportionality assumption, the Cox model is still inflexible because the hazard maxima for the disproportional subgroup functions are forcefully modeled at the same time. We believe that the more flexible log-logistic model is more appropriate here. It shows that the curves may intersect much earlier, that is, after 24 months. In fact, significant timing effects in the log-logistic model indicate a violation of the proportional hazards assumption. In our case, however, such violations did not result in visible coefficient biases of the Cox model estimates.

Whereas we posited that tenure would moderate the recruitment effect on the turnover hazard, we did not necessarily predict that the curves would intersect, nor did we offer an a priori suggestion as to when the effect would be equalized. In line with the unfolding model, we believe there are two explanations for why the hazard functions intersect. In both cases, we note that personal recruits are likely to have higher expectations for fit prior to organizational entry as compared with formal recruits. First, well-informed individuals are not immune from shocks. Moreover, such shocks may be even more "shocking" when expectations for fit are high. If we are correct that the two groups differ in their probabilities for an early role shock but do not differ in their probabilities for other types of shocks (e.g., family reasons for quitting or a firm merger) that may occur randomly over one's career, then the curves are in line with this argument. Second, well-informed individuals will be strongly committed to their job choices because choices are perceived as volitional when information is complete and accurate (Blau, 1993; Salancik, 1977). Dissatisfaction may nevertheless arise for various reasons as depicted in the standard turnover models and in Path 4 of the unfolding model. Whereas some job dissatisfaction may be cognitively manipulated and adjusted to the job choice decision (O'Reilly & Caldwell, 1981), we cannot assume that negative attitudes are entirely adjusted. As a conse-

quence, individuals from personal recruitment sources are likely to show comparatively higher levels of frustration when they realize that their jobs do not fit their pre-entry expectations. Because the job dissatisfaction–initiated turnover path is generally more time consuming (T. W. Lee et al., 1999), the effect will commence later in such persons' careers and, as a result, the hazard functions intersect.

Another implication of this research arises in the context of the attraction–selection–attrition (ASA) model (Schneider, 1987). The results suggest that organizations should increase their personal recruitment efforts if they want to increase the probability of retaining incoming employees. As they increase personal recruitment efforts, the effects of the attraction–selection–attrition model may become even more pronounced. For example, Ployhart, Weekley, and Baughman (2006) recently proposed multilevel theory and found evidence to demonstrate the structure and function of personality homogeneity. In particular, they found that individual-, job-, and organization-level mean personality were related to job satisfaction. Given the central role that job satisfaction plays in most turnover theories as well as in the mediation results found in the current study, there are important theoretical implications. Personal sources are more likely to provide high-quality information to new recruits and to offer rich channels for conveying personality fit information (Miller & Jablin, 1991). Thus, the use of personal recruitment sources may further strengthen the effects of the attraction–selection–attrition model with implications for job satisfaction and subsequent turnover. Further empirical testing is clearly warranted.

This research also points to the importance of explicitly integrating time into leading turnover theories (Kammeyer-Mueller et al., 2005). For example, meta-analyses (Griffeth et al., 2000; Tett & Meyer, 1993) reported moderate negative correlations between tenure and turnover. Such meta-analytic results, however, were based on correlations and do not fully account for potential nonlinearity and sampling problems with tenure data (Steel, 2002). Moreover, prior studies have not theoretically elaborated why different shapes of hazard functions may emerge, that is, to say how and why the relationships between time and turnover and between the independent variables and turnover may change across a person's career (a recent exception is T. H. Lee et al., 2008). In short, this study points to the need to clarify time dependence in the turnover process in the future—both theoretically and empirically.

Practical Implications

On the basis of the findings of this study, organizations suffering from high levels of premature turnover will likely benefit most from implementing and institutionalizing referral and rehiring practices. For example, Noe, Hollenbeck, Gerhart, and Wright (2006) reported that Whirlpool informs its employees via Intranet-based databases on vacancies to be filled and rewards successful recommendations. Such practices may help retain valued employees and at the same time act as incentives for current employees for prescreening the labor market. Some organizations may nevertheless prefer formal attraction and recruitment practices (news ads, employment agencies). Organizations may also want to use formal intermediaries because the number of vacancies to be filled is very large, or because job and skill prerequisites do not match a referral system. In such instances, organizations should consider using a relational approach to employee socialization rather than an informational approach (Allen, 2006; Bauer, Morrison, & Callister, 1998; Rollag, Parise & Cross, 2005). Because prior research has demonstrated that most employees value social learning and interaction (Allen, 2006; Ostroff & Kozlowski, 1992), relational socialization tactics might be helpful to avoid initial role shocks of newcomers. By helping new hires without prior personal contacts with organizational members to rapidly establish a network of relationships with coworkers, organizations may be able to help the newcomers more easily access the information they need to become productive (Van Maanen & Schein, 1979). Such coworker relationships will be instrumental in helping the newcomers to figure out issues that need to be addressed and to identify the important people in resolving a particular issue.

One way to assess the practical importance of this work is to estimate the cost savings that might result from increasing reliance on personal recruitment sources. Of course, such a calculation might vary considerably by industry and job level, so we present two quick examples to demonstrate the range of possible outcomes. First, consider the case of large national franchise operations in the fast food industry (e.g., Burger King, Domino's, Taco Bell) who hire at least 100,000 entry-level personnel every year. If we estimate first-year turnover conservatively at 80% (cf. Kacmar et al., 2006, p. 133) using formal recruitment sources, the number of quits is 80,000. If the turnover rate for personal recruitment sources is 25% less, the implied number of quits is $0.8 \times 0.75 = .60$, or 60,000. If the costs associated with these quits (exit interviews and paperwork, hiring and training a replacement) are $1,000 per employee (Zottoli & Wanous, 2000), the projected savings would be $\$1{,}000 \times (80{,}000 - 60{,}000) = \$20{,}000{,}000$. Again, this is a conservative estimate: Kacmar et al. (2006, p. 133) reported average turnover costs per (nonmanagerial) crew member in the fast food industry ranging from $500 to $3,600. Second, consider a medium-size computer services consultancy that employs approximately 10,000 employees and experiences industry average turnover of approximately 20%. Assume that the total costs of turnover are approximately 100% of annual salary for these employees (Hom & Griffeth, 1995) and that the salaries are approximately $100,000. If turnover were reduced from 20% (2,000 voluntary quits) to $0.2 \times 0.75 = 0.15$ (1,500 voluntary quits), the savings would be approximately $50,000,000 [$\$100{,}000 \times (2{,}000 - 1{,}500)$]. Although there will be some costs associated with increased personal recruitment efforts (e.g., incentives), they may be less than formal recruitment costs on a per-person basis and are likely to be much smaller than the potential retention benefits.

As suggested by our findings, the costs of turnover will vary according to both the rate and the timing. On the one hand, the earlier turnover occurs, the lower the investment in that individual's training and development. On the other hand, when an employee leaves soon after entering, the ex-ante and early ex-post transaction costs (e.g., search, selection, contracting and initial training costs) are spread over a shorter period and thus are relatively costly on a per-month-of-tenure basis. In industries and occupations with high early turnover rates, personal recruitment may be particularly helpful in saving money. HR managers and researchers must be aware that different career stages are associated with different types of turnover costs (e.g., ex-ante and

ex-post transaction costs) and that recruitment source usage and other retention measures might influence either single or multiple dimensions of those costs. From our analysis, we conclude that benefits from personal recruitment will be greatest in settings with high turnover rates during the first 24 months of the career.

Limitations

The present study has a number of potential limitations. First, turnover is not always harmful for organizations (Dalton, Todor, & Krackhardt, 1982). Indeed, the departure of low performers may even be desirable. Turnover researchers have demonstrated that both high and low performers are more likely to quit, and that promotions and wage growth are important moderators of the quadratic performance–turnover relationship (Salamin & Hom, 2005; Trevor, Gerhart, & Boudreau, 1997). Unfortunately, there is no direct measure of performance in the GSOEP data that we could use. However, we controlled for a wide variety of potential performance indicators and proxy variables, such as education, pay, pay ratio, and internal promotions (Trevor, 2001; Trevor et al., 1997). Moreover, in additional analyses, we tested whether these performance proxies influenced the turnover hazard function beyond level effects. When we entered the variables into the timing vector of the log-logistic models (step by step and jointly), none of them had a significant timing effect, whereas all of the level effects were robust as reported. In conclusion, we are convinced that the performance–turnover relationship is an important question to pursue but that our results do not hinge on this relationship.[5]

Second, the panel character of our data means that some variables were measured with relatively few items and in long intervals (i.e., once a year). This is typical in survival analysis with survey data, where continuous covariates are not measured with the same frequency as events. In such instances, Tuma (1982) suggested assuming linear changes in the covariates and then interpolating the data. When we reconstructed our data file and reran the models per this recommendation, we saw no material changes—all coefficients remained in the same direction, and all significance levels remained unchanged. We thus decided to keep the original information and not to interpolate. Another issue related to the use of this sample concerns external validity. It is possible that some aspects of the German labor market are different from those of other countries. For this reason, we have included extensive controls to model many of these potential differences, and although many are significant in the models, the pattern and strength of the results are basically unchanged when the controls are removed from the equations. Thus, we are convinced that the results are not a mere artifact of the German labor market setting, although we cannot precisely assess the degree of external validity. In general, we believe that it is necessary to generalize turnover research in multiple ways: First, following Salamin and Hom (2005), we find it important to generalize turnover research to countries other than the United States, and this study is one of only a few recent attempts. Second, we believe that turnover research can benefit from testing in a broad range of occupations and industries with representative and powerful (large) samples. However, such gains are naturally constrained because there are few such datasets available, and insights from the same sample have diminishing returns. Whereas a number of prior studies have used the National Longitudinal Survey of Youth (e.g., Dickter, Roznowski, & Harrison, 1996; Gerhart, 1990; Judge & Watanabe, 1995; T. H. Lee et al., 2008; Trevor, 2001), the GSOEP previously has not been used for the study of turnover. We find it both reassuring that most of our study variables behaved exactly as in the National Longitudinal Survey of Youth studies and promising that our hypotheses received support.

A third issue is that the GSOEP asks for the most important recruitment source only. It does not recognize that individuals may use multiple sources to find a job (Vecchio, 1995). While most prior studies have relied on the dichotomy of personal vs. formal sources, interaction between treatment effects (Williams, Labig, & Stone, 1993) can cause methodological problems. Such treatment effects may occur if individuals who used multiple search sources are classified into groups of single source users. Williams et al. (1993) showed that about one fifth of their population used multiple search sources, and an analysis of treatment effects revealed that random assignment of multiple source users to one of their sources resulted in an average change of turnover rates of 10%. However, Williams et al. concluded that "randomly assigning multiple-source users to just one of their recruitment sources is not the same as asking which recruitment source was most important in their decision to apply for a job" (p. 169). Thus, treatment effects may be considerably smaller if multiple source users are assigned to their most important recruitment source. In short, although we believe that our approach is conservative, future studies should focus on both the importance of search sources and their potential multiple usage (i.e., combination).

Fourth, we did not measure all of the mediating mechanisms between recruitment source and turnover. Building on the work of others, we theorized that multiple mechanisms operate during the early period of a person's tenure. The explanations include person–job/person–organization fit (e.g., Kristof, 1996), self-selection (e.g., Kammeyer-Mueller & Wanberg, 2003), individual differences (e.g., Schwab, 1982), whether the job met expectations (e.g., Wanous, Poland, Premack, & Davis, 1992), and shock-driven quits (Holtom et al., 2005; Kammeyer-Mueller et al., 2005). Although these theories overlap, they are not identical. In Hypothesis 4, we suggested that part of the recruitment effect on turnover is medi-

[5] This conclusion points in the same direction as a recent study by T. H. Lee et al. (2008). T. H. Lee et al. studied the turnover processes of specific types of leavers (leavers who quit (a) to take another job, (b) to search for another job, (c) to take an unsolicited job offer, or (d) for family reasons). In summary, these authors found that job satisfaction effects were less in Groups 3 and 4 as compared with Groups 1 and 2 and that the turnover hazard functions varied across groups. However, T. H. Lee et al.'s results fit well within the results reported here: First, quitters who left for an unsolicited job offer (likely high performers) had a similar hazard function (time of the peak) like leavers who traveled the traditional search and decision path—again, performance appeared to not alter the shape of the turnover hazard function. Second, from visual inspections of the hazard functions, T. H. Lee et al. reasoned that personal shocks (e.g., becoming pregnant) could occur at any time (randomly) during tenure, whereas organizational shocks would occur at more predictable times. Although T. H. Lee et al.'s results are in the same direction as ours, the GSOEP data did not allow us to model different reasons for quitting one's job (i.e., competing risks), either because of national or institutional differences (e.g., family reasons, gender differences) or because the needed information is unavailable. Future studies should certainly try to account for group differences among leavers.

ated by job satisfaction and that part of the effect operates directly through early shocks. Although mediation was confirmed, we did not measure the process by which it occurred. By proving a direct and an indirect effect, we narrowed down the set of explanations (i.e., multiple mechanisms exist), but we cannot determine which mechanism(s) contributed, and how much, to the direct and/or the indirect effect.[6]

To further address potential concerns about unmeasured mechanisms, we conducted additional validity checks. Maertz and Campion (2004) argued that "models should probably allow that affect can influence any decision, but that it may be more or less important to certain decision types." (p. 568). Following this rationale, and also our logic for the intersection of the hazard functions, we created personal and formal recruitment source subsamples and estimated the job satisfaction effect separately for each group (i.e., we tested the interaction effect of recruitment sources and satisfaction on the turnover hazard). According to theory, job satisfaction should have a stronger effect in the personal recruitment source group as compared with the formal group. In our models (for covariates, compare Cox Model 3, Table 4) the job satisfaction effect was $-.34$ ($p \leq .001$) in the formal recruitment group and $-.43$ ($p \leq .001$) in the personal recruitment group, and thus approximately 25% larger for personal recruits, which supports our logic. The interaction was not statistically significant, however (Wald test, $p > .05$). Although all of the reported results were in line with theory and robust to various validity checks, future research should nevertheless explore the mediating mechanisms from recruitment sources to turnover more closely, and should also take into account the potentially moderating effect of job satisfaction on the recruitment source–turnover path.

Finally, some methodological caveats merit attention. Parametric survival models are subject to a few potential pitfalls. For example, under wrong distributional assumptions, coefficient estimates may be biased. In many instances, Cox models will yield sufficient, identical, and/or even more accurate results. Thus, we do not intend to say that parametric models are always better. Instead, we believe that we have provided an example of how the generalized log-logistic model may be used to help answer questions that cannot be answered by Cox models.

Future Research

We have already posed some future research questions. First, more research needs to be done on the timing and strength of events (Elster, 2007). When do shocks occur? How severe will certain types of shocks be perceived? When do relations among covariates change, adjust, or reverse? The question of how strong an effect will be is definitely more challenging than the prediction of the sign of the relationship but also more informative. Second, some variables might have multiple roles, such as mediating and moderating, levels, and timing. Whereas the full complexity is unlikely to be captured in a single theoretical or statistical model, future studies should try to isolate some of the thus far underexplored facets of complex relationships.

A third important question involves the impact of recruitment source use on the selection of racially diverse candidates (Williams et al., 1993). Specifically, given that the social circles individuals occupy tend to be demographically similar, researchers should consider both the advantages and the disadvantages of using personal recruitment sources. Prior work has shown that minorities more often use formal recruiting sources (Kirnan, Farley, & Geisinger, 1989). Thus, reducing reliance on formal sources might reduce the number of minorities in the applicant pool. Alternatively, organizations with significant numbers of minority employees or concerted effort by a few might be able to emphasize personal recruiting to gain an advantage in attracting (Avery & McKay, 2006) and retaining minority talent (Friedman & Holtom, 2002).

Another issue to consider in future research is the impact of new technology. Specifically, organizations increasingly use the Internet to recruit, screen, and process applicants. Individuals seeking jobs are similarly using the Internet as one of their primary job search tools. While research on the main features of web sites is emerging, more fine-grained analysis is needed (Ployhart, 2006). One promising study by Dineen, Ling, Ash, and DelVecchio (2007) found that customizing information conveyed to potential applicants caused poorly fitting individuals to be less attracted to an organization. This points to the importance of dynamic, personalized aspects of formal recruitment sources. At this point, research speaks only to applicant attraction (Allen, Mahto, & Otondo, 2007). At some point, this technology may close or eliminate the gap between formal and personal recruitment. Clearly, studies that link this research theoretically and empirically to important outcomes such as performance or turnover will be highly valuable.

A last direction for future research involves the unfolding model (T. W. Lee & Mitchell, 1994). Future studies should analyze how the hazard functions of leavers from distinct paths to turnover differ. In the present study, we found that employees hired through formal sources were at a higher risk of separation early in their careers. Building on this, future research could specify ex-ante when certain shocks are likely to occur and thus predict the timing of peaks in hazard functions. Another way to build on the current research would be to capture shock or critical event data longitudinally for a large group of employees. Relating recruitment source to the number and intensity of shocks experienced as well as their influence on turnover hazards would provide additional linkages between the staffing and turnover literatures.

In conclusion, the aim of this research has been to expand theory and resolve conflicting prior results in the recruitment source literature by explaining and assessing the role of time. Absent such temporal specification, our theories may unintentionally distort the phenomena they are describing (George & Jones, 2000). We found that although the use of personal recruitment sources leads to lower initial turnover hazards and later peaks, the effects diminish and reverse over time. Building on the empirical integration of the temporal dimension into the recruitment and turnover research

[6] We note, however, that other researchers have similarly inferred the presence of one or more elements when testing the unfolding model (T. H. Lee et al., 2008). For example, Holtom et al. (2005) relied on reported "reasons for leaving" to infer the presence or absence of shocks. Further, some authors have experienced difficulties measuring shocks precisely. Donnelly and Quirin (2006) reported a relatively low rate of correct classification for shocks reported through interviews versus subsequent surveys (rs = .48 and .59 for two different interviewers).

presented in this article rather than treating time as a boundary condition may enable future research to predict in advance how turnover paths may vary in length (T. W. Lee et al., 1999) and explain why turnover predictors may change in effect strength during tenure (Dickter et al., 1996) rather than simply observing such. This will move research closer to providing answers that have business value (Ployhart, 2006).

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