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Transition to Entrepreneurship from the Public Sector: Predispositional and Contextual Effects

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Studies of career dynamics implicitly claim that government employees are not entrepreneurial. Utilizing longitudinal data from the U.S. Panel Study for Income Dynamics, we investigate the reasons for the low rate of entrepreneurship from the public sector. We conjecture that it is due to labor market matching processes and the bureaucratic nature of public organizations and bureaucratization of individuals. Our life-course analysis identifies labor market matching as a major determinant: nonentrepreneurial types choose public sector employment. We also uncover tenure and context effects, which decrease and increase the hazard rate of entrepreneurial exit, respectively. Whereas the former effect points toward adaptation and internal labor market sorting, the latter draws attention to exits due to frustration.

Key words: entrepreneurship; public sector; bureaucracy; endogeneity; tenure; sorting
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1. Introduction

Why is there a low rate of entrepreneurship out of the public sector? This is an important question with no established, definitive answer. It is important because dynamic adaptations of public organizations and public services are central to public welfare and social amelioration, and studies have identified entrepreneurial individuals as promoters, instigators, and drivers of change and innovation in standards, practices, policies, products, and services (Freeman 1986).

There is no definitive answer because scholars of entrepreneurship have typically focused inquiries into how, why, when, and where movements into entrepreneurship occur in the private sector context (e.g., Stuart and Sorenson 2003, Sørensen and Sorenson 2003) and neglect the public sector as a source of entrepreneurship. The few contributions that do investigate entrepreneurship in or from the public sector are exclusively focused on universities and academic scientists (e.g., Shane and Stuart 2002, Stuart and Ding 2006). However, even in a liberal economy, such as the United States, government (excluding university scientists) accounts for nearly 15% of total employment in 2007. Thus, a considerable portion of the workforce, with significant demographic and earnings heterogeneity, has been omitted from previous studies of entrepreneurship.

In this paper, we attempt to address this question comprehensively. We consider three potential drivers of entrepreneurial exit, which might explain the sector's low transition rate. We begin with the labor market, which is the point of entry into the world of organizations and the point where organizations systematically differ in terms of their preferences, abilities, orientations, and procedures in matching people to jobs (Baron 1984). We investigate whether this matching between types of individuals on the one side and organizations on the other has any bearing on entrepreneurial exit rates. We conjecture that labor market sorting matches public jobs to individuals that are predisposed not to become entrepreneurs, lowering the rate of entrepreneurship from the public sector. This predisposition angle and associated findings are important because there is a strong need for such studies of career mobility and particularly for research that probes the main effects of individual dispositions (Davies-Blake and Pfeffer 1989, House et al. 1996, Shane and Venkataraman 2000, Sørensen 2007a, Nicolaou et al. 2008).

At the same time, organizational scholars argue that if government differs from other management settings, it should be distinguished by the nature of the work or the environment, not by the individuals it attracts (Perry and Porter 1982). A low rate of entrepreneurial exit from the public sector, therefore, may be explained by the conditions in the system (McCain et al. 1983, Burton et al. 2002, Dobrev and Barnett 2005, Sørensen 2007a). We thus turn our attention to bureaucracy and bureaucratization of the individual. The public sector is epitomized by

"government bureaucracies [that] are more 'bureaucratic' than industrial ones" (Wilson 1989, p. 133). Public organizations embody all the core features of a bureaucratic system, including specialization, centralization, formalization, and an overemphasis on tenure and norms of impersonality, consistency, and objectivity. Public managers strive to build a "civil service culture" that defines the attributes of a "good public employee" and to establish the techniques of bureaucratic reason by which public employees must conduct themselves (Adler and Borys 1996, Williamson 1999, Dixit 2002).

We contend that organizational effects can be decomposed into a context effect and a tenure component. The context effect captures entrepreneurial exits prompted by dissatisfaction with working conditions. They are cumulated into the probability that "workers select themselves out of jobs in which their productivity is revealed to be low" (Jovanovic 1979, p. 973). The tenure effect evolves out of embeddedness in the organization over time. It emphasizes adaptation and internal labor market selection: individuals are highly responsive to organizational settings and situations. Those who remain in the same jobs for longer are those individuals who have been able to adopt or develop attitudes and abilities more consistent with organizational expectations and roles. Although both context and tenure emphasize the effect of the organization on the motivation and opportunity to become an entrepreneur, the tenure effect additionally emphasizes the organizational shaping of an individual's ability to pursue entrepreneurial endeavors.

We examine the impact of these mechanisms on entrepreneurial exit from a life-course perspective (Aldrich and Kim 2007) by analyzing the career choices of a large number of individuals in the United States between 1968 and 1999. We use a discrete hazard specification to model the first transition to entrepreneurship and correct for self-selection as a means to investigate the matching effect. This study contributes in three ways. First, we build labor market sorting behavior into the model, producing results that are not vulnerable to the problem of endogeneity manifested by entrepreneurial individuals selecting into particular types of organizations. Indeed, we confirm that nonentrepreneurial types are matched with public organizations. Additionally, we demonstrate that failing to apply a self-selection estimation method leaves the context effect substantially biased. In their analysis of public workers' decision to quit, Black et al. (1990) observe that most econometric models of job separation do not incorporate the potential sorting process of heterogeneity underlying the stay-leave decision, thus implicitly adopting only a "state dependence" perspective. The authors caution that "if self-selection is an important factor, the coefficients obtained are biased and policy implications potentially misleading" (Black et al. 1990, p. 246).

Our model and results add to this literature while demonstrating evidence of potential bias. The results of this study also contribute to the resolution of longstanding debate within the theory of entrepreneurship as well as organizational research as to whether predisposition significantly influences individual behavior such as entrepreneurial transition, or whether behavioral outcomes are profoundly determined by organizational structure, situations, and conditions under which individuals work (Davies-Blake and Pfeffer 1989, House et al. 1996). Second, we uncouple the context effect from the gradual adaptation effect of tenure for public sector employees. This allows us to derive more refined conclusions and stronger managerial and policy implications. Third, our framework is multilevel, cutting across individual psychodynamic attributes, familial contexts, and the broader macroenvironment, an orientation that is largely absent in the literature (Aldrich and Kim 2007, Sørensen 2007a). Thus, we are able to obtain more precise and detailed empirical estimates of how and in what direction the organizational settings matter.

2. Public vs. Private Employees: Labor Market Matching

A number of studies have confirmed the persistent existence of queues for U.S. government jobs even when there is no public sector earnings advantage (e.g., Krueger 1988, Heywood and Mohanty 1995). Moreover, this seems to be a persistent phenomenon. Krueger (1988) found the application rate for workers judged to be minimally qualified for prospective public jobs to be insensitive to unemployment rates. Also, research comparing the quality of employees entering the U.S. public and private sectors suggests that the public sector attracts higher-quality employees based on entrant quality as specified by education levels or aptitude test scores (e.g., Crewson 1995). Although such findings are informative about the supply side characteristics confronting public organizations in the labor market, they provide no direct evidence of the entrepreneurial propensities of entrants.

For more precise insights, we turn to the literature on civil service attitudes. Here there is considerable agreement on the basic behavioral dispositions of individuals working for the government. Public employees are collectively portrayed as being motivated by job security and stability. Relative to private employees, they are less concerned with challenge and autonomy and less keen on extrinsic rewards such as pay raises, performance awards, and health benefits. They place more value on the sense of impact, such as helping others and providing a service to society, than do

private sector employees. Public employees rate free time more highly and do not exhibit a willingness to do extra work (Perry and Porter 1982, Crewson 1995, Steinhouse and Perry 1996, Kurland and Egan 1999).

These stylized findings hint at inherent differences between employees in these sectors. They are at odds with behavioral attributes commonly conceived to drive entrepreneurialism (e.g., Zhao and Seibert 2006). However, the question remains whether these behavioral orientations are created by the organizational contexts and situations or whether public employees are predisposed. Most research in this vein is cross-sectional and suffers critical sampling, measurement, and methodological problems that prohibit distinction of the characteristics associated with public organizations from those associated with public employees. In our extensive survey of the research, we found only three papers that attempt to capture the sorting effects. Bellante and Link (1981) confirmed that individuals with a high degree of risk aversion would be more likely than others to seek employment in the public sector. Blank (1985) estimated the extent to which workers with different personal characteristics have different probabilities of choosing public versus private sector employment. Blank's findings indicate that those more concerned about job security seek jobs in the public sector. Heywood et al. (2002) found that job satisfaction was higher among public sector workers than private sector employees. However, once individual-specific elements were controlled for, the positive impact of the public sector disappears.

The literature on labor market matching conjectures that neither organizations' decision to recruit nor individuals' affiliation decision are random. Both parties make long-term decisions at the time of hiring. The individual-organization match corresponds to a match between individual dispositions and organizational properties. Individuals self-select into organizations that have behavioral constraints consistent with their own inclinations, and organizations select employees whose particular personal attributes are compatible with organizational expectations (e.g., Jovanovic 1979, Baron 1984, Fujiwara-Greve and Greve 2000). From this perspective, the alleged dispositions of public employees should reflect a priori parameters by which individuals delineate the distribution of potential employers, condition the direction of their job search, and eventually base their employment choices. Hence, people enter the public sector because they prefer job security, organizational stability, and free time; seek different rewards from their jobs than people entering private sector jobs; and are comfortable with working on low variety tasks in hierarchies and stratified environments. Because these behavioral tendencies are generally held to be paradoxical to the dispositional determinants of entrepreneurship, it can be hypothesized that public employees are nonentrepreneurial.

Hypothesis 1. *Predisposition to public employment decreases the hazard of entrepreneurial exit.*

3. Context Effect

Public bureaucracies are institutions of control and power within which individual discretion is limited by the existence of rules purporting to cover possible contingencies. Interpersonal relations are impersonalized. Individuals exhibiting good performance are rarely rewarded, and those displaying poor performance are rarely punished. Greater division of labor and the inflexible nature of hiring and promotion processes often reduce the possibilities for employees to do varied work (Meyer and Brown 1977, Wilson 1989).

The large body of literature on job satisfaction suggests that these contextual characteristics foster discontent among organizational members. Comparative research has revealed that public employees find their jobs relatively low in motivating potential and they experience substantially lower job satisfaction than do private employees. They report a strong and an unmet need for opportunities to achieve fulfilment at work and see their organizations as profoundly alienating (Perry and Porter 1982, Falcone 1991, Steinhouse and Perry 1996).

Research also shows that many public employees are especially dissatisfied with the intrinsic aspects of their work, their relations at work, and the low level of recognition for their contributions; they believe that continuing to work in the public sector constitutes a sacrifice on their part (Perry and Porter 1982, Steinhouse and Perry 1996). Chief among their concerns is the "diminished sense of impact." They perceive their personal influence on the organization to be small and feel that they are impeded from contributing to the value of public services (Perry and Porter 1982, Falcone 1991). As highlighted above, those who choose the public sector originally tend to have a greater interest in altruistic and ideological goals. They join the ranks of the civil servants to make a difference. The sense of inability to overcome the barriers of bureaucracy combined with widespread criticism of the quality of public services and difficulties involved in dealing with dissatisfied members of the public are detrimental to their organizational commitment (Steinhouse and Perry 1996, Falcone 1991).

We argue that the tensions between employees' idealism and the "cold face" of bureaucracy are likely to encourage entrepreneurial exits through job dissatisfaction (Freeman 1986). Public bureaucracies are hierarchical and strongly regulated structures, where employees' ability to implement what they see as

necessary organizational change is limited. Hence, although public employees might choose to continue in their employment, their constructive engagement in initiating and instituting change has limited potential to produce results.

Several factors make entrepreneurial exit a viable option. First, job matching theories suggest that a worker seeking to leave a bad match will seek to avoid another mismatch by searching for work conditions or organizations different from the current one (Jovanovic 1979, Fujiwara-Greve and Greve 2000), and studies show that private managers do not value the skills acquired in the public sector to the same degree that managers of public organizations do. Working in a public bureaucracy thus reduces the attractiveness of public workers in the labor market. For instance, employees who move from the public to the private sector receive lower earnings increases than workers who move in the other direction (e.g., Krueger 1988, Barnett et al. 2000). Second, compared to the private sector, the public sector has relatively lower re-entry barriers (Wilson 1989), which provides a potential safety net should the entrepreneurial pursuit fail. Third, because bureaucratic organizations are less able or willing to pursue internally generated entrepreneurial opportunities, there are individual incentives to take these opportunities to the market (Freeman 1986, Sørensen 2007a). Fourth, the entrepreneurship process is likely to provide psychological satisfaction to individuals who are deprived of a sense of influence in public organizations. With these considerations in mind, we hypothesize that:

Hypothesis 2. *The hazard of entrepreneurial exit is greater for public than for private employees.*

4. Tenure Effect

Many properties of bureaucratic organizations are inimical to the cultivation of entrepreneurial skills and enterprising individuals (e.g., Dobrev and Barnett 2005, Sørensen 2007a). The dysfunctional organizational barriers stressed in the extant literature also apply to public settings. We discuss the arguments surrounding entrepreneurial ability and the disincentives promoted by the public organization.

4.1. Tenure Effect on Entrepreneurial Ability

There is a mental connection with the emergence of entrepreneurial behavior, which should first and foremost encapsulate an entrepreneurial frame of mind (e.g., Shane and Venkataraman 2000, Sørensen and Sorenson 2003). The literature defines the appropriate cognitive schema as proactive, assertive, and critical of established processes. The "alert" individual must be mentally equipped to take on considerable economic, social, and psychological risk and assume full responsibility for the consequences. However, public sector norms and modes of reasoning, emphasis on systematic rules and procedures, and the institutionalized methods of organizing social conduct limit the development of entrepreneurial mindsets over time (Sørensen 2007a). The public sector culture suppresses the voices that challenge organizational norms and beliefs. Public managers do not tend to foster entrepreneurial environments in which creativity and experimentation thrive. New ideas or initiatives are sought episodically, usually in a top-down and highly controlled fashion. Public employees are expected to identify strongly with their work roles and be "conformist," "cohesive," and "collectivist" rather than "deviant," "self-directed," and "autonomous," the latter being the attributes of an entrepreneur (Wilson 1989). In addition, three pathological behaviors inscribed within the public sector culture might temper the flourishing of an entrepreneurial model. The overwhelming impulse to concentrate on immediate and observable outcomes (Dixit 2002) and the feeling that deference of problem solving and responsibility for decisions to supervisors is acceptable, which is promoted by the procedural norms and a lackadaisical stance toward work pace (Perry and Porter 1982). Thus, the longer the individual stays in the organization, the further these structural forces will distance him or her from the frame of mind required to become an entrepreneur.

Entrepreneurs must also be adept at scanning the environment for market opportunities and possess capabilities needed to exploit them (Burton et al. 2002). There are two factors that work against public employees in this regard. First, the absence of (intense) competition in public markets increases the degree to which organizations focus inward and erect information barriers that make it difficult for employees to glean information from the market for entrepreneurial quests. Low exposure to competition shelters employees from external labor market competition, locking them into passive and mechanistic patterns of behavior. The absence of competition limits the opportunity as well as the ability to forge diverse network ties across environments that could provide access to fine-grained information about entrepreneurial opportunities and facilitate resource mobilization (Freeman 1986, Stuart and Sorenson 2003, Shane and Venkataraman 2000).

Second, specialization, when coupled with formalization, leads to routinization and limits personal discretion at work. Moreover, specialization of skills and on-the-job training in public agencies increase the transaction and opportunity costs of leaving these organizations while reducing the chances of finding a good employment match. Barnett et al. (2000) documented that, during the period of study, intra-agency

job changes in the civil service in California were eight times more likely than interagency job shifts and that the salary increases related to the former were much larger than for interagency moves. Evidence also shows that public employees tend to be more mobile within than across sectors. Borjas (2003) reported that, between 1971 and 2001, the annual transition rate from the public to the private sector was just 2.5%, whereas the mobility rate within the public sector was greater than 19%. These "sticky" structural constraints contain exposure to varied problems and processes and heterogeneous learning. They undermine the development of personal initiative, problem-solving skills, and combinatory capabilities. They prohibit access to diverse resource networks and restrict the scope of opportunity exposure—all of which are key requirements for launching a new venture (Shane and Venkataraman 2000, Stuart and Sorenson 2003, Sørensen 2007a). Indeed, Lazear (2005) showed that the probability of being an entrepreneur is positively related to the number of an individual's different job roles over his or her career and the generality of skills possessed.

4.2. Tenure Effect on Motivation for Entrepreneurial Exit

Entrepreneurial ability is a necessary but not a sufficient condition. It must coincide with the motivation to pursue entrepreneurial opportunities. Several structural dynamics can generate disincentives by deterring the individual from breaking the career status quo.

First, tenure, promotion, and retention practices can constitute predicaments for the pursuit of an entrepreneurial endeavor. These mechanically fixed processes are designed to retain an employee within the public sector (and within the port of entry) for as long as possible. Studies estimate that the probability of unemployment is considerably less for public employees than for those in the private sector (e.g., Bellante and Link 1981). The resultant feeling of job security has a positive impact on the motivation and productivity of public employees, whose specialized skills and bureaucratized personalities represent significant investments. Moreover, rapid turnover in public organizations calls into question the legitimacy of the organization and harms its ability to attract funding.

The public sector relies on seniority for rewarding and promoting employees. These practices foster high employee dependence. Organizational theorists have argued that governments co-opt employees by creating opportunities for advancement via career ladders constructed by fragmenting work, differentiating tasks, and proliferating administrative job titles relative to actual tasks (e.g., Baron and Bielby 1986). Many public jobs are frequently reallocated to higher levels of seniority on the grounds that the way they are performed is sufficiently different in responsibility or skill from the job description (Stewman 1988). Likewise, when positions discontinue, public bureaucracies often create idiosyncratic job titles to retain employees (Miner 1990).

Second, the deterrent effects of income and nonwage compensation on mobility warrant consideration. Employment choices usually necessitate the weighing of pecuniary benefits against the costs of work alternatives. The initial earnings and earnings growth rates of most entrepreneurs are lower than those for comparable wage earners (Hamilton 2000). Research using the Panel Study for Income Dynamics (PSID) has found that about 35% of individuals who become entrepreneurs exited the entrepreneurial organization within a year (Quadrini 1999). Thus, at least in the short run, the decision to become an entrepreneur implies that a full-time wage earner in a government job chooses a risky entrepreneurial career with volatile earnings over a riskless wage. Were the riskless wage low and unattractive, one might predict a greater inclination to favor entrepreneurship. But existing evidence does not lend credence to this. The public sector tends to set a wage floor that is comparable to the average pay in the private sector. The consensus from studies of wage differentials between the public and private sectors in the United States is that over time, this practice—along with high unionization and political interference—has resulted in a situation where government employees are overpaid for all jobs except those at the top end of the occupational scale (e.g., Katz and Krueger 1991, Borjas 2003). This "public sector premium" makes the government an attractive workplace. Public sector pension schemes, too, seem to cap levels of quit rates in the public sector in the United States. The share of pension compensation paid by the government is substantially larger than that paid by a typical firm offering a pension scheme. Research demonstrates that unusually large capital losses are imposed by the government on public wage earners who quit early (Ippolito 1987).

We hypothesize through tenure because the effects of organizational dynamics—e.g., bureaucratic construction of the individual and accumulation of cospecialized human capital—tend to be amplified by length of public employment and to bind individuals to the public sector. Tenure captures adaptation to the organization and selection by the internal labor market. Longer tenure shows a more fit match. Similarly, penalties related to the financial components of compensation escalate with the length of service in the sector. The U.S. public sector relies on a seniority wage system. Public employees are paid less than the value of their marginal product in their

early careers and at a rate exceeding it later in life (Lazear 1979). Therefore, those who quit the public sector later encounter significant pension losses (Ippolito 1987) and forgo wages that are more than their marginal product (Lazear 1979). The captivating role of tenure is corroborated by evidence from research on public employee mobility. In the public sector people who quit voluntarily tend to be younger and have less seniority (Kalleberg and Mastekaasa 1998), and government organizations tend to have more entry-level jobs, fewer mid-level jobs, and even fewer high-level positions than similar sized private sector employers (e.g., Bridges and Villemez 1991). Likewise, studies of determinants of queues for public jobs show that public sector tenure has a significant positive influence on the decision to queue for public sector employment (Heywood and Mohanty 1995).

Hypothesis 3. *Public sector tenure decreases the hazard of entrepreneurship.*

5. Data and Method

In this section, we present the data and discuss the econometric method applied. We operationalize the variables used in the analysis and present some sensitivity tests.

5.1. Data

This paper exploits U.S. PSID data. PSID is a panel survey of U.S. households that began in 1968 with a national probability sample of about 4,800 U.S. households. It conducts annual reinterviews. The PSID survey questions build on each other and include many cross references useful for checking the validity of responses. PSID provides a wide variety of information on families and their individual members, plus detailed information on the neighborhoods and labor and housing markets in which they live. The data set is deemed to meet the criteria for a life-course analysis of work careers (Aldrich and Kim 2007) and has been utilized extensively in entrepreneurship studies (e.g., Dunn and Holtz-Eakin 2000). PSID allows us to estimate the likelihood of changing from one state to another over a one-year period, conditional on the respondent being at risk of such an event. We use the family and the individual files for the survey years 1968–1999, supplemental PSID packages, and the PSID data in the Cross-National Equivalent File.

The sample was assembled through a series of steps. First, we define our pool as individuals who appear at least twice between 1969 and 1999. From this, we exclude the following individuals: (a) those younger than 17 at the last year of appearance in the data; (b) those who appear in two years, but where the gap between these observations is more than one calendar year (an individual with records for, say, 1991 and 1994); and (c) those who have never left their parents' household units.[1] Because the paper aims at comparing the public and private sectors, we also drop entrepreneurial transitions out of unemployment.

We set the start of the observation window to age 16.[2] One implication is that individuals born before 1952 are excluded from the "risk pool." This gives us an age span of 16–48 years, which is when most transitions to entrepreneurship occur (Aldrich and Kim 2007, Sørensen 2007a). We treat the year following the last reported enrollment in school as the year at which individuals are formally at risk of becoming an entrepreneur and accordingly create life histories. This produces a data set that is right censored. We assume that the end year has no particular relation to becoming an entrepreneur and hence perceive this to be a minor issue.

5.2. Method

We investigate individuals' transition to entrepreneurship given particular individual characteristics and histories. Thus, we apply an econometric event history design analysis. The data consist of individual yearly observations rendering them discrete, but not intrinsically so. We therefore study the hazard function using a discrete time proportional hazard specification, which may be written as $h(j, g, \mathbf{y}, \mathbf{x})$. It expresses the estimated interval hazard rate of becoming an entrepreneur. g is a dummy for whether individuals were public employees in the previous year. $\mathbf{y}$ is a vector of other explanatory variables, and $\mathbf{x}$ is a vector of control variables including a time variable in logarithmic form.

There are substantial limitations to this model. Research argues that sectoral affiliation is an artifact of predisposition. Therefore, the finding of a low entrepreneurship hazard rate for public employees may be attributable to a self-selection mechanism expressed through labor market matching rather than context (hence, econometric endogeneity). We include a two-level categorical variable indicating whether the individual was a public or a private employee in the previous year. We use private employment as the benchmark category. Given the predisposition argument of sectoral choice, we cannot assume the choice

[1] PSID collects more extensive data on family heads and wives. The survey considers the household (HH) as the basic economic unit. The minimum HH size is one, which means the individual lives alone. The PSID procedure for assigning heads is as follows. (a) Individuals (male or female) living on their own are defined as HH heads. (b) Among married or cohabiting couples, the male is HH head. PSID does not stop observing an individual once a marital or HH transition occurs. It simply changes the individual's HH status. The relevant information comes from the respective HH status file.

[2] We tested whether setting the window to age 18 would change the results. It did not.

of public employment to be independent of the choice of becoming an entrepreneur. We thereby consider this to be endogenous; we extend the model with an equation for public employment. The proportional hazard model is transformed into

$$s_{it} = h(\alpha_g g_{it} + \boldsymbol{\beta}_y \mathbf{y}_{it} + \boldsymbol{\beta}_x \mathbf{x}_{it} + \varepsilon_{sit} > 0), \quad (1)$$

$$g_{it} = f(\boldsymbol{\beta}_g \mathbf{z}_{git} + \varepsilon_{git} > 0). \quad (2)$$

Equation (1) is the hazard function and Equation (2) is the indicator function $f(\cdot)$ for public employment. $\mathbf{z}_{git}$ is a vector of instrumental variables explaining the endogenous variable. $\boldsymbol{\beta}_g$ is the associated parameter vector. The covariations between the error terms (ε_{sit} and ε_{git}) indicate to what extent the model suffers from unobserved heterogeneity in the form of self-selection. The model simplifies to the standard discrete time duration model if the two error terms exhibit no covariation.

Two things distinguish this model from an ordinary endogeneity model. First, the dependent variable in Equation (1) is a dummy demanding a limited dependent variable regression technique. Second, the model estimates the effects of multiple binary endogenous regressors suggesting nonlinearity even in the first-stage estimation technique. We use a bivariate probit specification to model this as prescribed by Carrasco (2001). The Huber-White sandwich estimation technique is used to obtain robust estimates.

5.3. Measures

5.3.1. Dependent Variables. To measure the transition to entrepreneurship, we constructed person-year work histories. In line with prior research, we relied on the PSID question: "Head/Wife works for self or others?" This raises two issues. First, the question does not cover individuals who were neither household heads nor wives at the time of the interview. Yet several related PSID variables, such as employment status, work history, annual work hours, and weeks of work or unemployment and education, allow the completion of records. Second, it does not address the problem of respondent bias with regard to full-time work. The question classifies individuals as self-employed, unemployed, or employed (by an employer). We confirmed that wage/salary earners were working full time by cross-checking with total annual hours of work (and total annual hours of unemployment) based on a threshold of 1,200 hours. This led to reclassification from employed to unemployed for less than 0.5% of the sample. PSID provides relatively accurate depictions of employment status.

Based on the person-year work history, we treated entry into entrepreneurship as a transition. Because we model the occsurrence of the first transition, we deleted succeeding observations once the individual had become an entrepreneur for the first time. Our dependent variable is the hazard rate of entrepreneurship from the time the individual leaves full-time education.

5.3.2. Independent Variables. We merged the individual work history file with the PSID question "Work for government?" and, as a backup, the PSID data on industry affiliation (which classifies government) to construct a categorical variable for whether the individual is employed in the private or the public sector or is unemployed, in any given year. Should a transition occur, this categorical variable allows us to see its origin. We also generated two tenure variables: length of public sector and private sector employment. We reset the tenure clock to zero every time the individual switched between these states.[3] Hence, tenure shows the duration for any of these two states. We used the above categorical variable to operationalize tenure.

5.3.3. Control Variables. The fraction of male entrepreneurs has historically been larger than that of women entrepreneurs in the United States. Research highlights that gender differences significantly influence the probability of transition to entrepreneurship (e.g., Hout and Rosen 2000, Sørensen 2007a). We capture gender effects with a dummy. We also control for the potential linear and nonlinear effects of age (Dunn and Holtz-Eakin 2000, Sørensen 2007b). We center age on its mean. Educational attainment represents labor force skills and has been found to be related to entrepreneurship decisions (e.g., Hout and Rosen 2000, Dunn and Holtz-Eakin 2000). We add years of schooling completed. Studies show that entrepreneurship rates differ across ethnic groups in the United States (e.g., Aldrich and Waldinger 1990, Hout and Rosen 2000). We use dummies for three ethnic categories: whites, blacks, and Hispanics and Asians. Studies also show that the rate at which individuals start working for themselves is greater for married or cohabiting couples than for singles (Dunn and Holtz-Eakin 2000, Sørensen 2007a), for which we assign a dummy (1 = married/cohabiting, 0 = single). Because childbirth has short-term disruptive consequences on career evolution, we control for it with a dummy. Research shows that the offspring of an entrepreneur are more likely also to become entrepreneurs (Hout and Rosen 2000, Sørensen 2007a). We operationalize the influence of father with a dummy that indicates whether, when the individual was growing up, the individual's father was an entrepreneur.

[3] For theoretical reasons, we favored resetting the tenure clocks. However, as a robustness check, we used the cumulative years in a given sector. There were no substantial differences in our results or conclusions. Results are available on request.

The variable *hourly wage* controls for the opportunity cost of leaving the current employer. Shortage of financial resources is frequently cited in the literature as an obstacle to entrepreneurship (e.g., Hurst and Lusardi 2004). We add the logged value of the previous year's total household income to our models. We also control for three categories of home ownership: home owner, tenant, neither owner nor tenant (e.g., living with relatives). We expect home owners to have easier access to external financial resources. Children raised by wealthy parents might be more likely to become entrepreneurs. We use the corresponding PSID question (pretty well-off, average, poor) as a control. To capture the potential effects of the scale of economic activity and business cycles, we include logged gross domestic products (GDP) and year-on-year GDP growth rates of the residence state. We incorporate the ratio of entrepreneurs to total full-time employed in each state to control for geographic prevalence of entrepreneurship. We obtained these figures from the U.S. Bureau of Economic Analysis. We control for size of the largest city in the county of residence with a dummy ($1 =$ population $>$ $50{,}000, 0 =$ population $< 50{,}000$). Finally, our models control for urbanicity—whether the individual grew up in a rural area, a small town/suburb, or a large city.

5.3.4. Instruments. We apply several instrumental variables to net out person-specific effects. The literature holds that the father's education level influences to an extent the individual's sectoral choice of employment (Bellante and Link 1981). In the most comprehensive study to date of choice of public versus private sector employment, Blank (1985) instrumented for whether while the individual was growing up, the father worked in an occupation prevalent in the public sector. This construct substitutes for a direct measure of whether the father worked primarily in the public or private sector when the individual was growing up. The PSID permits us to develop an indirect measure only. We checked the U.S. current population surveys for various years, for the sectoral distribution of employment within major occupations. Almost 85% of U.S. government employment is within technical, professional, clerical, administrative, and managerial jobs. The government has a very low percentage of sales (less than 2% over the years), craft workers, operatives, kindred workers, and farm laborers (less than 10% combined). We classified the father's occupation by a dummy based on this distribution, indicating prevalence in the public sector. To predict sectoral choice, we added to the model the number of children under 16 in the household and the size of the city in which the individual grew up (Bellante and Link 1981, Blank 1985). The availability of public and private jobs varies among U.S. states. To purge the influence of geographic environment, we use the growth in the U.S. state public employment and the state ratio of public to private income as instruments. We obtained these data from U.S. statistical abstracts and the U.S. Bureau of Economic Analysis regional accounts. The attractiveness of the public sector pay might also be an important pull factor. To capture its effect, we included the annual entry-level wage (GS-1) reported in the General Schedule by the U.S. Office of Personnel Management. The General Schedule is a pay scale utilized by the majority of white collar personnel in the civil service and includes most professional, technical, administrative, and clerical positions. We adjusted the entry level rates of pay for inflation by the consumer price index-urban wage earners and clerical workers (computed by the U.S. Bureau of Labor Statistics). Finally, we added the duration in unemployment as an instrument.

5.4. Model Validity and Sensitivity

We tested the results for several possible sources of bias and sensitivity to evaluate their validity. First, we considered the possibility of selection bias caused by excluding transitions from unemployment using a trivariate heckit model specification (Fishe et al. 1981). This approach is useful when considering two rather than one endogenous explanatory dummy variables. Here the two endogenous dummy variables become public employment and private employment, leaving out unemployment as the benchmark.[4]

Second, we considered the selected instrumental variables. Murray (2006, p. 130) argues that "avoiding invalid instruments, coping with weak instruments, and interpreting instrumental variables estimates" are essential parts of modeling endogeneity through instrumental methods. Although some of our instruments could be considered weak, excluding them did not produce significantly different results, suggesting instrumental relevance.[5]

The applied model assumes proportionality across the time dimension of the data. It is conceivable that the context and tenure variables may exhibit a nonproportionality pattern. We performed three tests to

[4] Arendt and Holm (2006) show that the trivariate heckit exhibits fewer biased estimates under severe endogeneity than its alternatives when considering a limited dependent variable with two binary endogenous regressors (e.g., univariate, trivariate probit, instrumental variables regression). See Maddala (1983, pp. 257–291 for a detailed discussion of this method. Arendt and Holm (2006) also argue that the Heckman-correction inherited heteroskedasticity problem persists for the case of two endogenous variables. We follow their three-step solution to correct the estimates accordingly.

[5] Applicability of the Sargan (1958) test is questionable in this particular case for two reasons. First, the first-stage regression is a probit suggesting nonlinearity between the endogenous variables and the instruments. Second, the residuals of the discrete time duration model are nonnormally distributed.

Table 1 Descriptive Statistics and Pearson's Correlation Coefficients ($N = 73{,}823$)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1 *Entrepreneur*	0.01	0.11											
2 *Public employee*	0.15	0.35	−0.01*										
3 *Public sector tenure*	0.90	2.97	−0.02*	0.73*									
4 *Private sector tenure*	4.01	5.32	0.03*	−0.31*	−0.23*								
5 *Mean centered age*	0.14	6.52	0.01*	0.13*	0.24*	0.47*							
6 (*Mean centered age*)^2	42.56	55.06	−0.02*	0.02*	0.14*	0.22*	0.47*						
7 *Years of education*	12.57	1.93	0.02*	0.17*	0.14*	0.04*	0.19*	−0.06*					
8 *Female*	0.54	0.50	−0.04*	−0.02*	−0.04*	−0.22*	0.01*	0.00	−0.03*				
9 *Ethnicity—Black*	0.36	0.48	−0.04*	0.06*	0.04*	−0.13*	−0.02*	0.00	−0.19*	0.10*			
10 *Ethnicity—Hispanic and Asian*	0.03	0.16	0.00	−0.01*	−0.01*	−0.02*	−0.03*	0.00	−0.06*	−0.02*	−0.13*		
11 *Married*	0.66	0.47	0.01*	0.03*	0.06*	0.18*	0.19*	−0.01	0.09*	−0.12*	−0.22*	0.01*	
12 *Birth event*	0.10	0.29	0.00	−0.01*	−0.03*	−0.06*	−0.15*	−0.07*	0.00	0.00	−0.01*	0.01*	0.11*
13 *Father was entrepreneur*	0.02	0.15	0.01*	−0.02*	−0.02*	0.03*	0.01*	−0.01	0.06*	0.00	−0.08*	−0.02*	0.03*
14 log(*hourly wage*)	1.96	0.79	0.02*	0.16*	0.22*	0.47*	0.45*	0.09*	0.36*	−0.24*	−0.19*	−0.01*	0.18*
15 log(*total household income*)	9.65	2.03	0.02*	0.11*	0.12*	0.29*	0.24*	0.07*	0.29*	−0.1*	−0.28*	0.00	0.35*
16 *Tenant*	0.43	0.50	0.00	−0.01*	−0.07*	−0.17*	−0.19*	−0.15*	−0.10*	0.04*	0.18*	0.03*	−0.20*
17 *Neither house owner nor tenant*	0.13	0.34	−0.02*	−0.05*	−0.06*	−0.19*	−0.3*	0.04*	−0.11*	−0.04*	0.07*	0.00	−0.30*
18 *Parents' economic wealth—average*	0.42	0.49	0.00	0.00	0.01	0.07*	0.03*	−0.01*	0.12*	−0.05*	−0.25*	−0.07*	0.07*
19 *Parents' economic wealth—pretty well-off*	0.28	0.45	0.01*	0.01	0.00	−0.02*	−0.02*	−0.01*	0.07*	−0.02*	−0.02*	−0.01	−0.03*
20 *Size of the city*	0.60	0.49	−0.01*	0.00	−0.01*	−0.07*	−0.05*	−0.03*	0.07*	0.02*	0.15*	0.05*	−0.14*
21 *GDP of the state*	11.66	1.00	0.01*	0.03*	0.07*	0.15*	0.32*	0.10*	0.16*	0.02*	−0.09*	0.09*	0.00
22 *GDP growth of the state*	0.08	0.29	0.00	0.00	0.01*	0.00	0.00	0.02*	0.02*	0.00	−0.01	0.00	0.00
23 *State share of entrepreneurs*	0.15	0.03	0.02*	0.00	0.02*	0.09*	0.12*	0.05*	0.04*	−0.03*	−0.21*	0.05*	0.10*
24 ln(t)	2.16	0.69	0.02*	0.09*	0.20*	0.45*	0.91*	0.22*	−0.06*	0.01*	0.03*	−0.02*	0.21*

	12	13	14	15	16	17	18	19	20	21	22	23	24
13 *Father was entrepreneur*	0.00												
14 log(*hourly wage*)	−0.05*	0.03*											
15 log(*total household income*)	−0.01*	0.04*	0.54*										
16 *Tenant*	0.01	−0.03*	−0.14*	−0.22*									
17 *Neither house owner nor tenant*	−0.01*	−0.01*	−0.24*	−0.14*	−0.34*								
18 *Parents' economic wealth—average*	−0.01*	0.00	0.11*	0.13*	−0.08*	−0.02*							
19 *Parents' economic wealth—pretty well-off*	0.01*	0.05*	0.03*	0.00	0.01*	0.00	−0.53*						
20 *Size of the city*	−0.01*	−0.01*	0.00	−0.06*	0.16*	0.00	−0.04*	0.02*					
21 *GDP of the state*	−0.05*	0.00	0.30*	0.13*	0.05*	−0.14*	0.04*	0.04*	0.12*				
22 *GDP growth of the state*	0.00	0.01	0.00	0.01*	−0.01*	0.00	0.00	0.00	0.01	0.08*			
23 *State share of entrepreneurs*	−0.01	0.01*	0.11*	0.09*	−0.06*	−0.06*	0.04*	−0.01*	−0.08*	−0.01*	−0.04*		
24 ln(t)	−0.13*	−0.01	0.38*	0.17*	−0.13*	−0.34*	0.00	−0.04*	−0.07*	0.27*	−0.01	0.11*	

*Correlation coefficient significant at a 5% level.

check for proportionality. First, we applied a Cox-proportionality hazard model including interaction effects between these variables and the time variable. Second, in a similar approach we applied a discrete time model specification. Third, we used the scaled Schoenfeld residuals to evaluate possible violation of the proportionality assumption. None of these tests produced strong evidence of nonproportionality.[6]

We also explored the sensitivity of these results to particular covariates. We conducted two sensitivity tests exploring the influence each covariate has on the parameter vectors using the Pregibon (1981) $\Delta\beta$ measure and the goodness of fit using the Hosmer and Lemeshow (2000) $\Delta\chi^2$. We found that none of the covariates accounted for a substantial part of the overall fit or the estimates. All covariates contributed fairly evenly to the χ^2 statistics. The coefficient vector is to some degree sensitive to the inclusion of female public employees. However, the influence statistics are small. Overall, the analyses suggest that our findings are general rather than a product of particular covariates.

Table 1 summarizes the Pearson correlation coefficients for the dependent variable and the explanatory and control variables. We found no reason to suspect multicollinearity, supported by the variance inflation factor not exceeding 5.

6. Results

Table 2 presents the estimates of five model specifications. It introduces the effects in a stepwise procedure, which allows us to understand the interplay between

[6] We thank an anonymous reviewer for alerting us to the issue of nonlinearity in the context and tenure variables.

Table 2 Determinants of Hazards of Transitions to Entrepreneurship—Robust Estimates

	Probit	Probit	Bivariate probit	Bivariate probit	Trivariate heckit
Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Public employee	−0.134***	0.128**	0.636***	0.930***	0.244
	[0.041]	[0.064]	[0.083]	[0.104]	[0.220]
Private employee					−0.615***
					[0.117]
Public sector tenure		−0.040***		−0.040***	−0.035***
		[0.010]		[0.010]	[0.008]
Private sector tenure		0.009**		0.006*	−0.011***
		[0.003]		[0.003]	[0.002]
Unemployment duration					−0.008**
					[0.003]
Public sector predisposition effect (endogeneity correction)			−0.423***	−0.447***	−0.261**
			[0.044]	[0.049]	[0.122]
Private sector predisposition effect (endogeneity correction)					0.368***
					[0.073]
Mean centered age	−0.016	−0.019	−0.013	−0.017	−0.012***
	[0.013]	[0.013]	[0.012]	[0.013]	[0.004]
(*Mean centered age*)^2	−0.001**	−0.001***	−0.001***	−0.001***	−0.002***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.000]
Years of education	0.042***	0.046***	0.022*	0.025*	0.020***
	[0.014]	[0.014]	[0.013]	[0.014]	[0.006]
Female	−0.265***	−0.254***	−0.263***	−0.257***	−0.190***
	[0.029]	[0.029]	[0.028]	[0.028]	[0.019]
Ethnicity—Black	−0.222***	−0.222***	−0.268***	−0.270***	−0.229***
	[0.034]	[0.034]	[0.033]	[0.033]	[0.021]
Ethnicity—Hispanic and Asian	−0.058	−0.051	−0.084	−0.078	−0.117***
	[0.081]	[0.081]	[0.079]	[0.079]	[0.042]
Married	−0.067**	−0.066*	−0.073**	−0.072**	−0.036**
	[0.034]	[0.034]	[0.033]	[0.033]	[0.017]
Birth event	0.006	0.003	0.005	0.002	−0.027
	[0.045]	[0.045]	[0.044]	[0.044]	[0.022]
Father was entrepreneur	0.037	0.026	0.063	0.054	0.051
	[0.077]	[0.077]	[0.076]	[0.075]	[0.038]
log(*hourly wage*)	−0.053**	−0.067**	−0.068***	−0.077***	0.034
	[0.023]	[0.026]	[0.023]	[0.026]	[0.024]
log(*total household income*)	0.041***	0.038***	0.040***	0.039***	0.012**
	[0.010]	[0.010]	[0.010]	[0.010]	[0.005]
Tenant	0.068**	0.070**	0.058*	0.057*	0.016
	[0.031]	[0.032]	[0.031]	[0.031]	[0.016]
Neither house owner nor tenant	−0.206***	−0.196***	−0.222***	−0.215***	−0.195***
	[0.062]	[0.062]	[0.060]	[0.060]	[0.031]
Parents' economic wealth—average	−0.033	−0.036	−0.031	−0.033	−0.008
	[0.035]	[0.035]	[0.034]	[0.034]	[0.017]
Parents' economic wealth—pretty well-off	0.030	0.029	0.029	0.028	0.021
	[0.036]	[0.036]	[0.035]	[0.035]	[0.017]
Size of the city	−0.039	−0.037	−0.029	−0.028	−0.015
	[0.027]	[0.027]	[0.026]	[0.027]	[0.013]
GDP of the state	0.010	0.012	0.015	0.017	0.004
	[0.014]	[0.014]	[0.014]	[0.014]	[0.007]
GDP growth of the state	−0.007	−0.006	−0.011	−0.010	−0.010
	[0.046]	[0.047]	[0.045]	[0.046]	[0.026]
State share of entrepreneurs	1.226***	1.265***	1.142**	1.180***	0.715***
	[0.463]	[0.464]	[0.446]	[0.445]	[0.211]
ln(t)	0.268**	0.282**	0.228**	0.249**	0.042**
	[0.110]	[0.111]	[0.107]	[0.109]	[0.032]
Constant	−3.646***	−3.770***	−3.347***	−3.472***	−1.307***
	[0.447]	[0.454]	[0.436]	[0.442]	[0.133]
Number of observations	73,823	73,823	7,383	73,823	77,610
Number of subjects	5,560	5,560	5,560	5,560	5,934
Log-likelihood	−4,796	−4,754	−30,600	−30,600	−6,294
Wald χ^2	318***	343***	10,768***	10,744***	527***
Pseudo R^2	0.035	0.038			0.043

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

the variables. Model 1 only includes the context effect. Model 2 adds the tenure effect to Model 1. Both of these are modeled as probit regressions. Models 3 and 4 are bivariate probits. Model 3 extends Model 1 with the predispositional effect by adding a public sector choice equation. Model 4 adds the predispositional effect to Model 2, thereby containing all the hypothesized effects of the paper. Model 5 is the trivariate heckit model, which tests the sensitivity of the results with respect to the exclusion of the transitions from unemployment. The underlying regression models are probits. The results of the endogenous choice regressions associated with Models 3–5 are depicted in Table 3.

The parameter estimate of the public sector endogeneity correction term, considered here as a predisposition effect, is significantly negative. This holds both in Model 3 and 4, providing support for Hypothesis 1 and suggesting that predisposition for public employment does indeed decrease the hazard of entrepreneurial exit. The low rate of entrepreneurship observed in the public sector therefore may be explained at least partly by labor market matching in which nonentrepreneurial individuals are matched with public sector job opportunities.

The analysis also supports Hypothesis 2, that the context of the public sector increases the hazard of entrepreneurial exit. The public employment dummy exhibits significant positive estimates across Models 2–4. In Model 1 we do not control for tenure or predisposition, thereby producing a negative estimate. This reveals the importance of modeling tenure and the unobserved effect of predisposition. Otherwise the contextual effect may emerge as substantially biased, promoting misleading conclusions. In Model 5 we observe an insignificant estimate. However, this result suggests that the context of the public sector sets the individual on a par with unemployed individuals. Compared to private sector employees, we still observe a significant positive effect.

As predicted by Hypothesis 3, individuals with longer tenure in public employment are significantly less likely to become entrepreneurs. Hazard rate and tenure are negatively related. As we control for age effects and time, we can rule out these findings being by-products of increasing appreciation of job security with age and across time. The results hold regardless of the modeling method applied. Interestingly, we observe a stronger tenure effect in the public than in the private sector. We obtained this result using a Wald χ^2 test for differences between parameter estimates.

Additionally, Table 2 presents some other findings. First, the trivariate heckit regression results suggest that the private sector employees are predisposed to become entrepreneurs. The significant negative private sector dummy variable suggests that the private sector context effect inhibits transitions to entrepreneurship, indicating that individuals find the private sector more inviting and fulfilling in terms of their professional requirements. We find opposing results for the private sector tenure effect. Models 2 and 4 show a positive effect, and Model 5 reports an inhibiting effect for transition to entrepreneurship. We conjecture that the discrepancy between the findings may be attributable to the omitted endogeneity effect of labor market matching in the private sector.

The regression models point to other relevant and interesting determinants of the transition to entrepreneurship. Age has an inverted U-shaped relationship. The share of entrepreneurs is higher among individuals with higher education. We find support for the negative effect of ethnicity; blacks face substantially longer times to entrepreneurial exit than whites. Females also are less likely to make the transition to becoming an entrepreneur. Hourly wages seem to act like opportunity costs, creating a barrier to entrepreneurship, whereas the total household income decreases time to entrepreneurship. Individuals who are neither house owners nor tenants are less likely to move into entrepreneurial engagement. Among the ecological variables, the relative number of entrepreneurs in the state positively affects entrepreneurship.

7. Discussion and Conclusions

This paper is based on the premise that our understanding of how public sector employment inhibits individuals' choices to move into entrepreneurship is incomplete. We identify three mechanisms. First, several scholars have suggested research into the dispositional determinants of career choices (e.g., House et al. 1996, Nicolaou et al. 2008) and labor market matching (e.g., Borjas 2003, Sørensen 2007a). We show that public employees are predisposed to not become entrepreneurs, whereas private sector employees tend to posses the qualities most prevalent in entrepreneurial individuals. Labor market matching is ultimately a critical reason for the low rate of migration out of the public sector for entrepreneurial pursuits. Second, after controlling for predisposition, we show a contextual effect that increases the hazard of entrepreneurial exit. This points to a frustration-based explanation. When someone experiences poor fit with the public sector, entrepreneurial exit becomes a viable option. This is because public sector skills are often unattractive to the private sector, reentry to the public sector is relatively easy, and the process of entrepreneurship is likely to provide psychological satisfaction to individuals who are deprived of a sense of influence in public organizations. Third, our findings support contributions emphasizing a

Table 3 Determinants of Public and Private Employment Choice—Instrumentation of Endogenous Variables

	Public choice	Public choice	Public choice	Private choice
Variables	Model 3	Model 4	Model 5	Model 5
Unemployment duration	−7.678***	−7.658***	—	—
	[0.099]	[0.099]		
Number of kids under 16 years of age	0.008	0.008	−0.038***	−0.132***
	[0.007]	[0.007]	[0.006]	[0.006]
Father's education—11 grades or less	−0.013	−0.013	0.022	0.039*
	[0.028]	[0.028]	[0.026]	[0.021]
Father's education—high school	0.067**	0.068**	0.062**	−0.039*
	[0.029]	[0.029]	[0.027]	[0.022]
Father's education—college but no degree	−0.047	−0.047	−0.031	0.016
	[0.035]	[0.035]	[0.033]	[0.027]
Father's education—college degree and higher	−0.116***	−0.116***	−0.127***	−0.031
	[0.035]	[0.035]	[0.033]	[0.027]
Father's occupation prevalant in public sector	0.056***	0.056***	0.041***	−0.031***
	[0.014]	[0.014]	[0.013]	[0.011]
Public sector entry salary	0.026***	0.026***	0.037***	0.008***
	[0.004]	[0.004]	[0.004]	[0.003]
State public to private income ratio	1.281***	1.281***	1.030***	−0.757***
	[0.071]	[0.071]	[0.061]	[0.057]
log(*change in public employment level*)	−0.220*	−0.219*	−0.173	0.117
	[0.124]	[0.124]	[0.109]	[0.094]
Small town	−0.046**	−0.046**	−0.076***	−0.049***
	[0.020]	[0.020]	[0.019]	[0.016]
Large city	0.001	0.001	−0.042**	−0.093***
	[0.021]	[0.021]	[0.019]	[0.017]
Mean centered age	0.002	0.002	−0.008	−0.020***
	[0.006]	[0.006]	[0.005]	[0.004]
(*Mean centered age*)^2	0.000	0.000	−0.000	−0.002***
	[0.000]	[0.000]	[0.000]	[0.000]
Years of education	0.161***	0.161***	0.152***	−0.073***
	[0.006]	[0.006]	[0.006]	[0.005]
Female	0.115***	0.115***	−0.017	−0.375***
	[0.013]	[0.013]	[0.012]	[0.011]
Ethnicity–Black	0.365***	0.365***	0.400***	−0.174***
	[0.016]	[0.016]	[0.015]	[0.013]
Ethnicity—Hispanic and Asian	0.164***	0.164***	0.212***	−0.047
	[0.041]	[0.041]	[0.038]	[0.031]
Married	0.082***	0.082***	0.013	−0.144***
	[0.017]	[0.017]	[0.015]	[0.013]
Birth event	0.025	0.025	0.039*	0.066***
	[0.023]	[0.023]	[0.021]	[0.018]
Father was entrepreneur	−0.177***	−0.178***	−0.191***	0.117***
	[0.044]	[0.044]	[0.042]	[0.034]
log(*hourly wage*)	0.031**	0.032**	0.216***	0.495***
	[0.016]	[0.016]	[0.011]	[0.009]
log(*total household income*)	−0.064***	−0.064***	0.064***	0.174***
	[0.009]	[0.009]	[0.005]	[0.005]
Tenant	0.038**	0.038**	0.103***	0.104***
	[0.016]	[0.016]	[0.015]	[0.012]
Neither house owner nor tenant	0.211***	0.211***	0.096***	−0.352***
	[0.026]	[0.026]	[0.023]	[0.019]
Parents' economic wealth—average	0.009	0.009	0.021	0.022*
	[0.017]	[0.017]	[0.015]	[0.013]
Parents' economic wealth—pretty well-off	0.036**	0.036**	0.030*	0.001
	[0.018]	[0.018]	[0.016]	[0.014]
Size of the city	−0.064***	−0.064***	−0.095***	−0.027**
	[0.015]	[0.015]	[0.014]	[0.011]

Table 3 (Continued)

	Public choice	Public choice	Public choice	Private choice
Variables	Model 3	Model 4	Model 5	Model 5
GDP of the state	0.044***	0.044***	0.004	−0.073***
	[0.008]	[0.008]	[0.008]	[0.007]
GDP growth of the state	0.010	0.010	0.015	−0.005
	[0.018]	[0.019]	[0.018]	[0.017]
State share of entrepreneurs	1.761***	1.760***	1.697***	−0.733***
	[0.251]	[0.251]	[0.231]	[0.194]
ln(t)	0.197***	0.197***	0.317***	0.246***
	[0.047]	[0.047]	[0.042]	[0.033]
Constant	−4.944***	−4.945***	−6.542***	−0.437**
	[0.273]	[0.273]	[0.243]	[0.197]
Log-likelihood	−30,600	−30,600	−29,000	−43,300
Wald χ^2	10,768***	10,744***	5,678***	18,123***
Pseudo R^2			0.089	0.173

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

tenure effect (e.g., Dobrev and Barnett 2005, Sørensen 2007a). Public sector tenure constrains the transition to entrepreneurship, which is in line with the mover-stayer thesis. The bureaucratic nature of the work, the organizational culture, and the compensation systems appear to be strong barriers to mobility. Our results help fill an important gap in the literature.

Our findings and the limitations of our study provide incentives for further research at the nexus of public sector, entrepreneurship, and labor market sorting. For instance, we developed and tested a set of predictions at the sectoral level; future research could examine the causes and dynamics of transistions to entrepreneurship at greater disaggregation. There may be significant disparities in hazard rates across subpopulations of public employees defined by, e.g., occupation, education, income, and occupational status. In our empirical models we also do not discriminate the contextual factors inhibiting entrepreneurial ability from those reducing the motivation for entrepreneurial departure. Also, lack of data on organizational size prevented us from purging contextual effects associated with size from the effects of sectors. These issues merit further research. Comparative research focusing on the survival of companies founded by former public versus private employees would be rewarding. The public sector generates a lower rate of entrepreneurship than the private sector, yet there is no reason to assume that those who do exit from public employment will have higher failure rates. It might be that their decision involves more caution, leading to more informed search and selection.

Our results are also informative for policy formulation. The public sector does not appear to be the destination for those with entrepreneurial qualities. The positive context effect, in contrast, implies that the public sector is losing individuals with specialized skills and knowledge, which will ultimately affect the quality of public outputs.

These labor market outcomes pose severe challenges for public managers at a critical time. Recent demographic analyses predict significant labor shortages in the next decade because of an aging population of government workers. Estimates show that around one-third of U.S. public employees are now eligible for regular or early retirement (Donahue and Nye 2003). Additionally, the retirement and advancing age of the Baby Boomer generation will cause a growth in demand for public services, requiring more employees. Another troubling dynamic concerns the rapid growth of the nonprofit sector, which has become successful at diverting potential public employees from government careers. For those who value the quality of "making a difference" through work, there are now many attractive alternatives to public bureaus. Finally, and compounding the problem, there is a gradual shift in the U.S. private sector toward knowledge-based services jobs, which is fuelling the already intense competition for qualified personnel.

A comprehensive discussion of how the public sector should meet these challenges is beyond the scope of this paper. However, in light of our results, we would point out that reforms are needed on both the input and the operational sides. Public employees should be sorted from the upper portion of the distribution of entrepreneurial talent. This, at a minimum, requires public agencies to send strong signals to the labor market about the criticality of entrepreneurial qualities for public services. We acknowledge that a number of resource, political, and policy induced constraints might make this task difficult. However, the public sector has one critical edge: the social importance of public work. Psychology studies often

describe entrepreneurs as "idealists" and "sacrificers" who will commit their time and energies to some greater objectives, to the extent that the outcomes will reinforce their image of their self-importance. Thus, public recruiters could emphasize the attainment of a greater realization of self, emanating from advancing social equity through entrepreneurial endeavors. These signals should be accompanied by more proactive, more strategic, more streamlined, and more flexible hiring processes.

Labor market efforts will not bear fruit if the organizational context is not systematically improved. Senior public managers should devote considerable attention and energy to the means by which the commitment of public employees is secured. Beyond financial incentives, efforts should be directed toward creating a dynamic and entrepreneurial climate that supports learning, intellectual challenge, and personal growth (e.g., through continuous training, job rotations, or public-private partnerships or contracting arrangements). Public employees should be offered the means to exercise influence and creativity. Because they seem to be motivated by a concern for the community, they should be provided with opportunities to pursue original ideas that could ultimately advance the public interest. They should be made to feel that they are performing meaningful public and social service.

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References

Adler, P. S., B. Borys. 1996. Two types of bureaucracy: Enabling and coercive. *Admin. Sci. Quart.* **41**(1) 61–89.

Aldrich, H. E., P. H. Kim. 2007. A life-course perspective on occupational inheritance: Self-employed parents and their children. M. Ruef, M. Lounsbury, eds. *Sociology of Entrepreneurship Research in the Sociology of Organizations*, Vol. 25. Elsevier, Oxford, UK, 33–83.

Aldrich, H. E., R. Waldinger. 1990. Ethnicity and entrepreneurship. *Annual Rev. Sociol.* **16** 111–135.

Arendt, J. N., A. Holm. 2006. Probit models with binary endogenous regressors. CAM Working Paper 2006-06, Centre for Applied Microeconometrics, University of Copenhagen, Denmark.

Barnett, W. P., J. N. Baron, T. E. Stuart. 2000. Avenues of attainment: Occupational demography and organizational careers in the California civil service. *Amer. J. Sociol.* **106**(1) 88–144.

Baron, J. N. 1984. Organizational perspectives on stratification. *Annual Rev. Sociol.* **10** 37–69.

Baron, J. N., W. T. Bielby. 1986. The proliferation of job titles in organizations. *Admin. Sci. Quart.* **31**(4) 561–586.

Bellante, D., A. N. Link. 1981. Are public sector workers more risk averse than private sector workers? *Indust. Labor Relations Rev.* **34**(3) 408–412.

Black, M., R. Moffitt, J. T. Warner. 1990. The dynamics of job separation: The case of federal employees. *J. Appl. Econometrics* **5** 245–262.

Blank, R. M. 1985. An analysis of workers' choice between employment in the public and private sectors. *Indust. Labor Relations Rev.* **38**(2) 211–224.

Borjas, G. J. 2003. Wage structures and the sorting of workers into the public sector. J. D. Donahue, J. S. Nye, Jr., eds. *For the People*: *Can We Fix Public Service*? Brookings Institution Press, Washington, D.C., 29–54.

Bridges, W. P., W. J. Villemez. 1991. Employment relations and the labor-market—Integrating institutional and market perspectives. *Amer. Sociol. Rev.* **56**(6) 748–764.

Burton, D. M., J. B. Sørensen, C. Beckman. 2002. Coming from good stock: Career histories and new venture formation. *Res. Sociol. Organ.* **19** 229–262.

Carrasco, R. 2001. Binary choice with binary endogenous regressors in panel data: Estimating the effect of fertility on female labor participation. *J. Bus. Econom. Statist.* **19**(4) 385–394.

Crewson, P. E. 1995. Comparative analysis of public and private sector entrant quality. *Amer. J. Political Sci.* **41**(3) 1057–1065.

Davies-Blake, A., J. Pfeffer. 1989. Just a mirage: The search for dispositional effects in organizational research. *Acad. Management Rev.* **14**(3) 385–400.

Dixit, A. 2002. Incentives and organizations in the public sector—An interpretative review. *J. Human Resources* **37**(4) 696–727.

Dobrev, S. D., W. P. Barnett. 2005. Organizational roles and transition to entrepreneurship. *Acad. Management J.* **48**(3) 433–449.

Donahue, J. D., J. S. Nye, Jr. 2003. *For the People*: *Can We Fix Public Service*? Brookings Institution Press, Washington, D.C.

Dunn, T., D. Holtz-Eakin. 2000. Financial capital, human capital, and the transition to self-employment: Evidence from intergenerational links. *J. Labor Econom.* **18**(2) 282–305.

Falcone, S. 1991. Self assesment and job staisfaction in public and private organizations. *Public Productivity Rev.* **14**(4) 385–396.

Fishe, R. P. H., R. P. Trost, P. Lurie. 1981. Labor force earnings and college choice of young women: An examination of selectivity bias and comparative advantage. *Econom. Ed. Rev.* **1**(2) 169–191.

Freeman, J. 1986. Entrepreneurs as organizational products: Semiconducter firms and venture capital firms. G. Libecap, ed. *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*. JAI Press, Greenwich, CT, 33–58.

Fujiwara-Greve, T., H. R. Greve. 2000. Organizational ecology and job mobility. *Soc. Forces* **79**(2) 547–585.

Hamilton, B. H. 2000. Does entrepreneurship pay? An empirical analysis of the returns of self-employment. *J. Political Econom.* **108**(3) 604–631.

Heywood, J. S., M. S. Mohanty. 1995. Estimation of the U.S. federal job queue in the presence of an endogenous union queue. *Economica* **62**(248) 479–493.

Heywood, J. S., W. S. Siebert, X. Wei. 2002. Worker sorting and job satisfaction: The case of union and government jobs. *Indust. Labor Relations Rev.* **55**(4) 595–609.

Hosmer, D. W., S. Lemeshow. 2000. *Applied Logistic Regression*, 2nd ed. Wileys Series in Probability and Statistics. John Wiley & Sons, New York.

House, R. J., S. A. Shane, D. M. Herold. 1996. Rumors of the death of dispositional research are vastly exaggerated. *Acad. Management Rev.* **21**(1) 203–224.

Hout, M., H. Rosen. 2000. Self-employment, family background, and race. *J. Human Resources* **35**(4) 670–692.

Hurst, E., A. Lusardi. 2004. Liquidity constraints, household wealth, and entrepreneurship. *J. Political Econom.* **112**(2) 319–347.

Ippolito, R. A. 1987. Why federal workers don't quit. *J. Human Resources* **22**(2) 281–299.

Jovanovic, B. 1979. Job matching and the theory of turnover. *J. Political Econom.* **87**(5) 972–990.

Kalleberg, A. L., A. Mastekaasa. 1998. Organizational size, layoffs and quits in Norway. *Soc. Forces* **76**(4) 1243–1273.

Katz, L. F., A. B. Krueger. 1991. Changes in the structure of wages in the public and private sectors. *Res. Labor Econom.* **12** 137–172.

Krueger, A. B. 1988. The determinants of queues for federal jobs. *Indust. Labor Relations Rev.* **41**(4) 567–581.

Kurland, N. B., T. D. Egan. 1999. Public vs. private perceptions of formalization, outcomes and justice. *J. Public Administration Res. Theory* **9**(3) 437–458.

Lazear, E. P. 1979. Why is there mandatory retirement? *J. Political Econom.* **87**(6) 1261–1284.

Lazear, E. P. 2005. Entrepreneurship. *J. Labor Econom.* **23** 649–680.

Maddala, G. S. 1983. *Limited-Dependent and Qualitative Variables in Economics*. Cambridge University Press, New York.

McCain, B. E., C. O'Reilly, J. Pfeffer. 1983. The effects of departmental demography on turnover: The case of a university. *Acad. Management J.* **26**(4) 626–641.

Meyer, M. W., M. C. Brown. 1977. The process of bureaucratization. *Amer. J. Sociol.* **83**(2) 364–385.

Miner, A. S. 1990. Structural evolution through idiosyncratic jobs: The potential for unplanned learning. *Organ. Sci.* **1**(2) 195–210.

Murray, M. P. 2006. Avoiding invalid instruments and coping with weak instruments. *J. Econom. Perspectives* **20**(4) 111–132.

Nicolaou, N., S. Shane, L. Cherkas, J. Hunkin, T. D. Spector. 2008. Is the tendency to engage in entrepreneurship genetic? *Management Sci.* **54**(1) 167–179.

Perry, J. L., L. W. Porter. 1982. Factors effecting the contents for motivation. *Acad. Management Rev.* **7**(1) 89–98.

Pregibon, D. 1981. Logistic regression diacnostics. *Ann. Statist.* **9** 705–724.

Quadrini, V. 1999. The importance of entrepreneurship for wealth concentration and mobility. *Rev. Income Wealth* **45**(3) 1–19.

Sargan, D. 1958. The estimation of economic relationships with instrumental variables. *Econometrica* **26**(3) 393–415.

Shane, S., T. Stuart. 2002. Organizational endowments and the performance of university start-ups. *Management Sci.* **48**(1) 154–170.

Shane, S., S. Venkataraman. 2000. The promise of entrepreneurship as a field of research. *Acad. Management Rev.* **25**(1) 217–226.

Sørensen, J. B. 2007a. Bureaucracy and entrepreneurship. *Admin. Sci. Quart.* **52**(3) 387–412.

Sørensen, J. B. 2007b. Closure and exposure: Mechanisms in the intergenerational transmissions of self-employment. M. Ruef, M. Lounsbury, eds. *Sociology of Entrepreneurship, Reserach in the Sociology of Organizations*, Vol. 25. Elsevier, Oxford, UK, 83–125.

Sørensen, J. B., O. Sorenson. 2003. From conception to birth: Opportunity perception and resource mobilization in entrepreneurship. *Adv. Strategic Management* **20** 89–117.

Steinhouse, C. S., J. L. Perry. 1996. Organizational commitment: Does sector matter? *Public Productivity Management Rev.* **19**(3) 278–288.

Stewman, S. 1988. Organizational demography. *Annual Rev. Sociol.* **14** 173–202.

Stuart, T. E., W. W. Ding. 2006. When do scientists become entrepreneurs? The social structural antecedents of commercial activity in the academic life sciences. *Amer. J. Sociol.* **112**(1) 97–144.

Stuart, T. E., O. Sorenson. 2003. Liquidity events and the geographic distribution of entrepreneurial activity. *Admin. Sci. Quart.* **48**(2) 175–201.

Williamson, O. 1999. Public and private bureaucracies: A transaction cost economics perspective. *J. Law, Econom., Organ.* **15**(1) 306–342.

Wilson, J. Q. 1989. *Bureaucracy: What Government Agencies Do and Why They Do It*. Basic Books, New York.

Zhao, H., S. E. Seibert. 2006. The big five personality dimensions and entrepreneurial status: A meta-analytical review. *J. Appl. Psych.* **91**(2) 259–271.