

Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States¹

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This article elaborates and evaluates the neo-Weberian notion of social closure to investigate positional inequality in the United States. It argues that social and legal barriers around occupations raise the rewards of their members by restricting the labor supply, enhancing diffuse demand, channeling demand, or signaling a particular quality of service. Hypotheses derived from the closure perspective are evaluated using new data that map five institutionalized closure devices—licensing, educational credentialing, voluntary certification, association representation, and unionization—onto 488 occupations. Results from multilevel models demonstrate that closure practices, particularly those that generate tangible restrictions on the labor supply, shape the contemporary structure of occupational earnings. Returns to these strategies vary across occupations but are not tightly linked to the complexity of the occupation's knowledge base. If suitably elaborated, closure theory thus offers a promising complement to individualistic explanations of earnings inequality.

In contemporary industrialized societies, inequality stems from three logically, although not temporally, distinct processes: positions in the division of labor are differentiated from each other; reward packages of greater or lesser value are attached to these positions; and people are allocated to these differentially rewarded positions. The first and third components

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continue to captivate students of occupations and of stratification, respectively, whereas the second component, the link between positions and their rewards, receives little theoretical or empirical attention.

This neglect emerges, fittingly, from the sociological division of labor. Scholars who study the social rules of allocation typically assume that the structure of positions and their rewards are predetermined by historical or economic conditions or simply are exogenous to their models (e.g., Blau and Duncan 1967; Goldthorpe 1983; more recently, Marini and Fan [1997, pp. 589, 595]). Other scholars working within the stratification perspective focus their attention on labor market vacancies (e.g., White 1970) or on the proximate labor market structures that mediate individual-level attainment (for an overview, see Kalleberg and Berg [1987]), but devote far less energy to theorizing the link between positions and their rewards (Baron 1984, 1995; Smith 1990). On the other side of the disciplinary divide, scholars who study the emergence and institutionalization of new positions in the division of labor (e.g., Caplow 1954; Wilensky 1964; Abbott 1988; Freidson 1986, 1994; MacDonald 1995) typically leave the consequences for the stratification system unexplored or assumed (see, e.g., MacDonald 1995, p. 58). Even the exceptions—represented, for example, by Larson's (1977; also Berlant 1975) study of "professional projects"—are directed more toward locating particular occupations in the class structure than toward understanding the impact of these collective mobility projects on the stratification system as a whole.

The prevalence of these assumptions is curious, particularly among stratification scholars charged with the task of understanding inequality and its sources. After all, it has long been appreciated that individuals' economic and social interests can be advanced not only by their attainment of a highly ranked position in a preset hierarchy, but also by the collective upgrading of their positions within the hierarchy (Sorokin [1959] 1995, p. 245; also Hughes 1971, p. 367; Larson 1977, pp. 66–79). To address this source of inequality, researchers must shift their attention from individual outcomes to collective outcomes and, on the causal side, from individual opportunities for attainment to collective action.²

This article develops and evaluates one such group-level approach to inequality, focusing on the question, Why are some occupations more highly compensated than others? Its basic argument derives from Weber's ([1922] 1978) notion of social closure, its subsequent elaboration by strat-

² Structural inequalities between collectives and the possibility for action by these collectives are the centerpieces of Marxist class analysis. Although Marxian-inspired studies of economic rewards were once common (e.g., Wright and Perrone 1977; Kalleberg and Griffin 1980), interest in these purportedly derivative forms of inequality has apparently dwindled (see, e.g., Wright 1997). Theories of rent extraction, discussed shortly, are an important exception.

ification theorists (e.g., Collins 1979; Murphy 1988; Manza 1992; Parkin 1971, 1974, 1979; Brubaker 1992; Tilly 1998; see also Kerr 1954), and related arguments in the sociology of professions (Berlant 1975; Larson 1977; Abbott 1988; MacDonald 1995): social groups formed around positions in the technical division of labor create social and legal barriers that restrict “access to resources and opportunities to a limited circle of eligibles” (Parkin 1979, p. 3). These practices, in turn, shape the contours of the hierarchy of occupational rewards.

Despite its pedigree, closure theory has languished in the twin shadows cast by Marxian class analysis and status attainment research. Internal failings, more than exclusionary tactics within the discipline (cf. Murphy 1983), have hampered prior efforts to launch closure theory into the spotlight of stratification research. First, analysts typically search for closure at the level of aggregate classes and all but ignore the many highly institutionalized barriers that bound detailed occupations (Grusky and Sørensen 1998; Grusky and Weeden 2001). Second, closure theorists have paid inadequate attention to the mechanisms through which closure is translated into rewards and, consequently, to differences between closure strategies in terms of their impact on the reward structure. Third, closure theory’s development has been shackled by the dearth of convincing data and empirical evaluations of its core predictions.

To address these shortcomings, I first elaborate a positional approach to inequality based on closure theory. The workhorses of social closure in the model are five highly institutionalized strategies—licensing, credentialing, certification, unionization, and representation by associations—that create social and legal boundaries around occupations. Each affects occupational rewards through a unique combination of four mechanisms: restricting the supply of labor in an occupation, enhancing overall demand for a product or service, solidifying an occupation’s claim to be the sole provider of that service, or signaling to customers that the occupation provides a service of a particular quality. Because the mechanisms underlying the closure strategies vary, their impact on occupational rewards is expected to differ in strength.

The analyses in the second section of the article evaluate the main hypotheses of closure theory. Although much of the same logic could be applied to nonmaterial rewards, the analyses focus on contemporary patterns of earnings inequality. They exploit an innovative data set that codes detailed occupations in the contemporary United States by their closure characteristics. When linked to individual-level data from the Current Population Survey (CPS), these data allow the impact of closure on occupational rewards to be assessed net of the demographic attributes and human capital of occupational incumbents. This represents a substantial

improvement over existing research that ignores such compositional effects.

The analyses incorporate as many occupations as possible—488 in all—given the constraints of the CPS. This approach differs markedly from class-analytic traditions, which assume that market-based interests are structured around highly aggregate groups (see Grusky and Sørensen 1998), and from the conventional case study tradition, which is necessarily limited in scope to one or two occupations, most often professions (see Abbott 1993). It instead assumes that all occupations have the potential to be organized as social groups (Durkheim [1893] 1984; Freidson 1994, pp. 75–91; Weber 1978), implement closure, and thereby affect the reward structure.

OCCUPATIONAL CLOSURE

Social closure, according to Weber (1978, pp. 43–46, 339–48, 926–55), occurs wherever the competition for a livelihood creates groups interested in reducing that competition. These groups try to monopolize advantages and maximize their rewards by closing off opportunities to outsiders they define as inferior or ineligible. Such exclusion may be based on any convenient or visible characteristic, including race, social background, language, religion, and gender (p. 342), although according to closure theorists, exclusion based on ascribed criteria is inexorably being replaced by exclusion based on “individualistic” criteria such as educational credentials, knowledge, or property ownership (Parkin 1979; Collins 1979; Murphy 1988).

Closure theory has much in common with structural accounts of exploitation (Manza 1992; Grusky and Sørensen 1998).³ The latter link material advantages to the extraction of rents, which are payments attached to positions and obtained “independently of the efforts of persons occupying these positions” (Sørensen 1996, p. 1338; also Sørensen 2000*a*, 2000*b*; Wright 1997; Roemer 1982). Monopoly rents are generated when actors create artificial monopolies over the supply of an asset, thereby “increasing the returns on the asset over what it would have generated in the absence of a monopoly” (Sørensen 2000*b*, p. 23; see also Sørensen 1996, 2000*a*). Such rents are produced, for example, when unions, governments, or professional associations erect systematic barriers to the attainment of the credentials necessary to obtain or practice a skill, which in turn limits the

³ The affinity between the neo-Marxian and neo-Weberian approaches is brought home in Charles Tilly’s (1998) celebrated effort to explain “durable inequalities” by the interplay of property-based exploitation and social closure (i.e., “opportunity-hoarding”).

supply of labor (Sørensen 2000*b*, p. 23; Wright 1997, p. 22; Granovetter and Tilly 1988, p. 177).⁴ Rents, then, might be seen as the equivalent of purely economic returns to social closure (Grusky and Sørensen 1998, p. 1211). I concentrate here on the neo-Weberian version, if only because it is more amenable to disaggregate analysis and can gracefully subsume demand-side processes.

Occupational closure is a specific instance of social closure. Social groups formed around positions in the division of labor (i.e., “occupations”) construct and defend social and legal boundaries that, in turn, affect the rewards of their members. This does not mean that all members of an occupation receive identical rewards, nor does it mean that all members of an occupation will benefit equally from closure. Indeed, closure *within* the occupation, perhaps along racial or gender lines, may affect how the fruits of closure *between* occupations are distributed (Weber 1978, p. 343). Nevertheless, the social conditions that characterize an occupation will benefit (or harm) all its members, albeit to different degrees.

As this discussion suggests, closure theory is predicated on the assumption that social groups can and do act to further their collective economic interests (e.g., Weber 1978, p. 344).⁵ At a minimum, some members of the occupation must recognize that their personal interests can be advanced by collective action. It is not necessary for all occupational incumbents to agree on the appropriate strategy to improve the social or economic position of the occupation, nor even on whether the advancement should take the form of greater pay, greater prestige, or some other valued reward. Furthermore, recognition of the benefits of occupational collective action may be scattered among the membership. In many occupations, the collective action function has been centralized in a distinct organization. Few lay members may give much thought to protecting their privileges, instead leaving the task to the active members of the occupation’s representative association (see, e.g., Olson 1965).

Two additional points are worth clarifying. First, not all the units we

⁴ Monopoly rents can be distinguished from quasi-rents, which are due to temporary disequilibria in the market, and composite rents, which derive from a symbiosis between employer and worker (see Sørensen 2000*a*, 2000*b*, 1996; also Wright 2000).

⁵ Some scholars question whether occupations always act in an “unbridled bid for collective gain” (Halliday 1987, p. 387), while others point out that the impetus for closure may lie in the state or in more general processes of cultural diffusion (e.g., Zhou 1993; Burrage and Torhstendahl 1990). One possible response to these critiques is to avoid making assumptions about agency or motivation altogether, on the grounds that the consequences of occupational closure are unaffected by its sources. Because we know so little about these consequences, system-level analyses based on this weakened form of closure theory still have much to offer. In the long run, however, scholars who wish to push the closure case must take seriously issues of agency and motivation at lower analytic levels.

commonly call occupations are social groups capable of collective action. Some are administrative labels referring to aggregations that, like Marx's peasants, resemble little more than a sack of potatoes, while others may still be in the process of organizing and not yet show evidence of closure. Second, closure is a dynamic process. It secures advantages at the expense of another group, whether employers or consumers, who must pay a higher price for labor, or other workers, who are denied access to the occupation (see, e.g., Sørensen 2000*b*). As a result, the privileged group must constantly protect its control over an asset against attempts by other groups to usurp that asset (e.g., Parkin 1979, pp. 74–111). Because closure varies over time and across occupations, I treat its extent in an occupation at a given point in time as an empirical question. This analytic strategy is consistent with my focus on the consequences, rather than the sources, of closure.

CLOSURE MECHANISMS AND STRATEGIES

The core prediction of closure theory is straightforward: the greater the extent of closure characterizing an occupation, the higher the occupation's rewards. Students of stratification are typically content to end the story here, or perhaps with the qualification that some closure devices contradict modern individualist ideologies, generate public disapproval and reactionary backlash, and hence are less effective than others (e.g., Parkin 1979, pp. 74–86). In its current state, closure theory lacks a clear articulation of the mechanisms through which closure affects rewards, and therefore it can offer little explanation for how or why closure strategies might differ in terms of their economic and social payoff. Borrowing and elaborating ideas from the stratification and professions literature, I attempt to clarify closure theory by identifying four mechanisms that link closure practices to rewards: restricting the supply of practitioners, increasing diffuse demand for services, channeling demand to the occupation, and signaling quality of service.

These mechanisms are triggered by one or more closure strategies, the deeply institutionalized practices through which occupational closure is secured. In the contemporary United States, five such closure devices—licensing, credentialing through the formal education system, certification through voluntary programs, representation by occupational associations, and unionization—are particularly salient. These strategies certainly do not exhaust all forms of closure. Private property ownership, which figures so prominently in class analysis and closure theory (e.g., Wright 1979, 1997; see also Murphy 1988, pp. 70–74; Parkin 1979, p. 53), is excluded from this list on the grounds that it is more an intrinsic feature

of an occupation than an instrumental tactic *per se*. Also missing are social networks, including those derived from parental background, that shape recruitment into occupations (see, e.g., Giddens 1973; Manwaring 1984; Tilly 1998) and pattern the day-to-day interactions through which occupational cultures are formed and boundaries maintained (e.g., Collins 1979, pp. 58–60; see Manza 1992, pp. 286–87). Nevertheless, the strategies considered here are (arguably) the dominant institutionalized practices that create closure around social groups defined at the site of production. Each is expected to influence the reward structure, albeit through a different combination of the four mechanisms.

Restricting Supply

The first mechanism brings us back to Weber's definition of social closure and, indeed, has played the lead role in subsequent scholars' accounts of social closure: closure generates an artificial scarcity of individuals who have the legal, technical, or socially recognized ability to perform the bundle of tasks provided by that occupation (Weber 1978; also Larson 1977; Freidson 1994, pp. 80–83; Parkin 1979, pp. 44–71; Collins 1979, pp. 56–58; Sørensen and Kalleberg 1981). These supply-side restrictions are generated through three of the five strategies—educational credentialing, licensing, and unionization.

Educational credentialing refers to the use of the familiar symbols or markers of knowledge (e.g., grade levels, diplomas) conferred by formal educational institutions to monitor entry into occupations. Credentialing can restrict the labor supply in two ways, depending on the perspective one takes on the nature of educational credentials. One view posits that educational credentials certify the acquisition of real skills, and, as a result, any restrictions on opportunities to attain these credentials—whether through the influence of accrediting boards, the scarcity of native ability, or the “considerable expenses and long period of gestation” (Weber 1978, p. 1000) training entails—will shrink the pool of candidates who have the skills necessary to perform an occupation's tasks (Parkin 1979; Sørensen 1996; Wright 1979). Employers and consumers, in turn, support credentialism as “a necessary device for narrowing the range of choice” among candidates in a world in which alternative ways of judging expertise (e.g., trial employment, word-of-mouth testimonials) are simply too cumbersome or costly (Freidson 1994, p. 159). An alternative perspective argues that educational credentials are only loosely, if at all, related to the knowledge a person needs to be competent or productive in an occupation (Collins 1971, pp. 1005–7; 1979, pp. 12–21; Berg 1970; Jencks 1979, p. 192). Instead, these credentials serve as a largely arbitrary “cultural currency” that buys membership into a particular club (Collins 1979, p. 189;

Bourdieu 1984; Parkin 1979). In this view, credentialing restricts the labor supply because employers, occupational gatekeepers, and consumers value the cultural currency and believe that the credential certifies a unique capacity to perform a set of skills. Although a given occupation has little control over the cultural value attached to educational credentials, there is no shortage of examples of efforts by emergent or existing occupations to introduce specialized curricula into postsecondary educational institutions, develop specialized schools, encourage the state to support credentialism as a legitimate basis for exclusion, require special examinations or educational credentials as a precondition for entry into the occupation, or where occupational representatives do not directly make hiring decisions, define job requirements and prerequisites in ways that encourage employers to support credentialism (e.g., Abbott 1988; Freidson 1994).

Whereas educational credentialing is enforced largely through organizational rules, norms, and the hiring practices of gatekeepers, licensure relies on the state to enforce supply-side restrictions. Licensure requires that individuals obtain permission from the state in order to identify themselves by an occupational title (e.g., psychologist) and, in many cases, practice a particular set of skills (e.g., counseling). It thus restricts access to an occupation to candidates who have met a predefined set of criteria, where such criteria may include obtaining a specified educational credential or voluntary certification, demonstrating proficiency, paying a fee, or meeting minimum age, citizenship, residency, local experience, and moral turpitude requirements. These criteria, in turn, may be developed and administered by occupational representatives or, in some occupations, independent certification agencies whose decisions are honored by the state (e.g., occupational therapist, radiographic technician), state-mandated boards consisting of occupational and lay representatives (e.g., engineering occupations), or administrators within particular bureaucratic divisions of the state (e.g., insurance agents). Although occupations thus vary in the extent to which they have direct control over licensing criteria, even where occupational self-regulation is minimal, licensure cannot fail to restrict supply unless criteria are so lax, fees so low, and the process so painless that no potential licensees are discouraged or denied (cf. Shimberg, Esser, and Kruger 1973; Kleiner and Kudrle 1992).

Licensure is often justified to lawmakers and the public on the grounds that it protects consumers from incompetence or malfeasance in occupations where incompetence and malfeasance are difficult for consumers to judge and can threaten consumers' health, wealth, homes, or other valued "goods." As Parkin (1979, pp. 54–55) notes, efforts to control the "moral and technical standards" of occupational incumbents are not antithetical to, and in fact can be used to justify, efforts to control the supply of labor and enhance the market value of the occupation. Indeed, aca-

demics and policy makers have long been concerned that protecting the public through licensure comes at the cost of restricting the free operation of labor markets (e.g., Council of State Governments 1952; Friedman 1962; Holen 1965; Stigler 1971; Gellhorn 1976; Rottenberg 1980).

The extent to which this concern is empirically justified remains uncertain. Licensing appears to restrict geographic mobility (e.g., Boulier 1980; Kleiner, Gay, and Greene 1982; Holen 1965), and on average, licensed occupations have higher median earnings than partially licensed and unlicensed occupations (Stigler 1971, p. 17; Friedman and Kuznets 1945), although licensed occupations vary considerably in their earnings (Evans and Laumann 1983, p. 13). This observed association, however, may be confounded with the effects of educational credentialing (compare Cullen 1978, p. 189, and Freedman 1976) or voluntary certification, both of which may be prerequisites for licensure. Evidence from cross-state, intraoccupational analyses is similarly inconclusive. Pfeffer (1974) finds no correlation between regulation and the average income of real estate brokers, insurance agents, and plumbers, but finds modest positive correlations between income, failure rates on examinations, and the composition of licensing boards (also, White 1980; Kleiner and Kudrle 1992). Because these studies examine different labor market positions (and typically a narrow range of them), consider a limited range of closure strategies, and all but ignore the characteristics of individuals within occupations, they do not provide definitive evidence of the empirical consequences of licensure on rewards.⁶

The third and final strategy that implements supply-side restrictions is unionization. Here, state-sanctioned collective bargaining and the threat of the withdrawal of labor, the defining features of union organization, fundamentally alter the conditions of employment. Unions have a well-documented impact on the wages of union members (e.g., Freeman and Medoff 1984; Pencavel 1991, pp. 16–30). They may also affect the rewards of nonunion members through the “wage spillover” effect, wherein non-union employers pay union wages to reduce the outflow of personnel or to undermine unionizing efforts in their own firms. The wage-spillover hypothesis has received support in labor economic research (see Freeman and Medoff 1984, pp. 150–61; Pencavel 1991, p. 17; Curme and MacPherson 1991), but because these studies focus on reference groups defined by firm, industries, geography, or broad skill levels, they tell us little about

⁶ Freedman’s (1976) and Cullen’s (1978) studies are atypical in that they consider multiple closure strategies and incorporate a range of occupations, but neither is sufficient to evaluate the occupational closure argument. Cullen’s sample disproportionately represents the professions and excludes 45% of the labor force (1978, p. 34), while Freedman’s units are cells in a 10-occupation \times 27-industry matrix.

whether there is an occupation-level wage-spillover effect. If we assume occupations also act as a reference group for employers, the wage-spillover effect should be greatest in occupations with the highest proportion of unionized workers.

The complexity of contemporary union organization gives us reason to believe that this hypothesis might be overly simplistic. In response to declining membership, craft unions often recruit beyond their traditional occupational borders. Similarly, the rapidly expanding white-collar and service unions are more often organized around industries than around occupations (see Hirsch and McPherson 2001). These industrial unions may represent a large proportion of an occupation that is concentrated in highly unionized industries—for example, dressmakers are concentrated in the textile industry, which, in turn, is represented by the United Needletrades, Industrial, and Textile Employees (UNITE). To the extent that UNITE successfully restricts the supply of labor in this industry, dressmakers are likely to benefit. However, these benefits may be only tangentially related to *occupational* closure. Any observed effect of unionization on an occupation's rewards should be interpreted cautiously, because it may reflect the uneven distribution of that occupation within the industrial structure rather than an effect of occupation-based closure practices.

The preceding discussion is useful for understanding why the two remaining closure strategies, representation by associations and voluntary certification, do not restrict the labor supply. Occupational associations are organizations that, like unions, seek to improve the honor, status, conditions of work, or monetary compensation of the occupations they represent, but unlike unions, they lack the legal authority to strike or bargain collectively. Voluntary certifications are credentials developed, marketed, and administered by occupational associations, certifying boards, and less commonly, for-profit organizations and trade associations; they are not sufficient to practice a state-licensed occupation, although they may be a precondition of licensing in some occupations, nor are they typically obtained through the formal education system. Occupational associations and certifying agencies can exert control over the number of association members or certified practitioners, respectively, but this does not translate into control over the labor supply.

Consider, for example, voluntary certification. The criteria for certification vary considerably across occupations, but typically include some combination of specialized coursework (via correspondence courses, workshops, or online education), demonstrable experience, a passing score on a written or practical exam, subscription to a code of ethics, membership in the sponsoring organizations, and in some occupations, a formal educational credential. More commonly, though, the skills needed for cer-

tification are learned on the job, and hence workers can obtain the occupation's skills without becoming certified. As a result, certifications, like formal educational credentials in the culturalist view, restrict access to an occupation only if gatekeepers regard them as important markers of competence. However, voluntary certifications rarely enjoy such legitimacy. Indeed, the lack of oversight of certification programs may lead consumers to be suspicious of their effectiveness as a screening tool, and a certification that few consumers or gatekeepers recognize, or worse yet that they believe to be a sham, benefits neither the certified individual nor the certified occupation. Similar features characterize association membership, leading to the conclusion that this strategy also fails to generate supply-side restrictions.

Increasing Diffuse Demand

In the short term, the supply-side restrictions generated by educational credentialing, licensing, and unionization may be sufficient to raise occupational rewards. In the long term, however, an occupation that restricts supply without also guaranteeing a minimum level of demand for its services may wind up in the dustbin of history with railroad dispatchers, dancing masters, and psychological mediums (Abbott 1988, pp. 29–30). As students of professions convincingly demonstrate, much of an occupation's boundary-setting activities are directed not only toward restricting the labor supply, but also toward creating, enhancing, or defending demand for the occupation's work (e.g., Freidson 1986, 1994; Abbott 1988). These demand-side processes represent the second and third mechanisms through which closure may elevate rewards.⁷

Closure activities may increase the absolute level of demand for a particular product or service. Occupational associations, in particular, often attempt to raise diffuse demand. They may lobby state or federal governments for regulations that increase state services such as medicine, education, social services, and criminal justice (MacDonald 1995). They may also market the occupation's product in the private sector, as when the association representing plastic surgeons sponsors full-page advertisements in national magazines touting the many psychological benefits of altering one's facial features. These campaigns are broader in scope than unions' demand-raising efforts, which typically attempt to convince

⁷ The subsequent discussion includes statements obtained from association web sites and other publications. These statements should not be read as evidence of successful closure, but as (nonrandom) examples of the claims occupations typically make as part of their closure projects. Moreover, I do not wish to imply that closure projects are the only activities in which associations engage.

consumers to substitute union-made for non-union-made products or services.

Channeling Demand

An increase in the overall level of demand for a product or service is not sufficient to increase the demand for a particular occupation. For example, a number of occupations have attempted to fill the burgeoning demand for personal financial planning, including insurance agents, stockbrokers, accountants, lawyers, and advice columnists, not to mention the emergent occupation of "financial planner" (Cohen 1996). Similarly, plastic surgeons could, in theory, fail to benefit from an increased demand for new noses if other occupations could legally fill that demand. If an occupation restricts the supply of workers without also guaranteeing demand for the services it alone can claim, consumers will look for, and other occupations will provide, an alternative source of those services. Consequently, an occupation must defend the demand for its services from encroachment by other occupations (Abbott 1988).

Closure thus raises earnings through a third mechanism: channeling the demand for a good or service to a particular occupation. This is accomplished most formally and forcefully through licenses, such as the plastic surgeons', that spell out the tasks under purview of a particular occupation. Assuming there is no black market for services, such licenses represent a patent on a practice (Larson 1977) and effectively direct demand to the specified occupation. More commonly, however, occupation-specific demand is defended through largely symbolic means. Occupational associations carry much of the burden of marketing their occupation and, more generally, of making largely symbolic jurisdictional claims over a set of tasks. Licensing, even where it protects a title rather than a set of tasks, also helps convince potential consumers that a task is most efficiently, reliably, or safely provided by the licensed occupation alone. And, finally, voluntary certification programs allow occupations to define and claim ownership over their core tasks; if properly marketed, such programs can affect the cognitive maps of potential consumers and, consequently, the occupation to which they turn when in need of a service.

Signaling Quality of Service

The fourth and final mechanism through which closure affects reward is also largely symbolic. That is, exclusionary boundaries help occupational agents impose on the world a vision of their (desired) position in the social division of labor (Bourdieu 1987, pp. 10–11; see also Scott 1992, p. 139). They signal to consumers that the practitioners who fall within the bound-

aries are well trained to perform a complex task effectively, efficiently, and at a particular level of quality. Nonmanual and service occupations often claim their services are of professional quality, with all the cultural stereotypes implied by that label, and manual occupations often make analogous claims to craft status.⁸ A successful quality-of-service signal, in turn, increases the price consumers are willing to pay for an occupation's services beyond that expected from the intersection of supply and demand. Indeed, the strongest professions set a target income based on normative considerations and force services until the target is met or exceeded (Brint 1994, p. 76). However, returns to the quality-of-service signal need not be limited to the traditional professions. As a member of the Professional Association of Resume Writers (1998) explains, "once [clients] are convinced that you are a professional, they'l [sic] readily accept your quoted price."

If their mission statements are any indication, one of the primary goals of occupational associations is to broadcast such quality-of-service signals. The Opticians Association of America (1996), for example, have as their mission "fostering a broader understanding and acceptance of professional retail optical dispensing as indispensable to the health and welfare of the public" and "promoting the advancement of the science and art of opticianry to provide better eye care to the public." Associations may try to meet these goals through licensure, certification programs, or accreditation, which suggests that some of the effects of association representation will be mediated through these other strategies. Nevertheless, associations may also try to directly influence consumers' perception of the quality of the occupation's services through their involvement in the political economy, self-proclaimed expertise on social issues, organizational rhetoric, or even choice of a name (see Freidson 1986, pp. 185–205; Caplow 1954, p. 135).⁹

Association representation is but one tool occupations have at their disposal to shape public opinion. Other closure strategies allow an occupation to signal that it provides services of a particular quality by

⁸ An example of the former is nicely provided by management consulting, whose representatives framed their (failed) bid to licensure as follows: "State-based licensure will stem the rising tide of unqualified consultants passing themselves off as experts to unsuspecting businesses and improve the image of consultants as employed white-collar workers. Management consultants would be a 'Profession'" (National Bureau of Professional Management Consultants 1998).

⁹ To date, little empirical evidence assesses the direct tie between association representation and occupational earnings. In a notable exception, Cullen (1978) found that occupational earnings are positively correlated with the number of administrative staff, but not with number of members. As he acknowledges (p. 189), his sample shows little variance, and his "top-down" data collection procedure (see below) may seriously bias membership counts.

demonstrating that its *members* are of a certain quality. Unlike association representation, these devices ostensibly exclude on the basis of individual merit and achievement. By selecting its members according to these culturally legitimated rules, an occupation can maintain prestige and “the consequent opportunities to enjoy honor and even profit” (Weber 1978, p. 46).

Licensing, credentialing through the formal education system, and voluntary certification are three such strategies. Licensing allows an occupation to claim that its practitioners meet a minimum level of technical competence and moral superiority.¹⁰ Credentialing likewise serves as a selection device that, according to Collins, creates groups with castelike character (1979, pp. 43, 94–103). These groups benefit not only from their selectivity, but also from the link credentialing demonstrates between the occupation and formal, academic knowledge. This link legitimates the occupation’s work by tying it to values of efficiency and rationality, and also allows its practitioners to benefit from the “public’s mistaken belief that abstract professional knowledge . . . implies effective professional work” (Abbott 1988, p. 54). Finally, voluntary certification programs are explicitly designed to identify and select individual with desirable attributes, thereby improving the image of the occupation as a whole. For example, the Society of Clinical and Medical Electrologists (1999) claims that its certification program allows consumers “to sepearate [sic] the highly-skilled and well-trained practitioner from the few amateurs who gave the profession a bad name.” In a more eloquent statement of the same theme, the American Purchasing Society (1998) acknowledges that certification “promote[s] recognition and acceptance of [purchasers’] professional status.” By virtue of this purported selectivity, certified, licensed, and credentialed occupations are better able than other occupations to send a convincing quality-of-service signal and to enjoy the attendant rewards.

Summary

The preceding discussion is summarized in table 1, which lists the four mechanisms of closure and their associated closure strategies. Because the observable strategies operate through multiple unobservable mechanisms, disentangling the mechanisms empirically is difficult. However, it is pos-

¹⁰ Claims to moral superiority are exemplified by a recent case in which a review panel denied a law school graduate a license because of his white-supremacist views. In a well-publicized explanation, the panel wrote, “[He is] free . . . to incite as much racial hatred as he desires and to attempt to carry out his life’s mission of depriving those he dislikes of their legal rights . . . but in our view he cannot do this as an officer of the court” (*Seattle Times*, February 9, 1999, p. A7).

TABLE 1
MECHANISMS OF EARNINGS ENHANCEMENT CHARACTERIZING EACH CLOSURE
STRATEGY

	Restrict Supply	Increase Diffuse Demand	Channel Demand to the Occupation	Signal Quality of Service
Licensing	+	—	+	+
Formal educational credentialing	+	—	—	+
Voluntary certification ...	—	—	+	+
Representation by associations	—	+	+	+
Unionization	+	—	—	—

NOTE.—Symbols indicate the presence (+) or absence (—) of a mechanism.

sible to generate testable hypotheses about the relative effects of each closure strategy based on different assumptions about the importance of the underlying mechanism. Specifically, if stratification scholars are correct in assuming that supply-side monopolization has the strongest impact on the reward structure, we would expect voluntary certification and representation by associations to have relatively weak effects on earnings, because neither operate through this mechanism. If, on the other hand, jurisdictional protections have the strongest impact, we would expect formal educational credentialing to have relatively weak effects (except, perhaps, where it involves occupation-specific diplomas). Licensing offers the best of both worlds and thus should have a particularly strong effect on occupational rewards.

Closure strategies, and therefore the mechanisms on which they rely, are unevenly distributed across the occupational structure. Neither the sources nor the consequences of this uneven distribution for earnings are immediately obvious. Strategies may cluster in certain major occupation groups because federal laws prohibit some occupations (e.g., managers) from unionizing, because normative constraints prevent the “gentlemanly” professions from engaging in tactics that might contradict their occupational identities, or because occupational practices and incumbents are more likely to be exchanged across technically proximate occupations. To the extent that these forces drive the uneven distribution of closure strategies, there is little reason to expect uneven returns to these strategies across occupations.

Other explanations of the uneven distribution of closure point to variations in occupations’ core knowledge and skills. According to the received wisdom, professions are better able to create and defend labor market barriers because of the “special” knowledge and skills at the core

of these occupations (e.g., Larson 1977; Abbott 1988; MacDonald 1995).¹¹ Indeed, Larson (1977, p. xvii) argues that professional closure projects are little more than “an attempt to translate one order of scarce resources—special knowledge and skills—into another—social and economic rewards.” It is less clear from this literature whether these same features of an occupation’s knowledge base are expected to affect *returns* from closure, but this hypothesis is certainly reasonable. On the supply side, convincing claims to a particular type of knowledge may allow an occupation to push for licensing or credentialing criteria that exclude a substantial number of potential competitors. On the demand side, such claims may be necessary for the occupation to successfully channel demand or send a particular signal about the service its members perform. One would thus expect the returns to closure to be greatest in the professions and, moreover, for these differential returns to be related to the professions’ generally high levels of cognitive skill complexity.

DOMINANT MODELS OF REWARDS

With its emphasis on group-level stratification processes, closure theory offers a direct contrast to dominant models of wage determination. The latter models are decidedly individualistic, perhaps reflecting the strong jurisdictional claims of neoclassical economists over the topic of wages. In the basic neoclassical model, wages represent the equilibrium price between demand for and supply of labor. A profit-maximizing employer will hire labor until the revenue from the last unit produced exceeds the costs of producing it. The supply of labor available to this employer depends on workers’ reservation wage, the wages and amenities offered by competing firms, the geographic mobility of labor, government policies regarding immigration, basic trends in population size and characteristics, and other exogenous factors.

Human capital theory offers a well-known investment account of the supply-side forces that prevent labor mobility, hamper the market-equilibrating process, and create “wage stickiness” (Polachek and Siebert 1993, p. 13; also, Becker [1964] 1993).¹² In order to encourage workers to invest

¹¹ There is far less agreement concerning which characteristics of professional knowledge are the most relevant. I assume that the salient attributes include, or are at least highly correlated with, cognitive skill complexity.

¹² Human capital theory, like the basic neoclassical model, relies on marginalism to explain demand. Employers hire skilled labor as long as they believe the marginal productivity of labor of a given quality exceeds its higher cost; otherwise, they will substitute lower-priced labor or physical capital (assuming that such substitutions are legal).

in human capital—the productive resources learned and carried by people—wages must rise in proportion to accumulated human capital. Inequality thus derives from differences in the premiums employers pay to encourage human capital investments. Residual wage differences at the occupation level are attributed to imperfections in the measurement of individual-level human capital or, in some versions, to compensations for risk, danger, or rapidly depreciating skills.

The sociological cousin of human capital theory is the equally familiar functionalist theory of stratification (Davis and Moore 1945; for a useful comparison of the theories, see Granovetter [1981]). According to functionalism's central tenets, certain occupations are more critical to the social system than others, and more importantly, tend to require skills that few people have the inherent talent to perform. To motivate people to undergo the necessary training with all its attendant sacrifices and miseries, society must reward these occupations well. The occupational hierarchy of rewards is thus a consequence of qualitative and quantitative differences in occupations' job requirements. Although functionalism is an explicitly positional approach, it shares with human capital the implication that variations in rewards, whether across positions or persons, can ultimately be explained by differences in training, native talent, or human capital. The distinction between the theories' unit of analysis breaks down even further in practice whenever generous scholars attribute to human capital theory those earnings differences associated with occupational skill requirements under the assumption that these skills reflect unmeasured or specialized human capital (see Tam 1997). The empirical models implied by the two theories are thus much the same: variations in earnings should be captured by measures of individual-level investments in training and education in conjunction with occupation-level measures of job requirements and skills.

Sociologists have long been dissatisfied with these investment accounts, particularly with their silence about the many forces that generate a mismatch between marginal productivity or skills and wages in the ever-present short run. "New structuralist" and organizational scholars identify a laundry list of firm-, industry-, or sector-level features that mediate the relationship between individual attributes and wages (for reviews, see, Baron 1984; Kalleberg and Berg 1987). "Devaluation" theorists turn the neoclassical logic on its head by arguing that occupational rewards are a consequence rather than a cause of its demographic composition; that is, occupations containing a high proportion of women receive fewer rewards because women's labor or skills are devalued (e.g., Baron and Newman 1990; England 1992; Kilbourne et al. 1994; Steinberg 1990; cf. Tam 1997). Both reflect sociologists' interests in developing positional alternatives to the individualism of human capital theory and related sociological the-

ories. Neither, however, offers a clear specification of the links between the featured positional characteristics and rewards, nor have they coalesced into a parsimonious or comprehensive alternative to investment models (see Baron 1995; Smith 1990). Human capital and functionalist models thus provide the main alternatives against which I evaluate the claims of closure theory.

METHODS AND MODELS

Closure theory operates at the occupation level; human capital theory operates at the individual level; and functionalism straddles both. The few extant efforts to link occupational characteristics such as licensing, credentialing, unionization, or association representation to occupational earnings have failed to distinguish occupation-level effects on mean earnings from the wage-generating attributes of the individuals nested within occupations (e.g., Cullen 1978; Stigler 1971; Friedman and Kuznets 1945). Without this distinction, positional accounts become hopelessly entangled with far more popular individual-level explanations (see, e.g., Noyes 1945, p. 406).

The analyses address this problem with hierarchical, random-effects ANCOVA models. The general form of the models is given in equation (1):

$$Y_{ij} = c + \mathbf{a}'\mathbf{W}_j + \mathbf{b}'(\mathbf{X}_{ij} - \bar{\mathbf{X}}..) + u_j + \varepsilon_{ij}, \quad (1)$$

where Y_{ij} is the (logged) weekly earnings for person i in occupation j ; \mathbf{b}' is a vector of individual-level fixed effects on earnings; \mathbf{X}_{ij} is a vector of individual-level characteristics, all centered around their grand means; and ε_{ij} and u_j are mean-zero individual- and occupation-level error terms, respectively. Of primary interest is \mathbf{a}' , a vector of coefficients that estimates the association between occupational characteristics, \mathbf{W}_j , and mean (logged) earnings after adjusting the latter for cross-occupational differences in the characteristics of the individuals nested within them. The slopes of the individual-level coefficients are not allowed to vary across occupations. Maximum likelihood estimates of the parameters in equation (1) are generated in HLM/2L using the EM algorithm (see Bryk and Raudenbush 1992, pp. 44–48, 232; Bryk, Raudenbush, and Congdon 1989).

DATA AND VARIABLES

Individual-Level Data

The individual-level data are from the earner study sample of the 1992–99 March CPS (Bureau of Labor Statistics [BLS]), a nationally representative survey of all nonfarm wage and salary workers. These years are chosen to bracket the period of the closure data (see below). The surveys are pooled so most of the 501 occupations in the 1990 Census Bureau classification scheme are represented; even so, seven “empty” occupations, as well as six farm occupations, are excluded. The final weighted sample contains 97,084 civilian wage and salary workers ages 21–64, each with positive CPS weights and usual weekly earnings, nested in 488 occupations.

The individual-level variables are listed in table 2. The dependent variable in all models is the natural log of usual weekly earnings in 1999 dollars, including wages, tips, and bonuses. Weekly earnings are used instead of hourly earnings because the latter are only reported for hourly workers. Although it would be possible to estimate hourly earnings using self-reported hours, this practice may introduce considerable measurement error bias (see Rodgers, Brown, and Duncan 1993), particularly if the quality of self-reports differs across occupations. Top-coding, in which the BLS assigns reported values over \$1,923 per week to this cap, affects 1% of respondents; their reported earnings are replaced with the gender- and year-specific means of a Pareto distribution (see Hirsch and McPherson 2001, p. 6).

The covariates of earnings reflect those included in standard individual-level earnings functions. Their coding is straightforward (see table 2). Measures of human capital include education, experience and its square, and proxies for labor market commitment and firm-specific capital. Education, an ordinal variable in the CPS, is converted into a continuous measure of years of education using the gender- and race-specific means of each category calculated from the 1993–98 General Social Surveys (Davis and Smith 1998). Experience is approximated by age minus years of education (+ 6), with negative results set to zero; although it would be preferable to have a more direct measure of work experience, none is available in the CPS. Labor market commitment is approximated with a dummy variable that takes on the value of “0” if the respondent worked part-time, part-year, or both, and unity otherwise. Firm-specific capital is approximated by a binary variable coded “0” if a respondent had more than one employer in the past year, and “1” otherwise. Measures of gender, race, marital status, parenting status, Southern region, urban or rural location, industrial sector, and establishment size tap known geographic,

TABLE 2
MEANS AND SDs OF INDIVIDUAL-LEVEL VARIABLES: MARCH EARNER STUDY
OF THE CPS, 1992–99.

Variable	Mean	SD
Demography:		
Female .....	.482	.500
Nonwhite .....	.242	.428
Nonmetropolitan residence .....	.191	.393
Southern region .....	.340	.474
Spouse present in home .....	.616	.486
Young child (< age 6) .....	.191	.393
“Human capital”:		
Education, in years	13.894	2.557
Baccalaureate diploma .....	.274	.446
Experience (age – education – 6)	18.854	11.188
Experience ²	480.647	488.835
Intermittent labor force participation (1 = part time, part year, or both) ...	.271	.444
Usual hours worked per week	39.556	10.276
Single employer last year .....	.843	.363
Workplace characteristics:		
Union member .....	.163	.370
Establishment size > 500 .....	.487	.500
Industry (omitted category = manufac- turing):		
Extraction .....	.013	.114
Construction .....	.049	.216
Transportation, communication, and utilities .....	.079	.270
Wholesale and retail trade .....	.183	.387
Personal and entertainment services ...	.045	.208
Professional and business services .....	.386	.487
Public administration .....	.055	.228
Dependent variable:		
ln (weekly earnings)	5.974	.756
Usual weekly earnings, 1999 dollars	510.98	422.60

NOTE.—Weighted $N = 97,084$. Unless otherwise specified, dummy variables are coded “1” = yes and “0” = no. Within-occupation variance in log earnings = .380, between-occupation variance = .196.

demographic, and workplace correlates of earnings.¹³ Union membership is also included to measure any direct effect of collective bargaining on wages.

¹³ Establishment size pertains to the longest job held in the past year, whereas earnings pertain to the job held last week. This disparity introduces measurement error, but only where tenure at the current job is shorter than at prior jobs and the job-shift involved a change in establishment size.

Occupation-Level Data

The occupation-level variables and their means are presented in table 3. The first set of variables measure cognitive skills, physical demands, hazardous conditions, nurturing skills, and authority skills. These measures capture the functionalist argument that complex occupations, by virtue of the shortage of native talent, must be liberally rewarded, but they also could be interpreted as proxies for occupation-specific human capital. The first four scales are unweighted means of the *z*-scores of component items (see table 3) from the *Dictionary of Occupational Titles* (U.S. Department of Labor et al. 1991; England and Kilbourne 1988; for factor loadings, see Kilbourne et al. [1994]) and, for the nurturing scale, comparable worth research (England 1992, pp. 138–39). Authority is measured with a binary variable coding whether an occupation requires supervisory or managerial skills (England 1992, p. 137).¹⁴ The proportion of women in an occupation, constructed from the 1990 EEO file (U.S. Department of Commerce 1993), is included because of its demonstrated association with occupational earnings (England 1992; Kilbourne et al. 1994, cf. Tam 1997). An analogous measure of racial composition showed no significant association with earnings, did not affect the estimated closure coefficients, and was dropped from the final models.

The final set of variables indexes the extent to which an occupation is characterized by each of the five closure strategies. Occupation-level measures of educational credentialing and unionization can easily be constructed from standard public-use data files, but measures of licensing, voluntary certification, and association representation cannot. I collected the latter data from published directories and supplementary information obtained from state licensing departments, association web sites, and contacts with certification program coordinators. My general approach to data collection was identical for all three strategies and involved four steps.

First, I constructed comprehensive enumerations of the occupational licenses, voluntary certifications, and occupational associations existing between 1995 and 1997. Details about the data sources and operational definitions of each strategy are provided in the appendix (see also Weeden 1999). Second, I identified the occupation named in the license or certi-

¹⁴ England and Kilbourne's (1988) file maps *DOT* scores onto the 1980 census occupational scheme. Fortunately, this scheme differs little from the 1990 scheme. Using the 1991 *DOT* revision, I constructed scores for 12 1990 occupations that split or merged from lines in the 1980 scheme and for four small occupations missing from the 1988 file. The differences in the timing of the data should have no systematic impact on the results, particularly given the *DOT*'s notorious underestimation of temporal change in skills (Cain and Treiman 1981; Spenner 1983).

TABLE 3
MEANS, SDS, AND BIVARIATE CORRELATIONS OF OCCUPATION-LEVEL SKILL, GENDER COMPOSITION,
AND CLOSURE VARIABLES

VARIABLE	MEAN	SD	BIVARIATE CORRELATIONS										
			1	2	3	4	5	6	7	8	9	10	11
Skills and working conditions: ^a													
1. Cognitive skills .....	.014	.848	. . .										
2. Authority .....	.160	.366	.36										
3. Nurturing .....	.312	.880	.35	.14									
4. Physical demands	−.163	.803	−.03	−.32	−.30								
5. Hazardous conditions	−.175	.737	−.43	−.14	−.46	.25							
Gender composition:													
6. %female ^b .....	.466	.302	−.03	−.16	.46	−.08	−.49						
Closure strategies (proportion of occupation members covered): ^c													
7. Licensing .....	.330	.404	.39	.24	.43	−.19	−.17	.06					
8. Educational credentialing .....	.574	.257	.83	.18	.57	−.20	−.56	.23	.48				
9. Voluntary certification .....	.078	.220	.23	−.09	.12	.10	−.10	.07	.26	.29			
10. Association representation .....	.153	.344	.48	.01	.19	.10	−.18	−.01	.26	.49	.35		
11. Unionization .....	.161	.154	−.22	−.25	.10	.08	.33	−.18	.01	−.11	−.12	−.06	. . .

NOTE.— $N = 97,084$ individuals in 488 occupations. Values are weighted by occupation size. All correlations except the value in italics are significant at $P < .01$.

^a Scale items are as follows: (a) cognitive skills—general educational development, data complexity, numerical aptitude, intelligence, training time; (b) nurturing—face-to-face service (England 1992), talking/hearing, dealing with people; (c) physical demands—motor coordination, finger dexterity, form perception, spatial perception, visual requirements; (d) hazardous conditions—exposure to hazards, exposure to fumes, need to stoop, need to climb, environmental disamenities. Authority is a binary variable coded “1” if the occupation requires supervisory or managerial skills, “0” otherwise (see England 1992). Except as noted, items are from the *DOT* (see England and Kilbourne 1988).

^b Calculated from the 1990 EEO census file (U.S. Department of Commerce 1993).

^c See the appendix for variable definitions and data sources.

fication or represented by the association (e.g., certified public accountant, registered nurse, professional bowler, business communicator, paralegal). Ideally, the analyses would be carried out using these fine-grained groups, but unfortunately, nationally representative individual-level data at this level of detail are not available. The necessary third step, then, was to map these groups into the 501 occupation codes in the 1990 Census Bureau scheme using the descriptions of the occupations given in the directories, information from the supplementary sources, the *DOT*, and the *Alphabetic Index of Industries and Occupations* (U.S. Department of Commerce 1992). In some cases, the occupations identified in the enumeration of the closure strategies are contiguous with census categories (e.g., registered nurses, paralegals), whereas in other cases, they are lumped together in the census scheme with technically similar positions (e.g., professional bowlers share a census code with athletes and coaches, and business communicators are categorized with other public relations specialists).

This “bottom-up” approach to data collection does not impose a pre-defined map onto the terrain of closure but instead allows the occupations around which closure occurs to emerge from the data. Although it ultimately forces these occupations into a summary scheme, the approach has several benefits over the obvious (and more expedient) alternative, which is to begin with a census category and ask whether it is characterized by a closure strategy. Because the bottom-up approach creates a comprehensive enumeration of closure strategies, it can provide useful information about how much slippage exists between census categories and the groups around which closure exists. It also generates a more accurate measure of closure wherever multiple associations, for example, represent the detailed occupations constituting a broader census category. Finally, it yields data that are less likely to be tainted by stereotypes about the cohesiveness and practices of occupations, particularly those socially distant from our own (Caplow 1954; see also Bourdieu 1987, p. 10).

The final step was to construct continuous measures of the extent of closure in an occupation. For each strategy, this measure is estimated by the proportion of occupational incumbents who are covered by the strategy, although the definition of “coverage” necessarily varies across strategies. Accurate counts of the number of licensees by state are not readily available, so the extent of licensure in an occupation is instead measured by the proportion of individuals who work in a state that licenses the occupation (constructed from U.S. Department of Commerce [1993]). Fortunately, licenses tend to have a relatively broad scope and, consequently, to map neatly onto census occupation categories; moreover, workers who live in a state that regulates their occupations must obtain the relevant

license, at least if they are to work legally.¹⁵ Nevertheless, this state-based measure will overestimate licensure to the extent that the census scheme combines licensed practitioners (e.g., nursing home administrators) with unlicensed ones (e.g., clinical directors) into a single code (e.g., medicine and health managers). This “slippage” will dilute any positive effects of closure on earnings in these occupations, thereby leading to a conservative estimate of the licensing coefficient.

Voluntary certification is estimated by the proportion of occupation members who hold a certification that is sponsored by an occupational association, independent occupational certification board, trade association, or for-profit company (e.g., Microsoft). An alternative measure shrinks the universe of certifications to exclude those sponsored by trade associations or for-profit companies, on the grounds that such certifications may be qualitatively different from those offered by representatives of the occupation. Association representation is measured by the proportion of incumbents who belong to an occupational association. Because counts of the number of certificate holders and association members were obtained from the directories or the sponsoring organizations,¹⁶ these proportions will be inflated wherever individuals hold multiple certifications or belong to multiple associations. For example, real estate agents who hold both the Certified Residential Specialist and Accredited Buyer Representative certifications will be double-counted, as will agents who belong to both the National Association of Realtors and the National Association of Real Estate Buyer Brokers. As a result, these proportions should not be interpreted literally, but rather as relative measures of the extent of certification- and association-based closure.

Occupation-level measures of the two remaining closure strategies, educational credentialing and unionization, are aggregated from the individual-level records of the Outgoing Rotation Group files of the CPS (BLS 1994–96). Educational credentialing is measured by the proportion of

¹⁵ Professional engineers represent a notable exception. According to occupational representatives, trade associations successfully lobbied for industrial or sector exemptions in licensure laws, resulting in low licensure rates—only 18% in 1997—among engineers, with considerable heterogeneity across specialties (California Board of Registration for Professional Engineers and Land Surveyors [CBRPELS] 1998, p. 1; National Society of Professional Engineers 1997). Unfortunately, few states collect data on licensure by discipline, and the national engineering organizations were unable to provide this information. For this article, the proportion of licensed civil engineers is estimated at 0.44, chemical engineers at 0.08, and aerospace and marine engineering/naval architecture at 0 (CBRPELS 1998); licensure in each of the remaining engineering specialties is estimated at 0.15 in order to generate an average proportion of 0.18.

¹⁶ Counts were imputed for 4% of certifications (see the appendix). A variable indicating the percentage of imputed counts in the occupation was tested in models 2–6, but was not statistically significant. It was dropped from the final models.

occupation members who have attended some college (see Hauser and Warren 1997), under the assumption that *any* link between an occupation and formal, postsecondary academic knowledge is sufficient to activate the mechanisms discussed above. An alternative measure, the proportion of incumbents who have attained a baccalaureate degree, is also evaluated on the grounds that this more restrictive threshold corresponds to a major socially legitimated marker of group membership.¹⁷ Unionization is measured by the proportion of incumbents who are union members. An alternative measure reflects the proportion covered by a union or employee association contract.

Bivariate correlations among the closure strategies are presented in table 3. Positive correlations are found among the licensing, educational credentialing, voluntary certification, and association representation variables. The bivariate correlations involving unionization, by contrast, are null or slightly negative. The strongest positive correlations occur between educational credentialing and licensing (0.48) and between educational credentialing and association representation (0.49). The existence or absence of correlations between closure strategies within certain occupations is worth exploring further, but for my purposes, the critical feature of these correlations is that they appear modest enough that separate effects of each strategy can be estimated.¹⁸

RESULTS AND DISCUSSION

Main Effects

Table 4 presents the occupation-level coefficients from three models, all of which are based on equation (1). Each model fits all individual-level covariates of earnings (see table 2) as well as interactions between these covariates and sex. The estimated coefficients of the individual-level covariates are consistent with previous research, hold little theoretical interest, and consequently are not discussed here. (These results are available from the author on request.)

The individual-level covariates account for a respectable 42% of the

¹⁷ The literature relating “educational capital” to various outcomes offers surprisingly little guidance in the choice of threshold. Of the few analysts who explicitly filter educational capital through occupations, most use scales that do not privilege culturally significant levels of attainment (see, e.g., Kalmijn 1994).

¹⁸ More convincing evidence of the absence of a severe multicollinearity problem is provided by the stability of the estimated coefficients across various specifications of the models and definitions of the variables.

TABLE 4
ESTIMATED OCCUPATION-LEVEL EFFECTS FROM THE REGRESSION OF LOGGED WEEKLY
EARNINGS ON INDIVIDUAL ATTRIBUTES AND OCCUPATIONAL SKILLS AND CLOSURE
CHARACTERISTICS

Independent Variable	Model 1	Model 2	Model 3
Fixed effects: ^a			
Constant	5.984*** (.014)	5.711*** (.023)	5.805*** (.030)
Skills and working conditions:			
Cognitive skills .....	.142*** (.014)	...	.072*** (.015)
Authority .....	.118*** (.026)	...	.127*** (.024)
Nurturing	-.005 (.011)	...	-.047*** (.011)
Physical demands .....	.058*** (.010)	...	.047*** (.010)
Hazardous conditions .....	.010 (.012)	...	.008 (.012)
Proportion female	-.074* (.032)	...	-.132*** (.030)
Closure strategies:			
Licensing .....	...	.077** (.028)	.085*** (.023)
Educational credentialing ...	...	.363*** (.037)	.317*** (.054)
Voluntary certification .....	...	.102** (.035)	.116*** (.028)
Association representation ...	...	.012 (.016)	-.033* (.014)
Unionization .....	...	.131** (.050)	.047 (.044)
Random effects:			
Occupation-level variance .....	.019 (.002)	.026 (.002)	.014 (.001)
Individual-level variance .....	.220 (.001)	.220 (.001)	.220 (.001)
-2 log-likelihood	129,605	129,725	129,517
χ^2 test statistic ^b	301***	179***	88***
df	6	5	5

NOTE.— $N = 97,084$ individuals in 488 occupations. See table 3 for data sources.

^a Both models fit all individual-level covariates (see table 2) and their interactions with sex as grand-mean centered fixed effects.

^b The contrast for models 1 and 2 is a baseline model ($-2 \log\text{-likelihood} = 129,904$) in which no occupation-level covariates are fit. The contrast for model 3 is model 1.

* $P < .05$, two-tailed tests.

** $P < .01$.

*** $P < .001$.

within-occupation variance.¹⁹ Nonetheless, if any omitted individual-level covariates are correlated with occupation, the occupation-level estimates will be affected, perhaps substantially (e.g., Hauser 1974; Mason 1991). In these analyses, formal educational credentials and union membership are measured at both the individual and occupation level, which protects the occupation-level coefficients from the brunt of the omitted-variable critique. Licensing and association representation are more clearly occupation-level phenomenon. An individual-level measure of licensing would capture “slippage” between the Census Bureau occupations and the licensed titles, which, with the noted exception of engineers, seems to be minimal. An individual-level effect of association membership would capture any earnings that accrue from association activities or products (e.g., networking opportunities, employment bulletins) from which non-members are excluded; these effects cannot be assessed with these data, but they are not expected to be strong. Voluntary certification, on the other hand, may well have an individual-level effect on earnings if, as its sponsors often claim, it marks productivity or expertise.²⁰ Such an effect is, of course, entirely consistent with a human-capital interpretation. To my knowledge, no existing data can address whether certification offers purely occupation-level wage benefits; hence, little can be done except recognize the need for caution in interpreting the relevant coefficient.

The estimated effects of the occupational skill and gender composition variables are consistent with investment models of earnings and gender devaluation arguments, respectively (see model 1, table 4). Cognitive skill levels, physical demands, and authority requirements are positively and significantly associated with mean occupational earnings, even after the effects of incumbents’ attributes have been purged. As noted, these associations can be interpreted through either a human capital or functionalist lens. Finally, occupations that require nurturing skills or that contain a high proportion of women are associated with lower mean earnings (e.g., England 1992; Kilbourne et al. 1994), although the former effect is not significant at conventional levels.

The closure measures are incorporated into the analyses in model 2 (see table 3), which estimate the gross occupation-level effect of the five strat-

¹⁹ A random-effects model with no occupation-level covariates shows an estimated within-occupation variance of 0.220, while a random-effects ANOVA yields an estimated total within-occupation variance of 0.380. The proportion modeled is thus $(.380 - .220)/.380 = .421$.

²⁰ Studies by certifying organizations show an individual-level wage premium to certification (e.g., Briggs 1997; Association of Facilities Engineering 1999; American Society for Quality 1998), but these studies are plagued by questionable methods (e.g., sampling from organization rosters), low response rates, and omitted variables and are thus far from conclusive.

egies on earnings. The estimates from this model show significant positive returns to four of the five closure strategies and a positive point estimate of the fifth strategy, association representation, thereby lending credence to the claim that closure processes have a substantial impact on the occupational reward structure. Of course, it could be argued that the coefficients from this model merely capitalize on the tendency for highly skilled occupations to exhibit greater closure.

To address this critique, model 3 estimates the net association between closure and earnings, controlling for occupational skills and gender composition as well as the laundry list of individual-level attributes. The coefficients generated under this model offer substantial, although not unqualified, support for closure theory. Three of the closure strategies—licensing, voluntary certification, and formal educational credentialing—have positive, significant effects on mean earnings (see table 4). Moreover, the wage premiums associated with these strategies are hardly trivial. At mean levels of educational credentialing (see table 3), this wage premium is 20% ($\exp[.317 \times .574] = 1.200$), and if all incumbents have attended college, the estimated wage premium is 37% ($\exp[.317 \times 1] = 1.373$), relative to an occupation in which none of the incumbents have attended college. An occupation that is licensed in every state receives an estimated wage premium of nearly 9% ($\exp[.085 \times 1] = 1.089$), and an occupation that is fully certified enjoys a wage premium of 12% ($\exp[.116 \times 1] = 1.123$).²¹

Neither unionization nor association representation have significant, direct correlations with occupational rewards. It is possible that unionization generates real wage returns to both union and nonunion workers, but the relevant boundaries are formed around industries or even geographic regions, not occupations. That is, employers who face a labor shortage or fear union campaigns may look to other industry players or to trade association-sponsored wage surveys for their reference groups, whereas occupational references are unavailable or deemed irrelevant (Bridges 1995). Consistent with this interpretation, the coefficient of occupation-level unionization is positive and significant when the industry

²¹ OLS estimates of the full model show a similar pattern of results: significant and positive licensing, educational credentialing, and certification coefficients; a significant and negative association representation coefficient; and a positive unionization coefficient. The OLS coefficients are stronger than the multilevel coefficients, such that the unionization coefficient under the OLS specification is statistically significant. Further investigation indicated that some, although not all, of the difference in the coefficients is due to the lesser weight the multilevel model gives to sparsely populated occupations. Although an argument could be made for the OLS estimates (I thank an anonymous reviewer for posing this argument), I concentrate here on the multilevel estimates on the grounds that they appear to be more conservative in their support for closure theory.

dummies are excluded from model 3 (not shown). These dummies may be picking up other industry attributes related to earnings—for example, industry-specific human capital (see Tam 1997)—and hence this test is hardly conclusive.

The apparent failure of association representation to generate earnings returns is best understood by revisiting the mechanisms on which associations rely—enhancing diffuse demand, channeling demand, and sending a quality-of-service signal (see table 1). It is possible that these mechanisms indeed generate earnings returns but that high membership density is not enough to invoke them. Capturing consumer attention may depend more on name recognition, legislative power, organizational capital, or the financial assets necessary to mount an effective marketing campaign. Nevertheless, if we assume these resources are correlated with membership density, we would still expect a positive coefficient of association representation. An alternative interpretation points to the failure of one or more underlying mechanisms to generate earnings returns. We cannot rule out the possibility that channeling demand or sending quality-of-service signals are ineffective,²² but the obvious suspect is the only mechanism unique to occupational associations, namely, generating diffuse demand. If we accept that membership density or its correlates are linked to occupational power, the results imply this mechanism has no economic payoff. This interpretation is also plausible when we recall that an increase in aggregate demand will, in the long run, only raise mean earnings if occupation-specific demand is protected and entry into the occupation restricted. Apart from their licensing and certification activities, occupational associations have virtually no control over the labor supply and must rely on largely symbolic claims to protect task jurisdictions. Association rhetoric resounds with such symbolic claims, but apparently no one is listening.

This pattern of results—significant effects of licensing, educational credentialing, and certification combined with insignificant effects of association representation and unionization—is replicated under a number of alternative specifications of the variables and the model. For example, if the voluntary certification and unionization measures are substituted for alternative specifications that exclude company-sponsored certifications and include union contract coverage, respectively, the substantive conclusions are identical. Similarly, if the educational credentialing measure is substituted for the alternative measure, which uses college completion rather than attendance rates, the credentialing coefficient remains positive

²² Although the other strategies that rely on channeling demand and quality-of-service signals show positive coefficients, these strategies could be operating through yet other mechanisms.

and significant ($b_i = 0.160$, s.e. = .050) and the licensing, certification, association, and unionization coefficients are largely unchanged. Given the more restrictive measure's lack of strong precedence in the educational capital literature, skewed distribution, and the worse fit it generates ($-2 \log\text{-likelihood} = 129,540$), college attendance rates are used in the remaining analyses. Finally, if licensing, voluntary certification, association representation, and unionization variables are fit in logged form (after adding a constant $k = 1$), thereby drawing in outliers and adjusting for positive skewness, the estimated coefficients of four of the closure variables have the same valence, significance, and rank ordering as in table 4. The coefficient of (logged) association membership retains its negative sign, but is no longer statistically significant, suggesting that this variable is most safely interpreted as having no positive effect rather than a significant negative effect.²³

The pattern of results provides clues into the effectiveness of the underlying mechanisms. They do not uphold the prediction that licensing, by virtue of its dual effects on both the supply and demand sides, would have the strongest impact on earnings. Nevertheless, they suggest that the strategies generating the greatest earnings returns are those that create tangible restrictions on the supply of labor in an occupation: licensing, which embeds supply-side restrictions in the state, and educational credentialing, which "embeds" supply-side restrictions in the high mental or monetary costs of a diploma. The results do not rule out the possibility of a demand-side effect, and indeed the significance of the voluntary certification coefficient could be interpreted as evidence that either quality-of-service signals or jurisdictional claims are moderately effective. However, the lack of significance of association representation and the relative weakness of certification's effect, especially in light of the interpretational cautions discussed previously, suggest that demand-side and signaling

²³ As a reviewer noted, the *DOT* is subject to measurement error, with the implication that if more precise measures of skills, particularly cognitive skills, were available, the effects of the closure variables might be reduced or even disappear. The logic of this classic omitted-variable argument is indisputable, but its solution is elusive: the *DOT* is the best source of occupational skill data for cross-sectional research currently available. Nonetheless, I can evaluate whether the conventional practice of combining multiple cognitive skill items into a single scale underestimates the "true" skill effect, given that this scale excludes potentially relevant measures and forces the component items to be weighted equally. An additional specification of model 3 unpacks the cognitive skill scale into its elements (see table 3) and mines the *DOT* for three additional items: complexity in working with people, complexity in working with things, and verbal aptitude. The results (available on request) show that four of the closure coefficients are largely unaffected and the fifth, unionization, doubles in magnitude and reaches statistical significance. If anything, then, scaling dampens the estimated effects of the closure variables.

mechanisms supplement rather than surpass the benefits of supply-side restrictions. The emphasis of stratification scholars on supply-side monopolization appears partially justified.

Before turning to more complex analyses, it is worth noting how the introduction of explicit measures of closure affects the familiar relationships between earnings and other occupational characteristics. First, the negative association between earnings and nurturing skills and gender composition is strengthened in model 3 (compare rows 3 and 6 in columns 1 and 5), implying that “women’s” occupations are penalized not only by virtue of their characteristic skills or demographic composition, but also because they benefit less from closure than do other occupations. This relationship deserves to be explored systematically, but because it deviates from the core concern of this article, I leave the task to future research. Second, the estimated association between cognitive skills and earnings is more than halved when closure measures are incorporated in the model. This reduction is consistent with the claim that occupations receive an economic payoff to their specialized, abstract, and esoteric knowledge by converting it into occupational licensing or other formal labor market shelters (e.g., Larson 1977, p. xvii; Attewell 1990, pp. 435–38; Freidson 1994). That is, if the observed association between cognitive skill and earnings in model 1 emerges because cognitive skills approximate an occupation’s ability to implement formal shelters, we would expect the coefficient of the cognitive skill measure to be greatly reduced in model 3. The observed reduction is far from complete, though, and the cognitive skill coefficient estimated in model 3 remains significant. Those who favor the human capital or functionalist interpretation of skills can rest easy—closure strategies seem to operate in conjunction with, not in place of, skill requirements.²⁴

Which Occupations Benefit?

With the main effects of the strategies established, the next task is to explore whether the strategies generate equal returns for all occupations and, if not, how we might account for the observed differences. The first

²⁴ I have ignored the functionalist-inspired tradition of regressing individual-level earnings on occupational prestige, largely because the theoretical underpinnings of this practice are unclear. Nevertheless, in the spirit of providing a comprehensive evaluation of functionalist claims, a supplementary run of model 3 includes Nakao-Treas prestige scores (Hauser and Warren 1997; see also Nakao and Treas 1994) as an occupation-level regressor. The results show that the estimated prestige coefficient is not significant and the closure coefficients are largely unchanged. This further undermines a purely functionalist account of the hierarchy of rewards and makes the closure story yet more plausible.

model relevant to these analyses evaluates the simple claim that professions are particularly able to convert closure into higher rewards. It adds to model 3 interaction terms between each closure strategy and a binary variable coded "1" for professional occupations. A contrast of the fit statistics of the two models ($\chi^2 = 19$ with 6 *df*) indicates that the payoff to the closure strategies differs significantly, albeit modestly, across the professional and nonprofessional sectors. The estimated coefficients (table 5) show only partial support for the hypothesis. The professions do appear to benefit more from licensing and certification, although the coefficient of the latter interaction term is not statistically significant. However, the payoff differential between professions and other occupations is less substantial than the argument implies, and it is certainly not the case that closure-based wage premiums are limited to the professions.

Despite evidence of only modest differences in the returns to closure across the professional/nonprofessional divide, it is worth evaluating the source of these differences, in particular, the claim that professions are better positioned to benefit from closure by virtue of the complex nature of their tasks. To this end, model 5 fits additional interactions between the closure strategies and the level of cognitive skills indicated by the *DOT* scale.²⁵ If professions benefit disproportionately from closure because of the complexity of their tasks, the magnitude and significance of the professional-closure interaction terms should diminish when interaction terms are fit between the closure and the cognitive skill measures. As table 5 shows, this hypothesis also receives only partial support. The professional licensing interaction coefficient does decline slightly, but it remains positive and statistically significant, albeit at a less stringent ($P < .05$) level. Moreover, the other interaction terms show no consistent pattern of declining across the models.

These results suggest that task complexity is not the only relevant characteristic of professions that contributes to their ability to reap higher rewards from closure. A number of ad hoc explanations might be advanced: the cognitive skill items may not capture all the relevant dimensions of professional knowledge; professional occupations may exhibit more internal cohesion, which may affect their returns from closure, as well as their ability to implement market barriers (see Freidson 1994, pp. 84–85); the relative age of professions and their closure projects may influence the extent to which consumers are affected by stereotypes about the nature of their work; or professions may enjoy relatively stringent licensing criteria and correspondingly greater protection from competition

²⁵ If *DOT* skill ratings are influenced by occupations' social desirability, the cognitive skill scale will overestimate skills in the professions and the analyses may overstate the extent to which professions' cognitive skills explain their greater returns to closure.

TABLE 5
ESTIMATED EFFECTS OF CLOSURE CHARACTERISTICS ON LOGGED WEEKLY EARNINGS,
BY PROFESSIONAL STATUS AND COGNITIVE SKILL LEVELS

Independent Variable	Model 4		Model 5	
Fixed effects: ^a				
Constant	5.806	(.030)***	5.809	(.034)***
Professional occupation (PF)	−.080	(.175)	−.075	(.193)
Skills and working conditions:				
Cognitive skills (CS) .....	.093	(.016)***	.122	(.035)***
Authority .....	.097	(.026)***	.094	(.025)***
Nurturing	−.050	(.011)***	−.045	(.011)***
Physical demands .....	.035	(.010)***	.041	(.010)***
Hazardous conditions .....	.010	(.011)	.017	(.012)
%female	−.130	(.031)***	−.117	(.031)***
Closure strategies:				
Licensing .....	.044	(.027)	.045	(.027)
Educational credentialing .....	.353	(.056)***	.351	(.058)***
Voluntary certification .....	.072	(.036)*	.067	(.046)
Association representation	−.009	(.055)	−.009	(.055)
Unionization .....	.065	(.048)	−.001	(.054)
Closure strategies × professional occupation:				
Licensing × PF .....	.143	(.048)**	.135	(.064)*
Educational credentialing × PF	−.012	(.195)	−.070	(.225)
Voluntary certification × PF .....	.061	(.057)	.078	(.062)
Association representation × PF	−.014	(.057)	−.028	(.064)
Unionization × PF	−.240	(.132)	.044	(.165)
Closure strategies × cognitive skills:				
Licensing × CS			−.005	(.034)
Educational credentialing × CS .....			.012	(.051)
Voluntary certification × CS			−.012	(.069)
Association representation × CS .....			.009	(.025)
Unionization × CS			−.199	(.071)**
Random effects:				
Occupation-level variance .....	.014	(.001)	.013	(.001)
Individual-level variance .....	.220	(.001)	.220	(.001)
−2(log-likelihood)	129,498		129,489	
χ ² test statistic vs. previous model	19**		9	
df	6		5	

NOTE.— $N = 97,084$ individuals in 488 occupations. The relevant baseline model for the comparison in the first column is model 3 in table 4.

^a Both models fit all individual-level covariates (see table 2) and their interactions with sex.

* $P < .05$, two-tailed tests.

** $P < .01$.

*** $P < .001$.

(see, e.g., Pfeffer 1974). The latter hypothesis is consistent with the claim that tangible, supply-side restrictions are critical to a closure project's success, but obviously the alternatives cannot be ruled out.

The previous model may oversimplify matters if there is substantial heterogeneity in the returns to closure among the occupations constituting the "nonprofessional" category. These occupations certainly differ in the extent to which they rely on the different closure strategies, as is shown in the top portion of table 6.²⁶ Licensing has a predictably strong presence in the professions but is also substantial in managerial and sales occupations (where approximately 60% and 44% of workers are licensed, respectively) and hardly trivial in the remaining major occupation groups (row 1, table 6). Credentialing, unsurprisingly, is extensive in the professions, slightly lower in managerial and technical occupations, and decreasingly prevalent as one moves toward unskilled manual occupations. Voluntary certification, by contrast, is most prevalent in technical occupations, followed distantly by the professions. As the received wisdom would predict, association representation is more prevalent in the professions than in other major occupation groups, but it is not unique to them—the densities of association membership are 23% and 18% in technical and managerial occupations, respectively. This strategy is far less prevalent in manual occupations, where unions are the favored organizational agents of collective action (see row 5, table 6). More generally, table 6 demonstrates, first, that closure is not exclusive to the professions and, second, that closure devices are differentially distributed across the major occupation groups that constitute the "nonprofessional" sector.

The question of whether differential returns to closure accrue between the occupations constituting the nonprofessional category is explored in model 6, in which the effects of closure are allowed to vary across seven major occupation groups (managerial, professional, technical, sales/clerical, service, craft, and operative/labor).²⁷ Model 6 represents a statistically significant improvement in fit relative to model 4 ($\chi^2 = 80$ with 30 *df*), but the difference is not dramatic, particularly given the sample size and expended degrees of freedom. The estimated coefficients (see bottom portion, table 6) largely confirm the results of the simpler model. In the

²⁶ The values in the top of table 6 are (weighted) averages of the five closure variables in seven major occupation groups. A list of these groups' component occupations is available at <http://www.bls.census.gov/cps/bocccd.htm>. For parsimony and sample size considerations, sales and clerical occupations are combined, as are operative and labor occupations.

²⁷ The standard errors of the interaction terms are from seven runs of the model, each omitting a different major occupation group as the comparison category. A more elegant parameterization, which would constrain a strategy's effects to sum to zero across groups, is not easily implemented in HLM.

TABLE 6
DISTRIBUTION AND ESTIMATED EFFECTS OF CLOSURE STRATEGIES BY MAJOR OCCUPATION GROUP

Closure Strategy	Professional	Managerial	Technical	Sales & Clerical	Service	Craft	Operative & Labor
Proportion covered: ^a							
Licensing .....	.605	.602	.454	.255	.180	.161	.156
Educational credentialing .....	.938	.788	.795	.583	.386	.360	.252
Voluntary certification .....	.162	.075	.354	.067	.023	.063	.006
Association representation .....	.610	.175	.230	.058	.033	.015	.006
Unionization .....	.215	.058	.112	.104	.162	.243	.244
Selected coefficients ($\times 10$) from model 5: ^b							
Licensing .....	.160*** (.037)	-.062 (.061)	-.009 (.073)	.113 (.060)	.053 (.064)	.087 (.063)	.083 (.075)
Educational credentialing .....	.509** (.184)	.720** (.246)	1.475*** (.315)	.617*** (.127)	.335* (.149)	.018 (.122)	.012 (.126)
Voluntary certification .....	.117** (.040)	.077 (.087)	.057 (.062)	.087 (.063)	-.018 (.187)	.135 (.089)	.579 (1.034)
Association representation	-.021 (.014)	.020 (.092)	.169 (.141)	-.472** (.168)	.255 (.233)	-.126 (.206)	-.125 (.413)
Unionization	-.217 (.114)	-.226 (.291)	.201 (.239)	.014 (.098)	.086 (.119)	.211* (.091)	.159* (.079)

NOTE.— $N = 97,084$ individuals in 488 detailed occupations.

^a Proportions are calculated from data weighted by occupation size. See text for an explanation of these measures.

^b Model 6 (-2 log-likelihood = 129,418) fits interactions of the closure characteristic with major occupation group, as well as all individual- and occupation-level covariates (see model 3, table 4).

* $P < .05$, two-tailed tests.

** $P < .01$.

*** $P < .001$.

expanded model, statistically significant payoffs to voluntary certification and licensing are restricted to the professions, although the point estimates hint at positive returns to licensing in sales and clerical occupations and to certification in nearly all occupation groups. Model 6 reveals two exceptions to the general pattern of local returns. First, and consistent with the claim that educational credentials are a widely valued form of cultural currency (e.g., Collins 1979), the benefits of educational credentialing accrue throughout the occupational structure. The important caveat, however, is that credentialing has little payoff in manual occupations, perhaps because here the link between academic knowledge and productivity is difficult to establish and defend. Second, unionization offers modest premiums to craft and to operative/labor occupations, in contrast to the lack of significant returns (or even slight penalties) in non-manual occupations.

More generally, a comparison of the top and bottom portions of table 6 suggests an association between the prevalence of a closure strategy and the strength of its returns. Licensing and unionization, for example, offer the greatest earnings returns in professional and manual occupations, respectively, the major occupation groups in which these strategies are most prevalent. Certification represents a "near miss": its coefficient is significant only in the professions, where certification levels are second highest among all major occupation groups. Formal credentialing also has its greatest effects where it is most prevalent, although technical occupations, not the professions, appear to reap the greatest benefits. This pattern is imperfect—professional occupations do not profit from association representation, nor do technical occupations benefit significantly from certification. These results are suggestive, though, and imply that additional analyses into the features of occupations that generate differential returns would be well worth the data collection effort they would require.

SUMMARY AND CONCLUSION

Closure theory offers a collective action-based account of the processes that link positions in the division of labor to reward packages of unequal value: the exclusionary practices of a social group restricts access to economic opportunities to its members, thereby raising the rewards of the group as a whole. Despite the important role closure plays in Weber's theory of the stratification system, Weber never offered a unified and well-developed statement of closure (Manza 1992, p. 227), and subsequent scholars borrowed and modified bits and pieces of his fragments to suit their own purposes. Perhaps as a result, closure theory has lacked a co-

herent account of earnings inequality and, in particular, of the mechanisms that link various closure strategies to earnings.

This article addresses this critical gap. Borrowing from the stratification literature and from related arguments in the sociology of professions, it identifies and elaborates four mechanisms that translate formalized closure into occupational rewards. On the supply side, closure restricts the number of potential competitors in an occupation. On the demand side, closure may enhance earnings by boosting the aggregate level of demand for a product or service or, alternatively, by channeling this demand to a particular occupation by legitimizing its jurisdictional claims over a task niche. Finally, closure strategies may affect the reward structure by convincing consumers that an occupation is filled with practitioners who, by virtue of their qualifications, deserve high compensation or provides a quality of service worthy of high compensation.

The empirical analyses reveal the promise of this extension of closure theory, at least where the goal is to understand contemporary sources of earnings inequality. The results support the basic claim that closure affects earnings but also confirm the need to (a) distinguish between strategies of closure rather than treating them as substitutable means to the same ends and (b) recognize that the particular combination of mechanisms underlying the closure strategies influence the rewards they generate. Specifically, three institutionalized strategies of closure—licensing, formal educational credentials, and voluntary certification—have statistically and substantively important effects on the hierarchy of material rewards, with the caveat that an individual-level interpretation of the certification coefficient cannot be discounted. The relatively strong impact of licensing and credentialing suggests that tangible restrictions on the supply of labor are particularly effective, at least as measured by the criterion of occupational earnings. Conversely, the relatively weak effect of voluntary certification and the lack of a positive effect of association representation suggest that largely symbolic jurisdictional claims and efforts to enhance diffuse demand have a more modest impact on occupational rewards.

The results of the first set of analyses are thus consistent with the predictions of closure theory. They do not, however, recommend theoretical imperialism. The measures of occupational skills have significant, net associations with occupational earnings, even after explicit measures of formal closure are incorporated into the analyses. One could, of course, claim that skills are socially constructed as part of the closure project and that the *DOT*'s job analysts are no more immune to occupational rhetoric, meaning-making, or stereotypes than the lay public (e.g., Attewell 1990, pp. 427–29). However, if the occupations most able to influence *DOT* skill ratings are also those that make extensive use of formal closure strategies, the existence of a net skill effect suggests that skill is more than an indirect

measure of market power. The data can therefore only support a more cautious interpretation, namely, that both technical complexity and closure affect the occupational reward structure. Moreover, closure theory does not account for the substantial portion of the variation in earnings—in these data, approximately 66%²⁸—that occurs within census occupations. Some of this within-occupation heterogeneity may reflect the aggregate nature of the census occupation categories, and if the analyses instead used earnings data that mapped perfectly onto the actual groups around which closure takes place, some of this heterogeneity might rightfully be attributed to occupational closure. Nevertheless, neither these analyses nor prior research (e.g., Jencks et al. 1972, p. 226) support the claim that such group-level processes are the only ones at work. In the United States, closure practices shape the supply of and demand for certain occupations, thereby affecting the reward structure, but do not supplant market-based processes that differentially reward individuals based on their human capital or other personal attributes.

The second set of empirical analyses demonstrates that not all occupations benefit equally from social closure. The professions, in particular, benefit more than other occupations. Some of this disparity appears to stem from the greater cognitive complexity of professions' skills. However, cognitive skill differentials do not capture all cross-occupational variations in the payoff to closure, and indeed, there seems to be a link between the prevalence of closure and its returns (see table 6). This pattern is consistent with the claim that occupational representatives, in their calculated effort to advance their occupation's interests, choose or defend the closure strategies best suited to the occupation's social and legal environment. Occupations facing an environment in which the supply of labor is restricted, perhaps because institutional gatekeepers effectively weed out applicants without advanced degrees or because of stringent licensing laws, may find that strategies that further restrict the supply of labor (e.g., unionization) are less effective than those that solidify jurisdictional claims. Other occupations have an uncontested hold over a set of tasks but little control over the supply of recruits to those occupations; here, strategies that enhance demand or send a quality-of-service signal are likely to be ineffective. Nineteenth-century clerks, for example, lost prestige and pay not because they lost control over particular tasks, but because they were unable to prevent a glut of clerks, many of whom were from nonelite backgrounds, spawned by the spread of literacy (Attewell 1989, pp. 369–72). Although some of the relevant features of occupations' environments may be captured by their major group location (see table 6), these

²⁸ This is calculated from within (0.380) and between-occupation (0.195) variances estimated by a random-effects ANOVA ($.380 / [.195 + .380] = .661$).

contingency stories would be more convincingly assessed by research in which explicit measures of environmental features (e.g., the size of the unemployed labor force with occupation-specific training) are explored. And, of course, the contingency story is but one possible explanation; the larger point is that additional research is needed to uncover the sources of cross-occupational variations in the economic returns to closure.

The analyses from which these conclusions derive are in many ways unprecedented. First, they incorporate a comprehensive range of detailed occupations, thereby responding to the well-known overemphasis of the professions in the occupations literature and to the Durkheimian claim that all occupations have the capacity for social organization. The emphasis on breadth is justified by the widespread distribution of closure strategies throughout the occupational structure (see table 6); licensing, for example, is too pervasive outside the professions to be ignored or treated as anomalous, and voluntary certification is most prevalent in technical, not professional, occupations. The obvious tradeoff to the cross-occupational design, however, was that contextual or longitudinal comparisons of the impact of closure were not feasible. Such comparisons are well worth pursuing. A cross-state analysis, for example, might mute the standard rallying cry from individualist quarters, namely, that the available individual- and occupation-level measures of skill do not exhaust the human capital effect. If we are willing to assume that the skills required of an occupation are much the same in one state as they are in another, comparisons of the effects of closure strategies across states will help address the omitted-variable hypothesis. Likewise, longitudinal analysis would provide additional leverage on the question of causality and clues into which mechanisms are at work. That is, given the resistance of occupational stereotypes and consumers' cognitive maps to change, we would expect a relatively lengthy lag between the implementation of closure and any income returns if these demand-side forces are at work; supply-side restrictions, by contrast, should generate more immediate returns. Although issues of the availability and comparability of data complicate these extensions, their intellectual payoff could be substantial.

Second, the analyses in this article avoid many of the pitfalls plaguing earlier efforts to assess sociological alternatives to functionalism and human capital theory. The models include explicit measures of closure, some of which were previously unavailable. For obvious reasons, this improves on the inexplicably common practice of assuming that the existence of closure provides sufficient evidence of its consequences, and it avoids the interpretational uncertainties of "residual analyses," where any variance in earnings not captured by measures of skills or training is attributed to the favored theoretical alternative (e.g., Tam 1997, p. 1656). Moreover, the models distinguish the effects of occupation-level closure strategies

from those of occupational skills and of the many individual-level attributes that correlate with occupation. In some ways, this leads to a conservative test of closure theory—after all, closure involves not only erecting barriers, but also picking and choosing among candidates based on their attributes. Nevertheless, the models minimize the problem of attributing macrolevel effects from models in which microlevel covariates of earnings are ignored.

By virtue of these features, the analyses in this article offer convincing support for the longstanding sociological claim that human capital and functionalist theories are insufficient for understanding earnings inequality in the United States. As in any research, we cannot be certain that the estimated effects of the observable variables are driven by the posited but unobservable mechanisms. However, these estimated effects are consistent with the interpretation that closure processes shape the structure of occupational rewards; by contrast, neither human capital theory nor functionalism predict significant group-level effects of educational credentialing, licensure, or certification once the impact of individual-level skills and training and occupational skill requirements are absorbed. Although much work remains to be done, these results suggest that closure theory, if properly elaborated, provides a viable complement to dominant investment accounts of inequality and refocuses sociological attention on the critical link between positions in the division of labor and their rewards.

APPENDIX

In order to evaluate closure theory's claims, it was necessary to collect and code information on three closure strategies—licensing, voluntary certification, and association representation. As discussed in the text, this effort began with the construction of comprehensive lists of licenses, voluntary certifications, and occupational associations and with counts of the number of persons covered by these strategies.

The initial enumeration of licenses was obtained from the *Professional and Occupational Licensing Directory, Second Edition* (Gale 1996a; hereafter *POLD*). To be included in the census, a license must be (1) required to practice an occupation or to use a particular occupational title, (2) granted to an individual, (3) issued for the purpose of allowing the individual to work at a specific occupation, and (4) issued by a state, the District of Columbia, or the federal government. Business licenses, facility-specific licenses, owner licenses, and privilege licenses (e.g., a liquor license) are excluded, as are licenses for gambling and racetrack support personnel (e.g., cashiers, valets, etc.) on the grounds their inclusion would seriously overestimate the extent of licensing in these occupations. A com-

parison of the *POLD* against five states' lists of regulated occupations showed that the directory is comprehensive. Counts of the number of licensees were estimated using the number of individuals working in an occupation in a state that licenses the occupation.

An enumeration of 1,908 voluntary certifications was compiled from the *Certification and Accreditation Programs Directory* ([*CAPD*]; Gale 1996b, 1999), the *National Trade and Professional Associations of the United States* ([*NTPA*]; Columbia Books 1995, 1997), the *Encyclopedia of Associations* ([*EA*]; Gale 1996c, 1997), and information provided by certifying organizations. Certifications that are granted to hobbyists or volunteers, fulfill a federal mandate, honor longevity in a field, and identify one of 124 medical subspecialties were excluded, the latter to avoid duplication in the counts of board-certified physicians. Certifications offered by trade associations or for-profit companies (e.g., Microsoft) were coded separately. Counts of the number of certificate holders were obtained from the aforementioned directories, the sponsoring organizations' websites or published directories, E-mail or telephone contacts with the staffs of the certifying organizations, or for 4% of the certifications, imputed using predictive mean matching (Little 1998; see Weeden [1999] for the imputation model).

The census of occupational associations was compiled primarily from the 1995–98 *NTPA* directories. The *EA*, *CAPD*, and the American Society of Association Executives rosters contributed an additional 5% of the 2,058 associations. To be included in the enumeration, the association must (1) grant membership to individuals, irrespective of their employer, (2) state as one of its goals acting in the political or socioeconomic interests of the occupation, and (3) be founded before 1998. These decision rules exclude associations that represent organizations, scientific societies, certifying boards, for-profit associations, and hobby- and issue-based associations. Subsidiary associations are excluded if their parent organizations represent the same occupation and include the subsidiary's membership in their own counts. Four associations could not be contacted through repeated attempts and did not have websites; they are assumed to be defunct and are excluded from the analyses. Counts of the number of association members were obtained from the directories or from members of the association's staff.

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