Boundary of Internal Labor Markets:
Do we have the empirical facts right?

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(Preliminary, Comments are Welcome)

Abstract

This paper analyzes the internal labor market and its effect on workers' wages using an extensive Swedish dataset that includes employee and occupation characteristics and information about wages and work hours. Contrary to the conventional assumption, we find that there are no firm-based "ports of entry" in low level jobs. On the contrary, firms prefer to hire workers with relevant occupational experience at all ranks, even if that requires hiring from outside the firm. This effect is most pronounced at higher ranks and for smaller firms. Wage regressions reinforce the message, showing that overall experience and tenure in occupation have significant effects on wages but that firm tenure does not. In occupations where the occupation-specific port of entry is most pronounced, tenure in occupation has a larger effect on wages.

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1. Introduction

In their seminal work on internal labor markets, ILM (hereafter), Doeringer and Piore (1985) point to the existence of career ladders both within firms with limited "ports of entry" and within professional and craft communities.[1] The *boundaries* of the relevant pool of workers from which a job might be filled were, they found, established as an outcome of social group processes.[2]

Their study, which was limited mostly to unionised blue-collar workers in manufacturing industries of the early 1970s, leaves us today with several interesting questions. One is whether the Doeringer-Piore findings extend beyond blue collar manufacturing workers of that era to modern times and to workers in other industries. Another concerns the relative importance of the kinds of communities that establish boundaries to internal labor markets—firms and professional and craft communities.

Economists have mostly used the term "internal labor markets" to describe the entry level jobs, wages and promotions within the boundaries of a firm,[3] but the same term is used by sociologists to describe the same variables within the boundaries defined by an occupation[4]. In this paper, we ask: when a firm fills a job or set a worker's wage, how significant is previous experience in the same occupation versus experience in the same firm?

Given the economists' usual perspective that "internal" labor markets are internal to the firm, current economic theories of ILMs emphasize firm-specific aspects, such as firm-specific human capital, contracts between the firm and its workers, and/or firm-specific

[1] Already John T. Dunlop's Piece "Job Vacancy Measures and Economic Analysis pointed to the phenomenon that jobs clusters around stable group of job classifications or work assignment within a firm and Doeringer and Piore 1971) 1985 later built on this concept in their study of ILM when they introduced the notion of a mobility cluster. See Doeringer and Piore (1971) 1985 Pp. 2, 49,81, 100,104.
2 See also work by Lindbeck and Snower (1988). In the insider-outsider theory the jobs of incumbent workers are protected through the existence of labor turnover costs, and thus the incumbent workers are able to drive their wages above the level at which the unemployed workers or workers in the informal sector, the outsiders, would be willing to perform their jobs (see p18).
3 See Baker et al., 1994a/b, Lazear 1992, Lazear and Oyer 2002, Gibbons and Waldman 2003.
4 Within organization sociology empirical work have had a tendency to focus on internal movement within labor market clusters, firms or occupations (see Rosenbaum 1979a,b, 1984, Spilerman 1986, Spilerman and Lunde 1991).

matching. The theories hold that firms fill their high rank jobs with their own workers because: (i) firm-specific capital, which can be acquired only by experience working in the firm, becomes relatively more important at higher level positions,[5] (ii) promoting only from within improves productivity by providing additional incentives for lower ranked workers to work hard,[6] or (iii) long tenure at a firm indicates that the worker-firm match is a good one, and good matches are especially important in higher level positions.[7] Notice that theories (i) and (iii) could be adapted to explain why firms fill their higher ranked position from within an occupation if long tenure in an occupation accumulates occupation-specific skills or indicates a good match and those are particularly important in higher level positions.

As usually presented, the theories explain a pattern where higher level jobs are more often filled by workers already employed by the firm, but the evidence for such a pattern is hardly conclusive. Much of the literature is based on case studies of single establishments (Rosenbaum 1980, Lazear 1992; Baker et al 1994a,b, see an overview Gibbons and Waldman 1999a,b) and these provide too little data to evaluate the importance of job-candidates' experience working in the same occupation in other firms. Few systematic studies are sufficiently detailed to follow workers careers across firms or sufficiently encompassing to provide more than anecdotal evidence.

To resolve the empirical question of which ILM boundaries best account for recruitment decisions, one needs unusual data. For example, to compare empirically the roles of ILMs

[5] Becker (1975) introduced the modelling of human capital and used its accumulation to explain lifetime patterns of earnings. Employers attempt to tie trained workers to the firm in recognition of their superior value by promotion, salary raises and employment security. Employees invest in productivity enhancing skills, accumulating either general or specific human capital. The accumulation entails learning skills on the job and therefore a worker's relative wage increases over the life cycle.

[6] Lazear and Rosen (1981) argue that ports of entry, internal promotion, and a steep wage profile within the job hierarchy provide strong, tournament-like incentives for workers for an alternative explanations to tournament. It is difficult to test the tournament model as distinct, for instance, from the learning model (Baker and Holmström 1995) and empirical support has not been convincing (see Lazear 1992, Lazear and Oyer 2002). Waldman 1984 explains the same phenomena as an insurance arrangement against variation in individual productivity. For an alterative explanation to tournament theory, promotion as incentives, wage increases attached to job movements, see Kwon (1999). Finally, seniority rules in promotion and wage setting can be understood as a response to problems of collusion or influence activities (Milgrom and Roberts 1988). .

[7] Burdett (1978), Jovanovic (1979a,b), Greenwald (1986), Kwon (2003).

based on occupations or firms, one might analyze the extent to which openings of various kinds are filled by workers in the same occupation (especially when this requires hiring from outside the firm) versus by workers in the same firm (especially when this means training a worker from a different occupation). To do that with individual data, one needs data that traces individuals from one occupation to another and from one firm to another.

To identify internal labor markets, hiring decisions are only part of the story; pay levels are another important variable. According to all ILM theories, wages increase with experience within the relevant ILM. Thus, to compare which ILM theory best accounts for the facts, one would also want to compare the effects on wages of experience within the firm and within the occupation.

In this study we present a comprehensive analysis of data from the private sector in Sweden. The Swedish data encompasses entire populations of establishments in the private sector, including employee and occupation characteristics and information about wages and work hours. The data also covers entire populations of workers in the private sector for a 20-year period that belong to the bargaining cartel sphere except for the insurance and banking sectors. We analyse data from 1986 – 1989. In Sweden firing is rare, regulated by law and monitored by the labor union, so job changes are usually initiated by the employee. This makes interpreting the results more straightforward.

We focus on the two issues concerning ILMs described above, asking: (1) To what extent do occupation and firm boundaries influence hiring decisions at various levels in the firm? and (2) How does experience within the relevant boundaries affect white-collar workers' pay?

In the Swedish data, most high level positions are filled by workers who are both within the firm and within the occupation of the new job. Yet there is clear evidence that occupation-based ILM gives a better account of recruitment than the firm-based ILM. When hiring from within the occupation, the firm's tendency to hire from within its own boundaries does not increase significantly with the job's rank. However, when hiring

from within the firm, the tendency to hire from within the occupation does increase significantly with the job's rank. These findings contradict the common assumption in the ILM literature that there are low-level port-of-entry jobs within firms with at least a tendency for higher-level openings to be filled by current employees.

We do find variation in these typical results across different kinds of firms. Smaller firms hire more from outside and to higher ranks than the larger firms do. Large firms more often fill job slots with their own workers, even when they are from different occupations.

The Swedish wage data allow us to complement our analysis of recruitment with a study of the effects of firm and occupation boundaries on wages. This additional analysis is valuable for two reasons. First, the analyses of recruitment through ports of entry and 'promotion from within' are potentially sensitive to job and occupation definitions because they are based on cases in which workers are moved to jobs that are classified differently. Theoretically, workers who stay in the same job at higher pay could also be part of an ILM pattern, with the higher pay being a reward for long tenure in the firm or occupation. In that case, the relevant ILM theories would associate increased wages, rather than promotions, with the identified firm-specific and occupation-specific experience. Second, since many positions are filled by individuals from within both hypothesized ILMs, an analysis of hiring and promotions alone would leave open the possibility that experience in the firm ILMs is significant in explaining pay even when it is not significant for explaining promotions. If occupation alone determines the boundary of the ILM, then experience in the firm should not be needed to account for individual wages.

Our empirical analysis finds that both labor market experience and occupation tenure have positive and significant effects on wages but that firm tenure has no positive effect on wages. Occupation tenure has a larger effect on wages in those occupations that hire mainly from within, in smaller firms, and at higher ranks.

Taken together, these empirical findings point to a consistent pattern: the occupation-based ILM theory is most helpful for explaining hiring, promotion and wage patterns in Sweden, and the firm-based ILM theory does not account for any of the residual.

2. Literature

The idea that some jobs might be open to only a limited group of applicants is one that has been explored by both economists and sociologists.

Economic labor market research often assumes that the boundaries of the firm and the relevant labor market coincide, so that the ILM that is firm ILM (FILM)—a device that allocates workers to projects with very little influence from a spot labor market or, indeed, any other type of institution. Stylized facts within economic research are that workers accumulate firm specific capital[8], that there are ports of entry and that promotion is based on more on tenure/seniority than marginal productivity within the firm. If the firm makes up the relevant boundary for the labor market with low level ports of entry, then insiders with long tenure in a firm should earn higher wages than those with shorter tenure.

The findings in the economic ILM literature do affirm that there are ports of entry, but they are less well defined than the simple theory.[9] The findings do suggest some form of internal labor market. Wage studies, on the other hand, show mixed results. Topel (1991) and Altonji and Williams (1997) showed, respectively, that firm tenure is important or moderately important for determining pay, but Parent (2000), to the contrary, found that firm specific tenure is not so important. In assessing the boundaries of ILMs, Parent's key finding is that, controlling for industry tenure, firm tenure has no significant effect on wages. That finding contradicts the fundamental assumption of most economic theories about ILMs.

[8] Baker and Holmstrom (1995), and Gibbons and Waldman (1999a) have pointed out that many stylised facts of FILM can be explained by learning, general human capital and job assignments without referring to firm specific factors.
[9] Lazear 1992, Baker et al. 1994a,b Lazear and Oyer 2002

Although the founding discussions of ILMs (see Weber (1922) 1978, Doeringer Piore (1971) 1985, Kerr 1954, Dunlop 1966) point to the possibilities that occupations or firms or a combination of the two might define boundaries (see DiPrete and McManus 1993), past economic empirical studies usually do not distinguish between ILMs based on occupation (OILM) and firm (FILM). An exception is Parent (2000), who controls not only the firm tenure but also the industry tenure.

Sociologists emphasize a perspective on ILMs that incorporates many possibilities. In that literature, jobs are doled out to members of a social group, which might be organized in various ways. The boundaries of a social group may be more or less fluid over time. Influence activities (Milgrom and Roberts 1987 1988) or the social group processes described by Doeringer and Piori (1985), and Lindbeck and Snower (1988), may affect how sensitive the boundaries are to changes in the external environment.

The idea that occupations are often social groups has a long tradition in sociology (Durkheim, 1989 , see also Freidson 1986, 1994 pp.75-91, and Weber, 1978). As with other social groups, entry is controlled, creating barriers that restrict access to resources and opportunities. Weeden (2002) provides a detailed discussion and measures the process of "social closure" by focusing on strategies such as licensing, credentialing, certification, unionization, and representation by associations, all of which help to create social and legal boundaries around occupations.

An important premise of our study, that the boundaries of a labor market might be marked by either the firm or the occupation, is well established in sociological literature. According to Doeringer and Piore 1971, 1985, labor markets can be classified as enterprise, craft or secondary labor markets, depending on which kind of group has access to jobs. Althauser and Kalleberg (1981) classified labor markets as firm, occupational or secondary labor markets.[10] The consensus among organizational

[10] Althauser and Kalleberg 1981 created a concept that could be applied both to blue- and white- collar workers, and to unionized and non-unionized workers. They contrasted occupation internal labor markets with firm internal labor markets. The key difference was that in IOLM advancements occurred within the

sociologists is that being located in an ILM, whether based on the firm or the occupation, enhances employment security and opportunities for advancement (Althauser 1989).

Social groups are thought to stratify the labor market and influence individual's careers trajectories and earnings (Rosenbaum 1984, Spilerman 1986). Moreover, in this view, social processes such as normative equity and authority matter for promotions (see Granovetter, 1986 for an overview).

Empirical evidence that suggests that labor markets are organized primarily by occupation tends to be highly selective. These include case studies of ideal types such as athletic coaches, academics, or certain constructions crafts (see Smith 1983, Dalton and Snelling 1983, Ryan 1984.) See DiPrete and MacManus 1993, for an overview.

One of the few studies focusing directly on the *boundary* of ILM is by DiPrete and McManus 1993. They treat occupational and organizational structures as simultaneously influencing the labor market outcomes. They show that both occupational and firm tenure are associated with higher expected earnings in all occupational groups studied regardless of how they were grouped in occupations.

Given the contrasting views of the economic and sociological literatures, we ask: What are the boundaries of labor markets? Are they defined primarily by firm, occupation or something else?

To answer these questions, we focus on both job assignments and wages. For if the boundaries of the ILM are the same as the boundaries of the firm, then there is no path to higher pay by moving to an outside job, and one would expect firm-specific capital to generate payoffs that are as high or higher than general or occupation- specific human capitalskills. If, however, the boundaries of the ILM are primarily based on occupation (for example, within a professional or craft community), then a worker's job

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occupation while advancement in FILMS occurred within firms or at least the portion of the firm that contained the FILMS mobility cluster.

opportunities are determined in large part by her qualifications to take outside jobs. Firm-specific human capital, as measured for example by tenure at a firm, would then be expected to have a relatively lower return compared to occupation tenure or general skills, as measured by time in the labor market. Thus, data on wages, as well as on jobs, will be relevant for selecting which account of ILMs best fits the facts.

3. Labor market institutions

3.1 Labor market conditions in Sweden

The longitudinal data from Sweden present a valuable and rare glimpse of a period of institutional change within a country. Since our study focuses on the period 1986-1989, it is useful to review the conditions in Sweden then and the changes that were taking place.

Sweden has strong egalitarian traditions, allowing for much less inequality in pay than for instance the U.S. (see Fritzell 1991, Blau and Kahn 1996). The distribution of market rewards before taxes may be more unequal in Sweden than for other welfare states such as Norway. But Sweden has a more progressive tax system, so that disposable income after taxes and transfers is more equal in Sweden than many other countries (e.g., Fritzell 1991 pp. 143-48, Table 5 p. 174, Björklund and Freeman 1997)[11]. The Swedish earnings inequality 1970 to 1990 shows that from 1975 the inequality went down and in 1983 there was a very clear trend change and the inequality went up again. (Figure 1, Davis and Henrekson 2000). [12]

[11] Taxation has also been a device to keep small inequality small. Sweden has a high rate of taxation on labor income compared to the U.S. and many other countries. Given a flat rate schedule higher tax rates compress the after-tax earnings distribution compared to the pre-tax distribution. Sweden's tax rate schedule for labor income also looks highly progressive on the surface, although that assessment is less secure upon careful examination (Normann and McClure 1997).

[12] Finally Swedes express great concern for equality of the sexes, as is particularly apparent in the political sphere. This concern has been expressed in the area of family policies, where Sweden since the 1970s has had more extensive and progressive policies than any other country. Maternity as well as paternity leaves are longer than elsewhere, and childcare is provided universally with a strengthening of policies since 1979 (see Kamerman 1988, 1991a,b). For example, since 1937, Sweden has had laws providing job protection during absences in the period before and after childbirth.(The U.S. passed the first such legislation in 1993)).

Sweden has a small discount on wages for new entrants relative to more experienced employees, (Edin and Topel 1997), a low return to job tenure (Edin and Zetterberg 1992), a low return to schooling (Edin and Holmlund 1995; Edin and Topel 1997), and small industry wage differentials (Edin and Zetterberg 1992), small gender wage gap on occupation establishment levels (Meyersson Milgrom, Petersen and Snartland 2001,) small gender productivity gap (Petersen, Snartland and Meyersson Milgrom 2000,) and small gender reached-rank gap (Meyersson Milgrom and Petersen 2003, SOU 1998).

Sweden is a good case study for a labor market with long-term labor contracts. Gibbs et al (2002) show that 80% of men and 86% of women in the SAF wage statistics sample did not change firm while in the sample. And Fox (2003) showed, using the same sample, employees are more likely to change firms at younger ages. Promotion is more common than firm changes and doing both is even less common. The effects on pay of changing firm and getting a promotion is 7.3 % on your pay, promotion only is 3.3 % (Gibbs et al 2002).

Perhaps the clearest expression of the aversion to inequality is in the system of "solidaristic" wage bargaining in Sweden, which was particularly strong in the period 1950-1983. Conscious attempts were made to minimize wage differences between various groups and to institute the principle of equal pay for equal work and sometimes even equal pay for all. Edin and Richardsson 1999 report: "….based on strong ideological convictions among the union leaders and the membership at large, the aim of the policy turned to overall wage equalization." But since 1983, when the central bargaining system started to dissolve, there has been a move toward less rigid wage policies (SOU 1993, pp. 76-78). Research shows that there was a sharp decline in inequality during the first part of the period examined [13]

Beginning in 1966, wage setting for most white-collar workers in the private sector was determined through negotiations between SAF and PTK, the main cartel for the private

[13] Hibbs and Locking (1998) for example show a decline for blue collars workers in the private sector after 1962 and 1982. And the inequality increases after and at the same time as there is a starting of the dismantling of the system of "solidarity"/ central wage bargaining systems.

sector white-collar union. By 1970-71 there was a national system of centralized wage bargaining for white-collar workers in place. The system lasted until 1982, when the engineers' union struck a separate agreement with their own employers' federation (see Elvander and Holmlund 1997).[14]

After 1983, the central wage bargaining system started to dissolve despite the government's attempts to save the system. For the vast majority of all employees after 1988, wages were determined by industry-level and plant-level bargaining (Calmfors and Forslund 1990). The period of 1986 to 1989 is then a period of less pervasive centralized wage negotiation and more of locally-determined wage setting Thus the period 1986 to 1989 is a particular interesting period of change.

To summarize, Sweden has a system that seems to suggest an important role for firm-based ILMs, since there is so little movement of workers between firms. The period we have chosen to analyze has less centralized wage bargaining than earlier periods and more industry level and local wage bargaining. Local unions continued to represent workers during this period.

Employers are, by law, the sole decision maker when it comes to hiring and promotion. Firing workers was strictly regulated by law and monitored by the labor union. Very few workers were fired or laid off, except when the firm could claim that the jobs had become redundant. The employer cannot fire Sara and hire Kurt for the same position. To lay off a worker, the employer must certify that the position cannot be filled due to lack of demand for that particular skill. Thus, when a worker changes firms to accept a new position, it is generally because the new job is more attractive to the worker than the old.

Unlike hiring decisions, wages were set largely through negotiations at the central, industry and/or local levels.[15]

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[15] There are laws regulating the work time, terms of firing, and working environment. Between 70 to 89% of all employees in Sweden are unionised during the examined period. For a more extensive overview of the Swedish labor market (see Ekberg 2003).

3.2 The Wage Negotiation System

In the beginning of the period of 1970-1990 SAF, SIF SALF and CF were the parties involved in negotiating for salaried workers. For 1970-1974 they centrally negotiated an agreement to last for five years, whereas SAF and HTF concluded a three-year settlement for the period 1970-1972[16]. Thus the negotiated length of a central agreement may differ for different workers and years. After 1975 PTK became an umbrella labor union cartel consisting of the major labor unions for white collar workers. [17]

Detailed wage negotiations followed a top-down pattern. The national wage agreement set an overall framework negotiated among the employer and employee sector organizations. Companies and local union branches were bound by the national agreement and the allotment of individual salary increases were negotiated locally. The clauses in the salary agreement governing the size of the salary increases generally involved across the board increases and a variety of kitties for individual allotment among all salaried workers or among salaried workers in a given category, such as women or salaried workers in a specific occupational groups. The agreements also included clauses on supplements for age and qualifications. A promotion supplement could be disbursed in relevant cases.

[16] SAF (Swedish Federation of the Employers', SIF (the Swedish union of clerical and technical employees in industry), SALF (The Swedish Union of Foremen and Supervisors) , HTF (The Swedish Commercial Salaried Employees) and the CF (The Swedish Association of Graduate Engineers CF-STF).

[17] During the beginning of the period 70s, the norm for negotiations assumed the international business sector would lead in wages and the wage cost should be the same in the sheltered sector, i.e. non-trading sector. The wage bargaining process was based on three stages: a central framework agreement; a number of national industry negotiations; and local negotiations at the individual plants. The central framework agreement was implemented through subsequent rounds of bargaining at the industry and plant level. In the typical case three components were included. First, everyone received an equally large wage increase specified in monetary units, rather than in percent. Second a guarantee for wage drift--this to compensate workers that were not affected by wage drift conditions on the market. Third a specific increase of pay directed to low-wage earners. see Ekberg (2003)

3.3 The BNT Coding

The system for classifying salaried occupations in the Swedish data was developed jointly by SAF (Swedish Federation of the Employers), SIF (the Swedish union of clerical and technical employees in industry), SALF (The Swedish Union of Foremen and Supervisors), HTF (The Swedish Commercial Salaried Employees) and the CF (The Swedish Association of Graduate Engineers CF-STF) to facilitate the enumeration of the salary levels for different types of salaried work (BNT system). The first edition was published in 1955. [18]

Responsibility for updating the nomenclature and monitoring the proper implementation of the system was vested in the Committee for the Classification of Salaried Occupations, with membership drawn from all parties. *In its capacity as an aid to the compilation of salary statistics the position classification system is designed to produce salary statistics reflecting the salary level for occupations of similar job content and degree of difficulty.* It was argued that this system "promoted meaningful comparisons" of the salary levels of individual groups of salaried workers, companies, labor market sectors etc.

The position classification system was founded on two basic criteria. The first was work performed (types of tasks) and the second was degree of difficulty. Work performed was defined as a variety of operations such as designing, manufacturing, buying, and selling. And degree of difficulty was defined as the sum total of the requirements for a given job such as knowledge experience , creative effort, management with supervisory and financial responsibility, the nature and extent of contacts, and the diversity of the work performed.

Salaried occupations were classified exclusively on the basis of the work performed by given salaried workers. The *manner* in which the salaried worker performs his duties, i.e. the performance and skill exhibited by the salaried worker, were not to influence the

[18] Since 1980 the statistics include members of companies of the SFO (the SFO Employer's Association) KFO (The cooperative Employers' Association) and K.A.B (the Negotiation Organization of the Cooperative and Public Utility Housing Corporations of Sweden) and TA (the Swedish Newspaper Employers Association).

classification. Neither were formal merits such as education, period of employment and similar factors to affect the classification.

In developing the coding system, the employers and unions agreed that "…it is of cardinal importance that occupations are classified on the basis of objective and factual information. The parties are in full agreement that consultations should not take the form of negotiations." For this reason, such consultations did not take place at the same time as local salary negotiations.

Inspection of the central wage negotiating system and the occupation coding system were carried out regularly in order to ensure that the salary statistics were as accurate as possible. Both the labor unions and the employer federation conducted random sample checks. Each year experts from the national headquarters of the SAF and the salaried worker unions attended a large number of national consultation meetings at the instigation of the local level party. These meetings were held when companies and local union branches fail to reach agreement on classification at local consultations.

4. The Data

The Swedish data were collected and compiled by the Swedish Employers' Confederation (SAF) from their database on wage statistics, assembled from establishment-level personnel records. These data are extensive and detailed and contain information for all blue- and white-collar workers in every industry (except the insurance and banking industries) in the private sector within the SAF domain. Member firms have provided information to the database from 1970 up to 1990, once a year. The data have been used for inputs in the yearly wage negotiations and are monitored not only by SAF but also by the labor unions. Hence the data are of exceptionally high quality. They should be very reliable compared to standard sample surveys with personal reports of pay rates and hours worked.

The establishment characteristics include the following: 1-digit industry code; size (the number of employees); region and area within region. For each employee surveyed,

information was obtained on method of wage payment (incentive- or time-rated), education, age, hours worked, part-time or full-time employed, union status and if unionised the name of the union, and a detailed description of job content, usually a four-digit code. We shall refer to this job content information as occupational codes, although it might also be described as job titles. The white-collar occupations covers altogether 276-285 positions. Ten occupation areas (for instance, construction and design), and 51 broad occupational groups (for instance. construction work), with detailed information about task content are included. Each of the 51 groups are labelled by occupation family and each code consists of 3 digits. Within each group a further distinction is made with respect to the level of difficulty in the job, a code that runs from 2 (high) to 8 (low), for our present purposes we have recoded it as 7 (low) to 1 (high) which we refer to as ranks. Not all occupations span the entire 7 ranks, some start higher than rank 1 and some do not have the top ranks, 5-7. The cross-classification of 51 occupational groups and 7 ranks yields 276-285 occupation-by-rank groups, which we refer to as occupations for short.[19]

The titles in the present data do predominantly indicate content of work, including aspects of the amount of responsibility involved, such as whether the incumbent is in a position of leadership or supervision. Within the restaurant business, for instance, there are 14 job titles, among them cook, cold buffet manager, cutter, and cook assistant. It is naturally a question of judgment when titles are too fine or too coarse. The equal pay laws require that likes should be treated alike. As long as the titles delineate differences in content of work and responsibilities, they are treated as unlike jobs.

Note, however, that the occupation titles are not so fine as to rule out all the individual worker-firm wage bargaining. Figure 1 shows that there are large wage variations within occupations and within firms.

[Figure 1 here]

[19] The white-collar workers' code system for occupations, the BNT-code, was developed first in 1955 and has been revised several times since (SOU 1993, p. 204). Its main purpose was to aid in the collection of wage statistics, not for setting wages individually. It is not unlike the salary grade level structures in many large U.S. organizations (e.g., Spilerman 1986), where a salary grade level indicates such things as the level of responsibility and qualifications associated with the position, but without a strong tie between the grade level and the actual salary itself, though a clear correlation exists.

In particular, the wage distributions have remarkable resemblance to those found in US firms (see, for example, Baker et al. 1994a and Kwon 1999). Among others, there are wage distribution overlaps between adjacent ranks. That is, some workers at a low rank can receive larger wages than some workers at a higher rank. Also the wage variation increase at higher ranks. Figure 2 shows that the same patterns emerge even after controlling for individual heterogeneity. Therefore, despite the importance of centralized wage bargaining and the equal pay laws, it appears that the individual worker-firm wage bargaining plays a significant role in determining the individual wages.

[Figure 2 here]

The data for white-collar workers covers practically the entire occupational spectrum, including managers and professionals. Chief executive officers and members of executive teams are excluded. The system of white-collar occupation coding is the same across industries. See description in the overview of the data in Table 1.

[Table 1 here]

Focusing on 1990, we have information on 391,997 white-collar employees. Among the white-collar workers there were 280 occupations, 22,031 establishments, and 146,940 occupation-establishment units.

The wage data are reported in an unusually detailed manner. For each person, the wages (as well as hours worked) are reported separately for pay earned during regular hours and pay earned during overtime hours. For white-collar workers pay is given as monthly pay in full-time equivalents.

5. Boundary of Internal Labor Market

We identify the boundary of internal labor market by analyzing whether, controlling for other relevant variables, (i) hiring at high-ranked positions is more common from outside the firm or outside the occupation and (ii)whether occupation tenure or firm tenure has

the greater effect on wages. If the boundary of the ILM is established entirely along occupation lines, then we would expect to find that hiring to high level positions depends on tenure within the occupation but not within the firm, and similarly that wages reflected occupation tenure but not firm tenure. If, reversely, the boundary of the ILM is established entirely along firm lines, then we would expect to find the reverse pattern.

In human capital based ILM theories, high rank jobs typically require more skills and ability than lower rank jobs. Suppose that both occupation-specific human capital and firm-specific human capital increase from relevant experience, for example from learning-by-doing. If just one of these kinds of capital, for example occupation-specific capital, were important for productivity and increased in importance in higher ranked jobs, then firms would prefer workers with the relevant experience for higher ranked jobs and would compensate them accordingly. A similar argument applies to matching models of ILMs. If a worker's productivity depends on the worker-occupation match rather than the worker-firm match and if match quality is more important in high level jobs, then firms would want to hire workers who been in the same occupation (but not necessarily in the same firm) for a long time into high rank jobs and would pay them accordingly. This would imply that the occupation tenure will have larger effects on wages than the firm tenure, especially at high rank jobs. If this were the case, we would say that occupations, rather than firms, define the boundaries of the ILM.

To summarize, we ask the following questions to identify the boundary of ILM.

Question 1 *For a particular rank in a particular occupation, do firms hire from within the same occupation or from within the firm?*

Question 2 *In a particular occupation, as the rank gets higher, do firms hire more from within the same occupation or more from within the firm?*

Question 3 *Controlling for labor market experience, do wages depend on how long a worker has been in a particular occupation (i.e. occupation tenure) or on how long a worker has been in a particular firm (i.e. firm tenure)?*

Question 4 *As the rank gets higher, do wages depend more on the occupation tenure or more on the firm tenure?*

5.1 Within-Firm or Within-Occupation Hiring: an Overview

We first present an overview of the hiring patters during 1986 and 1989. Table 2 shows the sources of new recruitments to a particular occupation and rank.[20] We distinguish five different sources: (i) within firm within occupation, (ii) within firm outside occupation, (iii) outside firm within occupation, (iv) outside firm outside occupation, and (v) new entrants. The figures are averaged across different occupations and years. Even though the ranks in different occupations are not exactly comparable, this table provides a good first overview. Later we will control for the differences in occupations.

[Table 2 here]

Column [4] shows that 62.2% of these new recruitments at the top rank are from within the firm, while only 25% of them at rank 6 are from within the firm. That is, even though there is significant outside-firm recruitments in all ranks, high rank jobs are mainly filled with workers from within the firm, and low rank jobs are mainly filled with workers from outside the firm. This finding is consistent with other studies of ports of entry within firms (see, e.g., Baker et al. 1994a,b, Lazear 2002).

However, column [5] and [6] reveal important information that no other previous studies could look at. That is, 'within firm' hiring ratio increases in higher ranks mainly because 'within firm and within occupation' hiring ratio is increasing. This is difficult to interpret because we do not know whether the firm is promoting the workers because they are within the firm or within the same occupation. On the other hand, 'within firm outside occupation' hiring ratio does not vary much between ranks. If firm-specific factors are

[20] In the analysis we have excluded employees in firms that ceased to exist in the sample, or employees in firms that merged or were split, i.e. where a group of workers were taken over by a new legal owner as a separate entity.

sufficiently important relative to occupation-specific ones, one would expect that the firm would promote from within the firm regardless of the occupation. Therefore, this suggests that firm-specific factors are not responsible for the ports of entry that other studies have found.

If the occupation-specific factors are responsible for increasing 'within firm within occupation' hiring ratio in ranks, we can expect that 'within occupation outside firm' hiring ratio would also increase in higher ranks. That is, at the top ranks, the firm would want to hire someone from the same occupation, regardless of whether they are from within the firm or not.

Column [9] shows that the 'within occupation outside firm' hiring ratio increases significantly in higher ranks. This suggests that firms fill high rank jobs with their own workers (i.e. internal promotion) not merely because they are within the same firm, but because they are also in the same occupation family. Thus, occupation-specific reasons (such as occupation-specific skills) are more responsible for ports of entry within firms than the firm-specific reasons.

These results also imply that even if a worker remains at a particular firm for a long time, the probability of obtaining a promotion to an occupation family other than his or her own does not increase with rank. On the other hand, if a worker stays at a particular occupation for a long time, not only does this increase the probability of promotion to a higher rank in the same occupation family within the firm, but also his or her chance of promotion to a higher rank in an another firm. Thus, the occupation boundary is more important in the worker's career than the firm boundary.

In summary, to answer question 1 and question 2, Table 2 strongly suggests that the relevant boundary of ILM is occupation rather than firms. Employers recruit for occupation skill and that strategy grows in importance with rank. However, it does not control for the heterogeneity of firms and occupations. Firms may differ in size, industry and organization. And occupations may also differ in degree of specialization, number of

ranks etc. Thus, we first investigate the heterogeneity among firms and occupations, and then we study whether the findings in Table 2 are robust when controlling for this heterogeneity.

5.2 Heterogeneity in Firms

So far, we have treated the Swedish economy as if it were one large company. However, much heterogeneity exists among firms, especially in terms of firm size. Furthermore, there is much heterogeneity among occupations.

[Table 3 here]

We first consider heterogeneity of firm size, measured by the number of white-collar workers.[21] Table 3 shows that firm size distribution is highly skewed. For example, in 1988, there were 13,651 firms in our dataset with a median firm size of six white-collar employees. In addition, 95% of firms have less than 100 white-collar workers. The largest firm has more than 10,000 white-collar workers. The top ten largest firms hire approximately 10% of all white-collar workers.

[Table 4 here]

Table 4 expands Table 2 for two different firm size groups. First, we can note that rank structures differ depending on the firm size. For the top four ranks, large firms have relatively more people than medium-sized firms. However, for the three bottom ranks, medium-sized firms have relatively more people than large firms. [22] This is partly due to the way ranks are defined. For example, in occupation #120 (Manufacturing, Repair, Maintenance, and Transportation), the top rank requires managing 180 or more people (see appendix). Thus, such a rank can exist only in a relatively large firm. Ranks are also

[21] Remember that data contains only white-collar workers within a particular firm. Although we have access to blue collar workers as well that data set do not match well with the white-collar worker data set.
[22] Ekberg and Salabasis 2001 showed that smaller firms have smaller number of extreme low and high ranks where larger firms are more likely to have the total spectrum of ranks.

defined by the complexity of the tasks. Consequently, Table 4 also suggests that there are relatively more complicated tasks in large firms.

In addition, Table 4 shows that compared to medium-sized firms, the ports of entry in large firms are relatively better defined and firm boundary appears to be relatively more important than the occupation boundary. About 81% of new hiring to rank one is from within the firm, and the "within firm outside occupation" hiring ratios are much larger than "within occupation outside firm hiring" ratio. Therefore, large firms tend to fill high rank jobs with someone from within the firm regardless of his/her occupation rather than someone from outside the firm from the same occupation family.

Nonetheless, "within firm outside occupation" hiring ratios do not increase in rank. Therefore, large 'within firm' hiring ratios in large firms do not necessarily mean that the firm-specific reasons (e.g. firm-specific human capital or contracts between a firm and a worker) are more important in large firms. The occupation-specific reasons, especially the occupation-specific human capital, can still drive this result.

In general, large firms have more occupations than small firms and can, therefore, match occupations and workers better within the firm boundary than smaller firms. This can explain why a large firm has high "within firm outside occupation" hiring ratio. Furthermore, knowing this, workers with more flexible abilities would choose to go to a large firm because changing firms later is costly. This also makes it easier for a large firm to hire (or promote) from outside the occupation family and within the firm. This further increases the "within firm outside occupation" hiring ratio in a large firm. Furthermore, if there is a positive correlation between the flexibility and level of the skills, then it can also explain why a large firm also has high "within firm within occupation" hiring ratio.

Therefore, the "within firm" hiring ratio can be high in a large firm, not because firm-specific human capital or contracts between the firm and its workers are more important in a large firm, but rather the occupation-specific skills are better matched in a large firm. Then, despite the large 'within firm' hiring in large firms, the effect of the firm tenure on

workers' wages would not be necessarily greater in large firms. We will test this later in wage regression analysis.

5.3 Heterogeneity in Occupations

Some occupations require more occupation-specific skills (e.g. Medical Care) than other occupations. Thus, the importance of occupation-specific factors will differ across occupations. Simply considering the gross "within occupation" hiring ratio (column [7] in table 2) can be misleading because high "within occupation within firm" hiring ratio could also indicate the importance of firm boundary. Figure 3 shows the ratio of "within occupation outside firm hiring" (woof) against "within firm outside occupation hiring" (wfoo) for each occupation, along with the size of the occupations in 1988. A high ratio means that a firm is more likely to fill a job with a worker in the same occupation family even if the worker comes from an outside firm rather than with a worker in a different occupation family within the firm. Thus, a high "woof/wfoo" ratio implies that the occupation boundary is relatively more important than the firm boundary.

[Figure 3 here]

The data exhibit much heterogeneity. For example, in occupation #640 (Medical Care), firms are 40 times more likely to hire from "within occupation outside firm" than from "within firm outside occupation". In occupation #330 (Architectural Work), the firm is ten times more likely, and in occupation #970 (Telephone Work), it is unlikely to hire from "within occupation outside firm". This heterogeneity does not necessarily depend upon the size of the occupation. For any given size of occupations, there exists large heterogeneity.

5.4 Boundary of Internal Labor Market: Hiring Within Firm or Within Occupation?

In this section, we revisit Table 2 using a number of multinomial regressions that control for various heterogeneities among firms and occupations. We address questions 1 and 2 in more detail. For a particular rank in a particular occupation, do firms hire from within

the same occupation or from within the firm? And, in a particular occupation, as the rank gets higher, do firms hire more from within the same occupation or more from within the firm?

We estimate the relative probabilities of different hiring strategies against the benchmark "within firm outside occupation" hiring. That is, for a specific job j, the relative probability of using a hiring strategy k is:

$$\ln\left[\frac{P_{jk}}{P_{j0}}\right] = \beta_{k0} + \beta_{k1} firm\_size_i + \beta_{k2} firm\_growth_i + \beta_{k3} occupation\_size_i + occupation\_growth_i$$
$$+ \beta_{k4} rankdummy_i$$

(k: 0= "within firm outside occupation", 1= "within firm within occupation", 2= "outside occupation outside firm", 3= "outside firm within occupation", 4= "new entrants".)

[Table 5 here]

Table 5 reports the results of this multinomial regression for all firms controlling for year and occupation dummies.[23] Later, we also repeat this regression by each occupation to allow different coefficients for different occupations and to control for the differences in the definition of ranks occupations. The following qualitative results are the same in all cases:

Column [1] shows the relative probability of within occupation hiring over outside occupation hiring *conditional on within firm hiring*. Because we condition on 'within-firm' hiring, the comparison of these probabilities do not crucially depends on the firm-specific effects. As this probability grows, the occupation boundary increases in importance. The results show that given within firm hiring: (i) At higher ranks, it is more likely to hire from the same occupation. (ii) Larger firms are less likely to hire within

[23] The qualitative results do not change even if we restrict our analysis to large firms only, such as firms that have all seven ranks or firms that have more than 300 employees.

occupation. (iii) Growing firms are more likely to hire within occupation. (iv) There is no clear trend over time. In summary, the occupation boundary is more important in smaller firms, especially at higher ranks.

Column [2] shows the relative probability of 'outside-firm' hiring over 'within-firm' hiring *conditional on outside occupation hiring*. Because we condition on "outside-occupation" hiring, the comparison of these probabilities does not interact with the occupation specific effects. As this probability grows, the firm boundary *decreases* in importance.

Most importantly, we find that the rank coefficients do not decrease at higher ranks. This finding confirms our view that most aspects of the internal labor market are *not* driven by firm-specific factors. The current view of internal labor markets, based on the firm-specific factors, such as firm-specific human capital, contracts between firm and workers, and firm-specific matching, predicts that the probability of outside-firm hiring should decrease at higher ranks. However, we show that once we control for occupations, the outside firm hiring probability does not decrease at higher ranks, rather, it slightly increases (See Figure 4). Thus, controlling for occupations, we find no ports of entry within the firm.

[Figure 4 here]

Column [2] also shows that large firms are less likely to hire from outside the firm, but growing firms are more likely to hire from outside the firm. These findings are not surprising. Small firms are less likely to find a good candidate for promotion from within firms than large firms. Also, growing firms, by definition, need to hire from outside the firms.

Column [3] shows the relative probability of "outside firm within occupation" over "within firm outside occupation". This probability shows the relative importance of

occupation boundary over firm boundary. If firm-specific factors are responsible for internal labor markets, one should expect that this probability will fall at higher ranks. However, column [3] illustrates that this relative probability increases at higher ranks. (Also see figure 4) This is consistent with the view that occupation-specific factors are responsible for many aspects of the internal labor market, such as ports of entry within the firm. It also shows that firm boundary becomes relatively more important in larger firms that are not growing fast. The relative importance of occupation boundary is growing over time as we can see from the coefficients of year dummies.

Finally, column [4] shows the relative probability of hiring "new entrants" over hiring 'within firm outside occupation'. This probability is smaller in large firms and at high ranks, but larger in fast growing firms, as one would expect.

To better control the heterogeneity of occupations, especially the differences in the definition of ranks, we also repeat the multinomial logit analysis by each occupation. Figure 5 shows that the same patterns as Figure 4 emerge, regardless of occupation.

[Figure 5 here]

The answer to the first and second question can now be addressed. The results show that 'within firm' hiring ratio and 'within occupation' hiring ratios are approximately the same, and that both increase in higher ranks. However, closer inspection reveals that 'within firm' hiring ratio increases in higher ranks because 'within firm within occupation' hiring ratio increases, not because 'within firm outside occupation' hiring ratio increase. On the other hand, we find that 'within occupation outside firm' hiring ratio increases significantly in higher ranks. These findings strongly suggest that employers care more about occupation-specific factors than firm-specific factors in their hiring decisions.

5.5 Boundary of Internal Labor Market and Wages

This section addresses our last two main questions regarding wages. We ask whether the occupation tenure has larger effects on wages than the firm tenure, and especially whether the relative importance of occupation tenure over firm tenure increases in high rank jobs.

It is important to combine hiring (or worker mobility) analysis with wage analysis. If, for example, there are firm-specific factors that generate small mobility at top ranks and, thus, ILMs within firms, the workers' wages would depend on their firm tenures even controlling for experience and occupation tenure. However, if the productivity of workers at the top ranks are mainly dependent upon occupational skills, and if workers at the top rank are very homogenous, then we can imagine a steady state with very small mobility cross firms at the top rank even when there are no costs of changing firms. In this case, despite the small mobility at the top rank, we cannot conclude that there are ILMs within firms. Note that in this case, controlling for experience, workers' wages would not depend on their firm tenures.

Therefore, we estimate wage regressions controlling for labor market experience, occupation tenure, and firm tenure, then analyze both the absolute and the relative importance of occupation and firm tenures in determining the wages.

Before we present our results, however, we want to focus attention to an important issue, the occupation and firm tenure coefficients in simple cross-section wage regressions require careful interpretation. (see, e.g., Topel 1991) Thus, we first explain how the occupation and firm tenure coefficients are identified and argue that simple cross-section wage regressions are sufficient for our purpose.

Let us focus on the identification of occupation tenure coefficient. The occupation tenure coefficient is identified by comparing the wages of those who stay at the occupation and the wages of those who leave the occupation. (see, for example, Lazear 2003) For simplicity, suppose that a worker's wage is determined by the occupation-specific human capital and the occupation-worker match quality. If a worker changes occupation, his

wages change not only because he suffers the loss of occupation-specific human capital for the old occupation, but also because the occupation-worker match quality changes. Then, the occupation tenure coefficient measures both the changes in occupation-specific human capital and the changes in occupation-worker specific match quality. (see Appendix C for more details) Furthermore, as an occupation requires more specific skills, both the changes in occupation-specific human capital and the changes in occupation-worker match quality increase. That is, as an occupation requires more specific skills, the occupation tenure coefficient in simple cross-section regressions increases unambiguously.

Therefore, for our purpose, we do not need to separate the changes in occupation specific human capital and the changes in worker-occupation matching quality, which is notoriously difficult.[24] While analyzing the relative importance of different occupation-specific factors is certainly interesting, it is beyond the scope of this paper.

Table 6 shows the results of wage regressions controlling for experience, occupation tenure, and firm tenure. We exclude workers who entered labor market before 1970 because we cannot compute the experience and tenure variables for them. [25]

The answer to question three (Controlling for labor market experience, do wages depend on how long a worker has been in a particular occupation (i.e. occupation tenure) or on how long a worker has been in a particular firm (i.e. firm tenure)?) is clear. The occupation tenure coefficient is significantly larger than the firm tenure coefficient. That is, on average, how long a worker has been in the same occupation matters more than how long a worker has been in the same firm. Thus, occupation-specific factors appear to be more important determinants of wages than firm-specific factors.

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[24] See, for example, Altonji and Shakotko (1987), Topel (1991), Altonji and Williams (1997), Abowd and Kang (2002).

[25] Those who entered labor market before 1970 constitutes 25% of our observations. To evaluate the potential selection bias, we also repeated the analysis with 1989 data only where those who entered labor market before 1970 are less than 10%. We also repeated the analysis with those who have the same amount of experience. The qualitative results do not change. Thus, the selection bias, if there is any, appears to be very small.

[Table 6 here]

Contrary to any other previous studies, we find negative firm tenure coefficient. To understand the negative firm coefficient, note that it is very difficult for firms in Sweden to fire employees. That is, workers will change firms only if they can expect better match (i.e. better wages) in a new firm[26]. Since workers who change firms do not lose wages much and actually enjoy a wage increase, this reduces the firm tenure coefficient. (see also the appendix) If firm-specific human capital is not important, then this improved matching quality will dominate the loss of firm-specific human capital during the change of firms and provide a negative firm tenure coefficient.

In the US, it is difficult to tell whether the turnovers are voluntary or not. Thus, we cannot determine the sign of the changes in matching quality during the turnover ex ante, though it appears that workers in US, on average, suffer wage loss during the turnovers. (see Topel 1991)

Question four asks *as the rank gets higher, do wages depend more on the occupation tenure or more on the firm tenure?* It is important to check how the occupation and firm tenure coefficient changes in ranks. If the occupation is the relevant boundary of ILM, then especially the wages at the top ranks should depend on the occupation tenure, but not on the firm tenure. If, on the contrary, the wages at the top ranks crucially depend on the firm tenure, but not on the occupation tenure, then workers will try to stay at the same firm, but not necessarily at the same occupation. In this case, occupation will not be the relevant boundary of ILM, or workers' career.

Table 7 shows the interaction between tenure variables and rank. Recall that rank 1 is the highest rank, and rank 7 is the lowest. Therefore, a negative coefficient of these interaction terms implies that the tenure coefficient increases in higher ranks. Column [1] and [3] clearly shows that the occupation tenure coefficient significantly increases in

[26] Gibbs, Ierulli, and Meyersson Milgrom (2002) finds that the annualized wage growth is 1.03% for those who stay in firms and 3.74% for those who change firms and 7% for those who both change firms and get a promotion.

higher ranks, but the firm tenure coefficient decreases in higher ranks. This result provides another evidence that the relevant boundary of ILM is the occupation.

[Table 7 here]

Also note that from Column [2], the firm size *decreases* the effect of firm tenure on wages. In Table 4 and 5, we found that large firms hire more from within firms than small firms. If this indicates that the firm-specific factors are more important in large firms, the firm tenure would have larger effects on wages in larger firms. Therefore, our results imply that firm boundary is not necessarily more important in large firms than in small firms. An alternative explanation is that large firms hire more from within firms because they can find good worker-occupation matches within firms. Then, even in large firms, occupations become the more relevant boundary of ILM.

The previous sections also show that not all occupations are the boundary of ILM or workers' career. Figure 3 shows large heterogeneity among occupations in outside hiring. Then, we can expect that the occupation tenure coefficient will be larger in an occupation where most hiring is done within occupation, but not necessarily within firm. To test this hypothesis, we also estimate the coefficients of interaction terms between tenure variables and "within occupation outside firm hiring"/ "within firm outside occupation hiring" ratio (=woof/wfoo).

Column [4] shows that the occupation tenure coefficient is larger but the firm tenure coefficient is smaller when an occupation hires relatively more from within the same occupation than within the same firm. This is consistent with our hypothesis.

5.6 The Role of the Labor Union and Centralized Wage Bargaining System

The importance of labor unions and the centralized wage bargaining system in Sweden requires further discussion on how much of the occupation-specific factors that the previous sections have identified are due to these specific institutional settings in Sweden.

As Figure 1 and 2 imply, there is significant individual worker-firm wage bargaining in determining the individual wages, so the resulting wage distributions are similar to those found in US. However, one could still argue that the centralized wage bargaining has compressed the wage variations across firms for a given occupation and rank. Then, a worker can change firms within occupation without the uncertainty on future wages, while the changes of occupations could entail large uncertainty. This could explain relatively larger mobility across firms than across occupations. Furthermore, controlling for occupation tenure, the firm tenure coefficient in wage regression would become very small (recall that the firm tenure coefficient is identified by comparing the wages of those who stay at the firm and those who leave the firm.)

However, in late 1980s, the centralized wage bargaining system was dissolved, and the bargaining at the industry and firm level became relatively more important, generating large wage variations cross industries and firms. In particular, with the dissolution of the centralized wage bargaining system, workers' cross-firm mobility has substantially increased[27], which is contradictory to the argument that the centralized wage bargaining system was responsible for large cross-firm mobility. Furthermore, Gibbs, Ierulli, Meyersson Milgrom (2002) shows that workers receive, on average, a larger wage increase upon the change of firms than upon the change of occupation.[28] Thus, the wage bargaining system in late 1980s would predict that the firm tenure coefficient is larger than the occupation tenure coefficient in wage regressions. Therefore, the institutional settings in Sweden do not appear to be responsible for our results.

[27] For the top three ranks, outside firm hiring rate has increased from 31% in 1975 to 37% in 1988

[28] It would be interesting to compare the firm and the occupation tenure coefficients between 1970s and 1980s. However, we do not know the firm and the occupation tenures for most workers in 1970s because we do not know when they have entered a firm or an occupation. Thus, we focus on late 1980s in this study.

6. Conclusion

Most economic research on internal labor markets has assumed that the relevant labor market, with its entry level jobs and patterns of promotions and wages, is set up within firms, rather than within occupations. If internal labor markets are as sociologists describe them—the administrative rules set by social groups that may overlap firm boundaries, then the relevance of the firm boundary for promotions and wages is in dispute. Seldom has this dispute been tested; tests of the relative importance on wages of occupation versus firm tenure are even rarer.

The Swedish data has some important advantages as a basis for testing these alternative theories. Perhaps most important is that we are able to study a total population of firms participating in the wage bargaining system for 1986-1989, including movements between and within firms and between and within occupations.

A disadvantage of the Swedish data is that despite the similarities between the U.S. and Sweden in the legal right of the employer to hire and promote employees without interference by the labor union and in the wage structure within occupations, the labor union in Sweden still plays a very important role in wage negotiation. So even though the centralized wage bargaining system we knew during the 70s dissolved during the late 80s, the wage bargaining process carried out by labor unions both at the local and industry levels continued. The results from the wage regressions in Sweden may not generalize to differently organized labor markets.

The empirical results contradict the notion that recruitment follows the pattern of a firm-based internal labor market. Given that a worker is hired from within the relevant occupation, there is no tendency for the firm to hire more from within as the rank of the job increases. Also, if someone qualified in the occupation skill cannot be found within the firm, then the typical firm is ready to recruit from the outside. This tendency increases with rank. It thus appears that occupation specific skill becomes more important as job

rank increases. A complementary analysis shows that occupation tenure is more important than firm tenure for wage setting and that this tendency increases with job rank.

Based upon these patterns, we conclude that for the Swedish data, internal labor markets based within occupations give a better account of the facts concerning ports of entry, recruitment, and wages, than do markets based within firms. This is a significant finding. If similar findings hold for other countries, that calls for a change in the direction of theoretical and empirical research in ILM and in organization. The relevant unit of analysis might then be based on occupations rather than on firms.

As an example, we believe that a model where firms are different only in their occupation composition and where workers are different in their occupational skills can explain most aspects of the data described above without reference to firm-specific factors. We are pursuing such a model in current research.

Appendix A Three-Digit BNT (Occupation) Codes

BNT Family	BNT Code	Levels	
0			**Administrative work**
	020	7	General analytical work
	025	6	Secretarial work, typing and translation
	060	6	Administrative efficiency improvement and development
	070	6	Applied data processing, systems analysis and programming
	075	7	Applied data processing operation
	076	4	Key punching
1			**Production Management**
	100	4	Administration of local plants and branches
	110	5	Management of production, transportation and maintenance work
	120	5	Work supervision within production, repairs, transportation and maintenance work
	140	5	Work supervision within building and construction
	160	4	Administration, production and work supervision within forestry, log floating and timber scaling
2			**Research and Development**
	200	6	Mathematical work and calculation methodology
	210	7	Laboratory work
3			**Construction and Design**
	310	7	Mechanical and electrical design engineering
	320	6	Construction and construction programming
	330	6	Architectural work
	350	7	Design, drawing and decoration
	380	4	Photography
	381	2	Sound technology
4			**Technical Methodology, Planning, Control, Service and Industrial Preventive Health Care**
	400	6	Production engineering
	410	7	Production planning
	415	6	Traffic and transportation planning
	440	7	Quality control
	470	6	Technical service
	480	5	Industrial, preventive health care, fire protection, security, industrial civil defense
5			**Communications, Library and Archival Work**
	550	5	Information work
	560	5	Editorial work – publishing
	570	4	Editorial work – technical information
	590	6	Library, archives and documentation
6			**Personnel Work**

	600	7	Personnel service
	620	6	The planning of education, training and teaching
	640	4	Medical care within industries
7			**General Services**
	775	3	Restaurant work
8			**Business and Trade**
	800	7	Marketing and sales
	815	4	Sales within stores and department stores
	825	4	Travel agency work
	830	4	Sales at exhibitions, spare part depots etc.
	835	3	Customer service
	840	5	Tender calculation
	850	5	Order processing
	855	4	The internal processing of customer requests
	860	5	Advertising
	870	7	Buying
	880	6	Management of inventory and sales
	890	6	Shipping and freight services
9			**Financial Work and Office Services**
	900	7	Financial administration
	920	6	Management of housing and real estate
	940	6	Auditing
	970	4	Telephone work
	985	6	Office services
	986	1	Chauffeuring

Appendix B Sample Description of Four-Digit BNT (Occupation) Codes

Occupation Family 1: Occupation # 120- Manufacturing, Repair, Maintenance, and Transportation
11% of 1988 sample
There is no level 1 in this occupation.
Level 2 (4% of occupation # 120 employees) - Assistant for unit; insures instructions are followed; monitors processes
Level 3 (46%) -In charge ofa unit of 15-35 people
Leve14 (45%) - In charge of 30-90 people; does investigations of disruptions and injuries
Level 5 (4%) - In charge of90-180 people; manages more complicated tasks
Level 6 (0.3%) - Manages 180 or more people
There is no level 7 in this occupation.

Occupation Family 2: Occupation #310- Construction
10% of the 1988 sample
Level l (0.1%) - Cleans sketches; writes descriptions
Level 2 (1%) - Does more advanced sketches
Level 3 (12%) - Simple calculations regarding dimensions, materials, etc.
Level 4 (45%) - Chooses components; does more detailed sketches and descriptions; estimates costs
Leve15 (32%) - Designs mechanical products and technical products; does investigations; has 3 or more subordinates
at lower levels
Level 6 (8%) - Executes complex calculations; checks materials; leads construction work; has 3 or more subordinates
at level 5
Level 7 (1%) - Same as level 6 plus has 2-5 level 6 subordinates

Occupation Family 3: Occupation #800- Marketing and Sales
19% of 1988 sample
Level l (0.2%) - Telesales; expedites invoices; files
Level 2 (6%) - Puts together orders; distributes price and product information
Level 3 (29%) - Seeks new clients for 1- 3 products; can sign orders; does market surveys
Level 4 (38%) - Sells more and more complex products; negotiates bigger orders; manages 3 or more subordinates
Level 5 (20%) - Manages budgets; develops products; manages 3 or more level 4 workers
Level 6 (7%) - Organizes, plans, and evaluates salesforce; does more advanced budgeting; manages 3 or more level
5 workers
Level 7 (1 %) - Same as level 6 plus 2-5 level 6 subordinates

Occupation Family 4: Occupation #900- Financial Administration
5% of 1988 sample
Level 1 (1%) - Office work; bookkeeping; invoices; bank verification
Level 2 (7%) - Manages petty cash; calculates salaries
Level 3 (18%) - More advanced accounting; 4-10 subordinates
Level 4 (31 %) - Places liquid assets; manages lenders; evaluates credit ofbuyers; manages 3 or more level3 employees
Level 5 (28%) - Financial planning; analyzes markets; manages portfolios; currency transfers; manages 3 or more level 4 employees
Level 6 (12%) - Manages credits; plan routines within the organization; forward-looking budgeting; manages 3 or more level 5 employees
Level 7 (2%) - Same as level 6 plus 2-5 level 6 subordinates

Appendix C Identification of Occupation and Firm Tenure Coefficients in Wage Regression

Without loss of generality, let us focus on the identification of the occupation tenure coefficient, and, to illustrate better, consider a simple two-period model similar to Lazear (2003). Worker i's productivity (and, therefore, the wages) at time t in occupation j is given by

$$y_{ij}^{t} = w_{ij}^{t} = h_G(\exp erience^{t}) + h_j(occupation\_tenure_j^{t}) + \mu_{ij}$$

$h_G(.)$ captures the general human capital and $h_j(.)$ measures the occupation-specific human capital. μ_{ij} is the matching quality between worker i and occupation j. Then, worker i's wage in period 1 is

$$w_{ij}^{1} = h_G(1) + h_j(1) + \mu_{ij}.$$

If the worker stays at the same occupation, the wage will be

$$w_{ij}^{2} = h_G(2) + h_j(2) + \mu_{ij}.$$

However, if the worker changes the occupation to k, the wage will be

$$w_{ik}^{2} = h_G(2) + h_k(1) + \mu_{ik}.$$

The occupation tenure coefficient is identified by comparing those who leave the occupation with those who stay at the occupation. That is, the occupation tenure coefficient in this simple model is

$$w_{ij}^{2} - w_{ik}^{2} = h_j(2) - h_k(1) + \mu_{ij} - \mu_{ik}$$

Notice that the occupation tenure coefficient measures two changes; one is the loss of occupation-specific human capital and the other is the change is the worker-occupation matching quality.

If the occupation-specific human capital in occupation j is large, then the loss of the human capital, $h_j(2) - h_k(1)$, will be large, too. Also the worker from occupation j will have difficult time in binding a better match because his skills are too specific. Then, on average, μ_{ik} will be small. Therefore, if the occupation-specific human capital in occupation j is important, then the occupation tenure coefficient will increase.

We can also easily see why the firm tenure coefficients are negative in Table 7. Since firms in Sweden cannot fire employees, the workers change firms only when they expect better match, or larger wages, in a new firm. That is, in Sweden, $\mu_{ij} - \mu_{ik}$ is negative. Therefore, if the loss firm-specific human capital from firm change is small, the firm tenure coefficient will become negative.

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Table 1 Description of data for blue, and white-collar workers in Sweden. 1970 –1990*

Year	Number of employed	Number of women	Number of men	Percent women	Number of occupations	Number of establishments	Number of occupations-establishment pairs	Number of industries	Total average wage	Average wage women	Average wage men
	1	2	3	4	5	6	7	8	9	10	11
	White-collar workers										
1990	391 997	135 581	256 416	34.6	280	22 031	146 940	32	92.71	74.63	102.27
1985	380 513	124 423	256 090	32.7	279	20 669	145 070	32	63.03	50.03	69.35
1980	381 702	117 798	263 904	30.9	281	19 769	148 461	31	44.06	34.56	48.30
1978	367 207	110 460	256 747	30.1	271	18 457	144 309	34	37.19	28.93	40.74
1975	351 459	100 050	251 409	28.4	345	15 894	135 340	36	29.09	21.83	31.98
1970	299 154	73 318	222 472	24.8	256	13 779	108 121	40	17.09	11.46	18.94

Note: In 1990 643,349 blue-collar workers worked at 1,849 different occupations at 23,544 different establishments within the SAF domain. In this table wages are reported as pay per hour and in Swedish Kronor SEK.

* Taken from Meyersson Milgrom et. Al, 2001.

Table 2 Hiring from Within Firm or Within Occupation

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
				within firm			within occupation			outside occup.	
rank	N	stay	import	total	within occup.	outside occup.	total	within firm	outside firm	outside firm	new
1	2565.00	2033.50	531.50	0.622	0.447	0.175	0.664	0.447	0.218	0.099	0.062
2	15859.50	12826.75	3032.75	0.642	0.446	0.196	0.639	0.446	0.193	0.098	0.067
3	55241.25	44328.50	10912.75	0.614	0.409	0.205	0.589	0.409	0.181	0.101	0.104
4	112241.50	88717.25	23524.25	0.478	0.292	0.186	0.447	0.292	0.156	0.098	0.268
5	111871.25	86284.50	25586.75	0.352	0.183	0.168	0.291	0.183	0.108	0.084	0.457
6	62934.75	47230.00	15704.75	0.252	0.073	0.179	0.135	0.073	0.063	0.094	0.591
7	8251.50	5918.75	2332.75	0.120	0.027	0.094	0.059	0.027	0.033	0.076	0.771

Note : rank: 1(=highest) – 7(=lowest). Column 1shows the average number of white-collar employees (N) in each rank between 1986 and 1989, Column 2 shows number of employees who stay at the same job and at the same firm from the previous year (stay). Column 3 shows the number of employees that have changed either their occupation or their firm compared to the previous year (Import). Column (6), for example, can be read as follows, on average, 17.5 % of new hires to rank 1 were hired from within the same firm but from a different occupation family.

Table 3 Distribution of Firm Size

Year	N	mean	std. dev.	min	5%	25%	50%	75%	95%	max
1986	13116	29.28	175.45	1	1	2	6	15	96	9711
1987	13465	28.8	166.05	1	1	2	6	15	93	9939
1988	13651	29.34	164.03	1	1	2	6	16	98	10125
1989	14009	28.89	165.25	1	1	2	6	16	96	10105

Note: Firm Size is measured by the number of white collar employees in a firm.

Table 4 Firm Size and Boundary of ILM

(firm size>5000)

					within firm			within occupation			outside occup.	
rank	N	%	stay	import	total	within occup.	outside occup.	total	within firm	outside firm	outside firm	new
2	322.25	1.2%	273.25	49	0.813	0.587	0.226	0.710	0.587	0.122	0.038	0.027
3	1533.75	5.5%	1298.5	235.25	0.847	0.574	0.273	0.657	0.574	0.083	0.053	0.018
4	5909	21.1%	4922.5	986.5	0.794	0.522	0.272	0.614	0.522	0.092	0.065	0.049
5	10470.25	37.4%	8449.25	2021	0.627	0.388	0.239	0.449	0.388	0.061	0.059	0.253
6	6381.75	22.8%	4749.25	1632.5	0.380	0.174	0.207	0.209	0.174	0.036	0.044	0.540
7	2907	10.4%	2213.75	693.25	0.353	0.096	0.257	0.128	0.096	0.032	0.051	0.564
8	443.5	1.6%	319.25	124.25	0.145	0.020	0.125	0.029	0.020	0.009	0.021	0.825

(500<firmsize<1000)

					within firm			within occupation			outside occup.	
rank	N	%	stay	import	total	within occup.	outside occup.	total	within firm	outside firm	outside firm	new
2	390.25	0.9%	315.25	75	0.652	0.472	0.180	0.671	0.472	0.199	0.098	0.052
3	2364.5	5.8%	1952	412.5	0.660	0.470	0.191	0.661	0.470	0.192	0.082	0.065
4	8004	19.5%	6535.5	1468.5	0.628	0.409	0.220	0.604	0.409	0.195	0.085	0.091
5	12882.25	31.4%	10175.5	2706.75	0.490	0.284	0.206	0.448	0.284	0.164	0.100	0.246
6	11327.5	27.6%	8812.75	2514.75	0.371	0.195	0.177	0.313	0.195	0.118	0.073	0.438
7	5555.75	13.5%	4213	1342.75	0.260	0.076	0.184	0.160	0.076	0.084	0.081	0.576
8	561.25	1.4%	382.75	178.5	0.127	0.048	0.080	0.092	0.048	0.044	0.037	0.791

Table 5 Hiring Strategy: Multinomial Logit Analysis

Number of obs = 324167
Comparison Group="within firm outside occup" Pseudo R2 = 0.1106

	within firm within occup	outside firm outside occup	outside firm within occup	new entrants
	[1]	[2]	[3]	[4]
firm size	-7.82E-06	-.0001635	-.0002118	-.0000479
	(2.63e-06)	(4.61e-06)	(4.58e-06)	(2.61e-06)
fsize growth	.2536156	1.252106	1.252806	1.244597
	(.0272205)	(.0231292)	(.0231184)	(.0230869)
occup size	-1.17e-06	-.0000104	-.000024	-.0000133
	(9.07e-06)	(.0000106)	(9.57e-06)	(8.26e-06)
osize growth	.1020451	.1326616	.5729609	-.1027899
	(.2283852)	(.2729546)	(.2514197)	(.2124158)
rank=1	3.146988	-.289693	1.727706	-3.275871
	(.1004031)	(.1029186)	(.1008)	(.1114023)
rank=2	2.876666	-.4746174	1.349778	-3.483495
	(.0806596)	(.0655841)	(.0743358)	(.0580068)
rank=3	2.581378	-.5349499	1.112159	-3.209155
	(.0774262)	(.0576935)	(.069454)	(.0441786)
rank=4	2.216637	-.4810405	.9614946	-2.22835
	(.076661)	(.0556901)	(.0682417)	(.0409515)
rank=5	1.701134	-.5664044	.6197678	-1.469315
	(.0763263)	(.0549685)	(.0677975)	(.0400819)
rank=6	.511283	-.5214514	-.0206422	-1.073451
	(.0765776)	(.0545313)	(.0681375)	(.0395615)

Note: All regressions include occupation and year dummies. ‘fsize growth’ and ‘osize growth’ measures the annual growth rate of firm size and occupation size, respectively.

Table 6 Wage Regression I

(dependent variable=log(wage))

	[1]	[2]	[3]	[4]
age	.0063097	.0044358	.0063095	.0044358
	(.0000488)	(.0000292)	(.0000488)	(.0000292)
experience	.0131772	.0040165	.0131778	.0040173
	(.0001609)	(.0000931)	(.0001609)	(.0000931)
otenure	.0026472	.0005884	.0026473	.0005881
	(.0001609)	(.0000908)	(.0001609)	(.0000908)
ftenure	.0068684	-.002617	-.0068698	-.002618
	(.0001421)	(.0000806)	(.0001421)	(.0000806)
firm size	.00000259	-2.05e-06	2.59e-06	-2.05e-06
	(2.14e-07)	(1.22e-07)	(2.14e-07)	(1.22e-07)
fsize growth	.0007238	.0005765	.000724	.0005766
	(.0001367)	(.0000915)	(.0001367)	(.0000915)
female	-.2160248	-.0783526	-.2160167	-.0783517
	(.0011345)	(.0006661)	(.0011345)	(.0006661)
woof/wfoo			-.0008821	-.0007913
			(.0001588)	(.0001083)
rank=1		1.157833		1.157833
		(.0043257)		(.0043257)
rank=2		.8971598		.8971432
		(.002075)		(.0020751)
rank=3		.6238922		.623894
		(.0015775)		(.0015775)
rank=4		.3755655		.375568
		(.0014105)		(.0014105)
rank=5		.2059994		.2060052
		(.0013321)		(.0013321)
rank=6		.0743198		.0743261
		(.0012805)		(.0012805)
#obs.	955708	955708	955660	955660
R^2	0.4904	0.7867	0.4904	0.7867

Note: All regressions include occupation, industry, town, and year dummies. Standard errors are adjusted for correlation within individuals. ‘experience’ measures the number of years a worker has stayed in our data (i.e. labor market). ‘otenure’ and ‘ftenure’ stand for the occupation tenure and the firm tenure, respectively. ‘woof/wfoo’ is the ‘within occupation outside firm’ hiring divided by ‘within firm outside occupation’ hiring in each occupation.

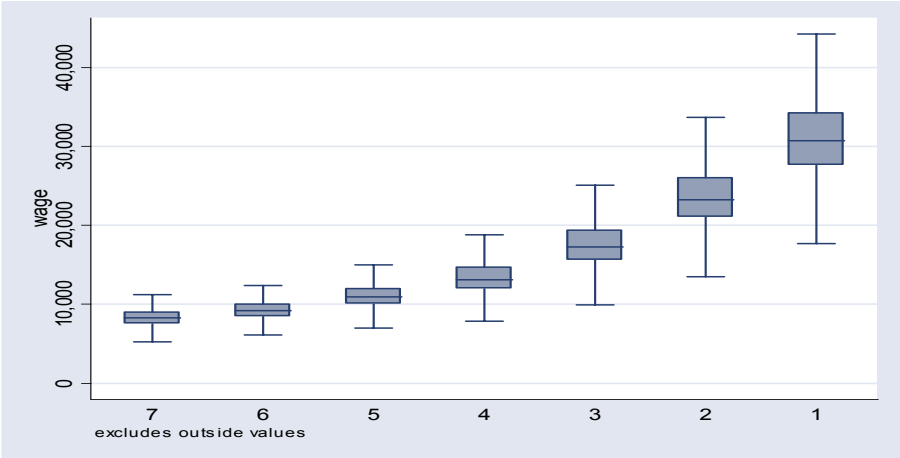
Table 7 Wage Regression II

(dependent variable=log(wage))

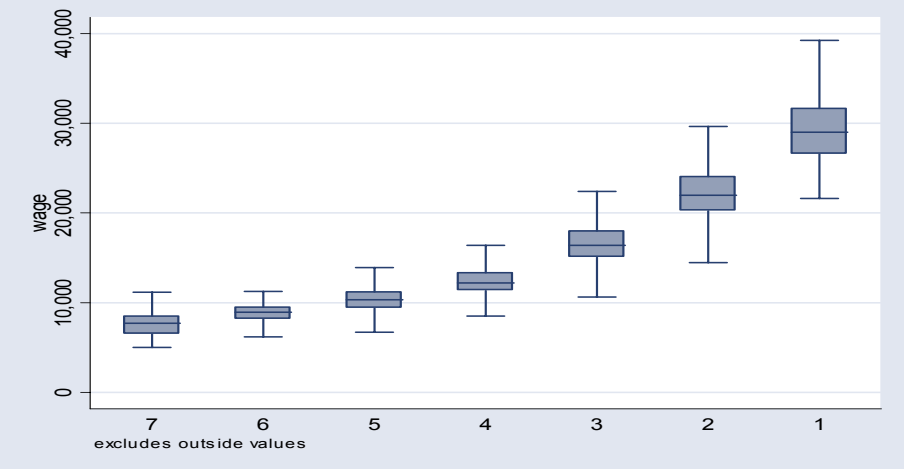
	[1]	[2]	[3]	[4]
age	.0045276	.0063102	.0045235	.0063094
	(.0000309)	(.0000488)	(.0000309)	(.0000488)
experience	.020069	.012071	.0194287	.0131921
	(.0004601)	(.0001758)	(.0004688)	(.0002119)
otenure	.0005878	.0030538	.000938	.0022718
	(.0004821)	(.000179)	(.000491)	(.0002082)
ftenure	-.0109048	-.0069662	-.0110664	-.0067781
	(.0004126)	(.0001576)	(.0004196)	(.0001684)
firm size	-2.13e-06	-3.36e-06	-3.86e-06	2.58e-06
	(1.30e-07)	(3.06e-07)	(1.90e-07)	(2.14e-07)
fsize growth	.0006222	.0006829	.0006094	.0007216
	(.0000948)	(.0001368)	(.0000947)	(.0001367)
female	-.071203	-.2159567	-.0712799	-.2160377
	(.0006926)	(.0011341)	(.0006925)	(.0011345)
rank	-.1754126		-.175674	
	(.0004844)		(.0004849)	
rank*exp	-.0030264		-.0029677	
	(.0000827)		(.0000831)	
rank*otenure	-.0000116		-.0000468	
	(.0000872)		(.0000875)	
rank*ftenure	.0016392		.0016573	
	(.0000757)		(.0000759)	
fsize*exp		1.30e-06	3.76e-07	
		(9.03e-08)	(4.83e-08)	
fsize*otenure		-2.52e-07	-1.14e-07	
		(7.61e-08)	(4.16e-08)	
fsize*ftenure		-3.33e-07	-5.77e-08	
		(8.87e-08)	(4.79e-08)	
woof/wfoo				-.0027399
				(.0003899)
woof/wfoo				-.0000481
*experience				(.0001771)
woof/wfoo				.0003972
*otenure				(.0001759)
woof/wfoo				-.000091
*ftenure				(.000091)
#obs.	955708	955708	955708	955660
R^2	0.7705	0.4912	0.7705	0.4904

Note: All regressions include occupation, industry, town, and year dummies. Standard errors are adjusted for correlation within individuals.

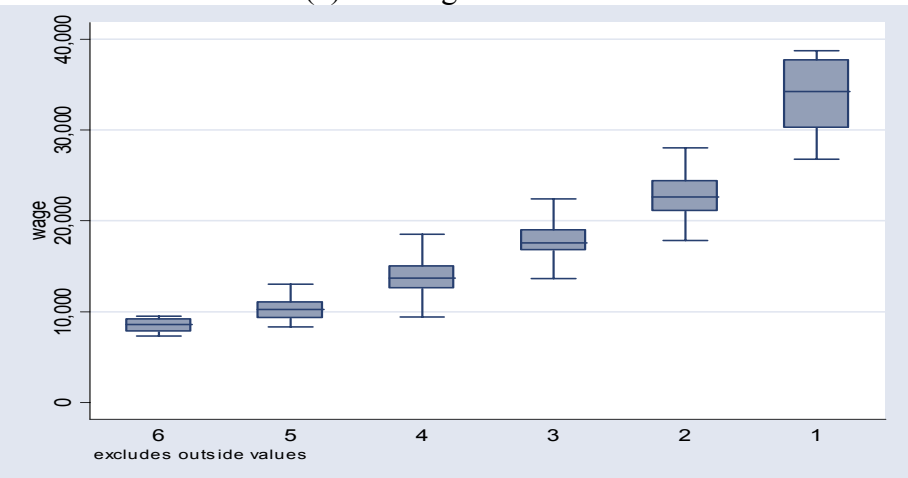
Figure 1 Wage Distribution (Box Plot) and Rank



(a) All Firms



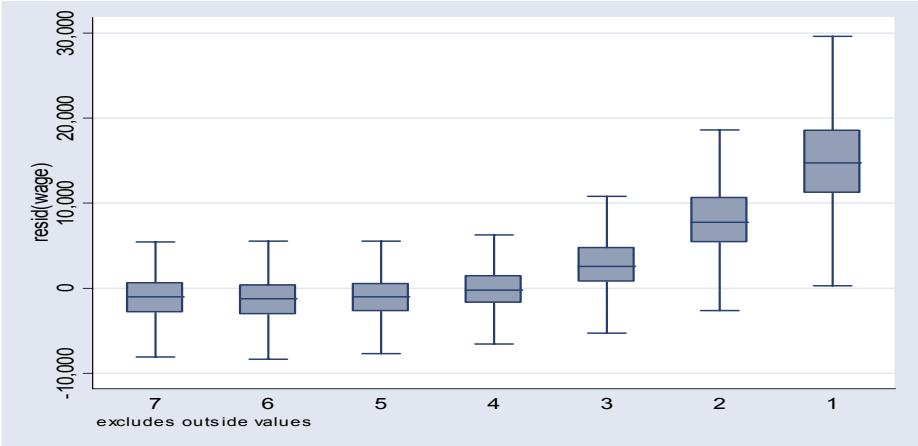
(b) The largest firm



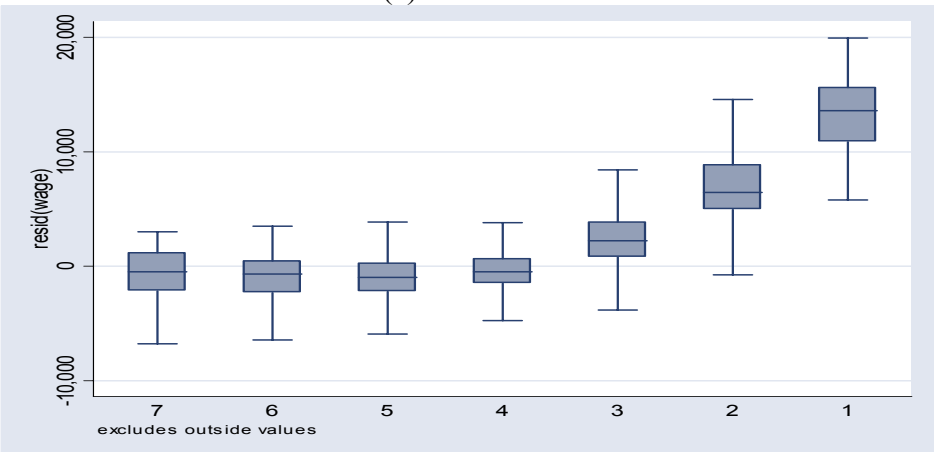
(c) Occupation=800 in the largest firm

Note: These figures show the box plots of wages in 1988.

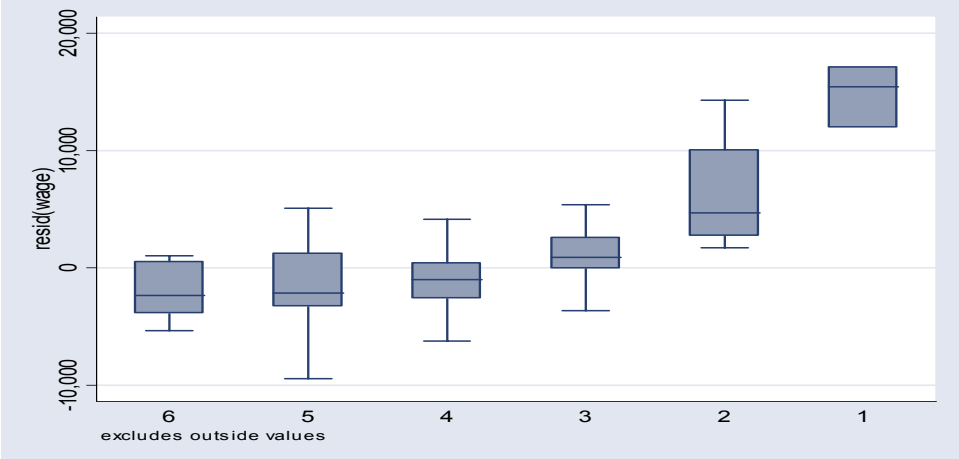
Figure 2 Wage Residual Distribution (Box Plot) and Rank



(a) All Firms



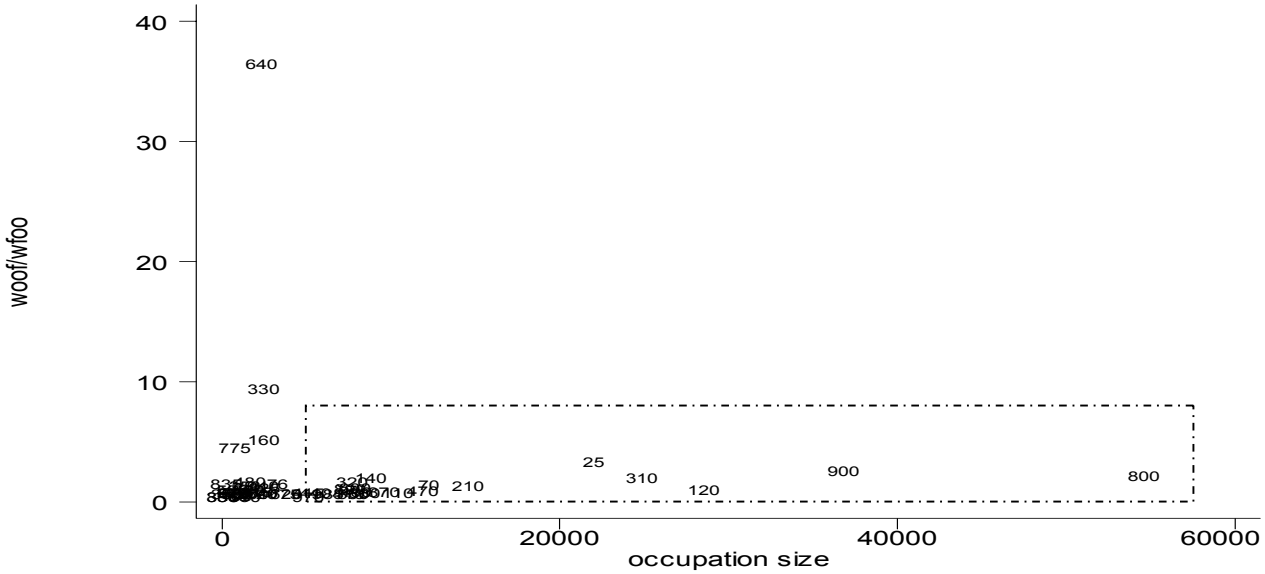
(b) The largest firm.



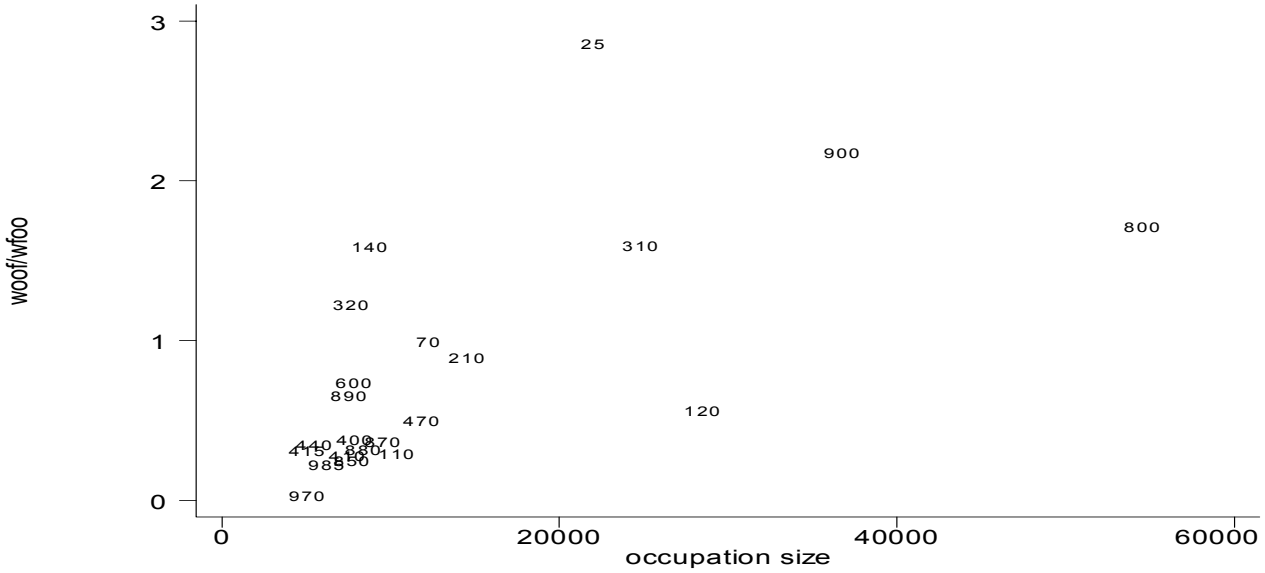
(c) Occupation=800 in the largest firm.

Note: These figures show the box plots of wage residuals in year 1988 after controlling for age, tenure, gender, occupation, town, and industry. To control for tenure, we excluded the workers who entered the labor market before 1970.

Figure 3 "Within Occupation Outside Firm" or "Within Firm Outside Occupation" (Year=1988)



(a) For all occupations

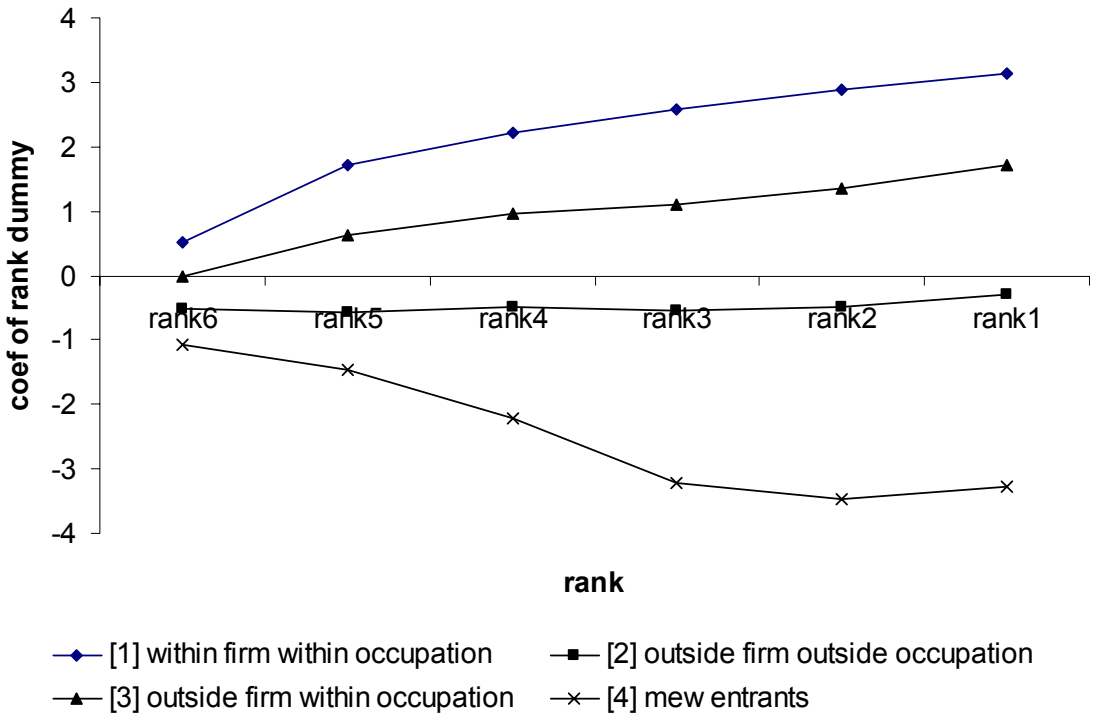


(b) For occupation size > 5000.

Figure 3 (b) enlarges the box in figure 3 (a).
woof/wfoo= "within occupation outside firm hiring"/ "within firm outside occupation hiring" (average for the top four ranks). Occupation size: Total number of white collar employees in an occupation.

Figure 4 Hiring Strategy and Ranks

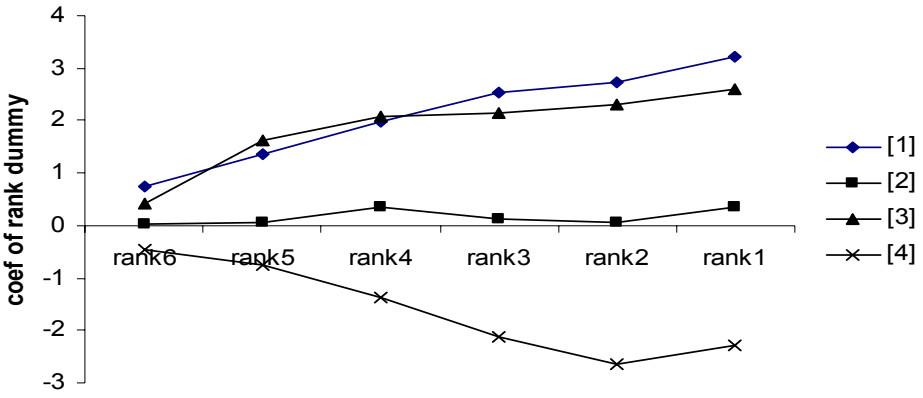
(for all occupations)



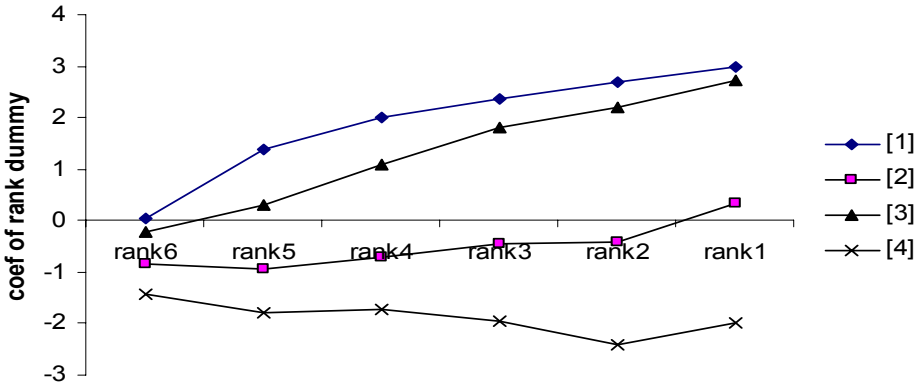
Note: The figure shows the coefficients of rank dummies in the multinomial logit analysis in Table 5. The comparison group is "within firm outside occupation" hiring. Therefore, [1] represents the relative probability of "within occupation" hiring over "outside occupation" hiring conditional on within firm hiring. Similarly, [2] represents the relative probability of "outside firm" hiring over "within firm" hiring conditional on outside occupation hiring.

Figure 5 Hiring Strategy and Ranks

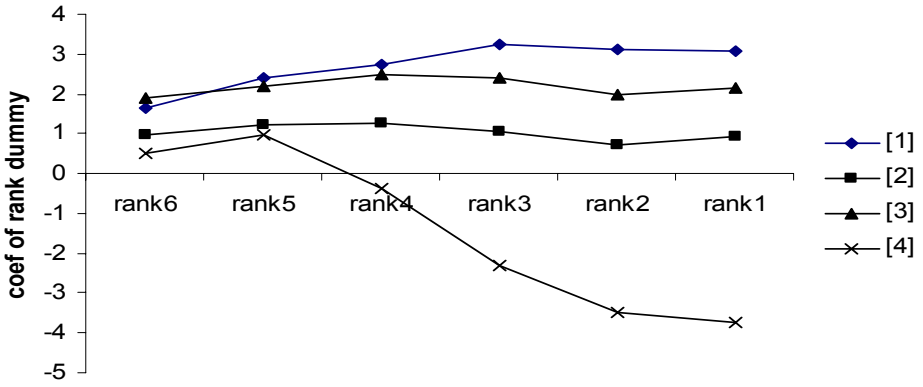
(for three largest occupations)



(a) Occupation=800 (Marketing)



(b) Occupation=900 (Financial Administration)



(c) Occupation=310 (Mechanical and electrical design engineering)