

The Structure of Wages and Internal Mobility

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Abstract

Sweden has extremely detailed information about individual jobs, covering a significant fraction of the country's economy. These data are used to analyze promotion-from-within, worker mobility, and wage setting behavior. Even in a highly unionized and regulated economy such as Sweden's, there is considerable mobility and external hiring at all white-collar levels. There is much promotion from within, but no well-defined ports of entry. Also, short term changes in wages are affected by factors that are idiosyncratic to individual firms. In the long term, wages are determined externally, reflecting either the market or centralized bargaining.

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Edward P. Lazear and Paul Oyer*

As the fields of personnel economics and organizational economics have become more visible in recent years, more economists, practitioners, and policy makers have become interested in the internal workings of firms. Fortunately, at the same time as interest in these areas has grown, new datasets have emerged that provide consistent personnel data from a wide variety of firms. This paper provides an example of how newly available data can be used to analyze internal labor markets and suggests how such data can be used to address other issues.

Basic questions in personnel economics include how firms set wages and how people move between jobs (within and across firms). Answering these questions is essential to assessing the relative importance of theoretical models as explanations of the nature of employment relationships. These models include agency theory, matching, and search theory, among others.

Historically, most attempts to study these models were limited to datasets, such as the Current Population Survey (CPS), that are drawn from a random sample of individuals with no identification of firms. While much can be learned from such studies, much of the inference is indirect and the data may suffer from inconsistent or inaccurate self reported data. An alternative strategy (used by, for example, Lazear, 1992, George Baker, et al, 1994, and Kenn Ariga, et al, 1999) is to procure detailed personnel information from a single firm and use it to study the policies at that firm. While these papers were successful at providing details of the individual firms, they leave open the question of how widely the results generalize, especially given that the results are not consistent even across these three papers, which are based on different firms.

An important step in getting past the limits of CPS-style and individual firm data is to find datasets that provide employee details for numerous firms. Such datasets have been created

in the United States, France, Sweden, and other countries. As John M. Abowd and Francis Kramarz (1999) show, these datasets take many forms and, like the data that preceded them, have varying strengths and weaknesses. They have already been used, according to Abowd and Kramarz (1999), in over 100 studies of more than fifteen countries. That paper provides details on many of these studies, as well as comparing some of the features of the various datasets.

Although the U.S. data have many virtues, they lack job information. A key advantage of the Swedish data used here is its detailed and accurate job classifications. This makes it possible to determine if job openings are filled internally or externally and to follow employees as they change jobs. The data include many firms, a long panel of years, and accurate wage data, allowing the study of the relative importance of firms and jobs on wage changes and levels.¹

The main results of this paper are as follows. First, the Swedish firms studied fill a significant number of positions internally, and this tendency becomes more pronounced at higher levels. However, at every level and at basically every large firm, there is some significant portion of jobs that are filled by external hiring. This suggests that firms do not follow a strict policy of hiring people into a limited set of “ports of entry.” Also, although idiosyncratic firm effects matter in determining wage levels, these firm effects are trivially important relative to job effects. It appears that firms have to follow the external labor market when setting wages.

While the results below are not limited to a single firm, they are limited to Sweden. Conclusions about personnel policies in Sweden may not generalize to other countries given Sweden’s high unionization and limits on firms’ ability to fire workers. However, it is currently impossible to perform similar analyses on US data because, as mentioned, the US data do not include any details on jobs or tasks. This highlights the fact that, though very useful employer-

employee data has become available, the work of creating these datasets is not yet complete.

I. The Swedish Data

The employer-employee dataset used here was gathered by the Swedish Employers' Federation (SAF). This study confines attention to white collar workers and covers the majority of private sector firms that are not in the financial services industry. Demographic information is limited to age and gender. The information on wages, occupation, industry, and other firm characteristics is quite detailed and accurate.² Data for 1970-1990 are used.

The key variable in this analysis is the “BNT” code. This four-digit variable (which will be referred to as a “job”) is a precise characterization of an individual’s job duties. Because the SAF and labor unions negotiate wages at the BNT level, both groups insure that each employee’s duties closely match the BNT code assigned to that person. The first digit of the code describes the general area (or “occupation group”), the first three digits describe the type of work more precisely (or “occupation family”), while the fourth digit determines the “level.” Each occupation family has up to seven levels. See Lazear and Oyer (2004) for examples of occupations and jobs. The top and bottom of the seven levels have very few employees. Therefore, the analysis that follows focuses on five levels – the top two levels combined into one level (level 5), the bottom two combined into another level (level 1), and each of the middle three levels (levels 2-4).

II. Internal and External Mobility

Ever since the early work of Melvin Reder (1955) and Peter Doeringer and Michael Piore (1971), the analysis of “internal labor markets” has focused on whether firms set up personnel practices that insulate them (and their employees) from some of the competitive forces of the

labor market. One key feature of internal labor markets is the “port of entry.” Firms that set up internal labor markets are thought to hire into only a select group of low-level occupations and then to promote some employees up through the ranks. The SAF data’s detailed job information makes it possible to determine the importance of ports of entry in white collar Swedish jobs.

Table 1 displays the proportion of jobs held as of 1988 that were filled by moving a person to that job from another job at the same firm, by level. The first column shows internal hiring rates for all occupations. At all levels, there is substantial internal hiring because many low-level workers transfer occupation families at a similar (or even lower) level. On average, over 40 percent of jobs at the lowest level are filled by a person from another job in the same firm. As the level increases, however, internally filling the position becomes more common.

The table’s second through fifth columns show the internal transition rates for the four largest occupation groups – product management, construction, technical jobs, and trade (largely sales and marketing). As the table shows, filling jobs internally is more prevalent at higher levels and internal hiring rates of 85 to 90 percent at the highest levels are found consistently across occupation groups (including smaller occupations not displayed in Table 1).

An important finding in Table 1 is that, while internal hiring rates increase with level, there is some substantial amount of external hiring at every level in every occupation. Even at the highest level, 12 percent of jobs are filled externally, which suggests that there is some reasonable level of fluidity at all levels of this labor market.

Table 2 shows employees’ 1988 level and, where known, entry level. This connects workers with *starting* job, rather than *previous* job as in Table 1. However, because some employees are already working at their 1988 firm when their firm enters the data, there are many

workers with unknown starting jobs. Some of these are classified as “unknown lower level” if they are working in a lower level of the same occupation family when their firm enters the data. Others are classified as “other occupation” if they either start their job in a different occupation family or work in a different occupation family when their firm enters the data. Those workers already working in their 1988 job when their firm enters the data are classified as “unknown.”

Table 2 shows that, at every level, a large fraction of workers enter in the job that they hold in 1988.³ At least among those workers for whom the entry job is known, the current level is either the most common entry level or very nearly the most common. For the highest level jobs, more enter at that level than at any other level. About half of those at the highest level switched occupation families within their current firm. Among those at the highest level that entered into their current occupation, at least a quarter entered directly into their current job. Similarly, a large fraction of people at the second highest level entered directly into that level. While many workers move up within firms, many are also hired directly into every level.

The results in Tables 1 and 2 suggest that firms have a tendency to concentrate hiring in certain positions. However, the extreme form of port of entry, where hiring is strictly limited to certain jobs, is not supported by the data. Many people are hired directly into middle level jobs and a non-trivial number are hired directly into high level jobs. This is true in all occupations.

III. Wage Structure

The previous section suggests that there is external entry into all levels and occupations at Swedish firms, though internal hiring increases at higher levels. This section investigates whether the external entry insures that individual firms’ wages are driven by external forces (that is, either the market or centralized wage bargaining) or whether individual firms can choose their

wage policies. Fully understanding the relative importance of internal and external factors on pay requires a more structured analysis that is beyond the scope of this paper. However, a few simple analysis of variance exercises both shed some light on the importance of individual firm policies and demonstrate the power of matched employer-employee datasets such as the one used here.

Table 3 shows the results of a series of regressions where the dependent variable is the log of a worker's salary (in monthly Swedish kroners). An observation is a person-year between 1986 and 1990. The sample is limited to the 100 largest firms and includes full-time workers at these firms who are between 25 and 50 years old. Explanatory variables include a set of indicator variables for firm, job (that is, 4-digit BNT code), 25 regions of Sweden, year, 16 industries, age, and gender. Each regression has nearly 400,000 observations, which allows for very precise estimates of each set of indicator variables. The null hypothesis that any set of indicators is equal to one another can easily be rejected at the 1 percent level in every column of the table.

The first column shows that firm, job, region, and year effects, among others, matter. Firm indicators explain some variation. However, the partial sum of squares assigned to the firm effects is less than 1 percent of the variation in log wages. The job indicators, on the other hand, explain over a third of the total variation in wages. This suggests that wages are driven by the external wage for a certain skill set rather than firms' policies.

The second column shows that the total fit of the model is hardly affected at all when the firm effects are omitted. The third column shows a very different story when job effects are omitted. The firm effects become over three times as important in the absence of job effects, which just suggests that the types of jobs done varies from firm to firm. Note also that the age and gender indicators become much more important when job effects are missing. The gender

effect is particularly dramatic. The female coefficient (which is not reported in the table) is -0.220 in column 3 when there are no controls for job, but drops to -0.047 when the job indicators are included. This is consistent with the well-established fact that much of the difference between male and female wages is due to women working in lower-wage occupations.

A similar analysis of variance with *change* in log wages as the dependent variable was also undertaken, although the details are not reported. That analysis showed that variations across people in wage changes are much more idiosyncratic than variation in wage levels. Not surprisingly, the year effects are most important in explaining variation in wage *changes* because raises are generally high when the economy does well and/or when the union negotiates successfully. While all sets of indicator variables are significant in the wage change regressions, the explanatory power of jobs is quite small and is actually lower than the firm indicators. This suggests that individual firm fortunes affect short term wage movement, but over the longer haul, external factors, as reflected in job, dominate.

IV. Conclusion

This paper served two purposes. First, it demonstrated how detailed “job” information in matched employer-employee data can shed light on personnel economics questions in a way that individual-based surveys cannot. Second, it provided some evidence on how, even in a unionized and regulated labor market such as Sweden, external forces in the labor market are important.

Though firms appear to be driven by the external labor market, this does not imply that the Swedish labor market is efficient. It is likely that external wages are largely determined by non-competitive institutional factors, such as centralized wage bargaining. But the external “market”, however determined, does seem to be an important factor for all firms’ wage policies.

Table 1 (Panel A)

Percent in a Level who Moved into their 1988 Job Internally

Level	All	Occupation Group			
		Product Management	Construct	Technical	Trade
1	42.85	21.10	26.74	35.29	48.75
2	51.06	33.16	36.06	45.58	64.56
3	74.26	69.26	68.96	79.02	78.32
4	87.56	90.29	87.66	92.27	87.68
5	88.43	89.31	91.76	91.78	88.55

Table 1 (Panel B)

Number of Individuals in a Level who Moved into their 1988 Job Internally

Sample Sizes Level	All	Occupation Group			
		Product Management	Construction	Technical	Trade
1	6,131	526	172	1,088	2,238
2	24,770	6,130	1,822	5,011	7,540
3	47,505	10,958	7,074	9,057	11,098
4	29,106	3,781	6,125	3,907	6,705
5	11,292	1,881	1,893	949	2,804

Employee levels and the number of levels in firm based on 1988. Employees whose 1988 level is the same as their level when the firm first enters the dataset are dropped. A total of 1,537 firms are included.

Table 2
Entry Level by Current Level

1988 Level	Entry Level					5 Unknown Lower Level	Different Occupation	Unknown	Total
	1	2	3	4	5				
1	3,784	104	2	0	1	0	2,046	827	6,764
2	2,673	12,122	253	14	1	969	8,400	4,223	28,665
3	1,506	8,626	12,230	169	9	6,109	18,497	6,189	53,335
4	265	1,757	3,728	3,620	106	5,474	13,984	2,664	31,598
5	21	200	632	829	1,434	1,953	6,057	938	12,064
Total	8,249	22,809	16,845	4,632	1,551	14,505	48,984	14,851	132,426

The columns with entry level 1-5 include all people for whom their first job in the firm for which they work in 1988 is known, if that entry job is in the same occupation as their 1988 job.

Employees who enter their firm in a different occupation than they hold in 1988, or who are in a different occupation when their firm enters the data, are classified as “different occupation.”

Employees who are working in the same occupation, but a lower level, when their firm enters the data are defined as “unknown lower level.” Employees who are working in the same job (that is, same occupation and family) when their firm enters the data are classified as “unknown.”

Table 3**Analysis of Variance of Wages**

Dependent Variable = Ln(wage)

Type of Indicator	Number of Indicators (Partial Sum of Squares)	Number of Indicators (Partial Sum of Squares)	Number of Indicators (Partial Sum of Squares)
Firm	100 (230.05)	--	100 (910.25)
Job	272 (13023.48)	272 (13703.69)	--
Region	25 (195.43)	25 (387.21)	25 (604.38)
Year	5 (3745.72)	5 (4304.65)	5 (4184.07)
Industry	16 (4.32)	16 (80.75)	16 (21.25)
Age	26 (813.13)	26 (788.68)	26 (4047.70)
Gender	2 (82.37)	2 (73.56)	2 (2,966.72)
R-square	0.8300	0.8232	0.4481
Total Sum of Squares	34,104.83	34,107.83	34,107.83

Regressions of wages for 391,750 worker/years. Sample includes white-collar workers at 100 largest firms in SAF dataset. An observation is a worker/year between 1986 and 1990. The null hypothesis that *any* set of indicator variables in *any* column are equal can be rejected at the 1 percent level.

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Endnotes

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1. See Lazear and Oyer (2004) for theoretical background relating to the issues addressed below, as well as more detailed empirical results using the same data.

2. See Eva M. Meyersson Milgrom, et al (2001) for a more detailed description of the data.

3. Part of this reflects censoring over time. After a period of time, some of these workers will be promoted out of those jobs. That issue is dealt with in more detail in Lazear and Oyer (2004).

The conclusions reported herein do not change as a result of that analysis.