**Data Survey: Administrative and Survey Data in Personnel Economics**

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**1. Introduction**

Personnel economics – the analysis of strategic decisions taken by firms with regard to hiring, training, job assignments and compensation of their workers – has been a fast growing sub-field of economics over the last two decades. The underlying issues of personnel economics are not new; economic theorists have been examining labour contracts for decades; however, empirical work has long lagged behind theory. One of biggest issues hindering empirical research has been gaining access to suitable data, specifically firm-level administrative records.

Over the past two decades, researchers have gained increased access to personnel data. This has come about as a result of on-going relationships between researchers and companies. Another important source of personnel data has been historical records housed in company archives or public libraries. A third important source of data has been Matched Employer-Employee (MEE) data constructed from administrative records.

In this paper, we examine the use of these three types of data in personnel economics. This article is a data survey rather than a literature review, and we only briefly consider how researchers have used the data to better understand labour contracts within firms. Even so, our coverage is incomplete. The number of empirical personnel economics studies using one of the three types of data is enormous, and we cannot summarize every data set used. In addition, we do not consider two alternative sources of data that have been utilized by personnel economists, namely broad-based surveys – such as the CPS and PSID in the United States, the LFS and BHPS in the United Kingdom and HILDA in Australia – and data generated by lab experiments. Personnel studies using these types of data have been thoroughly summarized elsewhere. See Charness and Kuhn (2010) and Waldman (2012).

The structure of the paper is as follows: Section 2 provides an overview of the information typically contained in personnel data sets and the underlying methodology of most personnel studies. Section 3 examines historical firm-level records. Section 4 examines contemporary firm-level data. Section 5 examines national administrative records. Section 6 concludes.

**2. Overview**

The record groups that we consider contain information on workers’ backgrounds and career outcomes. Typically the former includes some or all of the following: age, education, gender, race, marital status, prior experience and date of initial hiring at the current employer. The latter typically includes information such as: wages, position at the firm, productivity or performance evaluation and date of and reason for exit (if applicable). Many of the historical record groups only contain a relatively small sub-set of this information. Contemporary records, particularly the large MEE data described in Section 5 often also contain firm-level information. The frequency of observation is most often annual, but there are examples where data is recorded on a daily or weekly basis. See Bagger et al. (2014); Bandiera, Barankay and Rasul (2005, 2009, 2010) and Lazear (2000).

Although the studies we survey in this paper examine a range of outcomes, the single most widely used outcome variable in personnel economics is wages. The underlying approach to estimating wages is the Mincer wage regression, first described in Mincer (1958). A general specification of the Mincer Wage regression following Abowd, Kramarz and Margolis (1999) can be written as:

|  |  |  |
| --- | --- | --- |
|  |  | (1) |

where

* indexes employees,
* indexes time periods,
* identifies the employer of individual in period ,
* is a vector of observed time-varying employee characteristics,
* is a vector of observed time-varying employer characteristics,
* is an employee fixed effect and
* is an employer fixed effect.

This specification is richer than the typical Mincer specification as the unit of observation is a given employee at a given point in time and employees change employers over time. It allows for both observed and unobserved demand and supply side heterogeneity.[[1]](#footnote-1) In most of the data sets we describe in Sections 3 and 4 there is only a single employer. In this case, the firm-specific component drops out. In a few of the data sets there are multiple firms, but only a single time period. In this case, the subscript is superfluous and the individual and firm fixed effects drop out. Finally, there are data sets which cover a single firm at a single point in time. In this case, both the firm-specific component and the worker fixed effect drop out.

**3. Historical Records**

Governments dating back to antiquity have kept employment records.[[2]](#footnote-2) As far as we are aware, firm-level records date back to the large trading companies established in the 17th century.[[3]](#footnote-3) Data for most service-sector and manufacturing industries only date back to the Industrial Revolution. Firms employing hundreds or thousands of workers, which have only been commonplace since the Industrial Revolution, needed far more sophisticated labour management practices and record-keeping systems than the smaller entities which preceded them.

Several of the historical data sets we discuss below cover the entire careers of even the longest serving employees. Historical data typically has the additional advantage of comparatively low confidentiality requirements. The records of many now-defunct firms are stored in archives that are freely accessible to the public. Firms still operating are often relatively open to allowing researchers access to records of long-retired staff. However, most of the records we describe below were originally transcribed by hand. As a result, many of these records only contain the most basic information.

Banks are perhaps the single best source of historical personnel data. When banks evolved from operating a single branch to operating extensive branch networks, they began to adopt bureaucratic personnel practices. This transformation occurred first in Scotland in the late-18th century. See Boot (1991). A second pertinent feature of banking is that the nature of the business required meticulous record keeping. Larger banks employed hundreds of clerks, many specifically as ledger keepers, to record all business transactions. It was a small step from recording details of business transactions to recording wages and other personnel data. When the banks began to develop pensions in the mid-19th century, employment records became absolutely essential.

Seltzer and Merrett (2000) and Seltzer and Simons (2001) use records from the Union Bank of Australia (UBA) to compile a large data set covering the entire careers of all workers employed at the bank between 1887 and 1900 and a sample of entrants between 1917 and 1927. All totalled, the UBA data set contains 1,767 workers and approximately 38,000 man-years of data. Seltzer and Simons (2001) also use smaller data sets from personnel records of the Bank of Australasia (covering the entire careers of a sample of entrants between 1887 and 1897), the Queensland National Bank (covering all staff in 1892), the Bank of South Australia (covering all staff between 1864-1874 and 1879-1891) and the Bank of Adelaide (covering all staff in 1917 and 1931). Pope (1989) has compiled a smaller data set from records of the Bank of New South Wales.

Similar data exists for banks in several other countries. Seltzer (2011 and 2013) uses data covering virtually all employees at Williams Deacon’s Bank (England) between 1890 and 1941 and smaller data sets covering employees at Manchester and Liverpool District Bank and Sheffield and Rotherham Bank. The Williams Deacons data cover over 2,300 male staff and 35,000 man-years, the other two cover 323 staff and 2,283 man-years combined. One advantage that the Williams Deacon’s data possesses relative to other data from the banking industry is that it also includes 1,300 women, who were first employed from 1915. There exists a long literature on gender in 19th and early-20th century clerical labour markets, see Goldin (1990), and personnel data are an excellent source of information about career opportunities for women and the effects of female employment on male staff.

Railroads are another widely used source for late-19th and early-20th century personnel records. The railroads were, by far, the largest employers during this period.[[4]](#footnote-4) The scale of their operations necessitated the development of internal labour markets. Sammartino (2002) uses publically available records from the Victorian Railways covering the period 1884-1921. These records were created as a result of a requirement in the 1883 *Railways Management Bill* that the Victorian Railway publish a list of its employees on a triennial basis. Sammartino has encoded data for all employees with surnames beginning A, B, or C. These data, which contain pay from 1902, are sufficiently rich to examine internal labour markets and the structure of salaries within the larger branches, as well as for the organisation as a whole. The data set contains 15,688 observations from about 6,000 staff.

Other studies of personnel practices at the railways have relied on firm-level administrative records, particularly pension files. Howlett (2004) uses data on long-serving employees in the Traffic Department of the Great Eastern Railway, England. His data cover the entire careers of 848 staff present in 1880 and remaining until at least 1906. MacKinnon (1996) constructs a database using the pension files of the Canada Pacific Railways. The database contains entire-career information for about 9,000 staff present in 1903.

There are fewer examples of surviving personnel records for manufacturing firms. Stanfors et al. (2013) use data from the Swedish tobacco industry. The data, which are drawn from an 1898 survey run by the Swedish Board of Commerce covering the entire industry, contain similar information to personnel records and can be linked to additional survey data covering their employers’ characteristics. Maloney and Whatley (1995) and Foote, Whately and Wright (2003) use data from 4,144 workers at Ford Motors between 1918 and 1947. An interesting feature of this data is that it contains both black and white workers, and thus the authors are able to examine the nature and extent of labour market discrimination during the time of legalised segregation. There have been very few studies of historical Australian manufacturing firms. Perhaps the most comprehensive personnel records which have been encoded are from Guest Biscuit. Fahey and Sammartino (2013) examine Guest’s wage books between 1870 and 1921, which cover 1,634 employees.

A general conclusion of the historical literature has been that large companies have long maintained sophisticated internal labour markets, similar to those of modern companies. The firms which have been studied generally contained long-term employment, well-defined career structures with internal promotion and tenure based wages. However, we need to be cautious about broader inferences for today’s labour market that can be derived from historical data, as the surviving historical records do not contain anything like a random sample of employees from the time.

**4. Contemporary Firm-Level Records**

Researchers have used contemporary personnel data in two different ways. First, scholars have studied whether incentives motivate workers in the short-run. These studies often employ an experimental methodology to examine the causal effect of a change in the nature of compensation on workers’ productivity or selection into or out of a firm. See Bandiera, Barankay and Rasul (2011) for a comprehensive survey of this literature. A second major research agenda examines the nature of internal labour markets in larger firms. It is well-known that short-term pay for performance can often create perverse incentives where workers have even moderately complex tasks, and thus the majority of workers in larger firms are paid hourly rates or annual salaries. See Pendergast (1999). This literature has used the employment records of workers at specific companies to examine the nature of job assignment, promotion and compensation. The empirical work in this literature has been largely descriptive and the incentives created by the practices identified in the data have largely been explained by economic theory, rather than by direct tests on the data.

*4.1 Short-Term Incentives*

Lazear (2000) uses records from Safelite, an American company that replaces broken windscreens, to determine the effects of a change from fixed wages to a piece rate plus guaranteed minimum pay scheme. The data in this study comprise monthly records of about 3,700 individuals who worked as installers at some point during a 19 month period in 2004-05. The switch to the piece rate plan at Safelite was phased in over a period of several months, and thus it is possible to estimate the productivity effects of piece rate plan without the estimates being confounded by any potential time effects. Lazear’s empirical approach is to estimate individual-level and firm-level productivity before and after the implementation of the piece rate plan, and he interprets the difference between the firm-level and individual-level changes to be the effect of employee self-selection into and out of Safelite (e.g. whether the new plan attracted inherently higher productivity workers).

Bandiera, Barankay and Rasul (2005, 2009, 2010) examine ‘natural field experiments’ using personnel records covering immigrant farm workers at the largest soft fruit company in the United Kingdom. These studies utilize data from the harvest seasons between 2002 and 2004. In the middle of each season the employer made some change to their compensation practices, and these studies focus on how workers responded to the incentives created by these changes. The data used in these studies contain daily observations of the productivity of individual workers, i.e. the amount of fruit picked each day. A unique element of their data is that it contains information about workers’ social connectedness to each other. They use this information to examine the interaction between social relationships and incentives in the workplace, and show that properly designed incentives can reduce the consequence of nepotism in the workplace.

*4.2 Incentives in Larger Firms*

One of the earliest papers to use firm-level administrative records is Medoff and Abraham (1980). They use records from two American companies in undisclosed industries to examine the relationship between pay and performance. The records from the first company cover personnel actions in 1977, while the records from the second company cover personnel actions between 1971 and 1977 for all staff in employment from 1974 to 1977. Their data contains an annual performance evaluation for each employee, which provides a description of their position and their supervisor’s subjective evaluation of their performance over the previous year (excellent, superior, good, etc.). They use these data to compare the estimated experience-earnings profile to the estimated experience-productivity profile, and show that much of individuals’ earnings growth cannot be explained by productivity growth.

Perhaps the best known studies which utilizes personnel records are Baker, Gibbs and Holmstrom (1994a and 1994b). They use records covering all managerial employees of a medium-sized firm in an American service industry between 1969 and 1988, which provide over 68,000 man-years of data. One of their main objectives is to estimate the relationship between levels and salary, and they use the data on movement of workers between job titles to identify the hierarchy of the firm. They also examine other aspects of compensation practices, focussing on learning about ability, the existence of cohort effects, the extent to which wages of incumbent staff were shielded from the external labour market and the returns to promotion. Since Baker et al.’s pioneering study, several other authors have used similar firm-level records to examine personnel practices, including Treble et al. (2001), who examine a firm in the U.K. financial services industry and Gibbs and Hendricks (2004), who examine a large American firm in an undisclosed industry.

As with the historical studies, researchers examining contemporary personnel practices have also used survey data which provides the same basic information as administrative records. Bognanno (2001) and Belzil and Bognanno (2008) use proprietary data from a 1981-88 survey of compensation practices at over 600 firms employing over 25,000 executive employees. These data are particularly useful for personnel economists as they contain information similar to that covered in administrative records, but cover a much wider range of industries than is possible with firm-level administrative data. The major limitation of this data is that it only covers executive employees and thus is not suitable for examining personnel practices for the vast majority of the workforce. The authors use this data to examine the nature of executive compensation, particularly the importance of promotions and demotions for base pay and bonuses.

**5. Matched Employer-Employee Records**

The rise of personnel economics coincides with an increased availability of comprehensive Matched Employer-Employee (MEE) datasets. One of the most widely used MEE data set is the Danish IDA (Integreret Database for Arbejdsmarkedsforskning) and various ‘add-ons’. However, similarly structured administrative data are also available for Sweden, Norway, Finland, Germany, the Netherlands, Belgium, France, Austria, Italy, Portugal and the US.

*5.1 The Prototypical MEE Dataset*

The defining feature of a MEE dataset is the presence of both worker and firm identifiers which allow the researcher to observe which workers are employed in which firms at a given point in time. The data often has a panel structure where individual workers and firms are followed over time and are typically constructed by merging many administrative registers. Hence, the typical MEE dataset is very large in both the cross-section and the time dimension, often representing entire populations followed for decades. There are examples of much smaller and shorter MEE datasets. See Bailey, Berg and Sandy (2001).

Working with MEE data has several advantages. First, both demand and supply side heterogeneity may be incorporated into the analysis. Second, the size of the typical MEE dataset allows the researcher to document a tremendous amount of heterogeneity in most outcomes of interest. Moreover, since firms employ multiple workers, observed heterogeneity can often be decomposed into within- and between firm components. Third, since most MEE data sets are constructed from administrative records, they are likely to contain much less measurement error than survey data or hand-transcriped historical data.

Still, MEE data is no panacea. The drawbacks include a tendency to have rather rudimentary background information on firms, and the lack of subjective information (e.g. expectations) or contextual information (e.g. work environment). These concerns can be somewhat alleviated by merging MEE data with firm-level survey data. This approach is taken by some of the studies we cite further below. A final drawback worth mentioning here is the restricted accessibility of MEE data.

*5.2 MEE Data in Applied Personnel Economics*

Recent work by a number of scholars published in Lazear and Shaw (2009) attempts to understand the structure of wages (and wage growth) within and between firms, and how the wage structure is related to worker mobility. The book brings together studies carried out on MEE data from the US, Denmark, the Netherlands, Finland, Belgium, Sweden, Germany, Norway, Italy and France. Lazear and Shaw sum up the empirical findings as follows: First, within-firm wage variation accounts for about 60-80 percent of total wage dispersion. Second, between-firm wage variation appears to have grown over time. Third, within-firm wage growth exhibits a considerable amount of variance. Fourth, high wage firms have lower turnover.

*5.2.a Within-Firm Individual-Level Wage Formation*

Using administrative MEE data from Portugal, Cardoso (2000) analyses heterogeneity in firms’ wage policies. Cardoso applies a flexible empirical model that allows for firm-specific rewards for tenure, experience, schooling, etc. She finds statistically significant differences in many dimensions of firms’ wage policies, including returns to education, tenure, experience and the gender wage gap.

Bingley and Westergaard-Nielsen (2003) re-assess whether wages exhibit ‘returns to tenure’ using the Danish IDA data for 1980-98, a period marked by increasingly decentralized wage setting. The authors identify returns to tenure from exogenous worker mobility via plant closures. They find an increase in the measured returns to tenure during the observed period, suggesting firms use wages strategically to retain workers. They also find firm-level heterogeneity in returns to tenure.

Guiso, Pistaferri and Schivardi (2005) consider whether risk-neutral firms insure risk-averse workers against idiosyncratic firm-level shocks. The empirical analysis is carried out using Italian Centrale Dei Bilanci (firm-level) and Instituto Nazionale della Previdenza Sociale (worker-level) administrative data. The data allow the authors to separately identify the extent to which transitory and permanent firm-level shocks are transmitted to wages. They find that firms insure workers fully against transitory shocks, but only partially against permanent shocks. Using Portuguese Quadros de Pessoal data, Cardoso and Portela (2009) find corroborating evidence for wage insurance within the firm.

Iranzo, Schivardi and Tosetti (2008) investigate how firm productivity is related to the skill-mix of the firm’s workforce. They examine the Bank of Italy’s INVIND survey of manufacturing firms and data on firms’ balance sheets obtained from the Italian Company Accounts Data Service (CADS) which allows them to devise a measure of firm-level skill composition that accounts for both observable and unobservable worker skills. The authors estimate a version of (1) and use the within-firm distribution of the estimated worker fixed effects as a measure of the within-firm skill-mix. These skill-mix measures are subsequently used in the estimation of firm-level production functions. Most skill-dispersion appears within occupations, and firms’ productivities are positively related to within-occupation skill dispersion, but negatively related to between-occupation skill dispersion.

*5.2.b Human Resource Management (HRM) Practices and Individual Wages*

Datta Gupta and Erikson (2012) merge an employer-level survey containing detailed information on the adoption of HRM practices with Danish MEE data on the individual workers in the surveyed firm. They consider whether the within-firm gender wage gap is influenced by the adoption of HRM practices. They find that women are more likely to be employed in firms adopting new HRM practices, but that HRM practices appear to widen within-firm gender wage gaps.

Bauer and Bender (2001) study the effect of ‘flexible workplace systems’ (characterized by team work, job rotation and decentralized decision making, flatter hierarchies, etc.) on individual wages. The empirical analysis is carried out using German IAB (firm level) and Employment Statistics Register (employee level) panel data. The data allows the authors to consider the entire within-firm wage structure and to address issues arising due to unobserved establishment characteristics. They find that flexible workplace systems are associated with wage gains, although the gains are small in magnitude.

*5.2.c A Non-Standard, Non-Administrative MEE Dataset*

Bailey, Berg and Sandy (2001) examine the impact of High-Performance Workplace Practices (HPWP) on workers’ remuneration. The data used in the analysis is MEE in the sense that it maps individual workers to establishments, but it differs substantially from the type of MEE data discussed hitherto. First, the data is not administrative, but collected via a survey. Hence, the data contains information that are not present in typical administrative records, such as work organization and contextual information. The drawback is the size and coverage of the data; it only covers 4,000 workers in 45 establishments in three industries, and only contains a single cross section. Hence, the empirical analysis can control for establishment fixed-effects, but not worker fixed-effects. The authors find that workers employed in HPWP environments earn more than workers employed in traditional environments. For two of the industries, apparel and steel, this result is robust to employee-level controls for gender, race, education, experience and tenure. However, in the third industry, medical electronics and imaging, the unconditional return to HPWP practices is soaked up by the employee-level controls.

**6. Conclusions**

Personnel economics has developed into an important sub-field of economics by combining relevant economic theory and state-of-the-art empirical analysis. In this paper we considered three important data-types commonly used in empirical personnel economics: historical firm-level records, contemporary firm-level records, and administrative MEE data. The continued progress of personnel economics requires continued development of data resources. This involves developing new datasets, expanding existing ones and working on broader data availability. For example, there exist very long-term employment records from government agencies, militaries and universities in a range of countries which have yet to be exploited by personnel economists. With respect to MEE data, we believe the construction of non-standard MEE data as in Bailey, Berg and Sandy (2001) represents a promising, albeit costly, avenue for future research in personnel economics.

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1. Attempts to introduce additional unobserved heterogeneity at the match level include Woodcock (2007). Bagger, Christensen and Mortensen (2013) allow for time-varying unobserved firm effects. [↑](#footnote-ref-1)
2. Classical scholars have used a variety of papyrus manuscripts and secondary sources to describe internal labour markets in the Roman army. See Brunt (1950). [↑](#footnote-ref-2)
3. Rei (2014) examines administrative records describing the entire careers of 115 servants of the Dutch East India Company in the 18th century. [↑](#footnote-ref-3)
4. Howlett (2004) notes that all of the 10 largest firms in Britain in 1904 were railroads. Similarly, Sammartino (2002) notes that the Victorian Railways employed substantially more people than any manufacturing industry or government department in the colony. MacKinnon (1996) notes that in Canada around the First World War, railroads employed about 10 percent of men working outside of agriculture. [↑](#footnote-ref-4)