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Measuring Organizational Capital in the New Economy

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Measuring Organizational Capital in the New Economy

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March 2005

Forschungsinstitut
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Institute for the Study
of Labor

Measuring Organizational Capital in the New Economy

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ABSTRACT

Measuring Organizational Capital in the New Economy*

A growing body of literature over the past decade suggests that a firm's organizational structure/capital can contribute in significant ways to the productive capacity of a firm. But, as with other intangible assets, there is no consensus definition of what this organizational capital is, how to measure it, or how to best quantify its contribution to output (either current or future). We try to address this gap in the literature by proposing a definition of organizational capital based on recent empirical work on the impact of organizational capital on firm productivity and workers' wages. We then discuss in detail how organizational capital has been measured and the measurement issues that face those trying to understand the extent of organizational capital in an economy.

JEL Classification: J2, D2

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I. What is Organizational Capital?

A growing body of literature over the past decade suggests that a firm's organizational structure/capital can contribute in significant ways to the productive capacity of a firm. But, as with other intangible assets, there is no consensus definition of what this organizational capital is, how to measure it, or how to best quantify its contribution to output (either current or future). Unlike physical capital, its value does not appear on the balance sheet of a firm, and when firms undertake substantial organizational change or re-engineering this is typically treated as "consumption" rather than an increase in the assets of a firm. There is no "market" for organizational capital that we could use to generate a book value for it, and, unlike general human capital, it is not portable.

When considering the issue of measuring intangibles, a recent Brookings Task Force chaired by Margaret Blair and Steven Wallman (2001) suggested that there are three categories of intangible assets, each with more measurement problems than the next – the easiest category exists for assets that can be owned and sold, the next category is for those assets that can be controlled by the firm but not separated out and sold, and finally, the category with the most difficult measurement issues contains assets that may not be wholly controlled by the firm. Intangible assets such as copyrights, brand, and trade names would be in the first category, the relatively easily addressed category of measurement problems, since they can be bought and sold. However, the degree of control the firm has over assets such the design of production processes, human capital, relationship capital, and organizational capital varies along with the ability of the firm to

"sell" these assets. As a result, they are much more difficult to measure in the usual accounting sense.

Before we can discuss how to improve the measurement of organizational capital, we must first establish a working, albeit crude, definition of organizational capital.[1] To do this we have chosen to focus on some of the elements of organizational capital that have been shown, in both theoretical and empirical studies, to be associated with higher productivity for firms and/or higher wages for workers. This is not meant to be an exhaustive list of all the elements of organizational capital but rather a starting point that is representative and tractable.

We divide organizational capital into three broad components – workforce training, employee voice, and work design (including the use of cross-functional production processes). While we will discuss these categories separately, it is important to note that there are important links and synergies between each of these categories that contribute to the overall value of organizational capital within a firm.

Although training is usually thought of in the context of human capital, employer provided training is an important component of workplace organization and organizational capital. We assume, for the sake of simplicity, that education decisions are primarily individual based and made independently from the employment relationship. But workplace training is a joint decision undertaken by the worker and the firm to invest in additional skills training after an employment relationship has begun.

[1] For a different approach and definition of organization capital see Atkeson and Kehoe (2002). They conclude that nearly half of the output in manufacturing that is not accounted for by payments to labor and capital could be attributed to organization capital. They also conclude that the value of this organization capital is roughly 2/3rd the value of physical capital. They model the acquisition of organization capital as coming from endogenous learning-by doing so it is embodied in the firm and jointly produced with measured output. But their empirical treatment of organization capital is based on plant specific productivity and age rather than any actual workplace practices.

This workforce training, along with the education a worker brings to a job, raise the productive capacity of a firm. Training demands of a firm are not limited to the introduction of new technology; as new organizational structures such as team work are put in place, this increases the need of workers to acquire additional training to help them function in a more interactive group environment. At the same time, organizational capital may interact with human capital and the ability of a firm to undertake organizational change may be a function of the human capital of its workforce. Finally, spillover effects even for "specific training" may be much larger depending on the organizational structure of a firm in which these investments in human capital are made. For all of these reasons, then, we include workforce training under our umbrella of organizational capital.

The second component of organizational capital is employee voice. By this we mean those organizational structures that give workers, especially non-managerial workers, input into the decision-making associated with the design of the production process and greater autonomy and discretion in the structure of their work. Traditional forms of work organization are very task-specific; each production worker has a specific task to complete, and once they learn how to accomplish the task, there is little independent thought involved. However, newer forms of organization involve giving employees, specifically lower level production workers, more input into the production process and greater opportunities to improve efficiency. As employee voice increases, firms are better able to tap into the knowledge of non-managerial workers.

There is a large continuum of practices associated with employee voice. It ranges from the employee suggestion box in the lunch room, to employees being consulted

individually about their views, to individual job enrichment schemes, to employees being consulted in groups, and finally, to self managed teams where production employees work in a semi-autonomous setting. In addition, all of this can take place in the context of unionization, which may serve to help or hinder this communication process. As discussed by Malcomson (1983), agreements made between managers and workers may not be legally enforceable so the presence of unions can address incentive compatibility problems that may arise at the workplace. In addition, negotiations that management undertakes with workers about the introduction of new workplace practices are less expensive if the company only has to deal with union specialists rather than each individual worker.

Our third component of organizational capital is work design, including the use of cross-functional production processes that result in more flexible allocation and re-allocation of labor in the firm. Examples of practices in this component include reengineering efforts that may involve changing the occupational structure of the workplace (including increasing the number of technical workers), the number of workers per supervisor, the number of levels of management within the firm, the existence and diffusion of job rotation, and job share arrangements. We also include in this component methods by which firms monitor their practices relative to others such as benchmarking. Some of the changes we see in work design are associated with the introduction and diffusion of information technologies within the firm. For example, as new technologies reduce the cost of lateral communication, we see firms using these technologies to facilitate greater communication between and across workers, both managerial and non-managerial. Monitoring technologies can also be used to reduce the number of

supervisors required in the production process. So there are possible complementarities between this and other dimensions of organizational capital, as well as with investments in physical capital.

While it is not a type of organizational capital per se, incentive based compensation plays an important role in organizational capital. More generally, if we observe wage premiums being paid in employment situations where there is a higher level of organizational capital we might, in a very crude way, think of this premium as another way to "price" the value of the asset we are calling organizational capital. Employers will use wages and other forms of compensation to try to hold on to this relational asset. In addition to the basic wage, employers can also pay workers by piece rate, stock options, profit sharing, and bonuses related to achieving specific production targets. These are all tools that firms have used to, in part, realign workers' interests towards those of shareholders. But when workers are asked to come forward with ideas that would improve the production process but may also put their own jobs at risk, they must be given an incentive to do this.

Putting a portion of compensation "at risk", especially for non-managerial employees, can have an important effect on the amount and type of relationship capital that exists within a firm and can have a large effect on workers' discretionary effort. Recent work by Boning, Ichniowski, and Shaw (2001) has found strong evidence of complementarity between employee voice and incentive pay. So while incentive based pay is not organizational capital per se, it is an important glue that holds the organizational capital together and keeps it within the firm. Therefore, in the remaining

discussion on measurement issues we will also include this dimension of workplace practices.

Our three components are not an exhaustive list of possible elements of organizational capital. For example, Kruse and Blasi (1998) identify employment security and recruitment and selection systems as important components of what they label high performance work practices. But as with compensation, employment security and recruitment and selection systems are probably best thought of as "glue" rather than organizational capital. The next section summarizes some of the empirical work on the impact organizational capital has had on firms and workers.

II. The Importance of Organizational Capital in the New Economy: Empirical Evidence

The importance of correctly measuring organizational capital stems from the evidence on its impact along a number of dimensions -- labor productivity, wages, and labor demand. In addition, there is evidence of links between organizational capital, human capital, and physical capital, especially information and communication technologies.

In terms of productivity, there is an extensive literature documenting the relationship between organizational capital and firm performance.[2] Examples of intra-industry studies include work by Ichniowski, Shaw and Prennushi (1995), Arthur (1994), Kelley (1994 and 1996), Bailey (1993), and Dunlop and Weil (1996). By examining human resource practices associated with one specific production process it is possible to greatly reduce problems of underlying heterogeneity of production processes. Most of

[2] See Ichniowski and Shaw (2003) for a thorough review of this literature.

the intra-industry studies conclude that the adoption of a coherent system of new human resource management practices such as flexible job definitions, cross-training, and work teams, along with extensive reliance on incentive pay, results in substantially higher levels of productivity than more traditional human resource management practices.

Another research strategy is to examine a more representative cross sectional sample of firms to determine the impact of workplace practices on broader measures of performance such as productivity or profitability. Examples this strategy include Black and Lynch (2001, 2004), Bartel (1989), Bresnahan, Brynjolfsson, and Hitt (2002), Caroli and Van Reenen (2001), Ichniowski (1990), Huselid (1995), Huselid and Becker (1996), and Delaney and Huselid (1996). All of these studies have found a correlation between human resource management systems and business performance as measured by labor productivity, Tobin's q, or present value gain in cash flow and firm market value. Many of these have also found evidence of the existence of synergies among workplace practices: the total impact is greater than the sum of the parts.[3]

Given that this volume is interested in measurement issues from the perspective of the economy as a whole, is it possible to translate some of the micro based evidence on the impact of organizational capital on labor productivity to the economy more generally? In particular, since a large fraction of the output growth in manufacturing in the 1990s was driven by increases in multifactor productivity, can any of this be potentially attributed to organizational capital? In Black and Lynch (2004), we use our estimates of

[3] The theoretical work of Milgrom and Roberts (1995) and Kandel and Lazear (1992), along with the empirical studies mentioned above, are important contributions in this area. Milgrom and Roberts argue that the impact of a system of human resource practices will be greater than the sum of its parts because of the synergistic effects of bundling practices together. Kandel and Lazear argue that introducing a profit sharing plan for all workers in a firm may have little or no impact on productivity unless it is linked with other practices that address the inherent free rider problem associated with corporate wide profit sharing plans.

the impact of workplace practices on labor productivity in manufacturing (done using establishment level data) in a growth accounting framework in order to see, roughly, how much of the overall growth in manufacturing during 1993-1995 our measures of workplace innovation could account for. We present these calculations again in Table 1 along with the figures reported by the BLS over the same time period to "benchmark" our findings with their numbers. As seen in this table, the sample of manufacturing establishments that we used in our empirical work (the Educational Quality of the Workforce, EQW, survey) experienced very similar output growth over the period 1993-1996 as reported by the BLS for the country as a whole. The BLS reports that output growth in manufacturing grew at a compound average annual growth rate of 4.2 percent between 1993-1996. We find a rate of 4.7 percent using the EQW data over the same period. The BLS reports that combined inputs (capital, labor and materials) grew 2.3 percent over this period and using the estimated coefficients from our empirical work (Black and Lynch (2004)) as shares we find inputs grew at 3.2 percent for the EQW sample. As a result, multifactor productivity grew 1.9 percent in the BLS reported figures and 1.6 percent using EQW data.

As a rough approximation of the contribution of organizational capital, we use the coefficients on the workplace practices that come from our micro level production function estimation to calculate the impact of workplace innovation on multifactor productivity. We find that they contributed 1.4 percentage points per year. In other words, changes in organizational capital may have accounted for approximately 30 percent of output growth in manufacturing over the period 1993-1996, or 89 percent of multifactor productivity. An important caveat is that many of the components of

workplace organization such as re-engineering reflect both technological as well as organizational changes. Though the number seems high, we believe that this accounting exercise indicates that measuring organizational capital can go some way in explaining recent trends in multifactor productivity.

Given that it improves productivity, it is not surprising to find that organizational capital also has an impact on workers, both in terms of their wages and in terms of skill demand. Investments in organizational capital seem likely to benefit the workforce because workers are unlikely to contribute in the manner these practices require unless they are assured a share of the gains (Osterman (2000)). Organizational changes may also require a higher level of human capital from individual workers since they need to deal effectively with increased uncertainty and responsibility (see Osterman (1994) and Lynch and Black (1998).) In terms of the empirical work on the impact of organizational capital on wages, the evidence is mixed. Using data from a representative sample of employers, Osterman (2000) finds no impact of work organization practices on wages of either core workers or all workers over the period 1996-1997, and Cappelli and Cater (2000) find no impact on wages of non-manufacturing workers. In contrast, both Black, Lynch and Krivelyova (2004) and Cappelli and Neumark (2001) find that wages of manufacturing workers increase when employers extend their usage of organizational practices such as team work. Black, Lynch and Krivelyova (2004) also find that the impact of organizational capital has the largest effect on the wages of supervisors, production and sales/clerical workers in the manufacturing sector.

The March 2001 Industrial and Labor Relations Review is a special issue devoted to the impact of technology and work organization on wage inequality at the industry

level. While not all studies in this volume were able to have access to data on organizational capital, some studies in this volume, such as Hunter et. al., Batt, and Bailey et. al., find a significant relationship between workplace organizational practices and earnings.

While there has been less done on the impact of organizational capital on labor demand, several recent studies have looked at this question. Theoretically, as discussed by Kremer and Maskin (1996), Acemoglu (2000) and reviewed in the context of organizational change and wage inequality by Aghion, Caroli and Garcia-Peñolosa (1999), when technological and organizational change take place, skill homogeneity can increase within firms. Therefore, if technical change and organizational change are complementary activities, as argued in Bresnahan et. al. (2002), and since technical progress tends to be skill-biased, it may be the case the organizational change would also be skill-biased. Osterman (2000) finds that measures of organizational capital are associated with a higher probability of layoffs, even within firms that have been experiencing net gains in total employment. This is suggestive of the reallocation process hypothesized in Kremer and Maskin and Acemoglu. Caroli and Van Reenen (2001) find evidence for British and French firms that a variety of measures, consistent with our definition of organizational capital, are associated with reduced demand for unskilled workers in both countries.

While the focus of this paper is not on measuring information technology, several researchers have found strong positive correlations between firms' decisions to adopt new technologies, especially information technology, and additional investment in organizational capital. Bresnahan, Brynjolfsson and Hitt (2002) find evidence of strong

complementarity between several indicators of IT use, workplace organization and the demand for skilled labor. The positive correlation between computers and workplace practices is also shown in Lynch and Black (1998) and Caroli and Van Reenen (2001). Finally, it is important to note that while we have divided our measure of organizational capital into three components there is an extensive literature both theoretical and empirical which suggests the existence of synergies in practices. For example, Athey and Stern (1998) discuss how the existence of complementarity in workplace practices implies that the adoption of one practice has externalities for adoption decisions about other practices. In addition, if practices are adopted in clusters, then some combinations of practices may occur only infrequently making it difficult, empirically, to precisely estimate the impact of these practices on outcomes such as productivity.

III. How Has Organizational Capital Been Measured?

Data on organizational capital and related components such as compensation, recruitment and selection methods, and employment security provisions have been collected at three levels of aggregation. The first level of aggregation is case studies of individual companies. One of the most famous examples is the 1983 Harvard Business School case study of the Lincoln Electric Company by Norman Berg and Norman Fast or, more recently, Ann Bartel's 2000 study of a Canadian bank. The next level of aggregation includes detailed intra-industry studies such as the work by Ichniowski, Shaw and Prennushi (1997) on the integrated steel industry. One of the many benefits of intra-industry data is the ability to examine organizational practices without the

confounding effect of different production processes and organizational structure that are due to the production of different goods.

But the focus of this paper is to examine how more nationally representative surveys of businesses have attempted to capture these measures of organizational capital. This will help identify whether or not there are some measures of organizational capital that might be relatively easy to add to nationally representative ongoing surveys of businesses. This could be especially useful from a national incomes account perspective. For this purpose we focus on micro employer surveys from the 1990s that measure the components of organizational capital we believe have been shown to be the most important in analyses of productivity, wages, and labor demand.

One of the earliest surveys of workplace practices to use these measures to study their impact on labor productivity and Tobin's q was Ichniowski (1990). He used data on personnel policies and practices taken from a 1986 survey by Columbia University's Industrial Relations Research Center covering 495 Compustat II business lines. This was a mailed survey of the Compustat sample with a ten percent response rate. Tables 2-4 summarize some of the questions used from this survey divided into the three components of organizational capital we are looking at --- training, employee voice, and work design. The training measure is a simple incidence of formal training. The employee voice measure is primarily the right of workers to voice complaints under some form of due process rather than any type of direct employee participation in decision making within the firm. Finally, the measure of work design collapses a variety of different work structures into one variable. In the empirical work done with these

measures, they are not introduced on their own but rather are collapsed into nine clusters of practices.

Mark Huselid conducted two mailed surveys of U.S. firms in 1992 and 1994. Surveys were mailed to 3,477 firms in 1992 and 3,847 firms in 1994, and employers were asked about their organizational practices in the previous year. The sample was drawn from the 12,000 publicly held firms listed in Compact Disclosure, a commercially available data base containing annual 10-K reports. The overall response rate was twenty eight percent in 1992 and twenty percent in 1994. In addition, there was a sub sample of firms that responded to both surveys, allowing for longitudinal analysis of organizational structure and performance outcomes of the firm. The survey included information on a wide range of organizational practices (shown in table 2-4). The responses to these questions were then factor analyzed to see their impact on Tobin's q and the gross rate of return on assets.

While Ichniowski and Huselid both focused their surveys on large business lines or entire firms, Paul Osterman employed a slightly different strategy and focused on individual establishments. He conducted two telephone surveys (rather than mail) in 1992 and 1997 to compile a nationally representative sample of U.S. establishments. By directing the questions to establishments rather than corporate headquarters, he hoped to obtain more accurate information about implementation of workplace practices. The response rates to the surveys were 65% for 1992 (806 establishments) 58% for 1997 (683 establishments). The 1997 survey also contained a subsample of 462 establishments that were also interviewed in 1992, thereby allowing for longitudinal analysis. The questions on workplace practices were restricted, however, to "core" employees within the

establishment and covered the proportion of these type of workers in training, self-managed work teams, job rotation, quality circles or off-line problem solving groups, and Total Quality Management (see Tables 2-4 for more information on the types of questions asked).

The Bureau of Labor Statistics (BLS) Survey of Employer Provided Training (SEPT) was conducted in 1993. While the primary purpose of this survey was to collect detailed information on employer training provided or financed by private nonagricultural establishments, information on other organizational practices was also collected. Nearly 12,000 establishments were surveyed, with a response rate of 71.3% (7,895 establishments). In addition to extensive questions on types of training and training practices, 5,987 establishments provided information on the organization of work. The target respondent was first the training department, next the human resource department, and finally, the office manager. Establishments were asked which if any of the following six work organization practices were in existence in 1993: worker teams; total quality management, quality circles; peer review of employee performance; employee involvement in the firm's technology and equipment purchase decisions; and job rotation. (See Gittleman, Horrigan, and Joyce (1998) for more details as well as Tables 2-4.)

The dataset we have used for our own work on labor productivity, training and wages (e.g. Black and Lynch (1996, 2001, 2004), Black, Lynch and Krivelyova (2004) and Lynch and Black (1998)) comes from the EQW National Employers Survey conducted in 1994 and 1997. The EQW National Employers Survey was first administered by the U.S. Bureau of the Census as a telephone survey in August and September 1994 to a nationally representative sample of more than 3,000 private

establishments with more than 20 employees. The survey represents a unique source of information on how employers recruit workers, organize work, invest in physical capital, and utilize education and training investments. The survey oversampled establishments in the manufacturing sector and establishments with more than 100 employees. Public sector employees, not-for-profit institutions, and corporate headquarters were excluded from the sample. The target respondent in the manufacturing sector was the plant manager and in the non-manufacturing sector was the local business site manager. However, the survey was designed to allow for multiple respondents, so that information could be obtained from establishments that kept financial information such as the book value of capital or the cost of goods and materials used in production at a separate finance office (typically at corporate headquarters for multi-establishment enterprises). Computer Assisted Telephone Interviewing (CATI) was used to administer each survey, which took approximately 28 minutes to complete.

The sampling frame for the survey was the Bureau of the Census SSEL file, one of the most comprehensive and up-to-date listings of establishments in the United States. By design, the survey allowed for a subset of establishments to be matched to the Census Longitudinal Research Database (LRD) that includes longitudinal information for manufacturing establishments only. The LRD, housed at the Center for Economic Studies at the Bureau of the Census, was created by longitudinally linking the establishment level data from the Bureau of the Census's Annual Survey of Manufacturers (ASM). The LRD data include information on shipments, materials, inventories, employment, expenditures on equipment and structures, book values of equipment and structures, and energy use (for more information on the LRD see Davis

and Haltiwanger (1991)). Because we are able to match the LRD with the EQW-NES, we have annual establishment level data on inputs and outputs of production for the manufacturing employers in our survey. It is important to note that the LRD is basically the universe of all manufacturing establishments with more than 250 employees but is only a sub-sample of establishments with less than 250 employees.

The response rate for manufacturing establishments in the 1994 EQW National Employers Survey was 66 percent (1621 establishments) and 60.6% (1324 establishments) for non-manufacturing establishments. These response rates are substantially higher than most other voluntary establishment surveys. Probit analysis (available from the authors upon request) of the characteristics of non-respondents indicates that there was no significant pattern at the two digit industry level in the likelihood of participating in the survey. The only businesses more likely not to participate were manufacturing establishments with more than 1000 employees.

The telephone survey was repeated again in 1997 and the overall response rate was 59% (4139 establishments). There was also a subsample of 766 establishments who had been interviewed in 1994. The response rate of establishments in the longitudinal sample was 74 percent. In both surveys, a wide range of questions were asked about training and workplace practices. The training questions included not only incidence measures of whether or not the establishment undertook any formal training of its workers but also types of training (e.g. computer literacy, team work training, literacy training), the proportion of workers trained by five occupational categories, and the percentage of total labor costs that training expenditures represented. In terms of employee voice, the survey included questions about the proportion of non-managerial

workers meeting regularly to discuss workplace issues, TQM, the proportion of workers in self-managed teams, and union status. For work design, the surveys included questions about the usage of benchmarking, the percentage of workers in job rotation, the number of managerial layers, and whether or not the establishment had undergone any reengineering efforts.

The last surveys we examine are those British and French datasets used by Caroli and VanReenan (2001) for their work on workplace organization and skill demand. The British data is from the British Workplace Industrial Relations Survey (WIRS), an establishment level dataset that consists of a cross section of over 2000 British establishments in 1984 and 1990. In 1984, there are a number of questions that relate to organization change and in 1990 there is a limited follow-up that asks more basic information. In both surveys, senior managers are asked whether there has been an introduction of new plant, machinery, or equipment that includes new micro-electronic technology; the introduction of new plant, machinery or equipment not including new micro-electronic technologies, and whether there have been substantial changes in work organization or working practices not involving new plant, machinery or equipment; a positive response to the last question would indicate changes in organizational capital. Caroli and Van Reenan attempted to verify that the change in organizational capital indicated in the survey actually corresponded to changes in relevant workplace practices by examining the 1984 data, in which managers were asked in more detail what the change actually involved. In general, this change in work organization was associated with increases in responsibility and is more likely to be associated with a widening range of more interesting tasks performed by workers.

The corresponding French dataset is the REPONSE (Relations Professionnelles et Negociations d'Entreprise) that was constructed with reference to the British WIRS. They surveyed 2500 establishments, asking senior managers in 1992 about industrial relations and organization in 1989-1992. This survey includes more detailed information on workplace organization, including explicit questions on delayering (removing one or more managerial levels), quality circles, and total quality management. (See Caroli and VanReenan (2001) for more details on both the British and the French surveys.)

It is clear that there is no "one way" that has been used to conduct these surveys. All of these surveys target different respondents, use a range of sampling frames, target different levels of the firm (from the establishment to business lines to the firm as a whole) for measures of organizational practices, utilize different methods to conduct the survey (mailed or telephone), and have a range of response rates. The next section of the paper summarizes some of measurement problems that arise from this range of strategies to collect information on organizational capital.

IV. Measurement Issues

There are a number of issues regarding data collection for organizational capital; however, many of these issues are not unique to organizational capital. One of the more basic questions is what is the appropriate business unit to study when considering organizational structure. Does each firm have a particular organizational structure, or is it even deeper than that; does organizational structure vary within the firm across establishments? Interestingly, there has been little focus on this question, with a variety of studies using different units of observation. Bartel (1989) uses a data set in which the

business line is the unit of observation, Huselid (1995) and Huselid and Becker (1996) use firm level data, while Black and Lynch (1996, 2001, 2004) use establishment level data.

Once the appropriate unit of observation is determined, the next question becomes who should be surveyed. Responses obtained from workers within a firm might be different from those obtained from managers, which in turn may be different from responses from human resource workers. In the training literature, there is evidence that firms report that significantly more training is given by firms than is actually received by workers when workers are queried (see for example Barron, Berger and Black (1997) and Barron, Berger and Black (1999)). Generally, the literature to date has focused on employer surveys under the assumption that employers have a better knowledge of the workplace structure and training that is being implemented. In addition, recent data collection efforts have focused on the human resource officer or training manager as the target respondent for questions pertaining to organizational structure. For smaller firms, this individual may be sufficiently knowledgeable to also answer questions on the financial aspect of the firm. However, with larger firms and perhaps more detailed surveys, as was the case in the EQW-NES, there may be multiple target respondents, with the financial officer answering questions on investment and output and the human resource officer answering questions on organizational structure.

Other issues that make organizational capital hard to measure deal with its intangible nature. The ability to calculate the depreciation rate of intangible goods has long eluded economists. High turnover could cause organizational capital to depreciate very quickly, whereas strong firm attachment could slow depreciation.

When considering the best way to measure organizational capital, evidence suggests that incidence of activities is not sufficient. It is crucial to know not only whether or not practices were implemented, but also how these practices are diffused both across employees/occupations and among employees within occupations. In addition, how long the practices have been in effect and what the start-up costs were, both direct in terms of dollars spent by the firm and indirect in terms of worker time are also found to affect wages, productivity, and skill demand. Finally, how are these practices being used together.

While the previous section of this paper summarized overall response rates to surveys that asked questions about organizational practices, the overall response rates do not reveal variations in response rates to specific types of questions included in these surveys. Sometimes employers are confused by jargon that is unfamiliar to them, or are concerned that answering a question may reveal proprietary information. Or employers may simply have a difficult time coming up with an accurate answer in the context of a short telephone or mailed survey. Therefore, it is important to understand which types of questions employers have an easier time responding to. In order to understand the efficacy of recent efforts to characterize workplace organization, it is useful to "benchmark" our relative success of getting responses to measures of organizational capital with more traditional questions of employer practices. Table 5 presents response rates for what we generally consider to be standard production function variables, broken down by manufacturing and non-manufacturing and then further broken down by firm size, using our 1994 EQW-NES survey. As one can see, response rates vary significantly across variables and firm size.

Interestingly, it is the larger establishments that have lower response rates; large non-manufacturing firms have the lowest response rates across the board. Though this may seem surprising, it may be the case that larger employers are more restricted in terms of the information they are able to release without approval from corporate headquarters. This limitation highlights the importance of allowing for multiple respondents in the survey.

In terms of specific variables, information on materials used generates the highest non-response rate, with only 59% of manufacturing firms and 45% of manufacturing firms responding. Second is capital, with a slightly higher (64% manufacturing, 54% non-manufacturing) response rate. Establishments seem most able or willing to respond to questions about employment and the breakdown of the labor force, with response rates in each occupation category of about 87 percent.

These response rates provide a benchmark with which one can consider response rates for survey questions on organizational capital. Table 6 provides evidence on response rates for questions regarding training. The top panel shows response rates for types of training, measuring incidence alone. It is clear that these questions are relatively easy for firms to answer, and these factors have been shown to be important factors in production function estimation (Black and Lynch, 1996).

The bottom panel of Table 6 shows that, when one moves beyond the incidence of training, response rates begin to fall. An important factor to measure is the cost of doing training; however, response rates in column 1 suggest that firms, particularly large firms, are not willing/able to answer these questions. In contrast, it is the larger firms in manufacturing industries who seem best able to answer the number of workers trained by

occupation; the smallest firms have very low response rates. Among non-manufacturing firms, the opposite is true, and response rates drop for the largest firms.

It is clear that, when training is measured along these dimensions, it is more difficult to get information from the establishments. However, it is particularly important to do so in order to build up some measure of the stock of additional human capital being added to the firm (similar to new capital investment). And though it is more difficult to obtain than simple incidence measures, response rates to these questions are still higher than those for standard capital and materials measures.

Table 7 focuses on another aspect of organizational capital: employee voice. Commonly used measures include the existence of a total quality management (TQM) system, the percentage of production or frontline workers meeting in groups, and whether or not an establishment is unionized. As Table 7 shows, response rates to all of these questions are relatively high, averaging a bit more than 90%. These variables have repeatedly been shown to have important impacts on wages as well as productivity.

Establishments also appear to be able to answer questions about the organization of the workplace. As Table 8 shows, response rates for questions on the organization of the workplace are high, both in manufacturing and non-manufacturing, large and small establishments. Again, the high response rates are particularly important given that these variables have also been shown to have an impact on productivity and wages in the empirical work.

On the compensation side, there is a bit more variation in response rates (See Table 9). Profit sharing appears to be relatively easy for firms to answer, with response rates hovering around 90% in all occupations except technicians, which have slightly

lower response rates (particularly in non-manufacturing and small firms). However, response rates drop significantly when one looks at wages. Again, technicians have the lowest response rates among the occupations. Although response rates seem much lower, it is important to note that they are still significantly higher than those for more commonly collected variables such as capital and materials. As with the more commonly collected variables from Table 5, response rates fall for larger firms.

Responses to questions, though necessary, is not sufficient. If all firms respond to a question but there is no variation across firms, it is difficult to impossible to identify the impact of that practice on establishment or worker outcomes. Given that we know which questions firms are best willing or able to answer, it is next important to examine how much variation there is in these practices, both across firms and over time. For example, if all firms indicate that they have some informal training in place (incidence), we would not be able to disentangle the effect of informal training on outcome measures.

Tables 10 through 13 present weighted means for a variety of workplace practices across manufacturing and non-manufacturing firms and by firm size. Table 10 shows the incidence of different types of training and then the cost of training, the percentage of training done during work hours, and the percentage of training done in-house. Among types of training, smaller firms tend to do less training and there is consideration variation across firm size (see Lynch and Black (1998) for a review). There is also substantial variation across types of training, with fewer firms, on average providing computer literacy training and more firms providing new methods training. There is also substantial variation across the costs of training. Consistent with the idea that large firms provide more training, training is a higher share of total labor costs for large firms, and

there is substantial variation both across firm size and between manufacturing and non-manufacturing firms. Finally, there is substantial variation in the timing and location of training, with small firms more likely to outsource and provide training outside of work hours. These variables have also been shown to have an association with establishment productivity (See Black and Lynch (1996)).

Table 11 shows that there is even more variation, relatively speaking, when one looks at employee voice. Among manufacturing establishments, small establishments show much less employee voice: they are less likely to have a system of Total Quality Management (TQM), a lower percentage of production workers meet in groups, on average, and they are less likely to be unionized. These numbers gradually increase as establishment size grows. In non-manufacturing, the situation is somewhat different. While many establishments have implemented a TQM system, the smaller establishments are the ones that are most likely to have a larger share of non-managerial workers meeting in groups. Although unionization numbers are low across the board in non-manufacturing, it is not surprising that larger firms are much more likely to be unionized.

Among different measures of the organization of the workplace in Table 12, there is far less variation in incidence and diffusion by establishment size. For manufacturing establishments, there is little variation in the percentage of non-managerial workers involved in rotation, with the number centered around 17%. The number of managerial levels does increase as the establishment gets bigger, both in manufacturing and non-manufacturing. Larger establishments are more likely to participate in benchmarking, while smaller establishments are slightly more likely to allow jobsharing. There is little relationship between establishment size and the availability of flextime (though non-

manufacturing establishments are more likely to have it as a whole) or the percentage of non-managerial workers in self-managed teams.

Finally, as shown in Table 13, among measures of compensation, the story is the same for both manufacturing and non-manufacturing establishments. There is little relationship between establishment size and profit sharing for clerical/sales workers of production/front line workers. However, larger establishments are more likely to offer profit sharing for managerial and technical workers.

In addition to differences across types of establishments, there are also differences over time. If one tries to identify the impact of organizational capital by focusing on changes within establishments over time (in order to eliminate unobserved establishment fixed characteristics), it is essential that there be significant variation over time. This suggests that one should consider not only the questions asked but the frequency with which establishments are surveyed. Table 14 examines the variation over time in a number of workplace practices when we consider changes between 1994 and 1997 in the matched panel of establishments in the EQW-NES. In this time period, there are a number of similarities across manufacturing and non-manufacturing establishments. Most establishments did not change their unionization status, with only approximately 15% becoming de-unionized during this time period and 1% unionizing. A significant number of establishments increased the percentage of production workers meeting in groups, while more establishments stopped the process of benchmarking than began. The percentage of non-managerial workers involved in job rotation increased, an equal percentage of establishments increased the number of managerial levels as decreased, and there was an unambiguous increase in the diffusion of technology, with more

establishments increasing the percentage of managerial and non-managerial workers using computers than decreasing.

It is important to note that, when considering changes over time, one is particularly susceptible to issues of measurement error, particularly when focusing on changes over a relatively short period of time. Surveying establishments too frequently exacerbates this problem.

Finally, it is also important to consider optimal breakdown of worker categories. While many datasets currently distinguish between production and non-production workers (for example, the LRD), recent surveys have begun to explore the advantages of finer worker categories. In the EQW-NES, workers are divided into supervisors, managers, technical workers, production workers, and clerical workers. While the distinctions may be less important for production function estimation, there may be significant benefits to the finer level of detail when considering the impact of organizational capital on wages and labor demand.

V. Final Recommendations

This paper has tried to identify three main elements of organizational capital that have been shown to have a significant impact on productivity, wages and labor demand. These three elements include training, employee voice and work design. While there have been an increasing number of researchers who have attempted to measure these and other dimensions of organizational capital for the purpose of documenting its impact on the so called "New Economy," these efforts have been uncoordinated and sporadic.

Part of the reason there has been no systematic attempt to measure workplace practices over time has been a lack of consensus on what to measure, along with concerns over the costs of measurement.

Our experience with training measures suggests that, while measuring the capital stock is tough, measuring the stock of training is even tougher. Evidence suggests that it may be too hard for firms to calculate a stock measure, and our best shot is to try to get at new investment in training. But we are still left with questions such as: What is the appropriate margin – any training, type of training, duration of training? How do we think about depreciation?

The good news is that other measures of organizational practices, such as the percentage of workers meeting on a regular basis, unionization, and various work design elements, are much easier to obtain. Respondents have a clear idea of what is being asked, these types of questions are not time consuming, there is currently substantial variation in the data, and, importantly, they are associated with outcomes we care about.

Our final question deals with the frequency of measurement: how often should you measure these elements of organizational capital. Our work suggests that this does not need to be done on a monthly basis, or even quarterly basis. For training and compensation information to be used for labor productivity analysis, an annual survey is probably sufficient. For the other components of organizational capital such as employee voice and work design, checking in every other year is likely more than enough, as these practices do not change with high frequency.

To date, the literature has been clear: workplace organization matters. While these findings have been consistent, the measures of organizational capital, the unit of

measurement, and the frequency of measurement have not been. Hopefully, careful consideration of the issues and problems associated with the measurement of organizational capital will help unify data collection efforts in the future, leaving us with more systematic information on firms, including measures not only of physical capital and human capital but also organizational capital as well.

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Table 1: Compound Average Annual Rates of Growth in Output and the Contribution of Factor Inputs and Multifactor Productivity, Manufacturing (percent per year) 1993-1996

	BLS	**Black and Lynch (2004)**
Output	4.2	4.7
Combined Inputs (includes capital, labor and materials)	2.3	3.2
Multifactor Productivity	1.9	1.6
Contribution of Workplace Practices	-	1.4
Remaining Residual	-	0.2

Source: Bureau of Labor Statistics, Multifactor Productivity Trends, 1998, released September 21, 2000 and authors' own calculations from the EQW-NES first and second round cross sections with a 1% trim as presented in Black and Lynch (2004).

Table 2: Survey Questions on Training

Survey	Training Questions Asked
Ichniowski 1990	Does your business have a formal employee training and development program?
Huselid (1995) and Huselid and Becker (1996)	How many hours of training per year are typically received by an experienced employee (someone employed more than one year)?
Osterman (1994, 2000)	Proportion of core employees who received different types of training (e.g. off-the job or cross training)
Gittleman, Horrigan and Joyce	Variety of training incidence measures including types of training offered (basic, workplace-related and job skills) along with reason for training (technology, skill specificity, seniority,retention)
Black and Lynch (1996, 1998, 2001, 2004)	Variety of training questions on incidence of formal and informal training programs; types of training offered including computer skills training, team work training, sales training, new methods training; proportion of workers trained by five occupational categories; the costs of training as a share of total labor costs; does training occur off the job.
Caroli & Van Reneen (2001)	In the past three years have you trained workers aiming at specialization or trained workers aiming at multiskilling? (French data)

Table 3: Survey Questions on Employee Voice

Survey	Employee Voice
Ichniowski 1990	Do you have any formal information sharing program with these groups of employees? Do you conduct attitude surveys among any of these groups of workers? Is there a formal grievance procedure or formal complaint resolution system? (All questions were asked separately for a business's union and non-union production workers)
Huselid (1995) and Huselid and Becker (1996)	What proportion of the workforce are included in a formal information-sharing program (e.g. a newsletter)? What proportion of the workforce is regularly administered attitude surveys? What proportion of the workforce participate in Quality of Work Life (QWL), Quality Circles (QC), and/or labor management participation programs?
Osterman (1994, 2000)	Proportion of the establishment's core employees involved in problem solving groups Proportion of the establishment's core employees involved in teams Proportion of the establishment's core employees involved in Total Quality Management
Gittleman, Horrigan and Joyce	Are there worker teams in the establishment Is there TQM? Are there Quality Circles? Is there employee involvement in the establishment's technology and equipment purchase decisions?
Black and Lynch (1996, 2001, 2004)	Is there TQM? Proportion of non-managerial workers meeting regularly to discuss workplace issues Proportion of workers in self-managed teams
Caroli & Van Reneen (2001)	

Table 4: Survey Questions on Work Design

Survey	Work Design
Ichniowski 1990	Does your organization use a formal job design program to integrate work content and the qualifications required of employees to perform work? If yes what type of job design do you use? a. work simplification, b. job rotation, c. job enlargement d. job enrichment, e. other
Huselid (1995) and Huselid and Becker (1996)	What proportion of the workforce hold jobs that have been included in a formal job analysis?
Osterman (1994, 2000)	Proportion of the core employees involved in job rotation
Gittleman, Horrigan and Joyce	Is there job rotation?
Black and Lynch (1996, 2001, 2004)	Variety of measures including benchmarking, reengineering, number of managerial levels, % of workers in job rotation, job sharing
Caroli & Van Reneen (2001)	Have you in the last three years made any substantial changes in work organization or working practices not involving new plant machinery or equipment that directly affected the jobs or working practices of the manual workforce – and then asked for non-manual workers? (for British est.) For any of the organizational methods I will mention, would you tell me whether it is already implemented, in the process of being so, being considered or not even thought of in your establishment? (Included in this list is delayering, quality circles, and TQM – French data)

RESPONSE RATES

Table 5: Response Rates for Standard Production Function Variables
1994 EQW-NES

	Total Sales	Capital	Materials	Percent Managers	Percent Supervisors	Percent Production/ Frontline Workers	Percent Technical Workers	Percent Clerical/Sales Workers
Manufacturing (total)	73	64	59	88	88	87	87	87
By Firm Size:								
1-49	82	76	67	88	88	88	88	88
50-99	81	73	69	92	92	91	91	91
100-249	78	67	60	93	93	93	93	93
250+	68	59	55	86	86	85	85	85
Non-Manufacturing (total)	62	54	45	88	88	86	87	86
By Firm Size:								
1-49	65	60	50	92	92	91	91	91
50-99	71	63	56	93	93	93	93	93
100-249	59	51	47	89	89	88	88	89
250+	58	47	36	82	81	79	79	79

Table 6: Response Rates for Training
1994 EQW-NES Survey

	Existence of Formal Training	Computer Literacy Training	New Methods Training	Cross-Training	Teamwork Training	% of Training Done During Work Hours	% of Training Done In House
Manufacturing (total)	>99	>99	>99	>99	>99	97	97
Non-Manufacturing (total)	100	>99	>99	>99	>99	97	97

	Cost of Training (As a Share of Labor Costs)	# of Managerial Workers Trained	# of Technical Workers Trained	# of Production/ Front Line Workers Trained	# of Clerical/ Sales Workers Trained
Manufacturing (total)	67	74	70	71	71
By Firm Size:					
1-49	84	57	55	57	57
50-99	82	75	74	75	76
100-249	64	76	72	74	74
250+	61	76	71	73	73
Non-Manufacturing (total)	61	73	68	71	71
By Firm Size:					
1-49	70	75	73	74	75
50-99	74	73	73	74	77
100-249	57	75	74	74	76
250+	51	69	61	65	65

Table 7: Response Rates for Employee Voice
1994 EQW-NES

	TQM	Percentage of Production Workers Meeting in Groups	Unionized
Manufacturing (total)	93	90	93
By Firm Size:			
1-49	90	89	90
50-99	95	94	94
100-249	93	92	94
250+	93	89	93
Non-Manufacturing (total)	92	87	92
By Firm Size:			
1-49	92	91	93
50-99	93	92	92
100-249	93	90	92
250+	91	81	90

Table 8: Response Rates for Workplace Organization Measures
1994 EQW-NES

	% Non-Managerial Workers Involved in Job Rotation	# of Managerial Levels	% Non-Managerial Workers in Self-Managed Teams	Participate in Benchmarking	Flextime	Allow Job-Sharing
Manufacturing (total)						
	90	92	91	92	93	93
By Firm Size:						
1-49	87	91	88	90	91	91
50-99	93	92	94	95	95	95
100-249	93	92	93	94	94	93
250+	90	92	91	92	93	93
Non-Manufacturing (total)	88	90	88	90	92	92
By Firm Size:						
1-49	93	92	91	92	94	93
50-99	92	90	92	92	92	93
100-249	90	89	90	91	92	92
250+	84	88	84	89	91	90

Table 9: Response Rates for Compensation Measures
1994 EQW-NES

	Profit Sharing for Managerial Workers	Profit Sharing for Supervisors	Profit Sharing for Technical Workers	Profit Sharing for Clerical/Sales Workers	Profit Sharing for Production/ Front Line Workers	Wages: Managerial Workers	Wages: Supervisors	Wages: Technical Workers	Wages: Clerical/ Sales Workers	Wages: Production/ Front Line Workers
Manufacturing (total)	91	91	86	91	91	64	66	59	70	75
By Firm Size:										
1-49	88	88	71	87	88	72	69	39	72	76
50-99	94	94	82	94	93	72	76	60	79	81
100-249	92	93	85	93	92	69	72	61	75	79
250+	91	91	89	91	90	60	62	61	67	73
Non-Manufacturing (total)	90	88	77	88	87	66	60	42	66	61
By Firm Size:										
1-49	90	87	76	89	88	71	87	76	89	62
50-99	90	89	69	87	87	76	67	40	72	69
100-249	90	89	75	89	89	67	64	43	70	68
250+	89	88	83	88	85	56	54	47	62	53

SUMMARY STATISTICS

Table 10: Summary Statistics for Training Measures
1994 EQW-NES Survey
Weighted Means

	Existence of Formal Training	Computer Literacy Training	New Methods Training	Cross-Training	Teamwork Training	Cost of Training (As a Share of Labor Costs)	% of Training Done During Work Hours	% of Training Done In House
Manufacturing (total)	76	62	71	69	52	.04	53	42
By Firm Size:								
1-49	62	48	60	62	39	.035	43	35
50-99	79	63	67	64	53	.037	58	42
100-249	86	72	84	78	56	.047	59	46
250+	92	85	90	84	77	.052	64	51
Non-Manufacturing (total)	82	49	77	68	55	.05	58	51
By Firm Size:								
1-49	77	43	73	61	52	.037	52	44
50-99	82	48	75	76	52	.077	63	57
100-249	92	62	89	76	66	.068	73	60
250+	92	71	95	81	76	.07	62	64

Table 11: Summary Statistics for Employee Voice Measures
1994 EQW-NES
Weighted Means

	TQM	Percentage of Production Workers Meeting in Groups	Unionized
Manufacturing (total)	42	40	21
By Firm Size:			
1-49	28	38	12
50-99	41	42	20
100-249	52	37	31
250+	66	50	35
Non-Manufacturing (total)	36	56	11
By Firm Size:			
1-49	33	62	8
50-99	36	55	8
100-249	38	44	18
250+	52	41	24

Table 12: Summary Statistics for Workplace Organization Measures
1994 EQW-NES
Weighted Means

	% Non-Managerial Workers Involved in Job Rotation	# of Managerial Levels	% Non-Managerial Workers in Self-Managed Teams	Participate in Benchmarking	Flextime	Allow Job-Sharing
Manufacturing (total)						
	17	2.0	12	24	25	23
By Firm Size:						
1-49	20	1.6	12	14	29	30
50-99	14	2.0	12	19	20	20
100-249	16	2.3	11	35	22	18
250+	18	2.7	15	43	28	18
Non-Manufacturing (total)	18	2.1	13	24	42	36
By Firm Size:						
1-49	21	1.6	14	20	39	41
50-99	15	2.5	11	27	47	32
100-249	16	2.7	13	23	38	27
250+	8	3.6	9	49	49	32

Table 13: Summary Statistics for Compensation Measures
1994 EQW-NES
Weighted Means

	Profit Sharing for Managerial Workers	Profit Sharing for Technical Workers	Profit Sharing for Clerical/ Sales Workers	Profit Sharing for Production/ Front Line Workers
Manufacturing (total)				
	66	49	55	49
By Firm Size:				
1-49	61	44	51	52
50-99	65	53	56	51
100-249	71	48	55	39
250+	75	58	52	52
Non-Manufacturing (total)	72	42	46	46
By Firm Size:				
1-49	72	43	47	48
50-99	69	36	41	39
100-249	73	41	49	53
250+	77	53	51	41

Table 14: Changes in Organizational Capital
1994 to 1997
Unweighted EQW-NES Data

	Unionized	% of Production Workers Meeting in Groups	Participate in Benchmarking	% of Non-Managerial Workers Involved in Job Rotation	# of Managerial Levels	% of Non-Managerial Workers in Self-Managed Teams	% of Non-Managerial Workers Using Computers	% of Managerial Workers Using Computers
Manufacturing								
% Increased	1	37	10	33	35	26	39	40
% Stayed the Same	81	36	60	43	35	58	34	41
% Decreased	18	27	30	25	30	16	27	19
Non-Manufacturing								
% Increased	1	41	7	26	39	19	49	36
% Stayed the Same	85	37	65	59	26	62	30	46
% Decreased	15	22	29	15	35	19	21	18