Contracting-out and the interindustry wage structure: Do norms of internal equity matter in wage determination?

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Abstract

This paper compares the wage of a worker performing an activity for an outside contractor with the wage that the firm contracting for this service would have paid were this worker on its payroll (i.e., working in-house). If norms of internal equity were a binding constraint, the wage paid by the outside contractor should not be expected to be identical to the in-house wage. Our results, obtained using data from the U.S. Current Population Survey and the Input-Output matrix, are consistent with the view that norms of internal equity are binding.

1. Introduction

This paper provides an empirical framework that may help to assess the role of norms of internal equity in wage determination. The kind of norms of internal equity we considered are:

- If firms must pay a high wage to some groups of workers, demands for pay equity will raise the general wage scale for other labor in the firm.

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- If firms are earning rents, demands by workers for an equitable share will raise the general wage scale.

Two pieces of empirical evidence that may suggest the relevance of norms of internal equity are important for this paper. First, persistent interindustry wage differentials (e.g., Dickens and Katz (1987)) and the uniformity across occupations of the interindustry wage structure (see, Dickens and Katz (1986)) have often been interpreted as the result of constraints imposed by norms of internal equity[1]. Why should otherwise high wage industries pay high wages to, for example, janitors and secretaries?

Second, Abraham and Taylor (1996) studying the use of outside contractors found that high wage firms are more likely to use outside contractors to perform janitorial services. If norms of internal equity are binding for some firms so that they pay above market wages for some occupations, then outside contractors may prove a valid mechanism to circumvent norms of internal equity for those firms. According to Abraham and Taylor (1996): '[their] findings concerning the relationship between an establishment's wage level and its contracting behavior corroborate other evidence that internal equity considerations constrain the relative wages paid to employees within a single internal labor market' (p. 417)

Certainly, these two pieces of empirical evidence do not provide undisputable backing for the hypothesis that norms of internal equity are important in wage determination. First, the observed uniformity in the industry/occupational wage structure could be caused by complementarities between workers in different occupations[2]. For example, a manager who works long hours and has a difficult job will need a very competent secretary who is also prepared to do long hours. Moreover, as the office is busy for long hours, this will imply that janitorial services are required to accommodate such needs as well. To the extent that all these characteristics are rewarded in the market, a strong correlation might be expected in the interindustry wage structure across occupations. Second, the data used by Abraham and Taylor (1996) comes from a set of questions added to the 13 manufacturing Industry Wage Survey conducted in 1986-87. It is unclear given the nature of the sample and the sampling procedure whether their results can be extended to the whole economy.

The idea in this paper is to compare the wage of a worker performing an activity (e.g., cleaning) for an outside contractor (e.g., cleaning service company) with the wage that the firm contracting for this service would have paid were this worker on its payroll (i.e., working in-house). On average, internal equity constraints will operate differently in different firms. Thus, if norms of internal

[1] Akerlof and Yellen (1990) and Thaler (1989), for example, defend this position.

[2] Mehta (1998) argues in a quite similar way.

equity were a binding constraint, one would not expect the wage paid by the outside contractor to be identical to the wage that the contracting firm might have paid to this employee.

In order to implement the idea expressed above, this paper combines the analysis of the interindustry wage structure with the use of outside contractors. Inference on the use of outside contractors is based on the categorization of firms in particular industries. Firms categorized in these industries allow firms in other industries to contract-out for support services such as, for example, janitorial services, accounting services, engineering services or drafting services.

The paper is organized as follows. Section 2 discuss how to generate a testable hypothesis with the available data. Section 3 provides a test specification and an outline of how to implement the test. Section 4 implements the test. Section 5 provides some plausible interpretations for the results obtained in the test. Section 6 concludes the paper.

2. Generating a testable hypothesis from the available data

As has been explained in the introductory section, we would like to compare the wage of a worker performing an activity (e.g., cleaning) for an outside contractor (e.g., cleaning service company) with the wage that the firm contracting for this service would have paid were this worker on its payroll (i.e., working in-house). Unfortunately, data on various sorts of market-mediated work arrangements that organizations rely upon (e.g., temporary employment, production subcontracting, and contracting out for a variety of business support services) is rather limited. As in Abraham (1990), inference concerning the use of market-mediated arrangements might rely on the categorization of firms in particular industries as providers of market-mediated services. In particular, this paper concentrates on two industries that can be categorized as providers of business support services [SIC(1987) in parentheses]: (i) Services to dwellings and other buildings (734) and, (ii) Engineering, architectural, and surveying services (871).

Using an individual level data set, such as the U.S. Current Population Survey (CPS), it is possible to obtain the wages and other demographic characteristics of employees that are 'central' to the services provided by these industries. Central employees for the business support industries named above are those engaged in Cleaning & building occupations and, Engineers, architects & surveyors, respectively. This is to say, central employees are those referred to other firms to perform their job.

Clearly, the potential wage that the firm contracting for a service would have paid to an employee is unobservable. However, a good proxy could be obtained from the wages of other workers performing similar activities in-house. In general, job market outcomes involve a certain match between individual and job characteristics[3]. It is widely accepted that the interindustry wage structure reflects characteristics of an individual-job match that are unobserved by the econometrician but are correlated with the observed industry affiliation. When a firm contracts-out a certain activity that is an input for its production process, it transmits to the contractor most of the characteristics of the job that affect how the wage is determined (i.e., most of the characteristics that determine the nature of the match). Therefore, potential wages can be obtained from the information on statistically similar individuals working in industries where the outside contractors provide services. In this case, a simple test for the relevance of norms of internal equity would be to compare the potential wage for an individual in industry k with the actual contracting-out wage for a statistically similar individual performing a job at industry k (i.e., an individual in the payroll of the business support industry). As the job is performed in a different 'firm' the dimension of what is internally equitable should not be transmitted. Therefore, if we could not reject that both wages were equal that would raise doubts about the importance of norms of internal equity in wage determination.

Unfortunately, the information available in individual surveys does not allow us to identify the industry using the contracting-out arrangement (i.e., in which industry the worker attached to a firm providing business support services is performing his/her job). This precludes a simple comparison of the average wage of statistically similar workers. However, under the null that norms of internal equity do not affect wage determination, the distribution of wages for an occupation central to an industry providing business support services can be expected to be a reflection of the potential wages for such occupation in different industries[4]. In

[3]Labor market outcomes are characterized by the interaction between individual and job characteristics. A labor market transaction has been interpreted as a tied sale (e.g., Rosen, 1986). On the one hand, a worker simultaneously sells the service of her/his labor and buys attributes of her/his job. These attributes are fixed for any one job, but may vary from job to job. On the other hand, employers simultaneously buy the services and characteristics of workers and sell the attributes of jobs offered in the market. The characteristics of a particular worker are fixed, but may differ among workers. This tied sale, however, is constrained by norms and institutions, where these norms and institutions are a property of a social system, *not of an actor within it*, that "specify what actions are regarded by a set of persons as proper or correct, or what actions are improper or incorrect" (Coleman, (1986) p. 37). Whether these constraints are binding or not depend also on the individual and job characteristics that determine the nature of a particular tied sale.

[4]Even if the null hypothesis that norms of internal equity do not affect wage determination were true, the distribution of wages in the business support industry may fail to be a reflection of the potential wages. That will be the case, if the unobserved individual-job traits captured by the interindustry wage structure have either change in the process of contracting-out or differ (within industries) between firms that contract-out and do not contract-out these activities. This issue is treated at length in the Discussion Section.

particular, an alternative testable hypothesis is that, ceteris paribus, the average wage for an occupation central to the industry providing business support services is equal to a weighted average of the wage for this occupation in all other industries; where the weights are the ratio of the number of employees used by the firms providing these services in each industry to total employment in that service industry for a given occupation. Given that such employment shares are not available, our intention is to use the share of each industry in the outside contractors final product. Again, a non-rejection of the null would raise doubts about the importance of norms of internal equity. This is because the unobserved individual-job components would be expected to change in the process of contracting-out, if these norms were a binding constraint for wage determination.

3. Test specification and implementation strategy

Consider the following wage equation,

$$\ln w_{qi} = \mu_{q0} + \delta_q' x_{qi} + \sum_{k=1}^{K} \beta_{qk} D_{qki} + \varepsilon_{qi}, \quad i = 1, ..., N, \tag{3.1}$$

where w_{qi} is the hourly wage for individual i performing an occupation q, x_{qi} is a vector of observable individual and job characteristics, D_{qki} is a dummy variable equal to 1 if the individual is affiliated to industry k and 0 otherwise, the dummy for the industry provider of business support services (denoted $k = 0$) for which q is a central occupation is omitted, and ε_{qi} is an error term with mean zero and variance σ_{qi}^2. Let us for simplicity omit from now on the sub-index q.

The null hypothesis that we want to test is that

$$\sum_{k=1}^{K} \pi_k E(w_i \mid x_i,\ D_{ki} = 1) = E(w_i \mid x_i,\ D_{0i} = 1), \quad 0 \le \pi_k \le 1, \text{ and } \sum_{k=1}^{K} \pi_k = 1, \tag{3.2}$$

where $E(w_i \mid x_i,\ D_{ki} = 1)$ is the mean hourly wage for a worker in industry k conditional on observable individual and job characteristics, and π_k is a set of non-stochastic weights (i.e., the share of each industry on the outside contractor final product). Given the log linear specification of the wage equation,

$$E(w_i|x_i, D_{ki} = 1) = \exp\left(\mu_0 + \delta' x_i + \beta_k\right) \times E \exp\left(\varepsilon_i\right). \tag{3.3}$$

Then, by (3.3), the null hypothesis (3.2) can be written as

$$\begin{aligned} \exp\left(\mu_0 + \delta' x_i\right) \times E \exp\left(\varepsilon_i\right) \sum_{k=1}^{K} \pi_k \exp\left(\beta_k\right) &= \exp\left(\mu_0 + \delta' x_i\right) \times E \exp\left(\varepsilon_i\right), \\ 0 &\le \pi_k \le 1, \text{ and } \sum_{k=1}^{K} \pi_k = 1 \end{aligned}$$

or

$$\sum_{k=1}^{K} \pi_k \exp\left(\beta_k\right) = 1, \quad 0 \leq \pi_k \leq 1, \text{ and } \sum_{k=1}^{K} \pi_k = 1. \tag{3.4}$$

In light of what has been assumed so far, one way of proceeding in order to test (3.2), is to estimate model (3.1) by ordinary least squares and then, to test (3.4) using a Wald test for a non-linear restriction (asymptotically distributed Chi-square with one degree of freedom)[5]. Given the usual heteroscedasticity problems in the estimation of wage equations, a variance-covariance matrix consistent to heteroscedasticity of an unknown type needs to be used in order to compute the Wald statistic.

Alternatively, provided that the actual interindustry wage differentials are not very large, (3.2) can be tested using a linear restriction as follows. The beta coefficients from (3.1) represent differences between industry means. Formally,

$$\beta_k = E(\ln w_i \mid x_i, D_{ki} = 1) - E(\ln w_i \mid x_i, D_{0i} = 1) \text{ for } k = 1, ..., K. \tag{3.5}$$

By using (3.3), it can easily be seen that it is also the case that,

$$\beta_k = \ln E(w_i \mid x_i, D_{ki} = 1) - \ln E(w_i \mid x_i, D_{0i} = 1) \text{ for } k = 1, ..., K. \tag{3.6}$$

Hence, provided that the actual interindustry wage differentials are not very large[6],

$$\frac{E(w_i \mid x_i, D_{ki} = 1) - E(w_i \mid x_i, D_{0i} = 1)}{E(w_i \mid x_i, D_{0i} = 1)}$$

can be approximated by β_k. Therefore, the null hypothesis (3.2) can be stated as

$$\sum_{k=1}^{K} \pi_k \beta_k = 0, \quad 0 \leq \pi_k \leq 1, \text{ and } \sum_{k=1}^{K} \pi_k = 1. \tag{3.7}$$

This restriction can be tested using a Wald test for a linear restriction which is, also, asymptotically distributed Chi-square with one degree of freedom. Again, a variance-covariance matrix consistent to heteroscedasticity of an unknown type needs to be used in order to compute the Wald statistic.

Before moving to the empirical results of the paper let me recapitulate and point out how, in practice, a test of the hypothesis (3.2) can be implemented:

[5] It is well known (see, Gregory and Veall (1985) and Phillips and Park (1988)) that, in small and medium sample sizes, the Wald test for non-linear restrictions is not invariant to reparametrization. However, the size of the samples in this paper are large enough (at least 7300 observations) for the above problem to be negligible.

[6] See Halvorsen and Palmquist (1980) for an idea of the size and direction of the resulting bias from this approximation.

1. An industry that provides the opportunity to other firms to contract-out business support services is chosen (e.g., Services to buildings and other dwellings).

2. Using an individual level data set, all individuals in the payroll of any industry performing an occupation that is central to the services provided by the business support industry under study are selected (e.g., all individuals performing Cleaning and building services occupations irrespectively of their industry affiliation).

3. A set of weights is constructed using data on intermediate sales to all other industries of the service produced by the business support industry. Such information can be obtained from the Input-Output matrix.

4. For the sample constructed in 2, a wage equation is estimated using ordinary least squares. In estimating (3.1) the industry dummy for the corresponding business support service industry is omitted.

5. Finally, the null hypothesis, that after controlling for the usual covariates the average wage for an occupation central to the business support industry is a weighted average of the wages in all other industries, is tested using either a Wald test for a non-linear restriction (i.e., restriction (3.4) is tested) or a Wald test for a linear restriction (i.e., restriction (3.7) is tested).

4. Empirical analysis

In pursuing the strategy outlined in Section 3 it is necessary to identify a set of business support industries and an associated group of central occupations. As was mentioned in Section 2, two business support industry / occupation cells are studied here:

1. Services to dwellings and other buildings [SDB from now on] / Cleaning & building occupations (except private households and elevator operators).

2. Engineering, architectural, and surveying services [EAS from now on] / Engineers, architects & surveyors.

Table 4.1 provides the industry and occupational coding of these cells for the data sets used in this paper.

One must deal with two practical issues in testing the null hypothesis stated in (3.2). First, it is required that the number of observations in each industry-occupation cell is not 'too' small so that the estimates of the β_{qk}s from equation

(3.1) are precise (i.e., the standard deviations are not too large). A detailed assessment of how we dealt with this potential small industry-occupation cell problem is presented in Section 4.1, which also provides descriptive statistics for earnings and individual-job characteristics in the business support industry and elsewhere.

The second issue is how to determine which wage the contracting-out worker would have received were his/her wage being paid by the buyer of the service he/she is an input for. In other terms, the issue is how to match the information on commodity sales with the β_{qk}s in order to produce the weighted average wage. The construction of the weights for the business support industries described in Table 4.1 is analyzed in Section 4.2.

Section 4.3 presents the results of estimating (3.1) and testing (3.2) using a short list and a long list of industry dummies.

4.1. Average individual characteristics in the business support industry and elsewhere

The information on earnings and individual characteristics used to estimate (3.1) is drawn from the U.S. Current Population Survey (CPS). In order to address the industry-occupation cell problem this paper pooled Basic Monthly files for the Outgoing rotation groups[7] over a period of three years: 1994, 1996 and 1998[8]. Under the rules used to select individuals for the main sample there are more than 440000 observations. The rules for selection were made according to the following conditions: all employed persons excluding farm and private household employees, who are sixteen years of age or older, with complete information on occupation and industry affiliation, and with an hourly wage higher than one dollar or a weekly wage higher than twenty-five dollars.

From the main sample, two sub-samples have been constructed containing those individuals employed in the following occupations: Cleaning & building service occupations (except private households and elevator operators) and, Engineers, architects & surveyors. How well can these sub-samples cope with the

[7] Only those individuals in Outgoing rotation groups are asked about earnings and people exit the sample only once a year. Hence, only those on month 4 or 8 enter the sample.

[8] Because of the 4-8-4 structure of the CPS it is not possible to use contiguous years without constructing a panel. The panel has not been constructed because of several reasons. First, due to changes in the CPS structure is not possible to match most of 1994/1995/1996 for confidentially reasons. So, only 1996/1997/1998 can be matched. Second, there are severe problems of representativity in matching cross sections from the Current Population Survey and especially in relation to industry switchers (see, Keane (1993) and Peracchi and Welch (1995)). Third, if we were willing to produce a fixed effect estimator it would be unlikely that industry-occupation dummies could be identified. This is due to the small number of switchers per industry-occupation cell that can be expected.

industry-occupation cell problem? To analyze this issue it is necessary to jump ahead to the estimation of the industry dummies' coefficients to be presented later in Section 4.3. In estimating (3.1) a short list of industry dummies (with fifteen estimated coefficients), and a long list of industry dummies (with forty-five/thirty-three estimated coefficients) have been used. The comparison group in these estimations is always the corresponding business support industry. It has been our intention to produce industry-occupation cells of at least thirty observations. Such an objective has been achieved for almost all industry-occupation cells. Starting with the comparison groups used in estimating the industry dummies' coefficients, the business support sector has always had more than 1000 observations. From a total of 276 industry dummies' coefficients estimated for twelve wage equations, only twenty coefficients have been estimated with less than thirty observations per industry-occupation cell[9]. Of these cases, the number of observations per industry-occupation cell was on average twenty-three[10].

Table 4.2 presents average characteristics for some of the variables to be used in estimating (3.1). The first two columns with data show, for each sub-sample, average characteristics for the corresponding business support industry and all other industries. The third column presents a comparison of the average characteristics of those individuals in professional and non-professional services with respect to those in all other industries using the main sample.

The dependent variable for the wage equation is the natural log of hourly wage. For those individuals where the survey does not produce an hourly wage figure, the ratio of weekly wage to usual weekly hours has been used[11]. Hourly wage is on average lower in the corresponding business support industry with respect to other industries. This happens despite, roughly speaking, similar levels of educational achievement.

Workers in the corresponding business support industry are younger than those working in the 'Other industry' category. The difference between the average individuals' age has a range of more than one year and less than four years. Also, the percentage of workers that are union members or that are covered by a union contract is much higher in the business support industry category than elsewhere.

[9] The estimates to be presented later provide the number of observations when an industry-occupation cell has less than thirty observations.

[10] In any case, these industry coefficients have very small weights attached; thus, we felt more comfortable leaving them this way rather than merging them with other industries 'contaminating' other averages.

[11] The CPS aim to provide information on weekly wages for all working individuals. Thus, they based their top-coding procedure on weekly wages. However, a person that is paid by the hour and receives more than U$S100 the hour is top-coded as U$S99.99. Because of this, all estimated hourly wages that exceed or equal U$S100 has been left as U$S99.99. It should be mentioned that for the main sample (443145 observations) there are less than 200 of these cases.

The final row of Table 4.2 presents estimates of wage differentials between the business support sector and other industries. These estimates have been obtained from ordinary least squares estimation of wage equations like (3.1) but only using an industry dummy for those individuals affiliated to the corresponding business support industry. The estimates follow the pattern observed for the average hourly wages. Nonetheless, wage differentials seem on average to be pretty small (not higher than three percent in absolute value).

It is clear, from a comparison of the averages for the main sample with those for the sub-samples, that the patterns observed for the business support industry are distinctive of that industry rather than a mere reflection from what happens with professional and non-professional services as a whole.

4.2. Weights

Were information on the destination of the workers attached to the business support industries available, it would not have been necessary to produce any sort of weight. It would have been enough to compare the wage paid, ceteris paribus, to workers hired by industry k with respect to the wage paid by an outside contractor to those individuals sent to work at industry k. Unfortunately, this is not the case. Constructing a set of weights parallels the imputation of an industry, and thus of a potential wage, for each worker attached to the industries providing business support services. This process involves two difficulties. First, to choose a suitable aggregation for the industries. Second, to decide how to impute wages to workers providing services for final consumption and own demand.

The weights required to test the null hypothesis (3.2) are obtained from the 1995 Input-Output matrix prepared by the Office of Employment Projections of the US Bureau of Labor Statistics. The back bone in the construction of the weights is the Use matrix of the input-output table. This matrix provides intermediate interindustry commodity sales for a 185 industry classification. The sales figures in the Use matrix are commodity rather than industry sales. The difference between commodity and industry sales stems from the fact that industries may engage in secondary production activities besides producing their own characteristic product (commodity). Therefore, the commodity sale in question (e.g., a purchase of services to buildings and other dwellings from the manufacturing sector) could have been provided by an industry that has not been classified as the primary provider of the commodity. It could also have been imported.

The weights are meant to reflect the participation of each industry on the outside contractors final output. Therefore, it is important to know to what extent the information in the Use matrix truly reflects the sales from the business support industry to other industries. The first three rows from Table 4.3 provide information on this particular issue. The first row compares total commodity output produced by all industries, to total commodity output produced by the business support industry. The second row compares imports of the business support commodity, to total commodity output produced by the business support industry. Both ratios indicate that the intermediate sales of the Use matrix provide an accurate picture of the intermediate sales of the commodity produced by the business support industry[12]. Moreover, the third row of Table 4.3 compares the business support industry total commodity output with the total business support industry output. It is clear that the firms providing business support services are not devoting resources to produce secondary activities.

Do intermediate sales to other industries compromise the total of the commodity output produced by the business support industry? No. From the fourth row of Table 4.3, it can be seen that the share of intermediate sales to other industries ranges between sixty-eight percent and seventy-four percent. The remaining part corresponds to final demand components and own intermediate demand. Table 4.3 presents the share of Personal consumption expenditure, Producers' durable equipment, Construction expenditure, Exports, Government purchases, and Own demand in total commodity output produced by the business support industry.

The first thing that is required in order to produce the weighted average is to generate a concordance between the industry classification of the CPS and the one in the Use matrix of the Input-output table. Although tedious, this task is straightforward as both classifications provide a SIC (1987) correlate that can be used in matching them. A more interesting issue is the level of aggregation for the industry variable. The trade-off is between using a lower level of aggregation, to improve the mapping from the distribution of potential wages to the distribution of wages in the business support industry, and estimating the potential wages more precisely by using a higher level of aggregation. As was pointed out earlier, a short and a long industry aggregation has been chosen. The short one is, more or less, standard in the literature. The longer one tries to maximize the number of categories without leaving industry-occupation cells with less than thirty observations. Complete details on aggregation and matching of industry classifications used to produce the weights can be found in Appendix A.

The evidence from Table 4.3 implies that some of the workers in the business support sector are working in providing services for final demand and own intermediate demand. This would not be a problem if the 'identity' of these workers were known. They could then be excluded when computing the average wage in the business support industry. Unfortunately, this information is not available in

[12] That was not the case for the business support services provided by the Advertising industry, where the commodity in question was produced by many other industries. Especially, those classified in the Communications industry.

individual level data sets. Therefore, if only the information from intermediate interindustry sales were used to produce the weights we would be (implicitly) imputing the average wage in the business support industry to individuals providing services for final demand and own intermediate demand. However, a better alternative may be to add final demand components and own intermediate demand to 'similar' categories of intermediate industry sales. The following paragraphs provide a case by case analysis of how this task can be performed[13]. Complete details of any imputation of final demand components to industries used to produce the weights can be found in Appendix A. It should be clear that these imputations only make sense under the null that internal equity constraints do not affect wage determination.

The final demand table of the input-output matrix is the final demand 'bridge' showing detailed purchases for 139 categories of final demand expenditures. This level of aggregation gives us some room to match industry characteristics with type of expenditure characteristics. To start with, Personal consumption absorbs seventeen percent of the total commodity output from SDB. Not surprisingly, in a less aggregated demand type classification, it can be seen that these sales correspond to the expenditure category Domestic services and household operation. It has been considered reasonable to sum these final sales to the intermediate sales of the industry that administers and rents flats, Real estate industry.

Producer's durable equipment absorbs thirteen percent of the total commodity output from the EAS. The idea here has been to match the type of expenditure with the industry that produces such item. Then, the average wage of that industry was imputed to those workers in the EAS industry assigned to produce these final demand services. For example, Furniture and fixtures final sales have been added to the intermediate sales of Lumber and wood products.

It is straightforward to impute wages for workers allocated to produce services purchased by the Government. For example, State and local government purchases of education have been assigned the average wage in the educational sector[14] and Federal government non-defense purchases, the average wage for those workers in the Public administration industry.

Finally, the share of own demand in total commodity produced by the business support industry is around one percent for SDB and seven percent for EAS services. If these sales reflect subcontracting within the industry there is not much one can do other than hope that this subcontracting is distributed across indus-

[13] Nothing has been done for the exports category but all in all it seems relatively unimportant.

[14] Notice, that the wage equations are estimated using a dummy for private sector employees so that the industry dummy for the education sector is computed holding constant that characteristic. In other words, the potential wage and the contracting-out wage are truly for observationally similar workers.

tries in a similar fashion to the other (observed) final and intermediate industry sales. Alternatively, own sales can reflect a purchase of a standard production input as it is does for any other industry. So, it can be assumed that the characteristics of the job are similar to those of other Professional or Business services firms and thus, own intermediate sales added to the corresponding industry.

In a fifteen industry classification, Table 4.4 presents three sets of weights for each business support industry. Weight 1, is the share of each industry in the intermediate sales of the business support industry in question. It includes own intermediate demand added to Professional services for EAS and to Business services for SDB. Weight 2, is similar to Weight 1 but includes final demand components. Finally, Weight 3 is similar to Weight 2 but excludes own intermediate demand.

It is clear from Table 4.4 that, for any of the three weights, the share of each industry in the contracting-out output is not evenly distributed. In particular, almost half of the production of SDB is directed to the Real estate industry. A somewhat similar concentration of sales, but to the Construction industry, occur for EAS services. The fact that the weights are so heavily concentrated in some industries is good news in terms of the potential robustness of the test to the use of different sets of weights.

4.3. Regression and test results

Table 4.5 shows the results of estimating (3.1) using a short list of industry dummies (fifteen) for each of the samples described in Table 4.2. The omitted industry is the corresponding business support industry (see, Table 4.1). The extent to which the average industry wage differs from that in the business support industry varies according to the occupation considered. In Cleaning & building services occupations, at a one percent level of statistical significance, thirteen out of fifteen industries exhibit an average wage different than that in the business support industry. However, Engineers, architects & surveyors have only two industry dummies out of fifteen statistically different from zero at the one percent level. Notice that the industries where the intermediate sales from the corresponding business support industry are heavily concentrated (see Table 4.4) exhibit an average wage different from that in the business support industry, at least, at a five percent level of statistical significance. Finally, the null hypothesis that the industry dummies are not jointly significant is always rejected.

Table 4.6 and 4.7 present the results of testing the linear restriction (3.7) and the nonlinear restriction (3.4), respectively. We will concentrate, however, only on the results for the non-linear test given that, as is clear from Table 4.5, the betas are not small (i.e., the bias they may produce on the test could be nonnegligible

– see, Halvorsen and Palmquist (1980)). At a one percent level of statistical significance, the null hypothesis that after controlling for the usual covariates the average wage for an occupation central to the business support industry is a weighted average of the wages in all other industries is rejected for any of the occupations and weights considered.

The robustness of these results has been checked in three different ways. First, the specification from Table 4.5 has been repeated but this time excluding union members and union covered workers. This can make a difference if the effect of unions on wages differs across industries (i.e., there are interaction terms). Second, a lower level of aggregation has been chosen for the industry variable (forty-five and thirty-three dummies). Although doing this reduces the average number of observations per industry-occupation cell, and thus the accuracy of estimation, it might provide a better mapping from the interindustry wage distribution to the wage distribution in the business support industry.

The regression results of these two exercises are presented in Table 4.8 and Table 4.9, respectively. Table 4.6 and 4.7 present the results of testing the linear restriction (3.7) and the nonlinear restriction (3.4), respectively. All in all the results from testing the non-linear restriction remain qualitatively similar. However, using the long list of industry dummies for Engineers, architects & surveyors, the null hypothesis can only be rejected at a five percent level of statistical significance[15].

Finally, the robustness of the results has been checked by adjusting the earnings figures to reflect industry variation in total compensation. The earnings data from the CPS includes wages, salaries, commissions, tips, piece-rate payments, and cash bonuses. However, it excludes employer contributions for social insurance, to private and welfare funds, etc. The adjustment that has been proposed in the literature (e.g., Krueger and Summers (1988) and Keane (1993)) relies on information from the National Income and Product Accounts (NIPA) on earnings and total compensation by industry. The ratio of total labor costs to wages in the corresponding industry is multiplied to the CPS hourly earnings data in order to account for industry variation in total compensation[16]. All of the results in tables 4.6 and 4.7 have been computed again using these adjusted earnings data[17]. In all cases the value for the Wald statistic increases considerably and the null is now rejected at a one percent level of statistical significance for all occupations and cases.

[15] Notice that using more industry dummies has only changed marginally our ability to explain wage variation.

[16] The industry breakdown of the tables in the NIPA compromise more than forty industries. It should be noted, however, that the information is for all occupations in the industry rather than only for the group considered here.

[17] This table is available from the author upon request.

5. Discussion

A rejection of the null hypothesis analyzed above may imply that the unobserved individual-job traits captured by the interindustry wage structure may have either changed in the process of contracting-out or differ (within industries) between firms that contract-out and do not contract-out these activities[18]. This could obviously be attributed to the fact that internal equity constraints will operate differently in different firms. However, one should not run into that conclusion without weighing up other reasons why the average unobserved individual-job trait in the business support industry might differ from the one hypothesized by (3.2).

First, in both competitive or (contract-theory motivated) efficiency wage models of wage determination, changes in unobserved individual-job components can occur through the process of contracting-out. A parent firm will purchase services from an outside contractor if by so doing it reduces the unit cost of producing a given good. The outside contractor could produce the required piece of activity at a lower unit cost than the parent firm, if it can obtain an efficiency unit of labor at a relatively lower price. In such cases, it can be said that wages determine the decision of the firm to use an outside contractor. This may happen when the outside contractor possesses a superior technical capability in managing human resources.

Economies of scale in recruiting, retaining and motivating workers can affect the wage paid for an efficiency unit of labor in many ways. In efficiency wage settings, for example, a contractor that can exploit economies of scale in monitoring worker characteristics can reduce the size of the rent that the firm is required to give up to achieve any given level of effort/quality[19].

In competitive labor market models one would expect that wages would not influence the decision of a firm to purchase services from an outside contractor. This is because the law of one price should also prevail for labor inputs. No doubt this is true when there are no asymmetries of information or workers are risk neutral.

However, when there is asymmetric information and workers are risk averse the answer is not so straightforward. With a perfect monitoring technology (although monitoring could occur randomly, as in the Shapiro and Stiglitz (1984) model) wages still should not matter[20]. If workers are risk averse, even in perfectly

[18] Alternatively the weighting system may be flawed or the wage equation misspecified.

[19] As it is well known (see, for example, Hamermesh (1993)), firms incur important fixed costs in hiring and training workers (i.e., turnover costs) so in efficiency wage settings unobserved individual-job traits may change because of economies of scale in recruiting, for example.

[20] When the monitoring technology involves no randomness the employer (principal) can always offer a forcing contract to the employee (agent) that will imply that there is no loss from

competitive labor markets, a contractor that possesses a relatively more accurate monitoring technology can obtain a given efficiency unit of labor at a lower wage. The reason for this is that given that the monitoring technology is imperfect, to induce any effort/quality level the firm needs to make the worker to bear some risk. Hence, a compensating differential will be needed to offset the effect of such a disamenity. Using a more accurate monitoring technology a firm can induce any level of effort/quality at lower risk levels, diminishing in this way the required compensating differential for risk bearing.

It is worth noticing that a firm that enjoys a technical superiority in managing human resources may find it profitable to demand a higher number of efficiency units of labor. Hence, although an efficiency unit of labor is relatively cheaper, the observed hourly wage does not need to be lower for a worker in such firm.

Finally, it is important to draw our attention to the effects of different sources of *intra*industry variation in the use of business support services. When the source of variation is related to a variable that is observable for the econometrician, the wages of individuals in the payroll of industry k could be used quite safely as potential wages for contracting-out workers in industry k. Such is the case, for example, if the contracting-out of business support services is related to geographical location[21]. Obviously, if the source of intraindustry variation is unobservable for the econometrician (and correlated with wage) then, the unobserved individual-job component for firms that use and do not use outside contractors will be different even within the same industry[22].

6. Conclusion

This paper has tested the null hypothesis that, ceteris paribus, the average wage for an occupation central to the business support industry is equal to a weighted average of the wages for this occupation in all other industries. It has been argued that a non-rejection of the null will cast doubts about the importance of norms of internal equity in wage determination. The results in this paper are consistent with the view that norms of internal equity are binding constraints for wage determination. It is also true that, as has been pointed out in the Discussion section and considering the many limitations imposed by the available

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the asymmetry of information (see, Harris and Raviv (1979)).

[21] Abraham and Taylor (1996), provide evidence that the use of services from outside contractors for the sort of activities considered here (e.g., Janitorial services and Drafting services) are strongly related to the metropolitan or non-metropolitan location of the contracting establishment.

[22] In relation to this, it will be important to control for the size of the firm as economies of scale might be one of the factors that explain intraindustry variation in the use of outside contractors. Unfortunately, such variable is not available in the CPS Basic Monthly survey.

data, they are consistent with other hypotheses. However, these results seemed harder to explain in competitive and (contract-theory motivated) efficiency wage frameworks given that most of the traits that characterize a certain task can be expected to be transferred to the contractor in the process of contracting-out.

7. Appendix A

Table 7.1, 7.2, and Table 4.1 have been prepared to provide all the details required to reproduce the different industry aggregations used in the paper. Further information for the Input-Output matrix and the CPS data can be obtained from the Bureau of Labor Statistics web site http://stats.bls.gov.

The first column of 7.1 and 7.2 shows the Industry census coding (the industry coding system used by the CPS) for the industry dummies used in producing Tables 4.5, 4.8 and 4.9. The second and third columns provide the necessary information to produce the short set of weights (Table 4.4) and the long set of weights (available upon request). The classification for industry and demand type in these two columns is the one provided by the Input-Output matrix.

Notice, first, that all the sales data used in constructing the weights is in current 1995 U.S. dollars. Weight 1 is the share for each industry of intermediate commodity sales from the business support commodity. It is the result of dividing the sales to each industry to total commodity sales, where industries are aggregated as shown in the second column of Table 7.2 and Table 7.1. The data on intermediate sales is drawn from the Use matrix. Weight 1 includes own intermediate sales. For the short set of weights, own intermediate sales have been added to Professional services for EAS services and to Business services for SDB. For the long set of weights, own sales have been added to Research and testing services for EAS services and to Miscellaneous business services for SDB.

Final demand sales have been added to intermediate industry sales in accordance with the third column of Table 7.2 and Table 7.1. The data on final demand is drawn from the Final Demand matrix. The shares constructed with these data constitute what has been called Weight 2. As was explained in Section 4.2 Weight 3 excludes own demand.

8. References

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Table 4.1: Industry and occupational coding

Business support industry	Services to dwellings and other buildings	Engineering, architectural, and surveying services
Industry census code, Input-output classification	722 , 137	882 , 165
Central occupations for the business support industry	Cleaning & building services occupations (except households and elevator operators)	Engineers, architects & surveyors
Occupation census code	448-453 & 455	43-63

Note: The occupation/industry classification is the one used by the 1990 US Census of Population code. The CPS uses this classification since January 1992. This coding system is based on the Standard Occupational Classification (1980) and the Standard Industrial Classification (1987), respectively. More details can be found on the CPS internet site: http://www.bls.census.gov/cps/cpsmain.htm

Table 4.2: Average characteristics: Business support industry versus Other industries. Standard errors in parentheses

Central occupations for the business support industry	Cleaning & building service occupations		Engineers, architects & surveyors		All occupations	
	Services to dwellings and other buildings	Other industries	Engineering, architectural and surveying services	Other industries	Professional and non-professional services	Other industries
Density	0.172	0.828	0.149	0.851	0.354	0.656
Hourly wage	7.488 (4.080)	8.045 (4.561)	21.648 (9.718)	22.815 (9.429)	13.003 (9.149)	12.382 (8.308)
Education	12th grade no diploma	12th grade no diploma	Bach. Degree	Bach. Degree	Assoc. degree-Ocupp./ vocat.	Some college but no degree
Age	37.627 (13.315)	41.226 (13.719)	39.113 (11.106)	40.469 (10.685)	38.716 (12.569)	37.173 (12.495)
Gender [1=male]	0.541	0.570	0.906	0.903	0.354	0.605
Ethnicity [1=white]	0.748	0.711	0.884	0.872	0.822	0.846
Marital Status [1=ever married]	0.677	0.722	0.776	0.818	0.728	0.713
Union member	0.096	0.180	0.026	0.064	0.142	0.153
Union coverage	0.013	0.020	0.005	0.019	0.024	0.014
Public sector	0.014	0.254	0.042	0.154	0.254	0.115
Part-time	0.353	0.235	0.045	0.019	0.223	0.149
Multiple Job Holder	0.055	0.060	0.047	0.044	0.074	0.052
Estimated wage diff. [1=Bus. Sup.]	-0.0309 (0.0093)		-0.0266 (0.0141)		-0.0493 (0.0017)	
Sample size	1994	10126	1132	6206	156683	286462

Note1: With the exception of Sample size average characteristics and standard deviations have been computed using the weights provided by the CPS for the Outgoing rotation group.
Note2: Covariates for Estimated wage differentials are: dummies for maximum educational attainment, age, age square, 3 regional dummies, metropolitan area dummy, gender dummy, ethniticity dummy, ever married dummy, public sector dummy, union member dummy, union coverage dummy, part-time worker dummy, multiple job holder dummy, 2 year dummies and dummies for intra-occupational categories. Except for occupational and regional dummies, all other variables are interacted with age and age square. The estimation method is OLS (i.e., without using weights) and Eicker-White standard errors are reported in parentheses.
Source: Pooled Basic Monthly CPS files (1994, 1996 and 1998).

Table 4.3: Business support industry: Commodity output, intermediate sales and final demand shares

Business support industry	Services to dwellings and other buildings	Engineering, architectural, and surveying services
Total commodity output	1	1.022
Imports	0.000	-0.002
Industry output	1.003	1.001
Intermediate comm. sales to other ind.	0.681[a]	0.740
Personal consumption expenditure	0.166[a]	0.000
Producers' durable equipment	0.000	0.128
Construction expenditures	0.000	0.000
Exports	0.002	0.047
Government purchases	0.138	0.016
Own demand	0.013	0.069

Note: The denominator in all ratios is commodity-industry output. Total commodity and industry output is obtained from the Out matrix. Commodity-industry output is taken from the diagonal of the Make matrix. Final demand components are from the Final Demand Aggregates matrix. All the used data is in current 1995 US dollars. Further information on the data and definitions can be obtained from the web site http://stats.bls.gov/empind3.htm. from which this data was downloaded.
Source: US Input-output matrix (1995).
[a]One of the industries in the Use matrix is Owner-occupied dwellings. As there is no correlate to such category in the SIC (1987) classification we found natural to add sales from this category to Domestic services and household operation from Personal consumption expenditure.

Table 4.4: Industry weights—short industry list

Business support industry	Services to dwellings and other buildings			Engineering, architectural, and surveying services		
Industry weight	1[a]	2[b]	3[c]	1[a]	2[b]	3[c]
1. Agriculture, forestry and fishery	0.000	0.000	0.000	0.003	0.002	0.003
2. Mining	0.000	0.000	0.000	0.012	0.010	0.011
3. Construction	0.005	0.003	0.003	0.581	0.494	0.532
4. Manufacturing—Durable	0.027	0.019	0.019	0.040	0.167	0.180
5. Manufacturing—Non durable	0.016	0.011	0.012	0.069	0.058	0.063
6. Transportation	0.016	0.011	0.011	0.008	0.007	0.007
7. Communications	0.016	0.011	0.011	0.017	0.015	0.016
8. Utilities	0.026	0.018	0.018	0.102	0.087	0.094
9. Wholesale trade	0.051	0.035	0.036	0.007	0.006	0.007
10. Retail trade	0.074	0.052	0.052	0.004	0.004	0.004
11. Finance and insurance	0.058	0.040	0.041	0.002	0.002	0.002
12. Real estate	0.465	0.490	0.496	0.033	0.028	0.030
13. Private, personal, business and other services	0.075	0.052	0.040	0.005	0.004	0.005
14. Professional and related services	0.170	0.176	0.178	0.116	0.100	0.030
15. Public Administration	0.000	0.080	0.082	0.000	0.015	0.017

Note: See Appendix A on the categories of the Use matrix and Final Demand matrix that are aggregated to produce each industry weight.
Source: US Input-output matrix (1995).
[a] Weight 1: Intermediate commodity sales. [b] Weight 2: Intermediate commodity sales plus final demand. [c] Weight 3: Intermediate commodity sales plus final demand minus own demand.

Table 4.5: Estimated interindustry wage differentials—short list of industry dummies. Robust standard errors in parentheses

Central occupations for the business support industry	Cleaning & building service occupations	Engineers, architects & surveyors
Dependent variable: Log (hourly wages)	Coefficient (s.e.)	Coefficient (s.e.)
1. Agriculture, forestry and fishery	0.0491 (0.0484)	0.0170 (0.0819)
2. Mining	0.0483[a] (0.0874)	-0.0253 (0.0441)
3. Construction	0.2104** (0.0475)	0.0480* (0.0228)
4. Manufacturing—Durable	0.1531** (0.0198)	0.0296 (0.0156)
5. Manufacturing—Non durable	0.1122** (0.0198)	0.0709** (0.0210)
6. Transportation	0.1672** (0.0313)	-0.1094 * (0.0503)
7. Communications	0.1891[b] (0.0657)	0.0106 (0.0290)
8. Utilities	0.1905 (0.0417)	0.0573* (0.0234)
9. Wholesale trade	0.0866** (0.0306)	-0.0690 (0.0496)
10. Retail trade	-0.0500** (0.0141)	-0.0690 (0.0503)
11. Finance and insurance	0.1346** (0.0347)	0.0788 (0.0482)
12. Real estate	0.0680** (0.0161)	-0.1226[c] (0.1119)
13. Private, personal, business and other services	-0.0392** (0.0114)	0.0203 (0.0297)
14. Professional and related services	0.0380** (0.0111)	0.0121 (0.0243)
15. Public Administration	0.0921** (0.0233)	0.1049** (0.0277)
p-value: F-test for industry dummies joint significance	0.0000	0.0000
R^2	0.3007	0.2840
Sample size	12120	7338
N-K	12019	7238

Note: Wage equations are computed under the same conditions than those stated in Note2, Table 4.2. The omitted industry is the corresponding business support industry (see Table 4.1).
Source: Pooled Basic Monthly CPS files (1994, 1996 and 1998).
[a] 27 industry observations.[b] 18 industry observations. [c] 24 industry observations. * significant at the 5% level. **significant at the 1% level.

Table 4.6: Linear restriction: Wald test

Central occupation for the business support industry	Cleaning & building service occupations	Engineers, architects & surveyors
	Wald statistic (p-value)	Wald statistic (p-value)
Short list of industry dummies (whole sample)		
Weight 1	31.99 (0.0000)	4.72 (0.0299)
Weight 2	32.82 (0.0000)	5.33 (0.0210)
Weight 3	33.92 (0.0000)	5.68 (0.0172)
Short list of industry dummies (excluding union covered and members)		
Weight 1	33.42 (0.0000)	3.30 (0.0693)
Weight 2	35.52 (0.0000)	3.84 (0.0500)
Weight 3	36.76 (0.0000)	3.97 (0.0463)
Long list of industry dummies (whole sample)		
Weight 1	45.17 (0.0000)	4.39 (0.0362)
Weight 2	48.73 (0.0000)	4.05 (0.0442)
Weight 3	49.21 (0.0000)	2.94 (0.0866)

Note1: The aggregation used to construct the weights can be found in the Appendix A.
Note2: The variance-covariance matrix used to compute the Wald statistic is robust to unknown forms of heteroscedasticity.
Source: US Input-Output matrix (1995) and Pooled Basic Monthly CPS files (1994, 1996 and 1998).

Table 4.7: Non-linear restriction: Wald test

Central occupations for the business support industry	Cleaning & building service occupations	Engineers, architects & surveyors
	Wald statistic (p-value)	Wald statistic (p-value)
Short list of industry dummies (whole sample)		
Weight 1	30.32 (0.0000)	15.41 (0.0001)
Weight 2	29.82 (0.0000)	15.10 (0.0001)
Weight 3	31.71 (0.0000)	17.19 (0.0000)
Short list of industry dummies (excluding union covered and members)		
Weight 1	31.28 (0.0000)	12.25 (0.0005)
Weight 2	32.01 (0.0000)	12.14 (0.0005)
Weight 3	33.96 (0.0000)	13.65 (0.0002)
Long list of industry dummies (whole sample)		
Weight 1	41.82 (0.0000)	4.45 (0.0350)
Weight 2	46.75 (0.0000)	4.37 (0.0366)
Weight 3	50.58 (0.0000)	3.88 (0.0490)

Note1: The aggregation used to construct the weights can be found in the Appendix A.
Note2: The variance-covariance matrix used to compute the Wald statistic is robust to unknown forms of heteroscedasticty.
Source: US Input-Output matrix (1995) and Pooled Basic Monthly CPS files (1994, 1996 and 1998).

Table 4.8: Estimated interindustry wage differentials excluding union members and covered—short list of industry dummies. Robust standard errors in parentheses.

Central occupations for the business support industry	Cleaning & building service occupations	Engineers, architects & surveyors
Dependent variable: Log (hourly wages)	Coefficient (s.e.)	Coefficient (s.e.)
1. Agriculture, forestry and fishery	0.0403 (0.0484)	0.0358 (0.0868)
2. Mining	0.0127[a] (0.1021)	-0.0305 (0.0454)
3. Construction	0.2282** (0.0538)	0.0414 (0.0246)
4. Manufacturing—Durable	0.1334** (0.0219)	0.0277 (0.0161)
5. Manufacturing—Non durable	0.0944** (0.0215)	0.0668** (0.0217)
6. Transportation	0.1182** (0.0453)	-0.0928 (0.0570)
7. Communications	0.1852[b]** (0.0737)	0.0254 (0.0308)
8. Utilities	0.1694** (0.0573)	0.0554* (0.0250)
9. Wholesale trade	0.0863* (0.0340)	-0.0775 (0.0500)
10. Retail trade	-0.0418** (0.0148)	-0.0690 (0.0513)
11. Finance and insurance	0.1562** (0.0351)	0.0781 (0.0485)
12. Real estate	0.0774** (0.0169)	-0.1488[c] (0.1266)
13. Private, personal, business and other services	-0.0483** (0.0118)	0.0129 (0.0308)
14. Professional and related services	0.0451** (0.0118)	0.0168 (0.0255)
15. Public Administration	0.1068** (0.0297)	0.1022** (0.0321)
p-value: F-test of industry dummies joint significance	0.0000	0.0022
R^2	0.2371	0.2841
Sample size	9828	6777
N-K	9733	6684

Note: Wage equations are computed under the same conditions than those stated in Note2, Table 4.2. The omitted industry is the corresponding business support industry (see Table 4.1).
Source: Pooled Basic Monthly CPS files (1994, 1996 and 1998).
[a]22 industry observations. [b] 15 industry observations. [c] 21 industry observations.
*significant at the 5% level. **significant at the 1% level.

Table 4.9: Estimated interindustry wage differentials—long list of industry dummies. Robust standard errors in parentheses.

<table>
<tr><th colspan="2">Central occupations for the business support industry</th><th>Cleaning & building service occupations</th><th>Engineers, architects & surveyors</th></tr>
<tr><td colspan="2">Dependent variable: Log (hourly wages)</td><td>Coefficient
(s.e.)</td><td>Coefficient
(s.e.)</td></tr>
<tr><td>1.</td><td>Agriculture, forestry and fishery</td><td>0.0538
(0.0485)</td><td>0.0052
(0.0819)</td></tr>
<tr><td>2.</td><td>Mining</td><td>0.0526[a]
(0.0876)</td><td>-0.0111
(0.0443)</td></tr>
<tr><td>3.</td><td>Construction</td><td>0.2218**
(0.0477)</td><td>0.0324
(0.0231)</td></tr>
<tr><td>4.</td><td>Lumber and wood products</td><td>0.0798*
(0.0347)</td><td>-0.0587
(0.0837)</td></tr>
<tr><td>5.</td><td>Stone, clay, glass and concrete products</td><td>0.1493[b]
(0.0920)</td><td rowspan="2">0.0179[δ]
(0.0325)</td></tr>
<tr><td>6.</td><td>Primary metal products</td><td>0.1318*
(0.0539)</td></tr>
<tr><td>7.</td><td>Other metal products</td><td>0.1090*
(0.0541)</td><td>-0.0164
(0.0330)</td></tr>
<tr><td>8.</td><td>Machinery, except electrical</td><td>0.1616**
(0.0470)</td><td>0.0189
(0.0210)</td></tr>
<tr><td>9.</td><td>Electrical machinery, equipment and supplies</td><td>0.1178*
(0.0584)</td><td>0.0254
(0.0207)</td></tr>
<tr><td>10.</td><td>Motor vehicles and equipment</td><td>0.3682**
(0.0454)</td><td>0.1322**
(0.0239)</td></tr>
<tr><td>11.</td><td>Other transportation equipment</td><td>0.2025[b]**
(0.0569)</td><td>0.0614**
(0.0210)</td></tr>
<tr><td>12.</td><td>Other non durable equipment</td><td>0.0629
(0.0496)</td><td>-0.0086
(0.0250)</td></tr>
<tr><td>13.</td><td>Food, kindred and tobacco products</td><td>0.1103**
(0.0269)</td><td>-0.0325
(0.0557)</td></tr>
<tr><td>14.</td><td>Textile mill products</td><td>0.0611
(0.0602)</td><td rowspan="2">0.0229[δ]
(0.0544)</td></tr>
<tr><td>15.</td><td>Apparel and other finished textile and leather products</td><td>-0.0287
(0.0614)</td></tr>
<tr><td>16.</td><td>Paper and allied products</td><td>0.1965**
(0.0668)</td><td>0.0978
(0.0427)</td></tr>
<tr><td>17.</td><td>Printing, publishing and allied products</td><td>0.0825
(0.0586)</td><td>0.0129
(0.0776)</td></tr>
<tr><td>18.</td><td>Chemical, petroleum, coal and allied products</td><td>0.2795**
(0.0529)</td><td>0.1237**
(0.0277)</td></tr>
<tr><td>19.</td><td>Rubber and miscellaneous plastic products</td><td>0.0290
(0.0475)</td><td>0.0497
(0.0352)</td></tr>
</table>

Table 4.9 (continued)

20. Railroads, Bus services and urban transit	0.2562** (0.0948)	
21. Trucking and warehousing	0.0077 (0.0467)	-0.1191$^{\delta}$* (0.0499)
22. Water and air transportation	0.1334 (0.0530)	
23. Other transportation	0.2685** (0.0455)	
24. Electric utilities	0.2661** (0.0743)	0.0838** (0.0259)
25. Other utilities	0.1732$^{\delta}$** (0.0395)	-0.0072 (0.0374)
26. Communications		0.0135 (0.0292)
27. Wholesale trade	0.0888** (0.0306)	-0.0645^{c} (0.0496)
28. Eating and drinking places	-0.0863** (0.0197)	-0.0704$^{\delta}$ (0.0505)
29. Other retail trade	-0.0234 (0.0170)	
30. Banking, Insurance and other finance	0.1384** (0.0346)	0.0144$^{\delta}$ (0.0503)
31. Real estate	0.0733** (0.0161)	
32. Hotels and other lodging places	-0.0573** (0.0147)	
33. Other personal and private services	-0.0154 (0.0344)	
34. Services to buildings	0	-0.0688$^{\delta}$ (0.0501)
35. Repair services	-0.0564 (0.0411)	
36. Miscellaneous business services	0.0429$^{\delta}$ (0.0650)	
37. Computer and data processing services		0.0690 (0.0399)
38. Personnel supply services	-0.0904* (0.0402)	0.0579 (0.0888)

Table 4.9 (continued)

39. Entertainment and recreation services	-0.0406* (0.0194)	-0.0496[d] (0.0794)
40. Hospitals	0.0295 (0.0159)	-0.0716[δ] (0.0532)
41. Offices of health practitioners	0.1705* (0.0688)	
42. Nursing and personal care facilities	-0.0272 (0.0177)	
43. Health services, nec	0.0048 (0.0425)	
44. Educational services	0.0746** (0.0150)	-0.1678** (0.0476)
45. Engineering, architectural and surveying services	0.0984[δ]** (0.0211)	0
46. Research and testing services		0.0875** (0.0312)
47. Accounting, auditing and other services		0.1115[δ]** (0.0482)
48. Other professional services, excluding social services		
49. Residential care facilities	-0.0134 (0.0273)	
50. Other social services	-0.1137** (0.0376)	
51. Public administration	0.1170** (0.0246)	0.0690* (0.0285)
p-value: F-test for industry dummies joint significance	0.0000	0.0000
R^2	0.3106	0.2927
Sample size	12120	7338
N-K	11989	7220

Note: Wage equations are computed under the same conditions than those stated in Note2, Table 4.2. The omitted industry is the corresponding business support industry (see Table 4.1).
Source: Pooled Basic Monthly CPS files (1994, 1996 and 1998).
[δ]the estimated coefficient is for all industries in the cell. [a] 27 industry observations. [b] 29 industry observations. [c]21 industry observations. [d]28 industry observations. * significant at the 5% level. **significant at the 1% level.

Table 7.1: Weights and dummies aggregates–short list

		Industry census code (CPS)	Input-output matrix industry coding	Input-output matrix final demand type coding
1.	Agriculture, forestry and fishery	010-032	1-3	
2.	Mining	040-050	4-8	
3.	Construction	060	9	
4.	Manufacturing—Durable	230-392	10-67	81-95[a], 100-102[a]
5.	Manufacturing—Non durable	100-222	68-107	
6.	Transportation	400-432	108-115, 170, 174	
7.	Communications	440-442	116	
8.	Utilities	450-472	117-119, 171-172, 175-176	
9.	Wholesale trade	500-571	120	
10.	Retail trade	580-691	121-122	
11.	Finance and insurance	700-711	123-127	
12.	Real estate	712	128, 130[#]	41-42[b]
13.	Private, personal, business and other services	721-810	169, 131-152	
14.	Professional and related services	812-893	153-168	136[c]
15.	Public Administration	900-932	173, 179	130[c], 133[c], 139[c]

Source: US Input-Output matrix (1995) and Pooled Basic Monthly CPS files (1994, 1996 and 1998).
[a]Demand type: Producers' durable equipment. [b]Demand Type: Personal consumption expenditure. [c]Demand type: Government purchases.[#]Industry 130 in the Input-Output classification is Owner-occupied dwellings. As there is no correlate to such category in the SIC (1987) classification we found natural to add sales from this category to Domestic services and household operation from Personal consumption expenditure. This implies that intermediate sales to industry 130 are not included when constructing weight 1.

Table 7.2: Weights and dummies aggregates–long list

		Industry census code (CPS)	Input-output matrix industry coding	Input-output matrix final demand type coding
1.	Agriculture, forestry and fishery	010-032	1-3	
2.	Mining	040-050	4-8	
3.	Construction	060	9	
4.	Lumber and wood products	230-242	10-17	81[a]
5.	Stone, clay, glass and concrete products	250-262	18-21	
6.	Primary metal products	270-280	22-27	
7.	Other metal products	281-301	28-36	82[a], 100[a]
8.	Machinery, except electrical	310-332	37-45	83-92[a]
9.	Electrical machinery, equipment and supplies	340-350	46-53	93-95[a]
10.	Motor vehicles and equipment	351	54	
11.	Other transportation equipment	352, 360-370	55-58	
12.	Other non durable equipment	371-382, 390-392	59-67	101-102[a]
13.	Food, kindred and tobacco products	100-122, 130	68-76	
14.	Textile mill products	132-150	77-80	
15.	Apparel and other finished textile and leather products	151-152, 220-222	81-82, 106-107	
16.	Paper and allied products	160-162	83-85	
17.	Printing, publishing and allied products	171-172	86-93	
18.	Chemical, petroleum, coal and allied products	180-192, 200-201	94-102	
19.	Rubber and miscellaneous plastic products	210-212	103-105	
20.	Railroads, Bus services and urban transit	400-402	108-109	
21.	Trucking and warehousing	410-411	110	
22.	Water and air transportation	420-421	111-112	
23.	Other transportation	412, 422, 432	113-115, 170, 174	
24.	Electric utilities	450	117, 171, 175	
25.	Other utilities	451-472	118-119, 172, 176	
26.	Communications	440-442	116	

Table 7.2 (continued)

27.	Wholesale trade	500-571	120	
28.	Eating and drinking places	641	122	
29.	Other retail trade	580-640, 642-691	121	
30.	Banking, Insurance and other finance	700-711	123-127	
31.	Real estate	712	128, 130[#]	41-42[b]
32.	Hotels and other lodging places	762-770	131	
33.	Other personal and private services	761, 771-791	132-135, 169	
34.	Services to buildings	722	137	
35.	Repair services	750-760	143-146	
36.	Miscellaneous business services	721, 733-742	136, 138, 141-142	
37.	Computer and data processing services	732	140	
38.	Personnel supply services	731	139	
39.	Entertainment and recreation services	800-810	147-152	
40.	Hospitals	831	155, 177	
41.	Offices of health practitioners	812-830	153	
42.	Nursing and personal care facilities	832-839	154	
43.	Health services, nec	840	156	
44.	Educational services	842-860	158, 178	136[c]
45.	Engineering, architectural and surveying services	882	165	
46.	Research and testing services	891	166	
47.	Accounting, auditing and other services	890	168	
48.	Other professional services, excluding social services	841, 872-881, 883-889, 892-893	157, 163, 164, 167	
49.	Residential care facilities	870	162	
50.	Other social services	861-869, 871	159-161	
51.	Public administration	900-932	173, 179	130[c], 133[c], 139[c]

Source: US Input-Output matrix (1995) and Pooled Basic Monthly CPS files (1994, 1996 and 1998). [a]Demand type: Producers' durable equipment. [b]Demand Type: Personal consumption expenditure. [c]Demand type: Government purchases. [#]Industry 130 in the Input-Output classification is Owner-occupied dwellings. As there is no correlate to such category in the SIC (1987) classification we found natural to add sales from this category to Domestic services and household operation from Personal consumption expenditure. This implies that intermediate sales to industry 130 are not included when constructing weight 1.