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Constructing Interarea Compensation Cost Indexes With Data from Multiple Surveys

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Abstract. We compare the cost of labor input for 39 areas of the United States using Törnqvist multilateral (transitive) place to place index numbers incorporating characteristics-based, hedonic labor characteristics adjustment as an integral feature. Our characteristics adjustments are based on establishment data at the level of the approximately 18,000 jobs priced in the Employment Cost Index (ECI) survey, and worker data at the level of the 39 areas in the ECI sample from the Current Population Survey. We find that the compensation parities prior to labor characteristics adjustment are generally more variable from place to place than after adjustment, and that the primary determinants of geographical compensation variations after controlling for industry and occupation are firm size and unionization from the establishment data, and education/experience from the worker data.

I. Introduction

Place to place compensation cost comparisons for areas within the United States are very much in demand to inform facility location decisions and locality salary administration policy in both the private and public sectors. The Bureau of Labor Statistics (BLS) has operated geographically comprehensive surveys measuring locality wage levels since 1991, primarily to support the Federal Employee Pay Comparability Act (FEPCA). This law was enacted to align the locality compensation for Federal employees with the comparable non-Federal workforce. Similar studies oriented more toward place to place comparisons of compensation are undertaken in the private sector by several companies, often with specialties in certain industry and/or occupational groups.

Labor services differ in type and quality from area to area. The central problem this paper considers is how indexes comparing employee compensation costs across geographic areas that account for the heterogeneity of jobs and workers may be formulated and calculated. A long-standing approach to the heterogeneity problem, taken for example by the BLS in the above mentioned Occupational Compensation Survey program, is to make interarea comparisons only between the same narrowly defined jobs that exist in every area for which comparisons are to be made. The limitation of this approach is that the comparisons apply only to the population of jobs that are found in all areas, while jobs that are specific to only certain areas are excluded from the comparisons.

Another approach, which we follow in this paper, is to define jobs more broadly by industry and occupation, and to utilize data for all jobs to make interarea comparisons. Within these broader groups, the compensation rates received by specific jobs are then related to specific quantitative information on the characteristics of the jobs using a statistical model, known in the economics and economic statistics literature as a hedonic model. Heterogeneity is controlled for by employing the parameters estimated in these hedonic models, fitted using regression analysis, to adjust for observable characteristics of workers and jobs. This approach has the advantage of covering all jobs in each labor market. However, it requires additional information about jobs or workers that can be used as covariates in the hedonic regressions.

To provide a context and rigorous interpretation for our indexes, we begin with a standard microeconomic framework for input price indexes developed in a long economic index number literature, positing a model of producer input cost minimization conditioning on output and exogenously determined input prices. A good statement of this basic economic input price index framework applied to labor input cost measurement is given in Triplett (1983). Triplett also discusses the application of hedonic regression methods to adjust for labor quality.

We take these index number concepts and hedonic labor quality measurement methods and incorporate them into an integrated, computable index number system. To construct place to place compensation comparisons, we use a Törnqvist index formula. We adopt the Törnqvist formula, rather than alternatives also used in geographical price comparisons such as the Geary (1958)-Khamis (1970) "international prices" system, or an adjusted Fisher ideal approach, because the Törnqvist framework simultaneously displays five important features:

- First, the Törnqvist formulas we use for bilateral comparisons have been shown by Diewert (1976) to be exact for the Translog flexible functional form. By implication, they accurately accommodate producer's substitution decisions among types of labor services as their relative prices differ from place to place.
- Second, Caves, Christensen, and Diewert (1982b) have shown that the Törnqvist index number is exact even when there are significant differences in the underlying technology between situations compared. These indexes therefore accommodate variations in the technology producers select as they consider various site locations.
- Third, Kokoski, Moulton, and Zieschang (KMZ) (1996) provide a closed form for the class of all systems Törnqvist bilateral index numbers that are transitive, generalizing a result along these lines introduced by Caves, Christensen, and Diewert (1982a), and provide a feasible algorithm for computing such systems of index numbers. Clearly, use of our compensation indexes to inform a salary administration policy for geographically dispersed organizations would require the transitivity property to

eliminate the possibility of gains and losses accruing to reassigned staff as a sole result of a series of relocations.

- Fourth, KMZ demonstrate that the Törnqvist multilateral system of parities will aggregate in a natural way with respect to a given classification hierarchy for types of labor. This facilitates explaining variations in aggregate compensation in terms of variations in the component occupations making up the aggregate, an important property for a system of public compensation statistics.
- Fifth, KMZ have adapted earlier exact index number results from Zieschang (1985, 1988) and Fixler and Zieschang (1992) to incorporate information on variation in the characteristics of detailed items when making Törnqvist index number comparisons. In this index number framework, coefficients from hedonic compensation regressions are used in constructing labor quality adjustment factors for place to place indexes of compensation rates. Because of the heterogeneity in the measured characteristics of labor employed within industry/occupation groups across areas, these exact quality adjustments are important for making accurate compensation comparisons from place to place.

In Section II we briefly state the microeconomic foundations of our approach using standard production theory, and show how the aggregate conceptual bilateral area indexes of this framework can be operationalized using Törnqvist exact and superlative index numbers. We then show how the differing measured labor services characteristics that are encountered in various areas can be accounted for in the index framework. In Section III, we establish the implications of transitivity in our Törnqvist interarea index system, and in Section IV, we show how transitivity can be imposed with minimal adjustment of the data. In Section V, we apply this methodology to establishment microdata on jobs from the U.S. Employment Cost Index (ECI), and area/occupation/industry data on workers from the Current Population Survey (CPS), and present labor services characteristics-adjusted interarea wage and compensation indexes for 39 major urban centers and rest-of-regional-division geographical areas. We conclude in Section VI.

II. Economic index number concepts incorporating information on the characteristics of heterogeneous labor services

Let p_i^a be the price or compensation rate in area *a*, of which there are *A* areas in total, of labor services of occupation *i*. Let q_i^a be the corresponding quantity purchased and let x_i^a be the vector of characteristics of the *ith* job specification for labor services transacted in area *a*. Let e_h^a represent the total labor services expense of establishment *h* in area *a*, and let q_h^a denote the vector of labor services consumed by establishment *h* in area *a* with vector of characteristics x_h^a and prices p_h^a.

We suppose that each establishment in area *a* minimizes the cost of achieving a given level of output u_h^a at expenditure level e_h^a so that the establishment expense incurred for a given quality of labor services as determined by the vector x_h^a would be

$$e_h^a = E_h^a(u_h^a, x_h^a, p_h^a) = \min_{q_h^a}\left\{p_h^{a\prime} q_h^a : d_h^a\left(u_h^a, x_h^a, q_h^a\right) \geq 1\right\}.$$

where $d_h^a\left(u_h^a, x_h^a, q_h^a\right)$ is the joint production function of establishment *h*.[1] To reduce clutter, we condition on and suppress the nonlabor inputs used by establishment *h*.

We suppose further that an establishment in area *a* faces a hedonic locus of market equilibrium prices across the labor services quality spectrum given by $p_h^a = H^a\left(x_h^a\right)$, and

---

[1] This particular joint production function is the *input distance function*, given by

$$d_h^a\left(u_h^a, x_h^a, q_h^a\right) = \sup_\theta\left\{\theta : \left(u_h^a, x_h^a, \frac{1}{\theta} q_h^a\right) \text{ is feasible}\right\}.$$

that the establishment minimizes the cost of achieving outputs u_h^a over the characteristics of labor services, so that

$$\nabla_{x_h^a} E_h^a\left(u_h^a, x_h^a, p_h^a\right) + \nabla_{x_h^a} p_h^{a\prime} \nabla_{p_h^a} E_h^a\left(u_h^a, x_h^a, p_h^a\right) = 0 \tag{1}$$

Since $\nabla_{x_h^a} p_h^a = \nabla_{x_h^a} H^a$ and $\nabla_{p_h^a} E_h^a\left(u_h^a, x_h^a, p_h^a\right) = q_h^a$, the latter by the Shephard/Hotelling lemma, we have

$$\nabla_{x_h^a} E_h^a\left(u_h^a, x_h^a, p_h^a\right) = -\nabla_{x_h^a} H^{a\prime} q_h^a \tag{2}$$

If H^a is semilog, as generally assumed in hedonic studies, so that

$$\ln H_i^a = \alpha_i^a + \beta_i^{a\prime} x_i^a \tag{3}$$

then the characteristics gradient expression can be rewritten

$$\nabla_{x_h^a} E_h^a\left(u_h^a, x_h^a, p_h^a\right) = -\beta^{a\prime} w_h^a e_h^a \tag{4}$$

where $w_{i,h}^a = \dfrac{p_{i,h}^a q_{i,h}^a}{\sum_i p_{i,h}^a q_{i,h}^a}$

$w_h^a = \begin{bmatrix} w_{1,h}^a \\ \vdots \\ w_{N_q,h}^a \end{bmatrix}$; N_q = number of types (occupations) of labor

$$\beta^{a\prime} = \begin{bmatrix} \beta_1^{a\prime} \\ \vdots \\ \beta_{N_x}^{a\prime} \end{bmatrix}; N_x = \text{number of labor services characteristics}.$$

Diewert (1987) considers the area aggregation of individual establishments in the context of an area production function. We follow this general notion but will require some modifications to handle the heterogeneity of labor service types and their prices within and between areas. Turning now to aggregate labor input expense over establishments in an area, we have

$$E^a\left(\vec{u}^a, \vec{x}^a, \vec{p}^a\right) = \sum_h E_h^a\left(u_h^a, x_h^a, p_h^a\right)$$

where the $\rightarrow$ over an argument indicates the concatenation of vectors across establishments. We then consider the labor services expenditure or cost function in terms of log transformed price arguments as

$$Q^a\left(\vec{u}^a, \vec{x}^a, \ln \vec{p}^a\right) = E^a\left(\vec{u}^a, \vec{x}^a, \vec{p}^a\right) = \sum_h E_h^a\left(u_h^a, x_h^a, p_h^a\right) = \sum_h Q_h^a\left(u_h^a, x_h^a, \ln p_h^a\right).$$

We aggregate across establishments in area *a* such that the expenditure weighted average for characteristics and log-labor services prices represent the indicators determining area demand behavior, where area item demand for labor services is the sum of the establishment item demands for the area. We do not require strong aggregation conditions, but effectively hold the distribution of labor services characteristics and compensation rates fixed across establishments within area *a* as in

$$\tilde{Q}^a\left(\vec{u}^a, \bar{x}^a, \overline{\ln p}^a\right) = Q^a\left(\vec{u}^a, \iota \otimes \bar{x}^a + \nu_x^a, \iota \otimes \overline{\ln p}^a + \nu_{\ln p}^a\right) \qquad (5)$$

where

$$\nu_x^a = \vec{x}^a - \iota \otimes \bar{x}^a$$

$$\nu_{\ln p}^a = \ln \vec{p}^a - \iota \otimes \overline{\ln p}^a$$

ι = a vector of ones equal in dimension to the number of establishments in area *a*

$\otimes$ = Kronecker product

give the deviations of the area means from the individual establishment values for labor services characteristics and log compensation rates paid.

Diewert (1976) and Caves, Christensen, and Diewert (1982b) have shown, using the derivatives of the expenditure function with respect to log prices expressed in terms of observable expenditure shares, that the Törnqvist index number is exact for the Translog flexible functional form, which differentially approximates any price aggregator function (i.e., cost of utility, input cost, revenue function) to the second order at a point, and it is exact even when some of the parameters (those on the first-order terms) of the underlying aggregator function are different in the two periods or localities compared. We take the derivative of the area expenditure function with respect to establishment labor cost weighted aggregate arguments to obtain

$$\begin{aligned} &\frac{\partial}{\partial \bar{x}_{iz}^a} \ln \tilde{E}^a\left(\vec{u}^a, \bar{x}^a, \exp(\overline{\ln p}^a)\right) = \frac{\partial}{\partial \bar{x}_{iz}^a} \ln \tilde{Q}^a\left(\vec{u}^a, \bar{x}^a, \overline{\ln p}^a\right) = \\ &\quad = \sum_h \frac{\partial}{\partial x_{izh}^a} Q_h^a\left(u_h^a, x_h^a, \ln p_h^a\right) / \tilde{Q}^a = -\beta_{izx}^a \sum_h w_{ih}^a s_h^a = -\beta_{izx}^a \overline{w}_i^a \end{aligned} \qquad ((6)$$

$$\begin{aligned} &\frac{\partial}{\partial \overline{\ln p}_i^a} \ln \tilde{E}\left(\vec{u}^a, \bar{x}^a, \exp(\overline{\ln p}^a)\right) = \frac{\partial}{\partial \overline{\ln p}_i^a} \ln \tilde{Q}\left(\vec{u}^a, \bar{x}^a, \overline{\ln p}^a\right) \\ &\quad = \sum_h \frac{\partial}{\partial \ln p_{izh}^a} Q_h^a\left(u_h^a, x_h^a, \ln p_h^a\right) / \tilde{Q}^a = \sum_h w_{ih}^a s_h^q = \overline{w}_i^a \end{aligned} \qquad (7)$$

where

$$w_{ih}^{a} = \frac{p_{ih}^{a} q_{ih}^{a}}{\sum_{i} p_{ih}^{a} q_{ih}^{a}} = \frac{p_{ih}^{a} q_{ih}^{a}}{e_{h}^{a}}$$

$$s_{h}^{a} = \frac{e_{h}^{a}}{\sum_{h} e_{h}^{a}}$$

are, respectively, the within firm labor cost shares of occupations and the between firm labor cost shares of establishments in area *a*.

Finally, we assume that the area aggregate labor services cost function $\ln \tilde{Q}^{a}\left(u^{a}, \bar{x}^{a}, \overline{\ln p}^{a}\right)$ has a quadratic, "semi-translog" functional form in its arguments with coefficients of second-order terms independent of location, but with possibly location-specific coefficients on linear terms. Following CCD (1982b), then, we can derive the following (logarithmic) index number result:

$$\begin{aligned}
&\ln I^{ab} = \\
&\tfrac{1}{2}\left[\ln \tilde{Q}^{a}\left(\vec{u}^{a}, \bar{x}^{b}, \overline{\ln p}^{b}\right) - \ln \tilde{Q}^{a}\left(\vec{u}^{a}, \bar{x}^{a}, \overline{\ln p}^{a}\right) + \ln \tilde{Q}^{b}\left(\vec{u}^{b}, \bar{x}^{b}, \overline{\ln p}^{b}\right) - \ln \tilde{Q}^{b}\left(\vec{u}^{b}, \bar{x}^{a}, \overline{\ln p}^{a}\right)\right] \\
&\qquad = \tfrac{1}{2}\left[\nabla_{\ln p} \ln \tilde{Q}^{a}\left(\vec{u}^{a}, \bar{x}^{a}, \overline{\ln p}^{a}\right) + \nabla_{\ln p} \ln \tilde{Q}^{b}\left(\vec{u}^{b}, \bar{x}^{b}, \overline{\ln p}^{b}\right)\right]\left(\overline{\ln p}^{b} - \overline{\ln p}^{a}\right) \qquad (8) \\
&\qquad + \tfrac{1}{2}\left[\nabla_{x} \ln \tilde{Q}^{a}\left(\vec{u}^{a}, \bar{x}^{a}, \overline{\ln p}^{a}\right) + \nabla_{x} \ln \tilde{Q}^{b}\left(\vec{u}^{b}, \bar{x}^{b}, \overline{\ln p}^{b}\right)\right]\left(\bar{x}^{b} - \bar{x}^{a}\right)
\end{aligned}$$

Substituting (6) and (7) into (8), we have

$$\ln I^{ab} = \ln T^{ab} \equiv \tfrac{1}{2}\sum_{i}\left[\left(\bar{w}_{i}^{a} + \bar{w}_{i}^{b}\right)\left(\overline{\ln p}_{i}^{b} - \overline{\ln p}_{i}^{a}\right) - \sum_{z}\left(\beta_{iz}^{a}\bar{w}_{i}^{a} + \beta_{iz}^{b}\bar{w}_{i}^{b}\right)\left(\bar{x}_{iz}^{b} - \bar{x}_{iz}^{a}\right)\right]. \qquad (9)$$

This is an extremely flexible result that permits all parameters of the semi-log "hedonic" labor services compensation equations to differ by area, and reflects establishments' optimizing behavior in considering location and the available characteristics of labor services.

III. Törnqvist Multilateral (Transitive) Systems of Bilateral Compensation Index Numbers

In another paper, Caves, Christensen, and Diewert (CCD, 1982a) noted that the system of bilateral Törnqvist interarea indexes is not transitive, but developed a simply calculated multilateral variant satisfying the transitivity property. Following Kokoski, Moulton, and Zieschang (KMZ, 1996), we apply the following general implication of transitivity for this class of index number:

$$\begin{aligned}
&\sum_n w_i^a \left(\ln p_i^b - \left(\sum_z \beta_{iz}^a x_{iz}^b \right) \right) - \left[\sum_i w_i^a \left(\ln p_i^a - \left(\sum_z \beta_{iz}^b x_{iz}^a \right) \right) \right] \\
&= \sum_i \sum_z \left[-\beta_{iz}^0 w_i^0 \right] \left(x_{iz}^b - x_{iz}^a \right) + \sum_i \sum_z x_{iz}^0 \left(\beta_{iz}^b w_i^b - \beta_{iz}^a w_i^a \right) \\
&+ \sum_i w_i^0 \left(\ln p_i^b - \ln p_i^a \right) + \sum_i \left[-\ln p_i^0 \right] \left(w_i^b - w_i^a \right)
\end{aligned} \tag{10}$$

where

x_{iz}^0	=	a reference characteristic z for index item i across the entire region
β_{iz}^0	=	a reference coefficient for the characteristic z of item i in a semi-log hedonic equation explaining specification price across the entire region
p_i^0	=	a reference price for item i across the entire region
w_i^0	=	a reference share for item i for the entire region, where $\sum_i w_i^0 = 1$.

If this condition holds, the multilateral Törnqvist index has the form

$$\ln T^{ab} = -\sum_i \sum_z \tfrac{1}{2}\left(\beta_{iz}^{0} w_i^0 + \beta_{iz}^{b} w_i^b\right)\left(x_{iz}^b - x_{iz}^0\right) + \sum_i \tfrac{1}{2}\left(w_i^0 + w_i^b\right)\left(\ln p_i^b - \ln p_i^0\right) - \left[-\sum_i \sum_z \tfrac{1}{2}\left(\beta_{iz}^{0} w_i^0 + \beta_{iz}^{a} w_i^a\right)\left(x_{iz}^a - x_{iz}^0\right) + \sum_i \tfrac{1}{2}\left(w_i^0 + w_i^a\right)\left(\ln p_i^a - \ln p_i^0\right)\right] \quad (11)$$

The proof is given in KMZ (1996). CCD(1982a) showed that application of the EKS principle to a system of bilateral Törnqvist indexes yields the price component of above formula with the reference shares and log prices set at their simple arithmetic averages across areas. Clearly, these simple averages could also be calculated as total compensation expenditure-weighted averages. Extension for the EKS/CCD approach to our labor quality-adjusted index given by equation (11) would simply require that the 0-superscripted terms comprising the product of the reference hedonic coefficients of each characteristic with the reference share weight of the index items be set to the regional averages for these terms. In this paper, however, we use the KMZ regression method for determining the reference parameters, as detailed in section IV below.

Analysis of the contribution of labor quality indicators to levels of place to place indexes. Because Törnqvist indexes are linear in the log differences of detailed, quality-adjusted specification prices, the contribution of each quality indicator, say, full time status, to the quality level ratio between two areas can be readily calculated by exponentiating the appropriate weighted sums of log price differences. These sums would be calculated from the transitive expression for the index given above, where it is expressed in terms of locality weights averaged with reference weights and price differentials from reference prices. The contribution to the level of $\ln T^{ab}$ of labor characteristic z would simply be the subordinate sum

$$\ln C_z^{ab} = -\sum_i \tfrac{1}{2}\left(\beta_{iz}^{0} w_i^0 + \beta_{iz}^{b} w_i^b\right)\left(x_{iz}^b - x_{iz}^0\right) - \left[-\sum_i \tfrac{1}{2}\left(\beta_{iz}^{0} w_i^0 + \beta_{iz}^{a} w_i^a\right)\left(x_{iz}^a - x_{iz}^0\right)\right].$$

IV. Estimation of the Reference Values for Shares, Prices, and Determinants of Quality

Adjusting for labor quality from place to place. In the present study, we utilize wage and compensation cost data from the Employment Cost Index (ECI) survey. This survey contains a limited amount of information about each surveyed job. We augment the observed characteristics of jobs with additional data on worker characteristics from the Current Population Survey (CPS).

We follow the method of Kokoski et al. (1994), who construct interarea price indexes for consumer goods using country-product dummy regression (Summers (1973)). We first estimate wage and compensation costs regressions for each broadly defined job, where the covariates include worker and job attributes and local area dummies. Let p_{ij}^{a} represent the wage in the *j*th quote for job *i* in location *a*, where a job is defined to be in an industry/occupational group. The wage can be described by the following regression equation:

$$\ln p_{ij}^{a} = X_{ij}^{a}\beta_{i} + L_{i}^{a} + \varepsilon_{ij}^{a} \tag{12}$$

where X_{ij}^{a} represents data on the characteristics of the job and the worker and where L_{i}^{a} represents a local area effect for job *i* in area *a*. This regression equation allows the coefficients on X_{ij}^{a} and the local area effects to vary across jobs. Equation (12) is estimated by weighted least squares, where the weights are the sample weights from the ECI.

A standard practice is to utilize the estimation results from equation (12) to make interarea wage comparisons. The regression defines a decomposition of interarea wage differences into components due to interarea differences in attributes X_{ij}^{a} and residual terms L_i^a. Let $\hat{\beta}_{iz}$ be the zth element of the vector of weighted least squares estimates of β_i from equation (12), and let x_{ijz}^a be the zth element of the vector X_{ij}^a. Also let $\overline{\ln p_i^a}$ and $\bar{x}_{iz}^a$ be weighted (by ECI sample weights) averages over j of $\ln p_{ij}^a$ and x_{ijz}^a, respectively. Then, by the properties of the weighted least squares estimators,

$$\overline{\ln p_i^a} = \sum_z \hat{\beta}_{iz} \bar{x}_{iz}^a + \hat{L}_i^a .$$

A Tornqvist index comparing wages in local area b to those in area a is defined (in logs) as

$$\ln T^{ab} = \tfrac{1}{2} \sum_i \left(w_i^a + w_i^b \right) \left(\overline{\ln p_i^b} - \overline{\ln p_i^a} \right) \tag{13}$$

where w_i^a is cell i's share of the labor expenditure in locality a. This differential can in effect be decomposed into contributions of the various covariates in X and contributions of the local area dummies. The contribution of the local area dummies takes the same form as (13),

$$\ln T_L^{ab} = \tfrac{1}{2} \sum_i \left(w_i^a + w_i^b \right) \left(\hat{L}_i^b - \hat{L}_i^a \right).$$

Further, the contribution of the zth characteristic of the job or worker to the index in (13) is

$$- \tfrac{1}{2} \sum_i \left(w_i^a + w_i^b \right) \hat{\beta}_{iz} \left(\bar{x}_{iz}^b - \bar{x}_{iz}^a \right).$$

This contribution depends on interarea differences in average characteristics (the difference in the mean X's) in conjunction with the importance of the zth characteristic in determining the wages in each job i (the $\hat{\beta}_{iz}$). The sum of these z contributions, plus $\ln T_L^{ab}$, equals the Tornqvist index in (13). In the following sections we present this decomposition for a (transitive, multilateral) set of Tornqvist bilateral index numbers.

Multilateral compensation indexes: A regression approach for imposing transitivity with minimal adjustment of the data. In this paper we employ an alternative to (or a likely superclass of) the EKS/CCD approach from KMZ (1996) for making the system of bilateral indexes transitive. When this condition on the cross-weighted differences of labor characteristics-adjusted log regional prices is not met, the data may be minimally adjusted to satisfy transitivity by fitting the equation

$$
\begin{aligned}
& w_i^a\left(\ln p_i^b - \left(\sum_z \hat{\beta}_{iz} x_{iz}^b\right)\right) - w_i^a\left(\ln p_i^a - \left(\sum_z \hat{\beta}_{iz} x_{iz}^a\right)\right) \\
&= \left[w_i^0\right]\left(\ln p_i^b - \sum_z \hat{\beta}_{iz} x_{iz}^b - \left(\ln p_i^a - \sum_z \hat{\beta}_{iz} x_{iz}^a\right)\right) \\
&\quad + \left[-\ln p_i^0\right](w_i^b - w_i^a) + \varepsilon_i^{ab}
\end{aligned}
$$

using least squares to obtain the estimates

$$
\begin{bmatrix} -\ln \hat{p}_i^0 \\ \hat{w}_i^0 \end{bmatrix}.
$$

This is a simplification of equation (10) since if, as our CPD model assumes, the hedonic slope coefficients are the same across areas for each specification characteristic so that $\beta_{iz}^a = \beta_{iz}^b = \beta_{iz}^0$, then the coefficient on the difference between the share vectors of the two areas is a *characteristics-adjusted reference price vector,* and no reference characteristics vector can be separately identified.

V. An Application to U.S. Labor Compensation Data

Data. The microdata used to construct the interarea indexes come from two sources: the Employment Cost Index (ECI) and the Current Population Survey (CPS). The ECI data program produces quarterly indexes that measure changes over time in wages and salaries and in the cost of total compensation. These indexes are calculated from micro data collected for sampled jobs in sampled establishments. All jobs in non-farm private industry and in state and local governments are within scope for the survey, meaning that the occupational coverage of the survey is nearly complete. The micro data available include the mean hourly wage and mean hourly compensation costs for all incumbents in the sampled jobs. Other data elements describe job or establishment characteristics: the establishment's number of employees; whether the employment is full-time or part-time; and whether the job is covered by a collective bargaining agreement. This study utilized the data for 18,486 sampled jobs for the fourth quarter of 1993 in non-agricultural private industry. Details of variable definitions, sample exclusion restrictions, and summary statistics for all data are in a statistical appendix.

A shortcoming of the ECI is that it does not collect key variables that are widely believed to measure human capital: education and labor market experience. To obtain these variables, data from the CPS were merged to the ECI micro data. The CPS is a monthly survey of households that contains information about the demographic characteristics and employment outcomes of individuals. For current purposes we used the 3 monthly surveys for the fourth quarter of 1993, and restricted our sample to employed individuals in non-agricultural private industry. We collected information on schooling, age, industry, occupation, and area of residence for a sample of almost 140,000 workers.

Merging the data from the CPS to the ECI presents a challenge, because the ECI micro data contain the means for jobs while the CPS contains data for individuals and, of course, the individuals covered in the two surveys are not necessarily the same. The strategy we followed was to calculate weighted mean values for CPS variables for cells defined by local area, occupation and industry. The industrial and occupational cell classification used for this purpose was determined by the availability of data; we chose to create cells defined by local area, major occupational group, and six industry groups.

After matching the CPS cell level data to the ECI micro data for individual jobs, we had to determine an appropriate locality/industry/occupation classification for the purposes of computing the interarea indexes. The methodology in the previous section, specifically equation (12), calls for estimating separate regressions for cells defined by industry and occupation in order to recover estimates of local area dummies for each cell. There is a trade-off between the size of the smallest local area for which we can calculate interarea indexes and how finely the industry/occupation cells can be disaggregated. We selected a set of cities that included both those that are the largest and those that are of interest in the Federal pay setting process. The remainder of the data were aggregated into Census geographic divisions (as “rest of division”). We then determined that indexes could be calculated for these local areas using 18 industry/occupation cells, defined by major occupational group and whether the job is in a goods or service producing industry.

To give the reader a feel for the underlying data we present some summary data in Tables 1 and 2. Table 1 gives wage and compensation shares and levels by our job classification scheme; major occupational groups are presented within the two broad industrial groupings. The first column, labeled “Wage Share,” reports the fraction of total wages that falls in the given category. These statistics are useful for showing where the bulk of the data reside. The second column simply reports the average hourly wage in the given cell (all figures are in nominal dollars). Roughly speaking, the professional, technical, and executive occupations have the highest hourly wages, production workers and operatives have average wages, and laborers and service workers have below average wages. There is a noticeable difference between the broad industry aggregates, with average wages in any particular occupational group being higher in the goods producing industries. The third column gives shares of total compensation. Goods producing industries have higher shares of total compensation than of total wages,reflecting the fact that a higher fraction of compensation comes in the form of benefits for workers in those industries. This fact is apparent in comparing average wages in the second column to average hourly compensation costs, in the final column. Finally, one other obvious inference that can be drawn from this table is that, given the wide variation in wages and compensation costs across jobs, index numbers might be expected to yield very different results than simple interarea differences in average compensation rates whenever there are interarea differences in the distribution of jobs.

Table 2 gives employment shares and average compensation by local area. The compensation shares, showing each local area's compensation as a fraction of total US compensation, give some idea as to which metropolitan statistical areas have relatively few ECI job quotes. Because of their small sizes, one might expect localities such as Charlotte and Columbus to have fairly noisy compensation index estimates. The "rest of division" localities, on the other hand, tend to be rather large. Comparing column two with column one shows that larger metropolitan areas tend to have the highest average compensation costs, while the "rest of division" localities have the lowest. The final column ("Compensation Relative") gives average compensation in the local area relative to the overall average compensation level in the data. The range in these area relatives is quite large. At one extreme, compensation in the Detroit, New York, and San Francisco areas is approximately 134 percent of average compensation in the US; at the other extreme lies the East South Central locality with 73 percent of overall average compensation. A comparison of these figures with the index numbers presented below will give some idea as to the importance of interarea differences in job characteristics for compensation cost comparisons.

Regressions. The first step in the construction of the interarea indexes was the estimation of log wage and log compensation cost regressions (equation 12). In addition to local area dummies, five sets of covariates were included as explanatory variables in the regressions to capture factors that affect worker productivity. Following a long tradition in the labor economics literature dating back to Mincer (1962) and Becker (1964), years of schooling, years of potential labor market experience (age minus education minus 6), and potential experience squared were included. These measure the average amount of human capital possessed by incumbents in the job.

The labor literature has shown that wages are positively associated with establishment size. Brown and Medoff (1989) argue that part of this wage-size relationship arises because large firms attract higher quality workers (even after controlling for observable characteristics). In order to control for this in the present study, we include a set of 8 establishment size class dummies.

In the literature, unionization is claimed both to increase and to decrease worker productivity. The traditional view holds that unions lower productivity by imposing staffing requirements and other restrictive work practices that prevent firms from efficiently utilizing capital and labor (Lewis [1986], Rees [1989]). A more recent literature argues that unions enhance worker productivity (Freeman and Medoff [1984]). First, unions provide a collective voice that communicates workers' preferences. This lowers worker discontent and turnover, increasing firms' incentives to invest in job-specific human capital. Second, unions typically establish seniority rules that may promote an environment where more senior workers are willing to provide less senior workers with informal on-the-job training. Finally, unions may enhance worker moral, motivation, and effort. While the literature is ambiguous about the effect of unions on productivity, most studies show that unions increase wages. To capture the effects of unions on productivity in our regressions, we include a dummy indicating whether a job is covered by a collective bargaining agreement.

The literature generally shows that, after accounting for observed differences in human capital, part-time workers earn less than full-time workers (see Lettau [1994] and citations therein). For at least two reasons, this differential may arise because part-time workers are on average less productive than their full-time counterparts. First, it is argued that innately less productive workers are more likely to select part-time jobs. For example, more productive workers may find it advantageous to work more intensively if their wages reflect their productivity. Second, average productivity might be lower for part-time workers due to fixed daily set-up costs that are spread over more working hours for full-time workers. We include a part-time dummy in our regressions to capture these productivity effects.

It is important to note that while the education and potential experience variables are widely viewed as measuring human capital, the other three variables -- establishment size, unionization, and part-time status -- may have effects on wages that are not strongly associated with labor productivity. All three represent or proxy to some extent characteristics of the labor services transaction in an industry and locality as much as the characteristics of the service itself. Although the nature of the transaction may have productivity effects, this is not a foregone conclusion. Large nonunion firms, for example, may pay higher wages simply to forestall unionization. Union wages may be higher simply because of union monopoly power. If the purpose of including explanatory variables in the regressions is to control for factors that affect productivity, then it is possible that our index factors overcontrol for some of these transaction and other effects. In the analysis that follows, we include all of the explanatory variables in the regressions, but we provide a set of adjustment factors associated with the explanatory variables. These factors measure the contribution of each variable (or variable group) to the unadjusted interarea differential. One advantage of our methodology is that analysts can add back the differential associated with a variable if they judge that it is not appropriate to control for that variable. In Tables 3 and 4, “adjusted” refers to interarea measures adjusted for differences in all our conditioning variables explaining wage and compensation variation. Future formats for interarea compensation data could reasonably include multiple summary columns of adjusted data corresponding to multiple subsets of conditioning factors to satisfy the interests of various users.

Eighteen regressions were estimated separately for wages and compensation costs. There is a regression for each of 9 major occupational groups in either the goods or service producing industries. The regressions for wages appear in Appendix B Table B.1, while those for compensation costs appear in Table B.2.

The adjusted R-squares for the regressions are comparable to or higher than those found for wage regressions estimated on individual micro data. The regressions typically explain between 20 and 50 percent of the variation of wages, while the corresponding range for compensation costs is 30 to 60 percent.

As expected by theory and found in most data, wages and compensation costs tend to rise with education. The returns to education are perhaps on average slightly smaller than would be obtained from person-level micro data. However, there are a few instances in our regressions where the education coefficient is anomalously negative (although not large relative to the standard error). This may arise in part due to small sample sizes for some of the regressions. Further, it is important to stress that we have an imperfect measure of education that is measured as a cell mean from CPS data. Within a regression, education varies across areas and across some industry groups, but does not vary for a given industry and area. It is likely that the education variable would perform better if it were collected for the same unit of observation as the wage and compensation data.

Previous empirical work has shown that wages display an increasing, concave profile with experience. This is often observed in our regressions as well, though there are a number of instances where the profile is convex and downward sloping at relevant experience levels. As with the education variable, problems with the experience variable might arise because its values are cell means whose source of variation for any regression is across areas and to a lesser extent across broad industry groups. The sample statistics indicate that the standard deviation of experience is much lower in our data than it is in micro data. This low variance is not unexpected, but could indicate that the variable cannot discriminate well in explaining wage variation.

As expected, jobs that are covered by union contracts command higher wages than uncovered jobs, while part-time jobs tend to receive lower wages. The return to union contract coverage is on average higher in these regressions than estimates derived from older data (Lewis [1986]). Finally, also as expected, larger establishments tend to pay higher wages, with especially notable premiums for establishments with 500 or more employees. Comparisons of the establishment size coefficients across industry/occupation groups are difficult because of substantial variability across those cells in the average compensation of workers in the omitted category (1-9 workers). However, the establishment size coefficient point estimates typically rise with establishment size.

Interarea Indexes of Wages and Compensation for the United States. Table 3 gives our main results for interarea wage rate differentials. The second column of the table presents Tornqvist wage indexes that control for the composition of employment across 9 major occupational groups and 2 industry groups, but where there are no other adjustments for observed differences in worker or job characteristics. The index numbers are relative to the reference wage generated by our method (described in section IV above) of making the bilateral comparisons transitive; one may loosely interpret 100.00 as average for the US.[2] As an example, the first entry in the second column indicates that wages, adjusted for broad differences in employment but unadjusted for observed differences in worker and job characteristics, are 10.1 percent higher in Boston than in the US as a whole. The amount of interarea variation in employment-adjusted wage indexes is striking, with numbers ranging from 128.6 for San Francisco to 78.1 for the East South Central rest of division locality. Generally one tends to find that wages are higher than average in the larger CMSAs and along the West coast; wage indexes are much smaller than average in the "rest of division" localities. Controlling for the composition of employment across industry and occupation by using a wage index tends to reduce interarea differentials as compared to the unadjusted wage relatives that appear in the first column of Table 3. This is most clearly seen in Figure 1, which plots the wage indexes against the average wage relatives. The figure contains a regression line through the data points (estimated with unweighted OLS) and a 45 degree line. If controlling for the

[2] Actually, neither the area share-weighted arithmetic nor geometric average of these locality levels is generally equal to 100.0 because of the way the reference shares and prices are determined using the "minimum bilateral relative adjustment" criterion implicit in our regression approach, in concert with our observation weighting, which gives greater importance to records representing relatively large bilateral average expense shares. Bilateral ratios of the index numbers in Tables 3 and 4 produce a transitive system of parities as provided by the objective of our algorithm, but do not provide a particular level normalization. Interpretation of these data as levels requires a normalization to, for example, the national average level, much as a time series of price index numbers would be normalized to be 100.0 in a particular time period to align it with other data series so normalized for a given analytical purpose. The data in Tables 3 and 4 are, therefore, valid for ranking localities in terms of labor services input price levels. As we note elsewhere in the paper, the weighted CCD/EKS method of determining the reference shares and prices of the transitive parities implicitly does normalize the regional geometric average level to 100.0.

composition of industrial and occupational employment had no effect on interarea wages, then the regression line would have a 45 degree slope. Instead, the regression line is flatter than the 45 degree line, indicating that, in part, wages are low in low-wage areas because employment is more heavily concentrated in low-wage industries and occupations.

The rightmost column of Table 3 gives adjusted wage differentials corresponding to the Tornqvist indexes calculated using the local area dummies ($\hat{L}_i^a$). Comparing the Wage Index column with the Adjusted Wage Index column of Table 3, the interarea variation in characteristics-adjusted wages is generally smaller than the interarea variation in wages alone. The standard deviation of the wage index is 12.2, versus a standard deviation of 9.8 for the adjusted wage index. This can be seen graphically in Figure 2, which plots one index against the other. The regression line through the plot is again less steep than the 45 degree line, indicating that controlling for worker and job attributes raises the wage index for low-wage areas and lowers it for high-wage areas. That is to say, some of the interarea variation about US mean wages can be attributed to interarea differences in the observable characteristics X, even after accounting for interarea differences in industry/occupation employment distributions. One of the larger adjustments is in Detroit, where the observed differences in characteristics would imply approximately a 9 percent (114.4/104.9 = 1.09) premium to hire labor. The seven localities with the lowest employment-adjusted wage indexes (five of which are “rest of division” localities) have on average a 4.2 percent increase in wage indexes through our labor characteristics adjustments. In contrast, the seven localities with the highest employment-adjusted wage indexes have on average a 4.9 percent decrease through characteristics adjustments.

Whether the characteristics adjustment for a particular locality reflects a premium mainly attributable to larger establishment size, greater unionization rates, a more educated workforce, or some other reason, is not clear from comparing the wage indexes. To address that question, Table 3 contains a set of columns that report the contributions of the observable characteristics to unadjusted wage differentials. Recalling the discussion following equation (13), variations in the area relatives for a characteristic will be larger, the larger is the coefficient for that characteristic in the wage regressions and the larger is the variation in the characteristic across areas. Our decomposition methodology implies that, for any given local area, the quality-adjusted index and the covariate contributions (appropriately scaled by 100) must multiply up to equal the employment-adjusted wage index . Whenever a number in one of the covariate columns exceeds 100 for a given area, the observed characteristic tends to raise wages in that area. For example, the covariate contribution for education in Boston, 102.5, indicates that Boston's workers have higher education than average, so that their unadjusted pay is 2.5 percent higher than the average area due to this characteristic. Although there is substantial noisiness in the results, especially among the smaller local areas, what one not surprisingly sees is that most of the adjustment factors for worker and job characteristics tend to exceed 100 for the highest wage areas (e.g., San Francisco) and to fall short of 100 for the lowest wage areas (including most of the "rest of regions"). Finally, as stated earlier, note that these adjustment factors can be used to add back to the characteristics-adjusted indexes the influence of variables that an analyst does not wish to remove in making interarea comparisons.

To get some sense of the relative contributions of the worker and job characteristics to wage differentials, Figure 3 graphs the data from Table 3 on area relatives for these characteristics against the interarea wage indexes. Each figure also plots the (unweighted) regression line through the points, and the scales of each figure are made the same to facilitate comparison. Each figure shows a positive correlation between the particular area relative and the wage index, indicating that on average all of the characteristics contribute to interarea wage differentials. More significantly, the steepest regression line is for education, indicating that this characteristic is most important in explaining observed interarea differentials in the wage index. The union variable has the second steepest slope, while the part-time dummy variable has the flattest regression line. Since our wage regressions indicated that wages tend to be significantly lower for part-time jobs, the fact that this variable accounts for little variation in wages across areas stems from the fact that the proportion of part-time jobs varies little across areas.

Table 4 gives analogous calculations for hourly compensation, as opposed to wages. Given that wages are approximately 70 percent of compensation costs, it is not surprising to find that the gross patterns apparent in Table 3 hold here as well. Controlling for industry/occupation and worker and job characteristics reduces interarea compensation differentials, implying that high compensation areas receive high compensation partly for observable reasons. One difference between Tables 3 and 4 is that the interarea differences in compensation indexes are slightly larger than those for wage indexes. One extreme example is Detroit, whose characteristics-adjusted compensation index (113.0) is much larger than its characteristics-adjusted wage index (104.9).

The greater interarea dispersion when computing compensation indexes holds for both the employment-adjusted and the characteristics adjusted series. The compensation share weighted standard deviations for these series are 17.2 and 13.3, respectively. Controlling for job and worker characteristics, therefore, reduces the interarea variation in compensation by about 23 percent. The greater interarea variation in compensation, as opposed to wages, no doubt reflects some combination of income effects (workers have income elastic demands for health care, pensions, and other benefits) and tax effects (benefits are generally lightly taxed or not taxed at all, and the occupational composition of the labor force and income tax rates vary by locality). As employers making location decisions presumably care about compensation costs broadly defined, it is useful to know that interarea wage comparisons are likely to understate the interarea compensation differentials.

VI. Conclusion

We have applied a promising methodology for place to place price measurement to the problem of constructing interarea labor force characteristics-adjusted compensation indexes for labor services that blends hedonic regression and economic index number techniques. We have used a combination of establishment data from the BLS Employment Cost Index program and household data on individual workers from the BLS Current

Population Survey to provide a more complete picture of labor quality than has been available to analysts working with only household data. As would be expected, incorporation of the labor quality information generally reduced the variability of labor costs from place to place, and provided insights into the contribution of various factors, such as education, experience, establishment size, union status, and full time work status to the level of labor compensation in major urban centers of the United States.

Enhancements to the data are needed. Fortunately, there are prospective developments on this score. The BLS Office of Compensation and Working Conditions is currently undertaking a major redesign and integration of its three major compensation surveys, the Employment Cost Index, the Employee Benefit Survey, and the Occupational Compensation Survey. One salutary result of this for the ECI is a substantial increase in sample size from the current 5,000 establishments to at least twice that number. Of particular interest for interarea comparisons is the adoption of an area-and-industry-based rather than solely industry-based rotational scheme for the samples in the new integrated survey, whose total size will be approximately 30,000 establishments. Comprehensive data on job content is included in the list of data elements to be collected from all establishments in the survey, greatly expanding the number and explanatory power of the covariates that can be used for characteristics adjustment. Publications incorporating data from the new survey are expected to begin in 1998.

Table 1. Industry/Occupation Shares, Wages, and Compensation

	Wage Share	Average Wage	Compensation Share	Average Compensation
Goods Producing Industries				
Professional/Technical	0.047	22.60	0.047	31.98
Executive/Administrative	0.054	26.03	0.054	36.84
Sales	0.007	17.09	0.007	22.92
Administrative Support	0.042	11.60	0.044	17.08
Precision Production	0.094	15.80	0.102	24.12
Machine Operatives	0.066	10.74	0.075	17.04
Transport Operatives	0.029	12.76	0.032	19.73
Laborers	0.030	9.70	0.033	14.78
Service Workers	0.008	14.08	0.008	20.30
Service Industries				
Professional/Technical	0.145	19.33	0.140	26.17
Executive/Administrative	0.101	20.95	0.098	28.47
Sales	0.095	10.12	0.087	13.14
Administrative Support	0.120	9.93	0.118	13.75
Precision Production	0.029	11.93	0.028	16.28
Machine Operatives	0.009	8.18	0.009	11.55
Transport Operatives	0.014	9.28	0.014	13.18
Laborers	0.027	7.03	0.026	9.54
Service Workers	0.084	6.00	0.079	7.89

Notes: "Wage Share" and "Compensation Share" are wage and compensation shares in the non-household, non-Federal, non-agricultural economy. "Average Wage" and "Average Compensation" refer to average hourly wages and compensation in nominal dollars, where averages within industry/occupation class are weighted by ECI sample weights.

Source: Winter 1993 Employment Cost Index.

Table 2. Compensation by Local Area

Local Area and Rest of Regional Division	Compensation Share	Average Hourly Compensation	Compensation Relative
		Northeast region	
Boston	0.029	$19.75	116.4
Hartford	0.009	20.60	121.4
New England	0.016	14.04	82.8
New York	0.116	22.73	134.0
Philadelphia	0.027	19.93	117.5
Pittsburgh	0.011	20.22	119.2
Middle Atlantic	0.070	17.18	101.3
		North Central region	
Chicago	0.039	19.19	113.1
Detroit	0.024	22.70	133.8
Cleveland	0.010	17.33	102.2
Milwaukee	0.008	16.34	96.3
Dayton	0.007	17.46	102.9
Cincinnati	0.006	15.89	93.7
Columbus	0.006	15.99	94.3
Indianapolis	0.005	18.59	109.6
East North Central	0.062	14.23	83.8
Minneapolis	0.011	17.35	102.2
Kansas City	0.006	20.94	123.4
St. Louis	0.006	18.27	107.7
West North Central	0.052	14.74	86.9
		South region	
Washington, DC	0.026	21.84	128.7
Atlanta	0.014	17.81	105.0
Miami	0.009	14.45	85.2
Tampa	0.008	13.89	81.9
Charlotte	0.005	14.32	84.4
South Atlantic	0.077	13.82	81.5
East South Central	0.042	12.35	72.8
Houston	0.020	19.21	113.2
Dallas	0.018	17.17	101.2
West South Central	0.056	14.00	82.5

Table 2. Compensation by Local Area

Local Area and Rest of Regional Division	Compensation Share	Average Hourly Compensation	Compensation Relative
		West region	
Denver	0.008	$15.08	88.9
Phoenix	0.007	16.24	95.7
Mountain	0.028	13.26	78.2
Los Angeles	0.060	20.02	118.0
San Francisco	0.032	22.74	134.0
Seattle	0.012	21.61	127.4
San Diego	0.010	20.86	123.0
Portland	0.008	18.66	110.0
Pacific	0.039	15.42	90.9

Notes: "Compensation Share" is the area share of compensation in the non-household, non-Federal, non-agricultural economy. "Average Compensation" is average hourly compensation in nominal dollars, weighted by ECI sample weights. "Compensation Relative" is the ratio of the local area average compensation to the US average compensation.

Source: Winter 1993 Employment Cost Index.

Table 3: Wage Indexes

Local Area and Rest of Regional Division	Average Wage Relative	Wage Index	Edu-cation	Ex-perience	Establish-ment Size	Full Time/ Part Time	Union	Adjusted Wage Index
				Northeast Region				
Boston	118.8	110.1	102.5	99.5	100.2	99.6	99.2	109.1
Hartford	120.9	111.9	99.6	102.6	102.1	96.0	101.1	110.6
New England	84.6	88.8	98.4	98.6	97.2	98.1	98.3	97.7
New York	132.7	128.0	100.6	100.7	100.0	101.1	100.6	124.2
Philadelphia	116.2	111.2	101.4	99.7	99.5	100.0	101.0	109.4
Pittsburgh	118.1	108.8	102.4	103.6	101.7	100.9	102.2	97.8
Middle Atlantic	99.0	101.6	99.2	98.8	101.5	99.1	100.6	102.4
				North Central region				
Chicago	111.9	108.8	101.3	100.3	99.1	100.6	101.7	105.6
Detroit	115.7	114.4	101.6	98.9	105.8	99.4	103.2	104.9
Cleveland	94.9	98.6	97.9	100.1	102.0	98.0	102.4	98.2
Milwaukee	96.8	101.2	97.7	99.5	100.3	100.9	100.8	102.0
Dayton	103.8	91.2	98.5	99.1	99.0	99.2	100.2	94.9
Cincinnati	95.2	100.9	100.3	99.4	100.3	100.5	99.4	101.2
Columbus	98.2	96.4	102.5	99.3	99.8	101.6	99.6	93.7
Indianapolis	106.8	101.0	98.1	106.9	98.9	102.9	101.1	93.5
E N Central	83.4	88.9	98.9	98.9	99.4	99.9	100.6	91.0
Minneapolis	100.6	107.0	102.2	97.9	100.0	99.5	102.1	105.1
Kansas City	120.7	110.9	103.6	99.2	99.0	102.3	101.6	104.9
St. Louis	101.3	95.1	104.5	99.8	98.4	101.6	101.2	90.2
W N Central	85.6	85.7	98.9	98.2	100.9	99.6	99.9	87.9
				South region				
Washington, DC	127.5	112.9	100.9	100.7	102.0	100.9	100.4	107.5
Atlanta	104.2	105.1	100.7	101.2	101.6	102.2	100.6	98.7
Miami	89.2	92.4	97.7	100.5	98.8	100.0	98.5	96.6
Tampa	84.7	87.4	99.7	99.7	100.3	99.3	97.8	90.3
Charlotte	86.4	87.3	100.7	96.4	101.7	99.3	97.2	91.6
S Atlantic	83.4	86.6	98.6	99.3	99.3	99.9	97.8	91.2
E S Central	74.2	78.1	99.2	99.3	98.2	99.8	100.0	80.9
Houston	116.4	111.1	100.0	101.2	99.2	98.8	98.3	113.9
Dallas	102.4	97.0	98.2	99.4	102.1	102.4	100.1	95.0
W S Central	84.2	81.4	97.8	98.8	99.3	99.7	98.2	86.7

Table 3: Wage Indexes

Local Area and Rest of Regional Division	Average Wage Relative	Wage Index	Edu-cation	Ex-perience	Establish-ment Size	Full Time/ Part Time	Union	Adjusted Wage Index
				West region				
Denver	94.3	96.2	100.6	98.7	97.9	99.9	99.6	99.4
Phoenix	98.0	98.6	98.8	101.4	105.2	100.1	98.4	95.0
Mountain	80.4	87.6	100.7	100.5	98.8	98.8	98.2	90.4
Los Angeles	119.4	114.0	100.3	100.6	101.0	99.6	99.9	112.3
San Francisco	136.7	128.6	103.8	101.4	100.9	99.7	100.9	120.5
Seattle	127.9	118.2	102.4	101.5	102.0	102.1	102.3	106.8
San Diego	119.7	115.3	102.7	98.9	98.4	99.1	99.5	117.1
Portland	108.7	109.6	102.1	98.6	97.9	101.0	99.9	110.1
Pacific	91.7	101.5	100.2	98.9	99.2	100.1	100.8	102.2

Source: Winter 1993 Employment Cost Index.

Notes: The Adjusted Wage Index in the last column is the Wage Index in column 3 divided by the product of the characteristics factors in columns 4 through 8, normalized to base 100.

Table 4: Compensation Indexes

Local Area and Rest of Regional Division	Average Compen-sation Relative	Compen-sation Index	Edu-cation	Ex-perience	Estab-lishment Size	Full Time/ Part Time	Union	Adjusted Compen-sation Index
				Northeast region				
Boston	116.4	111.2	102.7	99.5	100.0	99.2	98.8	110.9
Hartford	121.4	115.5	99.9	102.7	102.4	95.1	101.6	113.9
New England	82.8	87.0	98.4	98.8	96.1	97.6	97.5	97.8
New York	134.0	130.3	100.7	100.9	99.8	101.4	101.1	125.2
Philadelphia	117.5	113.1	101.1	99.9	99.2	99.6	101.8	111.3
Pittsburgh	119.2	109.3	102.1	103.0	101.4	100.3	102.3	99.8
Middle Atlantic	101.3	103.2	99.2	99.0	102.1	99.0	100.9	103.0
				North Central region				
Chicago	113.1	110.6	101.3	100.3	98.8	100.2	102.5	107.3
Detroit	133.8	129.5	101.3	99.1	109.1	99.6	105.1	113.0
Cleveland	102.2	104.4	98.5	100.5	103.1	98.3	103.7	100.3
Milwaukee	96.3	102.2	98.1	99.6	100.7	101.5	101.1	101.2
Dayton	102.9	92.3	98.0	98.9	99.1	99.5	100.2	96.3
Cincinnati	93.7	101.0	100.2	99.4	100.4	100.5	99.2	101.2
Columbus	94.3	93.6	102.0	98.7	100.1	102.1	99.5	91.5
Indianapolis	109.6	101.0	98.4	106.8	99.1	102.8	101.5	93.0
E N Central	83.8	88.9	98.7	98.8	99.4	99.8	100.9	91.0
Minneapolis	102.2	107.5	102.3	97.8	100.7	99.3	103.1	104.2
Kansas City	123.4	112.6	103.2	99.7	99.3	102.9	102.1	104.9
St. Louis	107.7	99.1	104.8	99.3	98.3	101.9	101.6	93.7
W N Central	86.9	85.8	98.8	98.1	101.0	99.6	99.7	88.3
				South region				
Washington, DC	128.7	114.3	101.0	100.8	103.1	101.2	100.7	106.9
Atlanta	105.0	105.0	101.1	100.5	101.8	102.6	100.8	98.2
Miami	85.2	88.9	97.5	100.1	98.6	100.2	97.8	94.1
Tampa	81.9	85.5	99.9	99.9	100.1	99.6	96.8	88.8
Charlotte	84.4	84.7	100.7	96.7	101.6	99.8	96.0	89.4
S Atlantic	81.5	84.2	98.5	99.3	99.0	100.0	96.8	89.7
E S Central	72.8	76.4	99.2	99.3	97.9	99.8	99.8	79.6
Houston	113.2	109.3	100.0	101.6	99.3	98.2	97.4	113.1
Dallas	101.2	96.3	98.5	99.3	102.3	102.7	100.0	93.7
W S Central	82.5	79.1	97.7	98.7	98.9	99.8	97.4	85.3

Table 4: Compensation Indexes

Local Area and Rest of Regional Division	Average Compen-sation Relative	Compen-sation Index	Edu-cation	Ex-perience	Estab-lishment Size	Full Time/ Part Time	Union	Adjusted Compen-sation Index
				West region				
Denver	88.9	91.2	101.3	98.4	97.5	99.3	99.5	95.0
Phoenix	95.7	97.1	98.8	100.7	107.1	100.2	97.6	93.2
Mountain	78.2	85.2	100.6	100.2	98.1	98.5	97.3	89.8
Los Angeles	118.0	112.8	100.3	100.5	101.3	99.6	99.8	111.2
San Francisco	134.0	127.8	103.7	101.4	101.1	99.6	101.6	118.9
Seattle	127.4	118.0	101.9	102.0	101.5	102.7	103.2	105.6
San Diego	123.0	119.9	102.2	99.1	98.8	99.0	99.5	121.7
Portland	110.0	111.6	101.8	98.3	97.0	101.0	100.1	113.7
Pacific	90.9	100.6	99.8	99.0	98.9	99.9	101.0	102.1

Source: Data from Winter 1993 Employment Cost index; October, November, and December 1993 Current Population Survey

Notes: The Adjusted Compensation Index in the last column is the Compensation Index in column 3 divided by the product of the characteristics factors in columns 4 through 8, normalized to base 100.

Figures

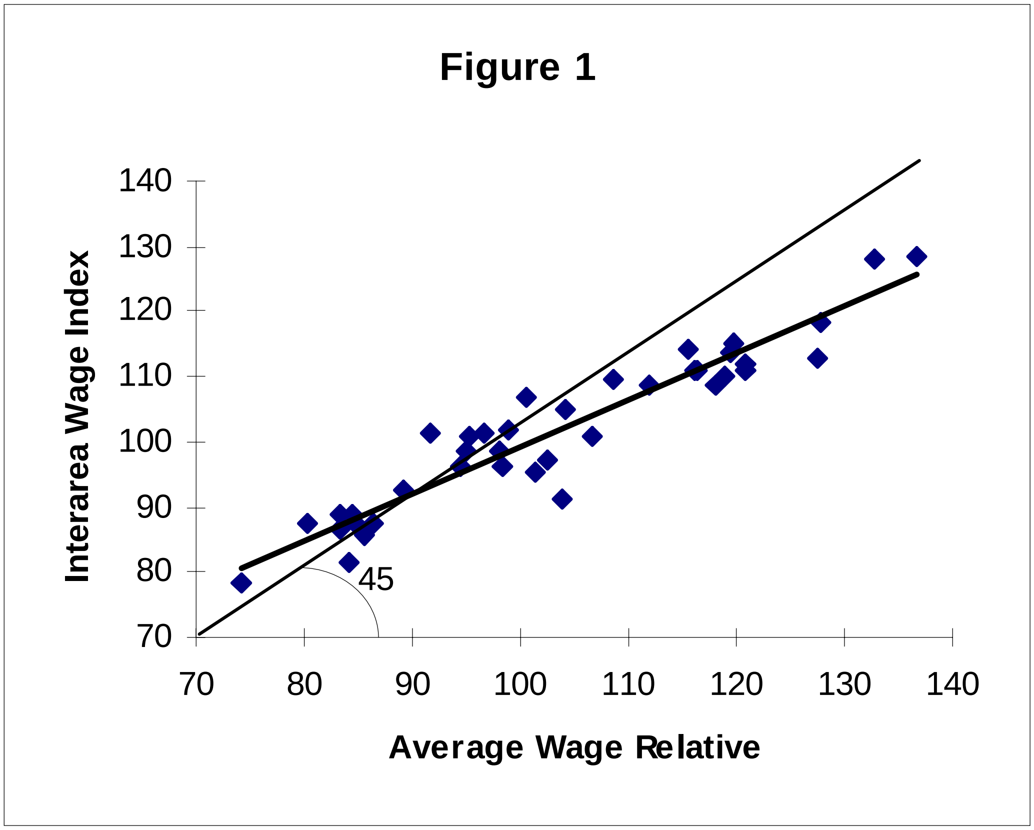
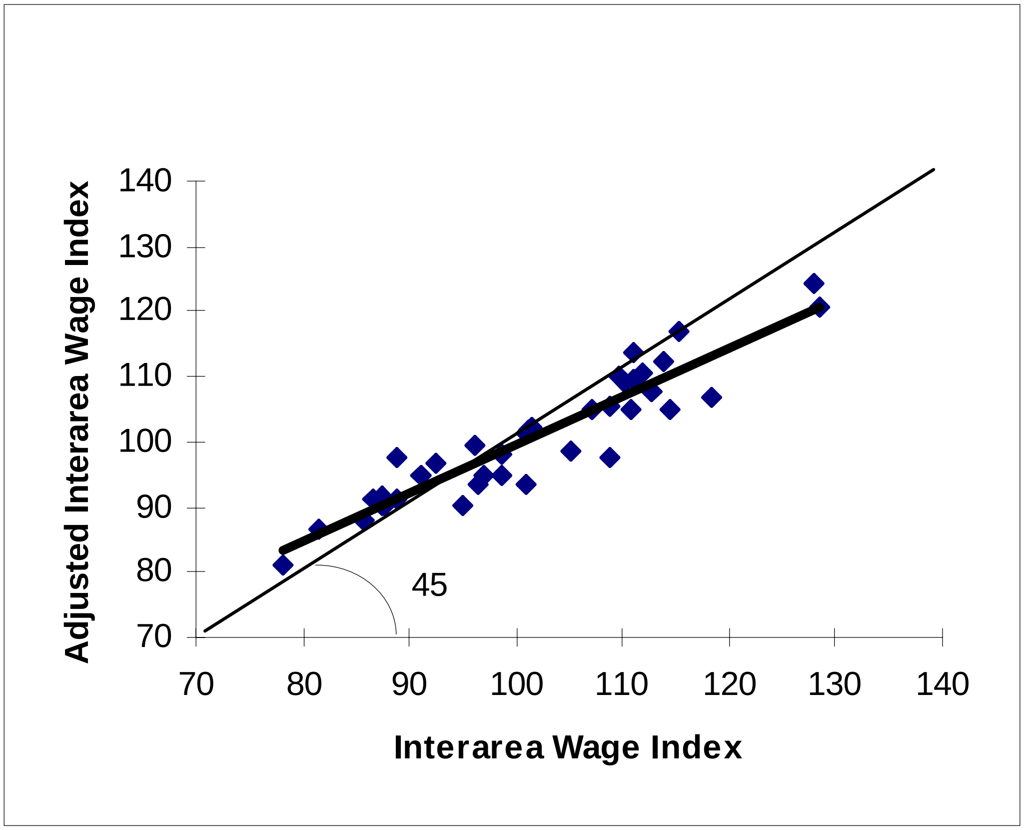
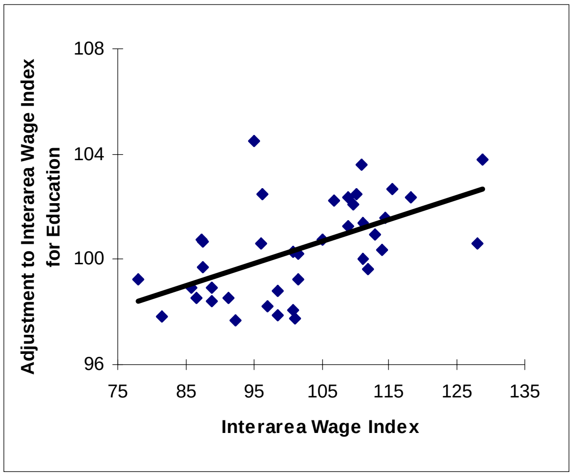
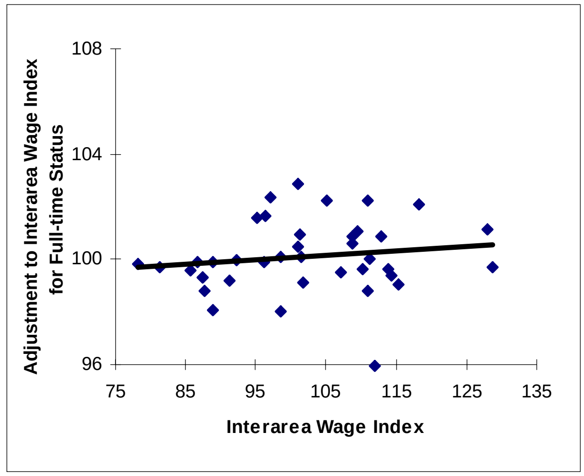
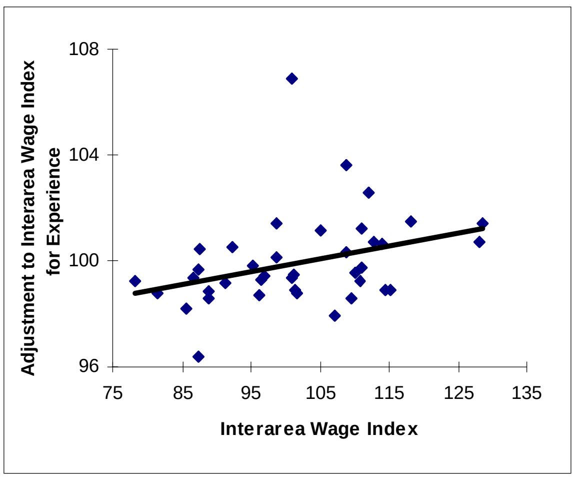


Figure 1
Interarea Wage Index
Average Wage Relative
140
130
120
110
100
90
80
70
70
80
90
100
110
120
130
140
45


140
130
120
110
100
90
80
70
Adjusted Interarea Wage Index
45
70
80
90
100
110
120
130
140
Interarea Wage Index


108
104
100
96
75
85
95
105
115
125
135
Adjustment to Interarea Wage Index
for Education
Interarea Wage Index


108
104
100
96
75
85
95
105
115
125
135
Adjustment to Interarea Wage Index
for Full-time Status
Interarea Wage Index


108
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100
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75
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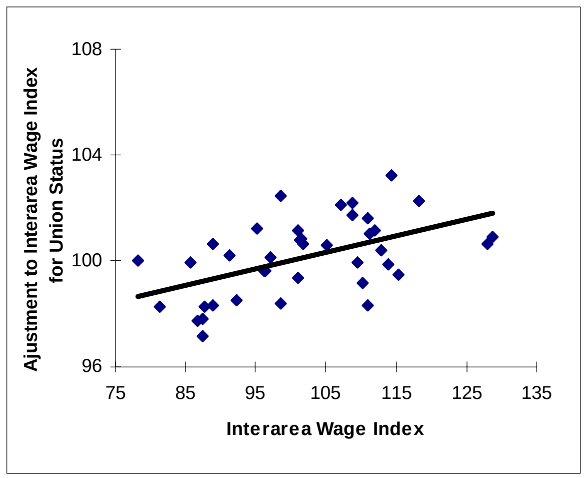
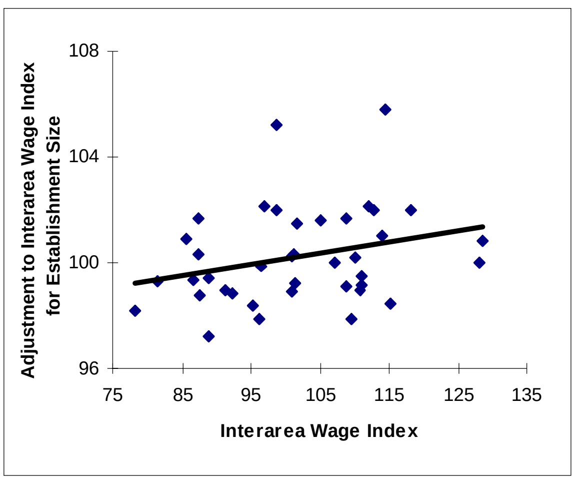
115
125
135
Adjustment to Interarea Wage Index
for Experience
Interarea Wage Index


108
104
100
96
75
85
95
105
115
125
135
Ajustment to Interarea Wage Index
for Union Status
Interarea Wage Index


108
104
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115
125
135
Adjustment to Interarea Wage Index
for Establishment Size
Interarea Wage Index

VII. Appendix A: Data

The Employment Cost Index (ECI). The ECI is a quarterly survey of randomly sampled establishments designed to produce estimates of wage and compensation cost changes. Within establishment, jobs are randomly sampled at the establishment initiation into the sample (sampling is carried out with probability proportional to establishment employment in the occupation). For each job, the ECI collects average wages and average compensation costs for the workers in the job. Non-wage compensation includes leave (sick leave, vacations, and holidays), supplemental pay (overtime, nonproduction bonuses), employer contributions to pensions and retirement savings accounts, health benefits, life and accident insurance, legally required labor expenses (state and federal unemployment insurance, workers' compensation, social security), and some other miscellaneous fringes. The ECI converts all data collected to a cost per hour worked basis. The ECI microdata also attach various establishment or job characteristics to each job quote, including more detailed industry and occupation codes, establishment size, the job's work schedule, and whether the job is covered by a union contract. The ECI collects quarterly updates on the wages and compensation costs and uses these updates to compute quarter-over-quarter and year-over-year indexes of change. Establishments are replaced in the sample using an industry rotation; the entire sample is replaced over the course of 4-5 years.

For this study we gathered a data extract from the ECI for the last quarter of 1993. We kept all private sector job quotes for which we had valid wage and compensation data, meaning that the job quote was used in computing the ECI. Data can be invalid for two main reasons. The first is that the data represent the establishment's responses at initiation, which of course are not used in computing the most recent ECI change. We exclude these data mainly so our sampling weights remain approximately correct; including these observations would improperly over-weight the industries that are the focus of initiation. The second is that establishments may be unable to, or may refuse to, report some benefits or wages for a paticular job. In this case the BLS attempts to impute wages or benefits based on the nonmissing data available; cases where these attempts fail are essentially dropped from the ECI calculations. Finally we note that in some instances the job's work schedule cannot be calculated and hourly compensation must be imputed even though the ECI has valid compensation data. Once exclusion restrictions are made we have a sample of 18,468 job quotes.

Because sample replacement is made on an industry rotation pattern and sample weights are not adjusted through the life of the industry panel, normal sample attrition results in cross-sectional samples that over-weight more recently initiated industries. Accordingly, we adjust the ECI sampling weights to bring them current by adjusting 2-digit SIC employments to equal those published in the BLS Employment and Earnings series. References to the ECI sampling weights in the text and tables reflect this weighting adjustment.

The Current Population Survey (CPS). While the ECI attempts to randomly sample establishments, the CPS is designed to randomly sample addresses and collect information on the households at each sampled address. The main function of these surveys is to generate official employment and unemployment statistics; however, they are utilized by researchers in a number of other ways as well. The survey is conducted monthly, with a given household surveyed for four months, not surveyed for 8 months, and then surveyed for four final months, at which point they leave the sample. The survey collects demographics and current employment outcomes, among other items, for each person in a sampled household.

We pooled the October, November, and December 1993 CPS surveys to gather worker characteristics by industry, occupation, and local area at approximately the same time frame as our ECI data. The sampling design guarantees some overlap in the month-to-month samples, but that overlap does not imply redundant information in all cases because of changing employment rates, industry and occupational distributions, etc. Our sample exclusions were made primarily to maintain comparability with the ECI sample: we included only individuals employed by non-agricultural, private sector employers. Our final sample contains 138,902 observations.

The covariates from the CPS data are mainly measures to proxy for human capital or other factors typically thought to affect wages. We have data on educational attainment, which we have converted into a measure of the years of schooling acquired by the individual. We derive “years of potential labor market experience”, or approximate years out of school, as a proxy measure for the amount of general human capital acquired by the individual through work; it is defined as age - years of schooling - 6 (if less than zero it is recoded to zero). Experience is entered as a quadratic to capture depreciation and decreasing investment rates through time (see Mincer [1974]).

In order to match these data to our ECI sample, we averaged these covariates up to cell levels, where cells are defined by the area locations, 6 industry groups, and the 9 major occupational groups. Averages are weighted averages, with weights being CPS sample weights. In matching the CPS to the ECI data, a small number of localities had missing values for some of the industry/occupation cells. These were allocated values from a donor cell of similar attributes within the local area. As these imputations account for a very small portion of the data, our results do not depend on the particular allocation method used.

Appendix table A.1 contains summary statistics, weighted by sample weights, for hourly wages, hourly compensation, and various job characteristics from the ECI.

Table A.1. Sample Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
		ECI Variables		
Average hourly wage	12.07	9.31	2.13	277.38
Average hourly compensation	16.97	12.96	2.13	470.34
ln(hourly wage)	2.30	0.59	0.76	5.63
ln(hourly compensation)	2.62	0.64	0.76	6.15
Establishment size 10-19	0.10	0.29	0	1
Establishment size 20-49	0.15	0.36	0	1
Establishment size 50-99	0.13	0.34	0	1
Establishment size 100-249	0.18	0.38	0	1
Establishment size 250-499	0.09	0.28	0	1
Establishment size 500-999	0.08	0.26	0	1
Establishment size 1000-2499	0.08	0.28	0	1
Establishment size 2500+	0.09	0.28	0	1
Works < 35 hours/week	0.21	0.41	0	1
Covered by union contract	0.14	0.35	0	1
		CPS Variables		
Years of schooling	12.95	1.25	4	17
Years of potential experience	17.39	3.87	0	48
Experience squared	466.54	149.31	0	2304
Number of observations	18,468			

Note: Data are weighted by Employment Cost Index sampling weights

Source: Winter 1993 Employment Cost Index; October, November, and December 1993 Current Population Survey

VIII. Appendix B: Hedonic, Country-Product Dummy Regressions

The regressions in equation (12),

$$\ln p_{ij}^{a} = X_{ij}^{a}\beta_{i} + L_{i}^{a} + \varepsilon_{ij}^{a} \tag{12}$$

where p_{ij}^{a} represents the average hourly wage or compensation for the *j*th quote for job *i* in location *a*, X_{ij}^{a} represents data on the characteristics of the job and the worker, and L_{i}^{a} represents a local area effect for job *i* in area *a*, are essentially analogs to the "country/product dummy" model in international product price comparisons. These regressions allow the coefficients on X_{ij}^{a} and the local area effects to vary across jobs. Tables B.1 and B.2 below give weighted least squares estimates for (12), where the weights are the sample weights from the ECI.

It is worth discussing a few obvious points of interpretation. The coefficients give the estimated marginal effect on wages within the industry/occupation cell. One would expect these marginal effects to depend on how broadly or narrowly the cells are defined, and to differ from the marginal effect from a regression over all industry/occupation cells. Furthermore, the CPS covariates are averages; a given CPS covariate value is not ECI quote-specific as multiple ECI quotes have the same values attached. In that case the proper interpretations to place on the marginal effects are less clear. For example, one tends to find higher wages in the ECI sample in locations and jobs where the population workforce (not ECI sample workforce, as this aspect is unknown) is more highly educated. Does the schooling variable proxy for the ECI sample workforce's schooling, its cognitive abilities more generally, or some other factors that are also related to wages? This leads to another issue, namely the question of which variables to use as regressors. Presumably the "proper" selection of covariates depends on what they proxy for, as well as on the end purpose of the generated statistics. If the end purpose of the statistics is to inform business location decisions, then one would want to control for those factors that are productivity related or which capture labor cost premia that do not reflect productivity differences but which are avoidable by prospective new firms. Although sensible readers might disagree with details of our specification, we feel that the covariates with the largest effects on the interarea wage indexes would fall primarily into these categories. Finally, the standard errors in tables B.1 and B.2 are likely to be biased downward for the CPS variables, since the regression equation disturbances are correlated within groups (Moulton [1986, 1990]). At this point we are mainly interested in generating consistent estimates of the local area effects, and are less interested in confidence intervals. Presumably generating correct standard errors would be more straightforward if estimating the hedonic regressions and interarea indexes simultaneously were practicable.

Table B.1: Hedonic Wage Regressions
A. Goods Producing Industries

Professional/ Technical	Executive/ Administrative	Sales	Administrative Support	Precision Production	Machine Operatives	Transport Operatives	Laborers	Service Workers
1.02	-0.03	0.04	0.12	0.09	0.25	-0.24	0.02	0.41
(0.24)	(0.11)	(0.21)	(0.05)	(0.03)	(0.07)	(0.08)	(0.07)	(0.32)
1.13	0.24	0.20	0.06	0.08	0.08	-0.14	0.05	0.65
(0.20)	(0.09)	(0.22)	(0.05)	(0.03)	(0.07)	(0.07)	(0.06)	(0.44)
1.11	0.29	0.61	0.21	0.17	0.09	-0.09	-0.01	0.48
(0.20)	(0.09)	(0.20)	(0.05)	(0.03)	(0.07)	(0.07)	(0.07)	(0.26)
1.14	0.40	0.29	0.06	0.15	0.08	-0.08	0.02	0.84
(0.20)	(0.09)	(0.19)	(0.05)	(0.03)	(0.06)	(0.07)	(0.06)	(0.27)
1.16	0.28	0.72	0.20	0.16	0.08	0.03	0.07	0.80
(0.20)	(0.09)	(0.22)	(0.05)	(0.04)	(0.07)	(0.08)	(0.06)	(0.28)
1.30	0.43	0.73	0.19	0.31	0.21	-0.16	0.22	0.85
(0.20)	(0.09)	(0.31)	(0.05)	(0.04)	(0.07)	(0.09)	(0.07)	(0.30)
1.32	0.46	0.47	0.24	0.30	0.37	0.09	0.17	0.98
(0.20)	(0.09)	(0.31)	(0.05)	(0.04)	(0.07)	(0.08)	(0.07)	(0.27)
1.50	0.47	0.18	0.30	0.29	0.50	0.02	0.27	1.10
(0.20)	(0.08)	(0.30)	(0.05)	(0.04)	(0.07)	(0.09)	(0.08)	(0.28)
0.14	-0.40	-0.80	-0.27	-0.12	-0.19	-0.08	-0.17	0.43
(0.08)	(0.18)	(0.17)	(0.03)	(0.06)	(0.12)	(0.07)	(0.05)	(0.11)
0.23	0.07	0.16	0.15	0.20	0.22	0.23	0.46	0.31
(0.05)	(0.10)	(0.30)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.09)
-0.03	0.02	0.11	0.02	0.06	0.00	0.13	0.06	0.06
(0.04)	(0.04)	(0.07)	(0.03)	(0.02)	(0.04)	(0.03)	(0.02)	(0.05)
0.01	-0.05	-0.04	0.03	-0.01	0.04	-0.05	0.01	0.07
(0.03)	(0.03)	(0.04)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
-0.05	0.08	0.09	-0.07	-0.03	-0.04	0.13	-0.06	-0.13
(0.06)	(0.06)	(0.12)	(0.03)	(0.04)	(0.07)	(0.04)	(0.05)	(0.05)
829	675	97	1128	1649	1208	339	500	124
0.32	0.25	0.58	0.34	0.37	0.47	0.43	0.55	0.75

:ost Index.

Table B.1: Hedonic Wage Regressions (cont.)
B. Service Industries

Professional/ Technical	Executive/ Administrative	Sales	Administrative Support	Precision Production	Machine Operatives	Transport Operatives	Laborers	Service Workers
-0.24	0.14	0.19	-0.05	0.18	0.01	0.01	0.24	-0.10
(0.05)	(0.05)	(0.04)	(0.02)	(0.06)	(0.18)	(0.07)	(0.05)	(0.03)
-0.14	0.13	0.18	-0.04	0.25	-0.11	0.18	0.06	-0.10
(0.05)	(0.05)	(0.04)	(0.02)	(0.05)	(0.13)	(0.06)	(0.04)	(0.03)
-0.04	0.21	0.27	-0.07	0.38	0.02	0.22	0.05	-0.14
(0.04)	(0.05)	(0.04)	(0.02)	(0.06)	(0.10)	(0.07)	(0.04)	(0.03)
0.01	0.05	0.09	-0.04	0.36	-0.20	0.24	0.11	-0.02
(0.04)	(0.05)	(0.03)	(0.02)	(0.07)	(0.10)	(0.08)	(0.04)	(0.03)
0.04	0.22	0.05	-0.02	0.32	-0.04	0.12	0.13	-0.03
(0.05)	(0.06)	(0.05)	(0.02)	(0.10)	(0.13)	(0.09)	(0.05)	(0.03)
0.09	0.39	0.08	-0.03	0.45	-0.16	0.35	0.13	0.03
(0.05)	(0.06)	(0.07)	(0.02)	(0.10)	(0.13)	(0.13)	(0.07)	(0.04)
0.08	0.32	0.14	0.01	0.31	-0.13	0.22	0.38	-0.02
(0.04)	(0.06)	(0.09)	(0.02)	(0.11)	(0.23)	(0.19)	(0.06)	(0.04)
0.05	0.29	0.04	0.00	0.42	0.11	0.20	0.17	0.15
(0.04)	(0.06)	(0.06)	(0.03)	(0.10)	(0.20)	(0.30)	(0.08)	(0.05)
-0.17	-0.46	-0.62	-0.23	-0.34	-0.40	-0.35	-0.28	-0.22
(0.02)	(0.08)	(0.02)	(0.01)	(0.08)	(0.10)	(0.06)	(0.02)	(0.02)
0.06	-0.26	0.09	0.12	0.21	0.25	0.24	0.29	0.07
(0.04)	(0.13)	(0.05)	(0.03)	(0.07)	(0.10)	(0.06)	(0.03)	(0.03)
-0.01	0.09	0.29	0.09	0.01	-0.07	0.06	-0.01	0.01
(0.03)	(0.03)	(0.03)	(0.02)	(0.06)	(0.06)	(0.05)	(0.02)	(0.03)
-0.01	-0.01	0.07	-0.01	-0.05	0.02	0.04	0.01	0.06
(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.01)	(0.01)
-0.01	0.00	-0.12	0.03	0.12	-0.12	-0.09	0.00	-0.11
(0.06)	(0.05)	(0.05)	(0.02)	(0.05)	(0.07)	(0.03)	(0.03)	(0.03)
2058	1482	1692	3259	425	165	246	659	1933
0.21	0.25	0.48	0.28	0.32	0.38	0.45	0.43	0.41

Cost Index.

Table B.2: Hedonic Compensation Regressions
A. Goods Producing Industries

Professional/ Technical	Executive/ Administrative	Sales	Administrative Support	Precision Production	Machine Operatives	Transport Operatives	Laborers	Service Workers
1.11	-0.01	0.04	0.17	0.14	0.30	-0.15	0.07	0.32
(0.22)	(0.11)	(0.21)	(0.06)	(0.04)	(0.08)	(0.08)	(0.07)	(0.30)
1.21	0.31	0.28	0.17	0.14	0.14	-0.04	0.16	0.84
(0.19)	(0.09)	(0.21)	(0.05)	(0.03)	(0.08)	(0.07)	(0.07)	(0.42)
1.22	0.33	0.69	0.30	0.24	0.13	0.01	0.03	0.63
(0.19)	(0.09)	(0.20)	(0.05)	(0.03)	(0.08)	(0.07)	(0.07)	(0.25)
1.26	0.42	0.36	0.18	0.20	0.15	-0.02	0.09	0.93
(0.19)	(0.09)	(0.18)	(0.05)	(0.03)	(0.07)	(0.07)	(0.07)	(0.25)
1.28	0.34	0.82	0.35	0.23	0.20	0.14	0.18	0.93
(0.19)	(0.09)	(0.21)	(0.05)	(0.04)	(0.07)	(0.08)	(0.07)	(0.26)
1.48	0.52	0.81	0.37	0.40	0.32	-0.04	0.30	1.01
(0.19)	(0.09)	(0.30)	(0.06)	(0.04)	(0.08)	(0.09)	(0.07)	(0.28)
1.48	0.55	0.53	0.39	0.41	0.53	0.22	0.33	1.19
(0.19)	(0.09)	(0.30)	(0.05)	(0.04)	(0.08)	(0.08)	(0.08)	(0.26)
1.66	0.59	0.20	0.49	0.43	0.74	0.33	0.44	1.33
(0.18)	(0.08)	(0.30)	(0.05)	(0.04)	(0.08)	(0.09)	(0.09)	(0.27)
0.06	-0.47	-0.91	-0.37	-0.16	-0.22	-0.24	-0.20	0.31
(0.08)	(0.18)	(0.17)	(0.04)	(0.06)	(0.14)	(0.08)	(0.05)	(0.10)
0.24	0.19	0.15	0.21	0.29	0.29	0.32	0.56	0.32
(0.05)	(0.10)	(0.29)	(0.03)	(0.02)	(0.02)	(0.04)	(0.04)	(0.09)
-0.04	0.04	0.11	-0.01	0.03	0.00	0.11	0.06	0.06
(0.04)	(0.04)	(0.07)	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)	(0.05)
0.02	-0.04	-0.05	0.04	0.00	0.03	-0.05	0.02	0.06
(0.02)	(0.03)	(0.04)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
-0.07	0.08	0.14	-0.08	-0.02	-0.01	0.12	-0.09	-0.13
(0.06)	(0.06)	(0.12)	(0.03)	(0.04)	(0.08)	(0.04)	(0.05)	(0.05)
829	675	97	1128	1649	1208	339	500	124

0.37	0.32	0.64	0.41	0.48	0.56	0.55	0.62	0.80

:ost Index.

Table B.2: Hedonic Compensation Regressions (cont.)
B. Service Industries

Professional/ Technical	Executive/ Administrative	Sales	Administrative Support	Precision Production	Machine Operatives	Transport Operatives	Laborers	Service Workers
-0.22	0.15	0.21	-0.04	0.23	0.08	0.04	0.27	-0.11
(0.05)	(0.05)	(0.04)	(0.02)	(0.06)	(0.20)	(0.07)	(0.05)	(0.03)
-0.11	0.15	0.17	-0.01	0.30	-0.11	0.22	0.09	-0.08
(0.05)	(0.05)	(0.04)	(0.02)	(0.05)	(0.14)	(0.07)	(0.04)	(0.03)
-0.01	0.25	0.28	-0.05	0.43	0.10	0.28	0.09	-0.09
(0.04)	(0.05)	(0.04)	(0.02)	(0.06)	(0.11)	(0.08)	(0.05)	(0.03)
0.03	0.07	0.10	-0.02	0.37	-0.13	0.29	0.16	0.02
(0.04)	(0.05)	(0.03)	(0.02)	(0.07)	(0.11)	(0.08)	(0.04)	(0.03)
0.07	0.27	0.06	0.02	0.41	0.02	0.17	0.16	-0.02
(0.05)	(0.06)	(0.05)	(0.03)	(0.10)	(0.14)	(0.09)	(0.06)	(0.03)
0.16	0.46	0.13	0.01	0.52	-0.06	0.51	0.17	0.09
(0.05)	(0.06)	(0.07)	(0.03)	(0.10)	(0.14)	(0.14)	(0.07)	(0.04)
0.16	0.36	0.22	0.07	0.41	-0.18	0.32	0.42	0.05
(0.04)	(0.06)	(0.09)	(0.03)	(0.11)	(0.25)	(0.20)	(0.07)	(0.04)
0.10	0.34	0.09	0.05	0.46	0.25	0.15	0.18	0.21
(0.04)	(0.05)	(0.06)	(0.03)	(0.10)	(0.22)	(0.31)	(0.08)	(0.05)
-0.26	-0.53	-0.70	-0.35	-0.42	-0.55	-0.47	-0.34	-0.27
(0.02)	(0.08)	(0.02)	(0.02)	(0.08)	(0.11)	(0.07)	(0.03)	(0.02)
0.12	-0.14	0.19	0.19	0.30	0.31	0.37	0.42	0.16
(0.04)	(0.13)	(0.05)	(0.03)	(0.07)	(0.11)	(0.07)	(0.04)	(0.03)
0.00	0.12	0.29	0.10	-0.01	-0.05	0.03	-0.02	0.03
(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)	(0.05)	(0.02)	(0.03)
-0.02	-0.01	0.07	0.00	-0.05	0.02	0.05	0.01	0.08
(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.01)	(0.01)
0.01	0.00	-0.12	0.00	0.09	-0.13	-0.10	-0.01	-0.14
(0.05)	(0.04)	(0.05)	(0.02)	(0.05)	(0.08)	(0.04)	(0.03)	(0.03)
2058	1482	1692	3259	425	165	246	659	1933

0.26	0.30	0.53	0.33	0.38	0.43	0.56	0.49	0.50

:ost Index.

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