Domestic employment in U.S.-based multinational companies

Establishments of multinational manufacturing firms in the United States are larger, are located disproportionately in the South, employ a disproportionate number of engineers, and pay higher wages, on average, than other U.S. establishments; these findings hold even after controlling for establishment industry, size, and age, and the interaction between industry and size

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The Bureau of Economic Analysis (BEA) collects data on multinational companies based in the United States—firms that have full or partial ownership of affiliate companies in foreign countries. However, BEA data offer little detail on the characteristics of these firms' U.S. employment. Identifying such firms in BLS data can show the geographic, occupation, and wage distributions of their employees in the United States. The popular media sometimes describe U.S. companies that make investments in companies overseas as "exporting good jobs," but there is little evidence on the *domestic* employment characteristics of these firms, either before or after their overseas investments have taken place.

Typically, firms that own at least a 10-percent interest in a foreign company are described as being engaged in *foreign direct investment*.[1] In the economics literature, such companies have been shown to be systematically different from firms that focus on the domestic market.[2] In particular, firms with foreign affiliates tend to be larger and more productive than firms that have no foreign affiliates, but that sell their products internationally.[3] Exporting firms in turn tend to be larger and more productive than firms that sell their products only on the domestic market.[4] However, aside from establishing that the firms engaged in foreign direct investment tend to be large employers that pay higher wages, the literature has uncovered very little about the geographic, occupation, or wage distributions of employment by U.S.-based multinational companies.

The research presented in this article is based on a joint BEA-BLS project that linked BEA firm-level data on U.S. multinational companies with BLS establishment-level data for all U.S. employers. By identifying a subset of all domestically located establishments in the BLS data that are the establishments of U.S.-based multinational companies, the article presents, for the first time, details on the employment, wages, and geographical and occupational distributions of these companies.

Background

Beginning with the enactment of the Foreign Direct Investment and International Financial Data Improvements Act of 1990, BLS and BEA collaborated to combine BEA data on foreign-owned businesses with BLS employment data until the funds dedicated to the project were eliminated. That project, which focused on the composition of domestic employment related to direct investments in the United States by foreign firms, produced the tabulations "Employment and Wages in Foreign-Owned Businesses in the United States" for 1989 through 1992 and "Occupations in Foreign-Owned Manufacturing Establishments in the United States" for 1989. Nowadays, there is more concern—reflected in both the popular press and the economic literature—about the impact of U.S. direct investment overseas on domestic employment.

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From 2005 to 2007, a National Academy of Public Administration panel, authorized and funded by Congress, studied the definition, available data, and impact of offshoring on the U.S. economy. The panel produced three reports,[5] and its efforts led to a memorandum of understanding between BEA and BLS. The memorandum permits relevant data sharing between the two agencies to investigate possible avenues for improving statistics through linking their data. The panel recommended that BEA and BLS work to link the BEA firm-level data on U.S. multinational companies with BLS establishment-level data for all U.S. employers. Following this recommendation, a team of researchers at BLS and BEA has been investigating the feasibility of linking the two datasets since the panel concluded its work in 2007.

Data and methods

In what follows, BEA data were used to match a pilot group of U.S. parent firms of multinational companies with their establishments appearing in BLS data. The pilot group consists of the largest 500 U.S.-based multinational manufacturers (by primary industry of the U.S. parent) in the BEA's firm-level data from the 2004 Benchmark Survey of U.S. Direct Investment Abroad. The efforts at matching were based primarily on the names, locations, and employer identification numbers (EINS)[6] provided in this survey.

The BLS Quarterly Census of Employment and Wages (QCEW) is the starting point for identifying the establishments of firms in the pilot group for the years 2004 and 2005. The QCEW collects information on total employment by month and total wage bills (total wages paid by establishments) by quarter for all U.S. establishments covered in the Unemployment Insurance program, as well as detailed information on the industry of main activity (at the six-digit North American Industry Classification System (NAICS) level) and geographic location (at the Census block level) for each establishment.

These establishments were then matched with those sampled in the BLS Occupational Employment Statistics (OES) survey from November 2003 to May 2006. This survey collects data from a sample of 1.2 million establishments over each 3-year cycle. Sampled establishments provide data on the distribution of their employees' occupations (by the 801 detailed civilian occupations of the Standard Occupational Classification (SOC) system) and hourly wages (in 12 broad wage bands). To calculate average wages in the OES data, each employee is assigned a wage based on the mean wage for these wage bands, following the methods used in OES publications.[7]

The automatic matching efforts entail matching EINs between BEA firm-level data and BLS establishment-level data. BEA firm-level data contain only one or two EINs per firm, while BLS establishment-level data contain one EIN per establishment, and the establishments of each firm may report many different EINs in the BLS data. Thus, additional EINs for each firm are found by matching firm names and addresses with the establishment names and addresses in the QCEW, as well as by using company family lists (lists of employers that operate under different names but are part of the same company) from other BLS programs, company information in the Compustat database, and other sources of data on firms. However, such automated matching procedures are imperfect: some firms are matched with unrelated establishments, while other firms appear to be matched with only a fraction of their establishments in the QCEW. Accordingly, the lists of all establishments found through automated matching were reviewed manually, and the establishments matched in error were removed. Then, the QCEW was searched for additional establishments identified from company Web sites, filings from the Securities and Exchange Commission (SEC), and company annual reports.

On the advice of BEA staff, the firms identified in their surveys were considered to be "adequately matched" with BLS establishment data if the total employment of all matched BLS establishments for a particular firm was within 20 percent of the total employment reported in the BEA survey. Of the 500 firms in the pilot group, 201 were considered to be adequately matched with the QCEW data with the use of only automated matching methods. After several months of labor-intensive review and "hand matching," 453 of the 500 firms were believed to be adequately matched. The remainder of this article discusses results for these 453 firms, which employ 90 percent of the workers of the largest 500 manufacturers, as the following tabulation shows:

Source of data and category of employment	*Number of workers*
BEA data from 2004 Benchmark Survey of U.S. Direct Investment Abroad:	
Total domestic employment of companies in survey	22,445,900
Employment in these companies whose primary industry is manufacturing	7,628,500
Employment in the largest 500 of these companies	6,829,300
Employment in the 453 matched companies	6,444,300
BLS data from QCEW and OES survey:	
Total employment in establishments matching with these 453 matched companies, per QCEW	6,112,919
Weighted[8] employment in establishments matching with these 453 matched companies, per OES survey	5,638,849

The establishments of the 453 adequately matched firms were then linked with establishments in the OES survey data. Because the OES sample design always includes all large establishments over the 3-year panel, about one-fifth of the matched establishments are part of the OES sample and responded to the survey between November 2003 and May 2006.

Caveats

Although a large portion of U.S. employment of U.S.-based multinational manufacturing companies was found in the QCEW and OES data, the missing employment is not random. The 453 multinational companies that were found to match with the BLS establishment data are different from the 47 firms that remained unmatched. For example, it was more difficult to match privately owned firms (which generally disclose less information than publicly owned firms and, in particular, do not file annual reports with the SEC) and firms that have undergone liquidation or reorganization since the survey date.

Even the establishments found in the 453 matched firms were not randomly distributed among those firms in ways that might affect the resulting estimates of wages and occupations. For example, in a multinational firm, 90 percent of whose BEA-estimated employment was found in the QCEW, matched establishments in the BLS data might include all of the firm's major manufacturing plants and just a few of the firm's smaller sales offices.

Furthermore, the sample design of the OES survey is intended to produce estimates at the State and industry levels, not to provide estimates for the unusual subsample of multinational firms examined in this article. The OES survey collects information from a sample of establishments rotating in 3-year panels, with sample probabilities that vary by establishment size. The probability that a larger establishment is included in the OES sample over the course of 3 years is greater than the probability that a small establishment is included. This difference could affect the distribution of occupations and wages in the subsample of establishments that are matched with multinational firms. In the extreme case, the distribution of occupations found in the OES data for a particular firm might represent only the large manufacturing plants of that firm, excluding the firm's sales and headquarters establishments. Consequently, the sample and nonsample variance of these estimates may be large.

Another concern is the difference in wage reporting between the QCEW and the OES survey. Total wage bills in the QCEW data include bonuses and overtime pay for all employees on the payroll of an establishment for each quarter, whereas wage payments in the OES include only base hourly or annual wages for employees at the time the establishment is contacted by the survey. It was found that, among the establishments in the pilot group, those included in the OES survey reported monthly wage bills per employee in the QCEW data that were about 219 times the average hourly wages per employee they reported to the OES survey (approximately equivalent to 27 days' wages times 8 hours per day), while the typical ratio for all establishments was an average monthly wage bill per employee in the QCEW data that was about 135 times the average hourly wage per employee reported to the OES survey. The following tabulation gives the breakdown:

Category of establishment	*Average monthly QCEW wage bill*	*Average OES wages per hour*	*Ratio*
All U.S. establishments.....	$2,538.53	$18.84	135
Matched establishments.....	5,193.16	23.74	219

This different relationship between QCEW and OES wage data for U.S.-based multinational manufacturers, compared with typical U.S. employers, could be due to differences in average hours worked, particularly in the incidence of part-time employment, overtime pay, or bonuses. To reduce the impact of bonuses on the comparisons of multinational companies with other employers, QCEW data from the third quarter of 2004 were used instead of data from the fourth quarter, during which bonuses typically are largest. However, it is still possible that the multinational companies pay higher bonuses, even in the third quarter. It is also possible that some of the difference between the measurement of wages in the QCEW and OES data is due to underreporting and topcoding of wages in the OES for highly paid workers.

Results

Employment in the 453 matched companies among the 500 largest multinational manufacturers accounts for 4.7 percent of total U.S. employment measured in the QCEW. As one would expect from a matching effort that began with firms whose primary industry is manufacturing, most establishments of those firms are involved in manufacturing; about 67 percent of the firms' employment is in manufacturing establishments.

Table 1 compares employment and monthly wage bills (based on the QCEW for the third quarter of 2004) per employee, by industry (major sectors and subsectors), for

Table 1. Employment and wages for major industry groups and manufacturing subsectors, all United States and matched U.S. multinational manufacturing companies, third quarter, 2004

Industry group or manufacturing subsector	All U.S. establishments				Matched U.S. multinational manufacturing companies						
	Number of establishments	Average monthly employment	Average establishment employment	Average monthly wages	Number of establishments	Average monthly employment	Percentage of average monthly employment for all U.S. establishments	Average establishment employment	Ratio of average matched establishment size to average U.S. establishment size	Average monthly wages	Ratio of average wages in matched establishments to average U.S. monthly wages
All industries	8,388,413	129,188,999	15.4	$2,538.53	105,462	6,112,919	4.7	58.0	3.8	$5,193.16	2.0
Agriculture, forestry, fishing and hunting	97,661	1,264,864	13.0	1,738.26	721	18,690	1.5	25.9	2.0	2,994.21	1.7
Mining, quarrying, and oil and gas extraction	25,431	525,340	20.7	3,722.63	1,223	64,471	12.3	52.7	2.6	6,207.66	1.7
Utilities	24,650	823,642	33.4	3,735.40	127	3,384	.4	26.6	.8	5,096.16	1.4
Construction	830,965	7,403,064	8.9	2,288.16	3,144	81,201	1.1	25.8	2.9	3,813.43	1.7
Manufacturing	370,645	14,368,451	38.8	2,804.14	19,323	4,098,018	28.5	212.1	5.5	5,254.62	1.9
Food manufacturing	28,583	1,519,225	53.2	2,095.70	1,916	424,300	27.9	221.5	4.2	4,233.34	2.0
Beverage and tobacco product manufacturing	4,287	199,578	46.6	2,890.18	501	83,004	41.6	165.7	3.6	6,223.41	2.2
Textile mills	4,538	237,662	52.4	2,786.02	166	33,599	14.1	202.4	3.9	4,016.26	1.4
Textile product mills	7,881	176,074	22.3	1,881.77	102	18,289	10.4	179.3	8.0	3,233.79	1.7
Apparel manufacturing	12,454	284,205	22.8	1,720.40	98	14,306	5.0	146.0	6.4	3,906.29	2.3
Leather and allied product manufacturing	1,496	42,589	28.5	2,062.75	8	598	1.4	74.8	2.6	3,990.32	1.9
Wood product manufacturing	17,744	559,338	31.5	2,155.77	554	61,140	10.9	110.4	3.5	3,703.68	1.7
Paper manufacturing	6,536	493,560	75.5	3,640.75	1,324	193,203	39.1	145.9	1.9	4,631.92	1.3
Printing and related support activities	38,402	662,736	17.3	2,482.77	654	82,534	12.5	126.2	7.3	4,927.15	2.0
Petroleum and coal products manfacturing	2,334	114,175	48.9	4,777.08	533	53,368	46.7	100.1	2.0	6,403.45	1.3
Chemical manufacturing	15,413	882,111	57.2	4,098.05	2,168	386,453	43.8	178.3	3.1	6,077.88	1.5
Plastics and rubber products manufacturing	14,809	806,133	54.4	2,883.31	1,051	194,313	24.1	184.9	3.4	4,022.45	1.4
Nonmetallic mineral product manufacturing	17,648	509,399	28.9	2,797.83	879	91,941	18.0	104.6	3.6	3,997.58	1.4
Primary metal manufacturing	6,057	467,500	77.2	3,412.04	521	137,663	29.4	264.2	3.4	4,849.14	1.4
Fabricated metal product manufacturing	60,794	1,503,397	24.7	2,764.81	1,520	204,347	13.6	134.4	5.4	5,294.56	1.9
Machinery manufacturing	32,166	1,141,544	35.5	3,303.69	1,595	322,836	28.3	202.4	5.7	4,893.30	1.5

Table 1. Continued—Employment and wages for major industry groups and manufacturing subsectors, all United States and matched U.S. multinational manufacturing companies, third quarter, 2004

Industry group or manufacturing subsector	All U.S. establishments				Matched U.S. multinational manufacturing companies						
	Number of establishments	Average monthly employment	Average establishment employment	Average monthly wages	Number of establishments	Average monthly employment	Percentage of average monthly employment for all U.S. establishments	Average establishment employment	Ratio of average matched establishment size to average U.S. establishment size	Average monthly wages	Ratio of average wages in matched establishments to average U.S. monthly wages
Computer and electronic product manufacturing	19,846	1,318,540	66.4	4,535.20	1,767	508,530	38.6	287.8	4.3	8,383.27	1.8
Electrical equipment, appliance, and component manufacturing	7,371	443,048	60.1	3,389.99	865	185,169	41.8	214.1	3.6	4,844.07	1.4
Transportation equipment manufacturing	15,390	1,780,375	115.7	3,149.14	2,004	889,093	49.9	443.7	3.8	5,381.64	1.7
Furniture and related product manufacturing	24,266	570,882	23.5	2,156.10	420	92,994	16.3	221.4	9.4	3,282.51	1.5
Miscellaneous manufacturing	32,630	656,380	20.1	2,466.70	677	120,338	18.3	177.8	8.8	5,333.30	2.2
Wholesale trade	593,377	5,661,253	9.5	4,068.79	37,384	678,511	12.0	18.1	1.9	6,356.45	1.6
Retail trade	1,037,755	15,062,368	14.5	1,745.98	18,634	205,966	1.4	11.1	.8	2,714.15	1.6
Transportation and warehousing	232,150	5,104,776	22.0	2,475.12	2,180	80,540	1.6	36.9	1.7	4,327.88	1.7
Information	148,334	3,222,535	21.7	4,148.19	1,010	57,529	1.8	57.0	2.6	5,950.71	1.4
Finance and insurance	450,062	5,852,186	13.0	3,776.96	2,097	54,380	.9	25.9	2.0	5,771.11	1.5
Real estate and rental and leasing	339,405	2,165,788	6.4	2,499.01	1,507	17,322	.8	11.5	1.8	3,587.29	1.4
Professional, scientific, and technical services	882,094	6,845,485	7.8	3,484.03	7,097	315,940	4.6	44.5	5.7	6,314.28	1.8
Management of companies and enterprises	40,667	1,698,843	41.8	5,781.58	1,891	252,113	14.8	133.3	3.2	10,191.68	1.8
Administrative and support and waste management and remediation services	424,372	8,106,947	19.1	2,250.98	3,114	92,816	1.1	29.8	1.6	5,203.35	2.3
Educational services	142,085	10,001,237	70.4	2,462.54	448	10,606	.1	23.7	.3	4,093.31	1.7
Health care and social assistance	685,556	15,788,272	23.0	3,266.01	969	18,827	.1	19.4	.8	3,100.36	.9
Arts, entertainment, and recreation	121,375	2,484,259	20.5	3,002.96	345	16,229	.7	47.0	2.3	2,172.59	.7
Accommodation and food services	564,739	10,957,166	19.4	1,026.36	601	14,445	.1	24.0	1.2	1,309.41	1.3
Other services (except public administration)	1,085,435	4,373,574	4.0	1,340.99	2,151	28,950	.7	13.5	3.3	3,619.24	2.7

SOURCE: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

all U.S. establishments and for the establishments of the matched multinational manufacturing companies. In general, the establishments of these matched multinational manufacturers have higher employment per establishment than do all employers. This difference is particularly large in certain manufacturing subsectors, such as printing and textiles. The establishments of these matched multinational manufacturing companies also have higher wage bills per employee than all employers have. Later, regression analysis is used to decompose how much of the difference in wages shown in table 1 can be attributed to differences in the geographic composition, industries, sizes, and occupational distribution of workers in those establishments.

These findings echo those of Mark Doms and J. Bradford Jensen, who reported that U.S. multinational companies were larger and paid higher wages in 1987, on average, than either small or large domestically oriented firms or than foreign-owned firms.[9] Controlling for establishment size, industry, age of the plant, and State in which the company is located, Doms and Jensen found that production workers in establishments of U.S. multinational companies were paid 7 percent more than those in establishments of large domestically oriented firms, about 17 percent more than those in establishments of small domestically oriented firms, and about 3 percent more than those in establishments of foreign-owned plants. These same authors found smaller differences in pay for nonproduction workers.

However, some of the differences in wages between all U.S. establishments and establishments of the matching multinational manufacturing companies are likely due to differences in the subsectors of the major industries in which the establishments are engaged. For example, the 142,085 U.S. establishments in educational services are largely public school establishments, whereas the 448 educational services establishments of multinational manufacturing companies are not.

Table 2 compares employment (based on the QCEW for the third quarter of 2004) by census region and division between all U.S. establishments and establishments of matched multinational manufacturing firms. The concentration of multinational employment ranges from 3.5 percent of employment in the West to 6.5 percent in the Midwest. More specifically, the concentration of multinational employment for the pilot group is greatest in the East North Central census division, where the companies in the group employ 6.9 percent of all workers. This census division also has the largest difference in employment between multinational employers and all employers: establishments of multinational employers average more than 5 times the size of average employers in the division. The difference in wage bills between matched multinational employers and all employers is greatest in the West, where the average matched multinational employer pays monthly wage bills per employee that are 2.3 times the monthly wage bills per employee of average employers overall.

Because the establishments examined in this article are in multinational *manufacturing* firms, some of the geographic distribution of matched establishments will be driven by the geographic distribution of the manufacturing industry throughout the United States. Table 2 shows that the manufacturing establishments—matched or not—are located mostly in the South and Midwest regions. Within manufacturing establishments, the fraction of employment that is in matched multinational employers ranges from 22.0 percent in the Middle Atlantic census division to 32.3 percent in the West South Central census division.

An interesting question that arises is, How is the geographic concentration of the matching multinational employers in the South and the Midwest regions influenced by factors such as industry composition? To answer this question, a simple linear probability regression may be performed for each geographic region. The regression results explain how much of the difference in the geographic locations of multinational employers is due only to differences in the industry composition, size classes, and ages of their establishments. For example, if large, older manufacturing plants are located predominantly in the Midwest and the matched multinational companies are composed disproportionately of large, older manufacturing establishments, this set of circumstances would explain the location of the matched multinational companies in the Midwest. The regressions take the form

$$y_i = \alpha + \beta \text{Match}_i + \gamma X_i + \varepsilon_i,$$

where y_i is the outcome variable of interest for establishment i (here, an indicator variable for the geographic region in which the establishment is located); Match_i is an indicator variable for whether establishment i matches with the multinational manufacturing parent firms identified in the BEA data; and X_i is a vector of establishment-level control variables (here, the industry,[10] size class, interaction of industry with size class, and age[11] in the QCEW in the third quarter of 2004).

The results of these regressions are given in Table 3. The first column of numbers shows the coefficients (and

Table 2. Civilian employment and wages, by census region and division, for all industries and manufacturing industries, all United States and matched U.S. multinational manufacturing companies, third quarter, 2004

Census region and division	All U.S. establishments				Matched U.S. multinational manufacturing companies						
	Number of establishments	Average monthly employment	Average establishment employment	Average monthly wages	Number of establishments	Average monthly employment	Percentage of average monthly employment for all U.S. establishments	Average establishment employment	Ratio of average matched establishment size to average U.S. establishment size	Average monthly wages	Ratio of average wages in matched establishments to average U.S. monthly wages
All industries											
Total	8,388,413	129,188,999	15.4	$2,538.53	105,462	6,112,919	4.7	58.0	3.8	5,193.16	2.0
Northeast	1,626,703	24,309,685	14.9	2,806.40	17,701	918,587	3.8	51.9	3.5	5,463.88	1.9
New England	476,115	6,754,517	14.2	2,964.37	6,461	286,953	4.2	44.4	3.1	5,812.92	2.0
Middle Atlantic	1,150,588	17,555,168	15.3	2,741.04	11,240	631,634	3.6	56.2	3.7	5,263.25	1.9
South	2,794,527	45,493,523	16.3	2,531.15	41,914	2,192,343	4.8	52.3	3.2	4,906.74	1.9
South Atlantic	1,583,836	24,476,157	15.5	2,554.75	21,319	1,044,412	4.3	49.0	3.2	5,154.00	2.0
East South Central	417,113	7,325,001	17.6	2,331.31	7,309	446,813	6.1	61.1	3.5	4,505.47	1.9
West South Central	793,578	13,692,366	17.3	2,589.07	13,286	701,118	5.1	52.8	3.1	4,730.74	1.8
Midwest	1,782,245	30,422,738	17.1	2,398.43	24,875	1,974,029	6.5	79.4	4.6	4,996.76	2.1
East North Central	1,181,720	20,930,306	17.7	2,465.47	15,847	1,434,707	6.9	90.5	5.1	5,184.99	2.1
West North Central	600,525	9,492,431	15.8	2,266.51	9,028	539,322	5.7	59.7	3.8	4,666.35	2.1
West	2,184,938	28,963,053	13.3	2,462.80	20,972	1,027,961	3.5	49.0	3.7	5,770.04	2.3
Mountain	595,144	8,748,932	14.7	2,547.16	9,072	292,659	3.3	32.3	2.2	5,988.24	2.4
Pacific	1,589,794	20,214,121	12.7	2,431.22	11,900	735,302	3.6	61.8	4.9	5,603.69	2.3
Manufacturing industries											
Total	370,645	14,368,451	38.8	2,804.14	19,323	4,098,018	28.5	212.1	5.5	5,254.62	1.9
Northeast	70,787	2,379,255	33.6	3,026.49	2,736	547,006	23.0	199.9	5.9	6,190.34	2.0
New England	22,400	753,135	33.6	3,176.94	884	189,121	25.1	213.9	6.4	5,846.08	1.8
Middle Atlantic	48,387	1,626,120	33.6	2,956.84	1,852	357,885	22.0	193.2	5.8	6,354.67	2.1
South	111,719	4,786,027	42.8	2,674.78	7,693	1,459,774	30.5	189.8	4.4	4,717.47	1.8
South Atlantic	55,384	2,241,437	40.5	2,695.06	3,527	660,089	29.4	187.2	4.6	4,704.99	1.7
East South Central	20,710	1,147,627	55.4	2,510.02	1,646	348,229	30.3	211.6	3.8	4,202.60	1.7
West South Central	35,625	1,396,963	39.2	2,739.04	2,520	451,456	32.3	179.1	4.6	5,071.24	1.9
Midwest	101,119	4,524,718	44.7	2,813.61	5,556	1,419,108	31.4	255.4	5.7	4,750.88	1.7
East North Central	73,242	3,297,125	45.0	2,915.16	3,981	1,038,622	31.5	260.9	5.8	4,962.15	1.7
West North Central	27,877	1,227,593	44.0	2,546.78	1,575	380,486	31.0	241.6	5.5	4,216.88	1.7
West	87,020	2,678,451	30.8	2,778.33	3,338	672,130	25.1	201.4	6.5	6,564.03	2.4
Mountain	22,158	623,233	28.1	2,447.92	896	172,464	27.7	192.5	6.8	5,253.28	2.1
Pacific	64,862	2,055,218	31.7	2,891.21	2,442	499,666	24.3	204.6	6.5	7,044.97	2.4

SOURCE: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

their standard errors) for the Match indicator without any controls X_i, while the second column of numbers shows the coefficients (and their standard errors) for the Match indicator when controls for establishment industry, size class, and age, and for the interaction of industry with size class, are added.

Because the matching is incomplete, some unmatched establishments may belong to the multinational manu-

Table 3. Difference in establishment locations for matched and unmatched firms

Region	Raw probability difference	Regression-adjusted difference
Northeast:		
β	[1]–0.0264	[1]–0.0250
S.E.	(.0012)	(.0020)
Midwest:		
β	[1].0236	[2]–.0048
S.E.	(.0013)	(.0022)
South:		
β	[1].0652	[1].0504
S.E.	(.0015)	(.0024)
West:		
β	[1]–.0624	[1]–.0206
S.E.	(.0014)	(.0021)

[1] Significant at p <.0001.
[2] Significant at p <.03.
NOTE: β = coefficient; S.E. = standard error of β.
SOURCE: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages.

facturing companies in the pilot group. Thus, the coefficients on $Match_i$ are biased toward zero. Furthermore, the incompleteness of the matching is not random, both because certain kinds of establishments are missing from the firms that were matched and because it was more difficult to match certain kinds of firms. As a result, given that the locations of the missing matched establishments are not known, neither is the direction of the resulting bias in the regression coefficients known, and the reported standard errors for these coefficients understate the true uncertainty of the estimates.

After adjustment for establishment size class, industry, and age, and for the interaction of industry with size class, the matched establishments turn out to be less likely than other establishments to be located in the Midwest, but they are still disproportionately located in the South, not in the Northeast or the West.

Table 4 shows the distribution of occupations in the OES data collected in the survey's six panels from November 2003 to May 2006, within the establishments of the matched multinational manufacturers. Because the OES data come from a sample, the weights from the OES (which account for sampling probabilities, among other factors) are used to weight the entries in the table.

These establishments employ a particularly high fraction of their employees in the production occupations group, which consists of supervisors of production workers (SOC 51–1000); assemblers and fabricators (51–2000); food processing workers (51–3000); metal workers and plastic workers (51–4000); printing workers (51–5000); textile, apparel, and furnishings workers (51–6000); woodworkers (51–7000); plant and system operators (51–8000); and other production occupations (51–9000). Matched establishments employ 33.1 percent of their workers in this occupational group, while all U.S. establishments collectively employ 7.7 percent of their employees in the group.

Matched establishments also employ a higher fraction of their employees than do all U.S. establishments in the following SOC groups: management (SOC 11); business and financial (13); computer and mathematical (15); architecture and engineering (17); life, physical, and social science (19); installation, maintenance, and repair (49); and transportation and material moving occupations (53). They employ a lower fraction of their employees in other groups: education, training, and library (25); healthcare practitioner and technical (29); healthcare support (31); protective service (33); food preparation and serving (SOC 35); building and grounds cleaning and maintenance (37); personal care and service (39); sales and related (41); office and administrative support (43); and construction and extraction occupations (47).

Much of this difference in occupational distribution derives from differences in the business activities of these establishments. Matched establishments are concentrated in manufacturing industries, which disproportionately employ people in the engineering and production occupations. Indeed, within the manufacturing establishments that can be matched with the U.S-based multinational manufacturing firms, nearly 48 percent of all employees are in production occupations and more than 10 percent are in architecture and engineering occupations.

To see how much of the difference in occupations between employees in establishments of U.S-based multinational manufacturing firms and those in other establishments stems from differences in the industries, sizes, locations, and ages of their employing establishments, simple linear probability regressions were conducted. These regressions are of the same form as the regressions used earlier, in which the outcome variable y_i is an indicator variable for each occupation.

As in table 3, the first column of numbers in table 5 shows the coefficients (and their standard errors) for the Match indicator without any controls X_i while the second column of numbers shows the coefficients (and their standard errors) for the Match indicator when controls for establishment industry, size class, age, and region, and for the interaction of industry with size class, are added. The variable of interest in these regressions is the occupational classification of the employees, so the regressions are weighted by the number of employees in each establishment, as well as the final benchmark weights from the OES. Again, the standard errors calculated for these regressions understate the true standard errors because

Table 4. Civilian employment and wages for major occupational groups, all United States and matched U.S. multinational manufacturing companies, all industries and manufacturing industries, fall 2003–spring 2006

Occupational group (SOC major category)	All U.S. establishments			Matched U.S. multinational manufacturing companies			
	Average monthly employment	Occupational distribution (percent)	Average hourly wages	Average monthly employment	Percentage of average monthly employment for all U.S. establishments	Occupational distribution (percent)	Average hourly wages
All industries							
All occupational groups	132,614,818	100.0	$18.84	5,638,849	4.3	100.0	$23.74
Management (11)	5,893,403	4.4	44.20	338,606	5.7	6.0	52.48
Business and financial operations (13)	5,827,125	4.4	28.85	311,334	5.3	5.5	31.91
Computer and mathematical (15)	3,077,193	2.3	33.29	274,778	8.9	4.9	36.84
Architecture and engineering (17)	2,433,326	1.8	31.84	490,716	20.2	8.7	35.52
Life, physical, and social science (19)	1,233,302	.9	28.72	114,595	9.3	2.0	32.53
Community and social services (21)	1,749,233	1.3	18.75	2,526	.1	([1])	18.81
Legal (23)	976,764	.7	41.04	10,166	1.0	.2	49.94
Education, training, and library (25)	8,206,455	6.2	21.79	7,938	.1	.1	25.16
Arts, design, entertainment, sports, and media (27)	1,727,520	1.3	22.17	41,648	2.4	.7	27.49
Healthcare practitioner and technical (29)	6,713,823	5.1	29.82	21,707	.3	.4	27.38
Healthcare support (31)	3,483,280	2.6	11.83	6,269	.2	.1	13.14
Protective service (33)	3,025,023	2.3	17.81	14,914	.5	.3	16.09
Food preparation and serving related (35)	11,029,282	8.3	8.86	20,301	.2	.4	9.06
Building and grounds cleaning and maintenance (37)	4,396,269	3.3	10.86	46,302	1.1	.8	12.04
Personal care and service (39)	3,249,766	2.5	11.02	9,952	.3	.2	9.93
Sales and related (41)	14,114,875	10.6	16.51	394,192	2.8	7.0	25.20
Office and administrative support(43)	23,078,144	17.4	14.60	631,016	2.7	11.2	16.87
Farming, fishing, and forestry (45)	450,042	.3	10.49	10,806	2.4	.2	12.20
Construction and extraction (47)	6,680,731	5.0	18.89	136,072	2.0	2.4	22.53
Installation, maintenance, and repair (49)	5,352,792	4.0	18.78	357,576	6.7	6.3	21.37
Production (51)	10,268,712	7.7	14.65	1,867,665	18.2	33.1	17.14
Transportation and material moving (53)	9,647,759	7.3	14.16	529,770	5.5	9.4	14.73
Manufacturing industries							
All occupational groups	14,185,767	100.0	19.35	3,746,781	26.4	100.0	22.87
Management (11)	690,667	4.9	49.47	191,354	27.7	5.1	51.49
Business and financial operations (13)	430,189	3.0	28.58	164,581	38.3	4.4	30.96
Computer and mathematical (15)	266,926	1.9	36.51	120,676	45.2	3.2	38.02
Architecture and engineering (17)	799,489	5.6	32.66	382,292	47.8	10.2	35.00
Life, physical, and social science (19)	149,884	1.1	29.43	66,945	44.7	1.8	31.20
Community and social services (21)	123	([1])	23.82	([2])	([2])	([2])	([2])
Legal (23)	5,509	([1])	54.67	([2])	([2])	([2])	([2])
Education, training, and library (25)	1,455	([1])	26.73	([2])	([2])	([2])	([2])

See footnotes at end of table.

Table 4. Continued—Civilian employment and wages for major occupational groups, all United States and matched U.S. multinational manufacturing companies, all industries and manufacturing industries, fall 2003–spring 2006

Occupational group (SOC major category)	All U.S. establishments			Matched U.S. multinational manufacturing companies			
	Average monthly employment	Occupational distribution (percent)	Average hourly wages	Average monthly employment	Percentage of average monthly employment for all U.S. establishments	Occupational distribution (percent)	Average hourly wages
Arts, design, entertainment, sports, and media (27)	84,672	0.6	22.96	17,400	20.5	0.5	$27.88
Healthcare practitioner and technical (29)	16,641	.1	26.38	6,750	40.6	.2	27.40
Healthcare support (31)	1,100	[1]	13.96	[2]	[2]	[2]	[2]
Protective service (33)	17,913	.1	15.08	7,401	41.3	.2	17.01
Food preparation and serving related (35)	36,993	.3	9.30	1,751	4.7	[1]	10.59
Building and grounds cleaning and maintenance (37)	94,311	.7	11.57	19,192	20.4	.5	13.53
Personal care and service (39)	1,123	[1]	12.73	[2]	[2]	[2]	[2]
Sales and related (41)	430,491	3.0	28.04	63,403	14.7	1.7	32.50
Office and administrative support (43)	1,384,539	9.8	15.82	282,440	20.4	7.5	17.64
Farming, fishing, and forestry (45)	36,860	.3	11.79	8,567	23.2	.2	12.13
Construction and extraction (47)	265,280	1.9	19.42	70,537	26.6	1.9	23.58
Installation, maintenance, and repair (49)	705,450	5.0	20.33	246,026	34.9	6.6	22.22
Production (51)	7,449,077	52.5	15.00	1,785,768	24.0	47.7	17.11
Transportation and material moving (53)	1,317,075	9.3	13.42	307,194	23.3	8.2	14.91

[1] Less than 0.1 percent.
[2] Value does not meet BEA or BLS publication criteria.

SOURCE: U.S. Bureau of Labor Statistics, Occupational Employment Statistics survey.

the matching is incomplete and the incompleteness is not random.

After controls are added for establishment industry, size class, age, and region, and for the interaction of industry with size class, the largest multinational manufacturers remain somewhat more likely to employ workers in the architecture and engineering; computer and mathematical; and installation, maintenance, and repair occupations. However, production workers are *less* likely to be employed in these matched establishments. These findings are consistent with the notion that multinational manufacturing employers have shifted some of their less skilled production work to plants overseas while retaining more skilled work in the United States. The findings are also consistent with the hypothesis that more productive firms with more highly skilled employees are more likely to become multinational firms.

The difference in wages between U.S.-based multinational manufacturers and other employers is examined with the use of similar controls. The following tabulation shows the results of regressions using various control variables X_i to examine the impact on wages of matching to the BEA firm data (all coefficients β are significant at $p < .0001$):

Category	β	*Standard error of* β
Raw wage difference	$2,690.50	(38.36)
Regression adjusted for—		
Census region	2,697.76	(38.36)
Size class of establishment	2,597.10	(38.36)
Age of establishment	2,455.55	(27.02)
Industry group	2,099.36	(38.88)
Specific industry	1,916.71	(39.69)
All control variables	1,673.41	(28.15)

In these regressions, the outcome variable y_i is the monthly wage bill per employee for all establishments. The first row of numbers shows the coefficient for the Match indicator without any controls X_i: U.S. parent firms of multinational manufacturers pay monthly wage bills per employee that are $2,690.50 per month higher than those paid by other establishments.

Table 5. Difference in occupational distribution between the employees of matched and unmatched firms

Occupational group (SOC major category)	Raw probability difference	Regression-adjusted difference
Management (11):		
β	[1].0163	[1].0064
S.E.	(.0002)	(.0003)
Business and financial (13):		
β	[1].0118	[1].0044
S.E.	(.0002)	(.0003)
Computer and mathematical (15):		
β	[1].0267	[1].0071
S.E.	(.0002)	(.0002)
Architecture and engineering (17):		
β	[1].0717	[1].0229
S.E.	(.0002)	(.0002)
Life, physical, and social science (19):		
β	[1].0115	[1].0043
S.E.	(.0001)	(.0001)
Community and social services (21):		
β	[1]–.0133	–.0002
S.E.	(.0001)	(.0001)
Legal (23):		
β	[1]–.0058	[1]–.0044
S.E.	(.0001)	(.0001)
Education, training, and library (25):		
β	[1]–.0632	[2]–.0007
S.E.	(.0003)	(.0002)
Arts, design, entertainment, sports, and media (27:)		
β	[1]–.0059	[1]–.0024
S.E.	(.0001)	(.0002)
Healthcare practitioner and technical (29):		
β	[1]–.0489	[1]–.0018
S.E.	(.0002)	(.0003)
Healthcare support (31):		
β	[1]–.0263	[1]–.0007
S.E.	(.0002)	(.0002)
Protective service (33):		
β	[1]–.0211	[1]–.0016
S.E.	(.0002)	(.0002)
Food preparation and serving related (35):		
β	[1]–.0831	[1]–.0027
S.E.	(.0003)	(.0002)
Building and grounds cleaning and maintenance (37):		
β	[1]–.0261	[1]–.0024
S.E.	(.0002)	(.0002)
Personal care and service (39):		
β	[1]–.0238	[1]–.0020
S.E.	(.0002)	(.0002)
Sales and related (41):		
β	[1]–.0382	[1].0057
S.E.	(.0003)	(.0004)
Office and administrative support (43):		
β	[1]–.0649	[1]–.0183
S.E.	(.0004)	(.0005)
Farming, fishing, and forestry (45):		
β	[1]–.0015	[1]–.0015
S.E.	(.0001)	(.0001)
Construction and extraction (47):		
β	[1]–.0274	[1]–.0055
S.E.	(.0002)	(.0002)
Installation, maintenance, and repair (49):		
β	[1].0241	[1].0103
S.E.	(.0002)	(.0003)
Production (51):		
β	[1].2651	[1]–.0088
S.E.	(.0003)	(.0003)
Transportation and material moving (53):		
β	[1].0221	[1]–.0080
S.E.	(.0003)	(.0003)

See footnotes at end of table.

Table 5. Continued—Difference in occupational distribution between the employees of matched and unmatched firms

[1] Significant at $p < .03$.
[2] Significant at $p < .0001$.
NOTE: β = coefficent; S.E. = standard error of β.
SOURCE: U.S. Bureau of Labor Statistics, Occupational Employment Statistics survey.

Successive rows of numbers show that controlling for region has a negligible impact on this wage difference, whereas controlling instead for establishment size class, age, and industry has a more substantial effect. Controlling for the industry groups shown in table 1 reduces the wage difference to $2,099.36, whereas controlling instead for specific six-digit NAICS industry categories reduces the wage difference even further, to $1,916.71. Adjusting for all controls X_i (as well as for the interaction between industry groups and establishment size class) shows a monthly wage bill per employee that is $1,673.41 higher in the establishments of U.S. parent firms of multinational manufacturers.

These estimates from regressions of establishment-level data show the differences in monthly wage bills per employee between establishments that belong to multinational manufacturing companies and other establishments. However, some establishments have more workers than other establishments, so the difference between average wages at matched and unmatched employers is not the same as the difference between average wages received by employees of matched and unmatched employers. Accordingly, to calculate the difference in monthly wage bills per employee between employees of establishments that belong to multinational manufacturing companies and employees of other establishments, the same regressions are performed, with the establishments weighted by their employment.

As shown in table 6, the average employee of a multinational manufacturer is paid a monthly wage bill that is $2,290.59 higher than the employees of other employ-

ers. After establishment characteristics (region, size class, age, specific industry, and industry group interacted with size class) are controlled for, this wage premium falls to $1,071.41 per month, smaller than the coefficient found in the unweighted regression. The difference in coefficients between the weighted and unweighted regressions suggests that the difference in wages between matched and unmatched establishments is greater in establishments with fewer employees.

The OES data also can be used in wage regressions. Here, y_i is the hourly wage level for each (weighted) employee. Regressions on the OES data show that the U.S. parent firms of multinational manufacturers pay hourly wages that are $5.11 higher than those of other employers. (See table 6.) However, after controls are added for establishment region, size class, age, and specific industry, and for the interaction between industry group and size class, the difference falls to $1.57, and after further controls are added for workers' occupations, the difference falls to $1.20.

To compare the results obtained here with those of Doms and Jensen, regressions of the logarithm of wages were run separately for production and nonproduction workers. (For the comparison, production workers were defined as those employed in the major occupational categories 33, 37, 43, 47, 49, 51, and 53 in the weighted OES data.) With establishment age, specific industry, and census division controlled for, the wage premium for production workers in the establishments of multinational manufacturers compared with that for production workers in other large establishments is nearly 5 percent and in other small establishments is about 13 percent. Analogous wage premiums are smaller for nonproduction workers in the establishments of multinational manufacturers. These estimates are similar to, but somewhat smaller than, the wage differences documented by Doms and Jensen between multinational and domestic manufacturing firms in 1987.

Even with establishment characteristics and workers' occupations controlled for, the results presented here show that the establishments matched with large multinational manufacturing firms pay their employees higher wages than do other establishments in the United States. However, the question remains, *Why* do the establishments of these firms pay higher wages? In one study, Raymond Mataloni found that U.S. establishments of large multinational manufacturing firms have higher levels of labor productivity than other U.S. establishments have.[12] It is also possible that these multinational firms have the same global levels of labor productivity as other firms, but have systematically moved their lower skilled work—particularly their lower skilled production work—overseas, leaving higher skilled, more productive, and more highly paid work in the United States.

Table 6. Difference in wage premium between matched and unmatched establishments[1]

Dataset	Wage measure	Raw wage difference	Regression-adjusted difference (without occupation)	Regression-adjusted difference (including occupation)
QCEW	Monthly wage bill per employee:			
	β	[2]$2,690.50	[2]$1,673.41	([3])
	S.E.	(38.36)	(28.15)	...
	Monthly wage bill per employee, employment weighted:			
	β	[2]2,290.59	[2]1,071.41	([3])
	S.E.	(7.07)	(9.72)	...
OES survey	Hourly wages per employee:			
	β	[2]5.11	[2]1.57	[2]$1.20
	S.E.	(0.02)	(0.02)	(0.02)

[1] Coefficients of the logarithm of wages show a pattern similar to that of the coefficients of wages and are available from the authors upon request.
[2] Significant at $p < .0001$.
[3] Coefficients cannot be calculated because the QCEW does not collect data on occupations.
SOURCE: U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages and Occupational Employment Statistics survey.

Future work

The research presented here has combined firm identifiers from the BEA 2004 Benchmark Survey of U.S. Direct Investment Abroad with BLS microdata on employment in establishments of these firms, for a pilot group of the largest U.S.-based multinational manufacturing companies. Other information collected in the BEA survey, such as the magnitude or the destination countries of these companies' foreign investments, has not yet been used. This information would facilitate an examination, for example, of whether there are differences in the occupational distribution of U.S. employees between multinational manufacturing firms with investments overseas in high-wage countries and those with investments overseas in low-wage countries. BLS and BEA researchers are working to combine the BLS

microdata collected in the OES Survey with the data items collected in the BEA Survey of U.S. Direct Investment Abroad.

Recent economic literature on international trade has emphasized the importance of heterogeneity among multinational firms in understanding how those firms structure their international operations.[13] Stephen Yeaple, for example, shows that multinational firms tend to be more productive than other firms and multinational firms that are more productive own affiliates in a larger number of countries.[14] In combining BLS establishment-level data with BEA firm-level data on the domestic and foreign operations of these firms, it will be possible to examine how the activities of multinational manufacturers correspond to their employment structure in the United States. The activities measured by BEA include the magnitude and scope of foreign direct investment, the amount of intrafirm trade, the destination countries for foreign direct investment, the companies' degree of "global engagement," their trade in services, and so forth. The collaboration described here between BEA and BLS will enable researchers in both agencies to analyze the occupations and wage structures of U.S.-based multinational firms by the characteristics of their international activities. □

Notes

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[1] See "Direct Investment Concepts," *U.S. International Transaction Accounts: Concepts and Estimation Methods* (Bureau of Economic Analysis, June 2011), pp. 76–77, **http://www.bea.gov/international/concepts_estimation_methods.htm**.

[2] Mark E. Doms and J. Bradford Jensen, "Comparing Wages, Skills, and Productivity between Domestically and Foreign-owned Manufacturing Establishments in the United States," in Robert E. Baldwin, Robert E. Lipsey, and J. David Richardson, eds., *Geography and Ownership as Bases for Economic Accounting* (Chicago, University of Chicago Press, 1998).

[3] See Sourafel Girma, Richard Anthony Kneller, and Mauro Pisu, "Exports versus FDI: An Empirical Test," *Review of World Economics*, July 2005, pp. 193–218; Keith Head and John Ries, "Heterogeneity and the FDI versus export decisions of Japanese manufacturers," *Journal of the Japanese and International Economies*, December 2003, pp. 448–467; Eiichi Tomiura, "Foreign Outsourcing, Exporting, and FDI: A Productivity Comparison at the Firm Level," *Journal of International Economics*, May 2007, pp. 113–127; and Raymond J. Mataloni, Jr., *The Productivity Advantage and Global Scope of U.S. Manufacturing Firms*, BEA Working Paper WP2011–02 (Bureau of Economic Analysis, March 2011).

[4] See Andrew Bernard and J. Bradford Jensen, "Exceptional Exporter Performance: Cause, Effect, or Both?" *Journal of International Economics*, February 1999, pp. 1–25; and Mataloni, *The Productivity Advantage*.

[5] "Off-Shoring: An Elusive Phenomenon" (Washington, DC, National Academy of Public Administration, 2006), **http://www.napawash.org/publications-reports/off-shoring-an-elusive-phenomenon; "**Off-Shoring: How Big Is It?" (Washington, DC, National Academy of Public Administration, 2006), **http://www.napawash.org/publications-reports/off-shoring-how-big-is-it**; and "Off-Shoring: What Are Its Effects?" (Washington, DC, National Academy of Public Administration, 2007), **http://www.napawash.org/publications-reports/off-shoring-what-are-its-effects-2**.

[6] The Internal Revenue Service assigns the EIN, or Federal tax ID number, to identify a business entity. Most large companies with many establishments report more than one EIN to the BLS Quarterly Census of Employment and Wages. The one or two EINs that companies report to BEA in the Benchmark Survey of U.S. Direct Investment Abroad generally match only a fraction of these large companies' establishments.

[7] The midpoints used for the wage bands in the OES survey are based on the exact distribution of wages in the National Compensation Survey. (For more information, see *Handbook of Methods* (U.S. Bureau of Labor Statistics, December 2008), chapter 3, "Occupational Employment Statistics," pp. 1–26, **http://www.bls.gov/opub/hom/pdf/homch3.pdf**, especially p. 16.)

[8] In the OES survey, smaller establishments are sampled with lesser probability than larger establishments and are then given larger weights in calculating estimates.

[9] Doms and Jensen, "Comparing Wages, Skills, and Productivity."

[10] Using the same aggregation of industry groups as in table 1.

[11] The age of each establishment is the number of years that the establishment has been observed to have positive employment in the QCEW. Because the QCEW data are linked longitudinally back to the first quarter of 1990, an indicator variable is added for establishments which had positive employment at that time.

[12] Mataloni, "The Productivity Advantage."

[13] See Stephen R. Yeaple, "Firm Heterogeneity and the Structure of U.S. Multinational Activity: An Empirical Analysis," *Journal of International Economics*, July 2009, pp. 206–215; Susan E. Feinberg and Michael P. Keane, "Intrafirm Trade of U.S. MNCs: Findings and Implications for Models and Policies toward Trade and Investment," in Theodore H. Moran, Edward M. Graham, and Magnus Blomström (eds.), *Does Foreign Direct Investment Promote Development*? (Washington, DC, Peterson Institute for International Economics, 2005); and Andrew Bernard and J. Bradford Jensen, "Firm Structure, Multinationals, and Manufacturing Plant Deaths," *The Review of Economics and Statistics*, May 2007, pp. 193–204.

[14] Yeaple, "Firm Heterogeneity."