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Abstract
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Keywords
Staffing Services, Temporary Help Services, Manufacturing, Labor Productivity, Manufacturing Employment, Contracting Out

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MANUFACTURERS' OUTSOURCING TO STAFFING SERVICES

MATTHEW DEY, SUSAN N. HOUSEMAN, AND ANNE E. POLIVKA*

The authors estimate the effects of U.S. manufacturers' use of staffing services on measured employment and labor productivity between 1989 and 2009. Using time series data constructed from the Occupational Employment Statistics program, they document the dramatic increase in manufacturers' use of staffing services to fill core production occupations and to adjust employment levels during recessions. In 2006, just before the recent recession, staffing services added an estimated 9.2% to manufacturing employment, compared with only 2.3% in 1989. Outsourcing to staffing services significantly dampened measured employment volatility and inflated the growth and volatility of measured labor productivity in manufacturing.

The manufacturing sector and its workforce have undergone rapid structural changes over the last two decades. Although the U.S. economy experienced robust job growth in the 1990s, manufacturing employment fell by 4%. From 2000 to 2010, the decline in manufacturing employment was precipitous. During this decade, the number of workers employed by manufacturing establishments decreased by a third or almost 6 million, with losses of more than 3 million employees even before the onset of the recession toward the end of the decade.

The structural changes affecting the manufacturing sector and its workforce have been widely attributed to new technology, competition from foreign companies, and the offshoring of production and service jobs by U.S. manufacturers. A less-discussed factor is outsourcing to domestic contractors. When, for example, a U.S. manufacturer outsources janitorial work to a contract cleaning company, packing and shipping to a transportation company, information technology (IT) to a computer services company, and part of its production work to a staffing agency, manufacturing employment

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declines in official statistics, but the occupational structure of employment in the economy may not change.

In this article, we present new estimates of an important component of outsourcing by manufacturers: outsourcing to staffing services, or what is termed *employment services* in government statistics.[1] The staffing services industry is composed primarily of temporary help agencies and professional employer organizations (PEOs), which assign workers to client organizations. The rapid growth of blue-collar workers in the staffing sector beginning in the 1980s, coupled with stagnant or declining employment in manufacturing, led the business press and researchers to speculate that manufacturers were largely responsible for the employment surge in the staffing sector and that their extensive use of staffing services was inflating manufacturing labor productivity statistics (Uchitelle 1993). Previous studies attempted to quantify manufacturers' use of employment services but were hampered by the absence of good data on the characteristics of jobs in staffing agencies and on the industries to which staffing agency employees were assigned (Segal and Sullivan 1997; Estavão and Lach 1999a,b).

A major contribution of our article is the development of consistent time series data that include information on employment by occupation and industry from the Occupational Employment Statistics (OES) program. These data in conjunction with information from the five Contingent Worker Supplements (CWS) to the Current Population Survey enable us to examine the evolving occupational structure of employment in the staffing sector and to estimate, by broad occupation, the number of staffing workers assigned to manufacturing over the two decades from 1989 to 2009. Our analysis highlights the dramatic occupational shift that has occurred within staffing services; the growth in manufacturers' use of staffing services, particularly in core production and low-skilled manual occupations; and the role staffing services played in the adjustment of employment during the 2001 and 2008–9 recessions.

Manufacturers' outsourcing to staffing services mechanically affects measures of trends and cyclical fluctuations in employment and labor productivity. While staffing services workers added an estimated 2.3% to manufacturing employment in 1989, they added 8.2% in 2000. As a result, although measured manufacturing employment fell by 4.1% from 1989 to 2000, we estimate that manufacturing employment actually rose by 1.3%, if one includes staffing industry workers assigned to manufacturers. Correspondingly, measured labor productivity growth was significantly inflated during this period. Although manufacturing employment fell precipitously during the first decade of the 2000s, the ratio of staffing services to manufacturing employees continued to rise. At its peak in 2006, we estimate that staffing services workers added more than 9% to measured manufacturing employment. Moreover, during this decade marked by two recessions, manufacturers' outsourcing to staffing services significantly dampened measured manufacturing employment volatility and inflated the volatility of labor productivity.

[1]Throughout this article we use the terms *employment services* and *staffing services* interchangeably.

Contracting Out to Staffing Services

The staffing services sector comprises three industries—(1) temporary help services, (2) professional employer organizations (PEOs), and (3) employment agencies—which accounted for 77%, 15%, and 9%, respectively, of employment in the sector in 2010, according to data from the Current Employment Statistics (CES) program. All three of these components of staffing services function as employer intermediaries. Temporary help services dispatch workers on their payroll to a worksite on a temporary basis to accommodate a client's short-term labor needs or to allow the client to screen workers for permanent positions. PEOs, which lease employees to the client company and handle payroll, benefits, and government compliance issues for the company, represent the full outsourcing of an organization's human resources function. Employment agencies assist in matching employers and workers.

Research points to several reasons why organizations use temporary help agencies in lieu of hiring temporary workers directly or having workers on their payroll during a probationary period (Abraham 1990; Autor 2001, 2003; Houseman 2001; Houseman, Kalleberg, and Erickcek 2003; Kalleberg, Reynolds, and Marsden 2003). Temporary help agencies may enjoy economies of scale in recruiting, training, and screening workers. In addition, clients may use temporary help agencies to reduce firing costs, for example, by lowering the risk of lawsuits brought by dismissed workers and by mitigating adverse morale and productivity effects associated with layoffs. Thus, temporary help agencies may facilitate more efficient matching of workers and firms and adjustment of labor to demand fluctuations. Using plant-level data, Ono and Sullivan (2010) find that manufacturers have made extensive use of temporary help workers to adjust workforce levels to fluctuations in output. Research on the reasons for companies' use of PEOs and employment agencies is less developed, but the industry trade literature suggests that employers use PEOs for similar cost savings or risk mitigation reasons (Katz 1999; Klaas et al. 2005; Sloan 2007; National Association of Professional Employer Organizations 2011).

Except for staff of employment agencies, which account for a small minority of the sector's employment, almost all employees in the staffing services sector are assigned to a client organization where they perform work. Unlike most other types of contract company workers, staffing agency employees typically work under the supervision of the client organization's management and often are employed in the client's core functions. Temporary help and PEO workers are paid by the staffing agency and are counted in the employment services sector in government statistics.[2] Thus, for sectors in which use of these staffing services is high, accounting for these workers is important in order to obtain an accurate picture of the sector's employment levels. Moreover, as discussed below, changes in a sector's use

[2]Workers who use employment agencies to find permanent jobs typically do not form a contractual employment relationship with the agency and so would not be counted as an employment agency employee in government data.

of staffing services workers can distort the picture of trend or cyclical changes in employment and bias measures of labor productivity.

Figure 1 shows staffing services and temporary help employment as a percentage of nonfarm payroll employment since 1989. Employment in the staffing services sector expanded rapidly during the 1990s, more than doubling from 1.4 million in 1989 to 3.8 million in 2000. By 2000, temporary help accounted for 2.0% of nonfarm payroll employment, and all staffing services accounted for 2.9% of employment.

The shaded areas in Figure 1 delineate the three recessions that occurred between 1989 and 2009, as determined by the National Bureau of Economic Research. Although employment in staffing services has always displayed above average cyclical sensitivity, cyclical fluctuations in employment have been particularly strong since 2000, as evidenced by changes in the sector's share of aggregate employment over the business cycle. During the 1990 to 1991 recession, average annual nonfarm payroll employment fell by 1.0%, while that of staffing services declined by 3.1% and accounted for 4.0% of the decline in aggregate employment. In contrast, while average annual nonfarm payroll employment declined by 1.1% from 2000 to 2002, employment in the staffing services sector declined by 15.0% and accounted for 40.0% of the fall in aggregate employment over this period. Similarly, from 2007 to 2009, average annual nonfarm payroll employment declined by

Figure 1. Staffing Services and Temporary Help Employment as a Percentage of Nonfarm Payroll Employment

Source: Bureau of Labor Statistics.
Note: Shaded areas mark recessions, as determined by the National Bureau of Economic Research Business Cycle Dating Committee.

4.9%, while staffing services dropped by 30.0% and accounted for 16.0% of the decline in aggregate employment in these years.

In addition, the staffing sector has become an important leading indicator of recessions and recoveries; in the last two recessions staffing services employment began falling well before aggregate employment, and its recovery commenced prior to that of aggregate employment. For example, between 2006 and 2007, average annual employment in the staffing services sector decreased 3.7%, while aggregate wage and salary employment continued to grow by 1.1%. From 2009 to 2010, the initial year of the official recovery, staffing services sector employment grew 9.5% while aggregate wage and salary employment further dropped 0.8%, continuing the decline that started in early 2008. Below, we argue that the role staffing services now plays in employment adjustment during business cycles is closely linked to the shift in composition of the staffing industry toward manual occupations during the 1990s and the extensive use of staffing services by the cyclically sensitive manufacturing sector.

The Difficulty of Measuring Manufacturers' Use of Staffing Services

Where employees of staffing agencies perform their work is important to understand; however, this information is difficult to glean from existing data. The Current Employment Statistics program, which is the monthly establishment survey from the Bureau of Labor Statistics (BLS), and the Current Population Survey (CPS) program, which is the BLS's monthly household survey, provide independent estimates of employment in the staffing services sector.[3] The number of staffing services workers included in any month's CPS sample is small, and more important, CPS estimates, which have been systematically lower than the CES estimates, are considered less reliable than the CES figures for counting workers in the staffing services sector.[4] Neither the CPS nor the CES has information on the industry to which staffing services workers are assigned.

The Contingent Worker Supplements (CWS) to the CPS, which were conducted five times between 1995 and 2005, partly fill this information gap. Respondents in the CWS were asked if they were paid by a temporary help agency, even if they did not report working for a temporary help agency earlier in the survey. Those identifying themselves as being paid by a temporary help agency were asked for information on the company to which they were assigned. The CWS suffers from several drawbacks as an information source on workers in the staffing services sector, however. No information

[3]In the CES, employers report the number of workers on the organization's payroll in the week that includes the 12th of the month. Because client organizations do not pay staffing workers, they should not report them as payroll employees in the CES.

[4]Confusion among household respondents working for temporary help agencies or PEOs about who their actual employer is likely contributes to the discrepancy (Polivka 1996).

was collected on individuals working for PEOs, and, in spite of questions designed to increase reporting accuracy, the number of temporary agency workers is still significantly lower in the CWS waves than in the CES.[5]

Input–output (I-O) benchmark tables generated by the Bureau of Economic Analysis (BEA) provide alternative estimates of the use of staffing services in manufacturing. Specifically, BEA I-O tables provide estimates of the fraction of the staffing services "commodity" used by various industries including manufacturing. If the wages of workers assigned to various industries are known or do not systematically vary, the fraction assigned to manufacturing, which is measured in real value terms, would provide an estimate of the labor hours input from the staffing industry used by manufacturers. Although relatively little is known about the variation of wages of staffing services workers across their industries of assignment, such variation is likely substantial because both the occupational mix of staffing workers and the wages paid to workers in a particular occupation differ across industries. Moreover, the BEA's imputations of the staffing services to manufacturing for the benchmark years, which are based on indirect and limited evidence, are at odds with point estimates and trend information contained in other government surveys (Dey, Houseman, and Polivka 2010).

Despite these data shortcomings, several studies conducted in the late 1990s estimated manufacturers' use of staffing services and its evolution over time. Segal and Sullivan (1997) used data on the industry of assignment for temporary agency workers from the 1995 CWS to compute rough estimates of the number of staffing services workers—temporary help and PEO workers—assigned to manufacturing in 1991 and 1995. Their calculation assumed that manufacturing's share of staffing services workers had not changed over this time period.

Estavão and Lach (1999a,b) sought to extend and improve upon the Segal and Sullivan estimates of manufacturers' use of staffing services. Using various pieces of direct and indirect evidence on the industry of assignment of staffing workers from the BEA I-O benchmark tables, the March Income Supplements to the CPS, and the 1995 and 1997 CWS to the CPS, they generated several estimates of the number of staffing workers in manufacturing from 1972 to 1997. Estavão's and Lach's efforts to generate plausible and precise estimates of manufacturers' use of staffing services, however, were severely hampered by the limitations of the data. Their point estimates were sometimes implausible, were associated with large bounds, and contained large discontinuities in the time series.

Our Approach

We develop a straightforward methodology for imputing staffing services workers to the manufacturing sector that overcomes key problems inherent

[5]One reason for the discrepancy is that the CES captures all jobs, whereas the CWS asks individuals about only their main job. This difference between the surveys, however, cannot explain all of the discrepancy (Polivka 1996).

in earlier attempts. One of our innovations is the development of consistent time series data on employment by occupation and industry over the period from 1989 to 2009 from the Occupational Employment Statistics (OES) program—a large, nationally representative establishment survey. One of the industries in the data set is staffing (employment) services. For the years 1999 to 2009 a breakout of the temporary help component of employment services also is available in the OES. A second innovation involves estimating the number of staffing services and temporary help workers within each occupation who are assigned to manufacturing based on industry assignment probabilities from the five waves of the CWS. Each step—the construction of the time series data set from the OES and the imputation of the resulting occupational employment estimates for staffing services to manufacturing —is discussed below.[6]

Constructing Occupation by Industry Time Series Data from the OES

The OES program, which is administered by the Bureau of Labor Statistics (BLS) and has operated since 1988, generates employment and wage estimates by detailed occupation. The program surveys approximately 400,000 establishments each year and collects wage and employment information for each occupation employed by the establishment. By collecting payroll information for a large number of establishments, the OES program allows precise estimation of industry–occupation employment levels at the national level. We aggregate detailed industry and occupation data into 18 major occupation groups and 16 major industry sectors from 1989 to 2009 to accommodate changes in the coding schemes for occupations and industries over time. In this article we utilize occupation data for the staffing services and manufacturing sectors.

To construct estimates of industry–occupation employment in any given year, we benchmark the OES data to each sector's employment levels as measured in the Current Employment Statistics (CES) in the specified year. For a substantial portion of the time period we study, OES data were collected only once a year in November; thus, we benchmark using November CES industry employment estimates that have not been seasonally adjusted.[7] To generate estimates of the number of employees in a specific occupation within an industry in a particular year, we multiply the industry total employment in that year, as measured by the CES, by the share of employment in that occupation, as measured in the OES. More formally, we estimate employment in occupation group i and sector j in year t (where t runs from 1989 to 2009), $\hat{E}_{ijt}$, according to the equation

[6]A paper providing further detail on the OES and methods used to construct our time series data is available from the authors.

[7]Benchmarking to the CES helps minimize sampling error that is inherent in the random component of the OES sample design. Also, as discussed below, benchmarking is necessary in the early years of the program when annual industry data are not available.

$$\hat{E}_{ijt} = E^{c}_{jt} \times \left(\frac{E^{o}_{ijt}}{E^{o}_{jt}} \right). \tag{1}$$

where E^{c}_{jt} is CES employment in sector j and year t; E^{o}_{ijt} is the employment level in occupation group i and sector j in year t reported by the OES program; and $E^{o}_{jt} = \sum_i E^{o}_{ijt}$ represents OES employment in sector j in year t. Therefore, (E^{o}_{ijt}/E^{o}_{jt}) is the share of employment in occupation i in sector j in year t as measured in the OES data.

One caveat about these estimates is that prior to 1996 the OES program collected occupational employment data for selected industries in one year of a three-year survey cycle. To examine changes in occupational structure over time in the pre-1996 period, we combine three years of OES data. For example, we combine OES data from 1988 to 1990 to estimate the occupational distribution of employment for each industry in 1989, we combine OES data from 1989 to 1991 to estimate the occupational distribution of employment for each industry in 1990, and so forth. For any particular year before 1996, the estimates of the occupational distribution of employment within an industry are based on an OES survey of the industry that was conducted in that year, in the previous year, or in the following year. Because we use these early OES data only to examine trends in the occupational distribution of employment across industries over long time horizons, the assumption inherent in our data construction for these early years should not unduly affect our results. Since 1996 OES has collected data for all industries annually. For the years 1996 to 2009, we have access to the establishment-level OES data, and thus we are able to compute standard errors for our industry–occupation employment estimates in these years using modified jackknife methods.

Imputing Staffing Services Workers to Manufacturing

The data set we have constructed includes information on employment for 18 occupations in the manufacturing and staffing services sectors from 1989 to 2009, and within staffing services, the temporary help industry from 1999 to 2009. Our next step is to impute the number of staffing services workers assigned to manufacturing within each occupation for each year. The only direct evidence about industry of assignment comes from the CWS. We pool information from the five waves of the CWS and use questions on the industry to which temporary help workers were assigned to compute the fraction of temporary help workers within each occupation assigned to the manufacturing sector, P_i, which we equate with the probability a staffing services worker in occupation i is assigned to manufacturing. To estimate the number of staffing services workers assigned to manufacturing in occupation i in year t, we apply the estimated probabilities from the CWS to the OES estimates of staffing services workers in occupation i in year t generated using Equation (1). Specifically, let $\hat{E}^{H}_{it}$ denote our estimate of employment in occupation i in year t in the staffing services sector so that $\hat{E}^{H}_{it} = \hat{E}_{ijt}$ where j

corresponds to the staffing services sector. The estimate for the number of staffing services workers in occupation i in year t assigned to the manufacturing sector is given by

$$\hat{M}_{it} = P_i \hat{E}_{it}^{H}, \tag{2}$$

and the total number of staffing services workers assigned to manufacturing then is

$$\hat{M}_t = \sum_{i=1}^{18} \hat{M}_{it} = \sum_{i=1}^{18} P_i \hat{E}_{it}^{H}. \tag{3}$$

In the subperiod 1999 to 2009, OES data for the temporary help services component of staffing services are available, and we use the same procedure to impute temporary help workers to manufacturing.

In pooling data on industry of assignment of temporary agency workers from the five waves of the CWS to construct these assignment probabilities, we make several assumptions. First, in imputing all staffing services workers to manufacturing, we assume that within occupations the probability that temporary agency workers are assigned to manufacturing is the same as the probability that PEO workers are assigned to manufacturing. For instance, we assume that PEO production workers and temporary help production workers are assigned to manufacturing with the same probability. Below, we show that analyses based on imputations of only temporary help workers, who compose the large majority of workers in the staffing sector, are qualitatively similar to those based on imputations for all employment services workers in the years temporary help data are available.[8]

Second, in pooling data from the five waves of the CWS to generate within-occupation assignment probabilities, we implicitly assume that these assignment probabilities are stable over time. To assess the reasonableness of this pooling, we examine assignment probabilities across waves for three occupations—(1) production, (2) laborer and helper, and (3) office and administrative support—which account for 75% or more of the staffing services workers assigned to manufacturing in each of the years from 1989 to 2009, according to estimates presented below. Formal tests support the assumption of stable assignment probabilities, at least over the 1995 to 2005 period covered by the CWS Supplements.[9] Below, as a further check, we generate imputations and adjustments based on individual-year CWS data, which relaxes the assumption that within-occupation probability of assignments

[8]Although employees of employment placement agencies should not be included in our estimates, they are small in number and we cannot separate employment agency employees from other staffing services employees in the early years of our data. Results that exclude this group in the latter half of our study period are nearly identical to ones that include all staffing services workers. Similarly, although permanent administrative staff of employment services agencies should not be included in our estimates, they make up only an estimated 3% of workers (BLS 1988: 2), and so their inclusion has minimal effect on our results.

[9]These results are available from the authors.

are constant. These estimates are very similar to those based on the pooled data, indicating that our results are not sensitive to this assumption.

The CPS and CWS seem to undercount temporary agency workers (Dey, Houseman, and Polivka 2010). Previous estimates based on the CWS (Segal and Sullivan 1997; Estavão and Lach 1999a,b), however, have assumed both that the number of temporary workers in the CWS are not undercounted and that temporary agency workers represented in the CWS are an unbiased sample of all temporary agency workers. Because we use data on employment by occupation for the staffing services sector that are generated from the OES, we need only make the less restrictive assumption that, conditional on their occupation, temporary agency workers in the CWS are representative of all temporary agency workers in terms of the industry to which they are assigned. For instance, while temporary agency helpers and laborers appear to be underrepresented in the CWS even relative to those in other occupations, we assume that the temporary agency helpers and laborers who are identified in the CWS are neither more nor less likely to be assigned to manufacturing clients than is the case in the general population of temporary agency helpers and laborers. We compute standard errors of these estimates that account for both the variance in assignment as measured in the CWS and the variance in OES occupational estimates for the years 1996 to 2009 using modified jackknife methods.[10]

Occupational Trends within Staffing Services

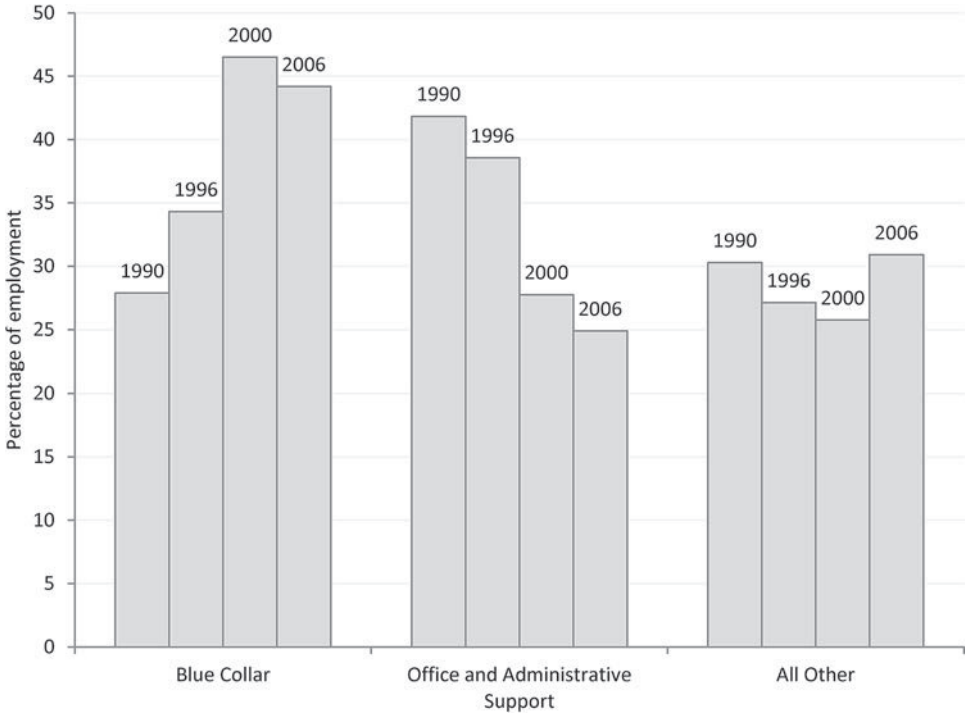
As noted above, the staffing services sector grew dramatically both in absolute terms and in relation to the size of the economy in the 1990s. Since then, staffing services has accounted for much of the cyclical variation in aggregate employment. Underlying these changes was a marked shift in the occupational composition of staffing services employment toward production and other manual occupations.

Using CPS data, Segal and Sullivan (1997) documented a shift in the composition of staffing services workers in the early 1990s away from clerical occupations and toward blue-collar occupations. In Figure 2, we report the fraction of staffing services employment in office and administrative support, blue-collar,[11] and all other occupations for selected years: 1990 is the first year of OES data for the staffing industry; 1996 is the first year in which all industries were sampled on an annual basis in the OES; and 2000 and 2006 represent business cycle peaks in the sector. Our data reveal that the trend uncovered in Segal's and Sullivan's work continued in the latter half of the 1990s, with the share in blue-collar occupations expanding and

[10]A paper detailing the methods used to compute standard errors reported in this article is available from the authors.

[11]We classify the following as blue-collar occupations: production; transportation and material moving; helpers, laborers, and hand material movers; installation, maintenance, and repair; construction; extraction; and supervisors of production, construction, and maintenance workers.

Figure 2. Occupational Distribution of Employment in Staffing Services, Selected Years



Source: Authors' calculations using OES data.

the share in office and administrative occupations shrinking. The change was so substantial that the relative importance of office and administrative support occupations and blue-collar occupations within staffing services reversed between 1990 and 2000. In 1990, office and administrative support workers constituted 42% of those in staffing services, while blue-collar workers made up just 28%. By 2000, blue-collar workers accounted for 47% of all those in staffing services, while office and administrative support workers accounted for just 28%. Throughout the first decade of the 2000s, the fraction of staffing workers in blue-collar occupations remained high. In 2006, just before the onset of the recession, the fraction of staffing workers in manual occupations was 44%, slightly lower than in 2000 but considerably higher than a decade earlier.

Table 1 shows the share of employment in the staffing services sector in each of the 18 more detailed occupational categories for selected years. Just three occupations—(1) office and administrative support; (2) production; and (3) helpers, laborers, and hand material movers—together accounted for 60% to 65% of all staffing services workers throughout the 1990 to 2009 period, although the relative importance of these occupations changed. As is evident from this more detailed breakout, the growth in production occupations was the most important driver of the increased share in blue-collar occupations within the staffing sector: the share of staffing services

Table 1. The Occupational Distribution of Employment within Staffing Services and Temporary Help, Selected Years

	All staffing services						*Temporary help*			
Occupation	*1990*	*1996*	*2000*	*2001*	*2006*	*2009*	*2000*	*2001*	*2006*	*2009*
Management, professional, and technical										
Management, business-finance	6.4	4.8	3.4	3.0	5.9	7.6	2.7	2.7	4.6	5.3
	—	(0.2)	(0.1)	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)	(0.2)
Computer and mathematical	0.7	1.4	1.4	1.3	2.2	2.8	1.5	1.3	2.0	2.8
	—	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)	(0.1)	(0.0)	(0.1)	(0.2)
Architecture and engineering	3.4	3.2	1.4	1.7	2.2	1.9	1.7	2.0	2.4	2.0
	—	(0.2)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)
Life, physical, and social science	0.2	0.4	0.1	0.2	0.5	0.4	0.1	0.2	0.5	0.4
	—	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.1)	(0.1)
Healthcare practitioners and technical	6.9	2.9	4.6	3.4	5.8	5.5	2.3	3.0	4.8	5.0
	—	(0.2)	(0.2)	(0.1)	(0.2)	(0.2)	(0.2)	(0.1)	(0.2)	(0.3)
All other professional	0.9	1.2	1.9	1.7	2.0	2.2	2.1	1.8	1.9	2.2
	—	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)
Service and agriculture										
Protective service	0.4	0.4	0.6	0.3	0.4	1.1	0.4	0.3	0.4	1.1
	—	(0.1)	(0.1)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.1)	(0.1)
Food preparation and serving	1.0	1.3	3.0	1.6	2.2	2.3	2.0	1.0	1.2	1.5
	—	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)

continued

Table 1. Continued

	All staffing services						*Temporary help*			
Occupation	*1990*	*1996*	*2000*	*2001*	*2006*	*2009*	*2000*	*2001*	*2006*	*2009*
Building and grounds cleaning and maintenance	2.0	1.7	2.5	1.9	1.9	2.2	2.8	2.0	1.5	1.9
	—	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)	(0.1)
All other service and agricultural	5.4	5.2	4.1	6.4	4.7	6.2	2.9	6.1	3.8	6.2
	—	(0.2)	(0.2)	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.2)	(0.3)
Sales and office										
Sales and related	3.2	4.7	2.8	2.1	3.1	3.5	2.4	1.4	2.2	2.5
	—	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)
Office and administrative support	41.8	38.6	27.7	24.0	24.9	23.4	28.7	27.5	25.3	23.9
	—	(0.3)	(0.3)	(0.3)	(0.3)	(0.4)	(0.3)	(0.4)	(0.3)	(0.4)
Production, construction, and maintenance										
Supervisors of product, construction, maintenance	0.3	1.3	0.4	0.5	0.5	0.5	0.2	0.4	0.3	0.3
	—	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Construction and extraction	1.3	2.1	6.2	8.5	5.5	4.1	6.4	5.5	5.3	4.0
	—	(0.1)	(0.1)	(0.1)	(0.2)	(0.2)	(0.1)	(0.1)	(0.2)	(0.2)
Installation, maintenance, and repair	1.4	1.1	1.5	1.3	1.6	2.3	1.1	0.8	1.5	2.1
	—	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)	(0.0)	(0.0)	(0.1)	(0.1)
Production	6.3	14.4	17.6	11.6	14.5	13.3	18.9	13.6	17.2	15.0
	—	(0.2)	(0.2)	(0.1)	(0.2)	(0.3)	(0.2)	(0.2)	(0.3)	(0.4)
Transportation and material moving	2.5	2.6	3.1	3.7	3.6	3.0	2.7	2.0	2.9	2.6
	—	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)	(0.2)	(0.1)	(0.1)	(0.1)
Helpers, laborers, hand material movers	16.0	12.8	17.8	27.0	18.6	18.0	21.1	28.4	22.3	21.2
	—	(0.2)	(0.3)	(0.2)	(0.2)	(0.3)	(0.4)	(0.3)	(0.3)	(0.4)

Source: Authors' calculations using OES data.

Notes: Figures are the percentage of staffing services employment or the percentage of temporary help employment in the indicated occupation. Standard errors, in parentheses, are provided for the years for which we have access to micro OES data.

workers in production occupations increased from 6.3% to 17.6% between 1990 and 2000, and production occupations accounted for almost a fourth of all of the industry's employment growth during this time period. By 2000, almost as many staffing services workers were employed in production occupations as in the less-skilled occupational category of helpers, laborers, and material movers.

The secular shift in the occupational distribution in staffing services was less dramatic in the first decade of the 2000s than in the preceding decade. While the share of staffing service workers in office and administrative support occupations continued to decline, mirroring the relative decline economy-wide of this occupational group, the share of staffing services employment in production occupations also dropped somewhat from its peak of 17.6% in 2000 to 14.5% in 2006, the next cyclical peak for this sector. No single occupation displayed strong relative growth in the staffing sector during this period. The share of staffing services workers in the helper, laborer, and material mover occupations, as well as the share of staffing workers in a range of professional, service, sales, and manual occupations increased somewhat between 2000 and 2006.

Table 1 also reports occupational shares within staffing services for the recession years 2001 and 2009. Not surprisingly, the share of staffing services workers in production occupations drops sharply in recession years. Interestingly, the construction industry was little affected in the 2001 recession, which may help explain why the construction occupations did not decline in relative importance in that year. In 2009, however, the shares in all manual occupations (construction, production, transportation, and helper and laborer occupations) were lower than in 2006. Similar cyclical patterns in the occupational distribution of employment are evident in the temporary help component of staffing services, as displayed in the right-hand panel of Table 1.

Although the staffing services sector constitutes a relatively small share of overall employment, its rapid growth in the 1990s and strong cyclical movement since 2000 is indicative of the significant role it plays in aggregate employment changes. Moreover, the fact that changes in the number of workers employed in staffing services have been concentrated in production and other manual occupations suggests that this sector plays a particularly important role in manufacturing, which heavily utilizes workers in these occupations.

Providing some evidence of that role, Table 2 displays the manufacturing, staffing services, and temporary help sectors' shares of employment for the aggregate economy and for major occupations in selected years. By far the largest occupational category in manufacturing is production, which during our period of study accounted for nearly half of all manufacturing employees. Correspondingly, a large majority of production workers in the economy are employed by manufacturing establishments, as shown in the top panel of Table 2. From 1989 to 2000, however, the share of production workers employed in manufacturing declined sharply from 77.6% to 70.9% and

Table 2. Share of Nonfarm Payroll Employment Accounted for by Manufacturing, Staffing, and Temporary Help Sectors, Selected Occupations and Years

Occupation	*1989*	*1996*	*2000*	*2001*	*2006*	*2009*
Share of employment in manufacturing (percentage)						
Production	77.6	74.0	70.9	71.7	72.0	72.0
		(0.14)	(0.15)	(0.18)	(0.16)	(0.19)
Helpers, laborers, hand material movers	35.3	29.2	25.6	24.2	23.9	24.4
		(0.20)	(0.20)	(0.17)	(0.19)	(0.25)
Transportation and material moving	14.3	11.2	11.0	10.4	10.0	9.3
		(0.09)	(0.09)	(0.12)	(0.12)	(0.14)
Construction and extraction	9.3	8.9	5.0	4.7	4.2	4.0
		(0.10)	(0.06)	(0.07)	(0.09)	(0.10)
Office and administrative support	9.5	6.6	6.7	6.0	5.8	5.3
		(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
All occupations	18.0	13.9	12.5	11.7	9.9	8.7
Share of employment in staffing services (percentage)						
Production	0.9	3.6	6.1	3.9	6.1	4.7
	—	(0.05)	(0.06)	(0.05)	(0.09)	(0.10)
Helpers, laborers, hand material movers	6.4	9.5	15.6	19.0	16.8	14.1
	—	(0.15)	(0.21)	(0.16)	(0.20)	(0.24)
Transportation and material moving	0.8	1.4	2.2	2.1	2.5	1.7
	—	(0.07)	(0.14)	(0.04)	(0.08)	(0.08)
Construction and extraction	0.5	1.4	4.2	4.7	3.4	2.3
	—	(0.05)	(0.07)	(0.06)	(0.09)	(0.11)
Office and administrative support	3.1	4.9	4.7	3.3	4.1	2.6
	—	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)
All occupations	1.5	2.3	2.9	2.5	2.7	2.0
Share of employment in temporary help services (percentage)						
Production	—	—	4.6	3.1	5.2	4.0
	—	—	(0.05)	(0.05)	(0.08)	(0.09)
Helpers, laborers, hand material movers	—	—	13.0	14.1	14.8	12.6
	—	—	(0.20)	(0.15)	(0.18)	(0.23)
Transportation and material moving	—	—	1.4	0.8	1.5	1.1
	—	—	(0.11)	(0.03)	(0.06)	(0.06)
Construction and extraction	—	—	3.0	2.1	2.4	1.7
	—	—	(0.05)	(0.04)	(0.09)	(0.09)
Office and administrative support	—	—	3.4	2.6	3.0	2.0
	—	—	(0.04)	(0.03)	(0.04)	(0.04)
All occupations	—	—	2.0	1.7	2.0	1.5

Source: Authors' estimates.
Note: Standard errors, in parentheses, are provided for the years for which we have access to micro data.

then stabilized at about 72% after 2001. Mirroring the decline in the fraction of production workers employed in manufacturing in the 1990s was an increase in the fraction employed in staffing services, as shown in the middle panel of Table 2. In 1989 less than 1% of all production workers in the economy were employed by staffing agencies, but by 2000 that fraction had risen to 6.1%, suggesting that many manufacturing production workers were being hired through staffing agencies.

For a number of other manual occupations—most notably helpers, laborers, and material movers—the fraction of workers employed in staffing services also increased significantly. Staffing services already accounted for a

sizable share—6.4%—of all helpers, laborers, and hand material movers in 1989, but that share swelled to 15.6% by 2000. As is evident from a comparison of the middle and bottom panels of Table 2, most staffing services workers in manual occupations are employed in temporary help agencies. With the exception of helpers, laborers, and material movers in 2001, staffing and temporary help services' share of aggregate employment and employment in specific occupations fell during the recession years 2001 and 2009, demonstrating the important role these intermediaries play in employment adjustment during business cycles.

Estimates of Manufacturers' Outsourcing to Staffing Services

From 1989 to 2000, manufacturing employment fell by 4%, compared with a 22% rise in nonfarm payroll employment. The observed decline in manufacturing employment mirrored the rise in the share of employment in blue-collar occupations within staffing services, as documented above and in Segal and Sullivan (1997). This symmetry caused many to speculate that manufacturing was simply shifting employment into the staffing sector and that the employment declines and productivity growth of the 1990s were exaggerated. We revisit this issue as well as examine the post-2000 period, one characterized by much steeper declines in manufacturing employment and no trend growth but greater cyclical fluctuations in staffing services.

Using Equation (2), we estimate the number of staffing services workers assigned to manufacturing for each year from 1989 to 2009 within each of the 18 occupational categories and sum these figures across all occupations to generate an estimate of the total number assigned to manufacturing.[12] Using the same methodology, we separately estimate the number of temporary help workers assigned to manufacturing from 1999 to 2009. The top panel of Table 3 reports our estimates of the number of staffing services and temporary help workers assigned to manufacturing for selected years, while Figure 3 shows measured manufacturing employment, manufacturing employment adjusted for use of staffing services from 1989 to 2009, and manufacturing employment adjusted for the use of just temporary help workers from 1999 to 2009. The gray shaded areas in Figure 3 display the 95% confidence interval for our estimates of manufacturing employment adjusted for staffing services and for temporary help workers in the years for which we have access to the micro OES data. We are able to place relatively tight bounds on our imputations of staffing services workers to manufacturing because the sample sizes in the OES are large and the three occupations that represent the large majority of workers assigned to manufacturing are well represented in the CWS.

We estimate that the number of staffing services workers assigned to manufacturing grew by about 1 million from 1989 to 2000, from about 419,000

[12]Based on CWS data, we assign 85.5% of production workers; 49.9% of helpers, laborers, and hand material movers; and 19.3% of office and administrative support workers to manufacturing.

Table 3. Staffing Services Workers Assigned to Manufacturing

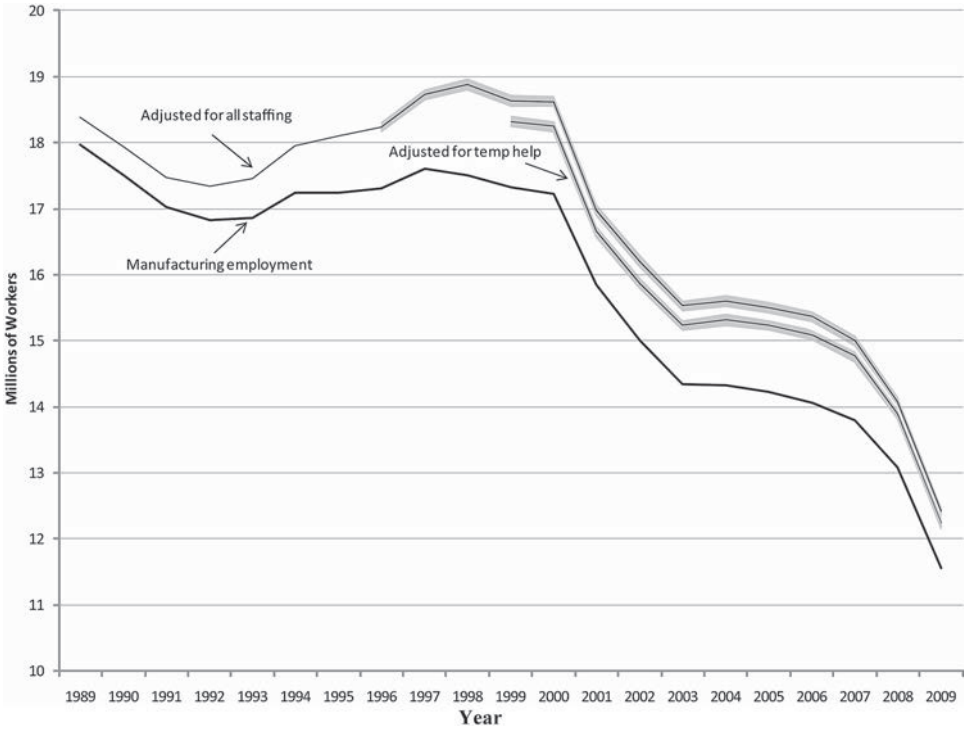
Occupation	*1989*	*1996*	*2000*	*2001*	*2006*	*2009*
Number of workers assigned to manufacturing (standard error)						
All staffing services	419,102	926,882	1,392,278	1,128,881	1,300,610	869,943
	—	(31,265)	(37,851)	(38,029)	(38,257)	(26,990)
Temporary help	—	—	1,020,989	806,074	1,026,906	694,422
	—	—	(35,538)	(34,128)	(36,534)	(25,820)
Staffing services as a percentage of manufacturing employees by selected occupation						
Production	1.0	4.2	6.9	4.8	7.2	5.6
Helpers, laborers, hand material movers	9.0	16.2	33.0	33.9	35.0	28.9
Office and administrative support	6.3	14.2	14.8	11.6	13.4	9.6
All Occupations	2.3	5.4	8.2	7.0	9.2	7.5
Temp help as a percentage of manufacturing employees by selected occupation						
			2000	*2001*	*2006*	*2009*
Production			5.4	3.7	6.1	4.8
Helpers, laborers, hand material movers			24.5	27.5	30.2	25.5
Office and administrative support			9.6	8.2	9.8	7.4
All Occupations			5.9	5.1	7.3	6.0

Source: Authors' estimates.
Note: In top panel, figures in parentheses are standard errors of the estimated number of staffing or temporary help workers assigned to manufacturing.

to almost 1.4 million. Although in 1989 there were approximately 43 workers directly employed in the manufacturing sector for every staffing service worker assigned to manufacturing, by 2000 we estimate this ratio had dropped to 12 to 1. The large growth of staffing workers in manufacturing during this period significantly altered the measured employment trend. Whereas measured employment in manufacturing fell by 4.1% from 1989 to 2000, adjusting for staffing services workers assigned to manufacturing, employment in manufacturing actually grew by 1.3% over that period.

Since 2000 the number of staffing services workers in manufacturing has fluctuated sharply with the business cycle. From November 2000 to November 2001, we estimate that the number of staffing services workers assigned to manufacturing dropped by about 263,000 or 19%, compared with an 8% decline in manufacturing employees. During the subsequent five years the number of staffing services and temporary help workers in manufacturing grew steadily and by 2006 were at about the same level as in 2000. During this period, however, manufacturing employment continued to fall, so that in 2006 the ratio of manufacturing employees to staffing service workers in manufacturing had fallen to 11 to 1. Staffing services again bore a disproportionate amount of employment adjustment in manufacturing in the recent recession. From 2006 to 2009, we estimate the number of staffing services workers in manufacturing fell by a third, or about 430,000 workers, of which about 330,000 were in temporary help. Thus, whereas the number

Figure 3. Manufacturing Employment: As Published and Adjusted for Use of Staffing Services



Source: Authors' estimates.
Note: The shaded areas denote the 95% confidence interval around the point estimates, which were computed for years for which we had access to the OES micro data. See text for further discussion.

of manufacturing employees fell by about 2.5 million from November 2006 to November 2009, the drop was close to 3 million counting the decline of staffing workers assigned to the sector.

More generally, the inclusion of staffing services workers in manufacturing employment estimates has a large effect on the volatility of employment growth (as measured by the standard deviation of annual percentage growth rates in employment), increasing the year-to-year volatility of the growth rate of manufacturing employment by 12% from 1989 to 2006. Thus, manufacturers' outsourcing to staffing services helps account for the observed decline in the volatility of manufacturing employment, a stylized fact that is widely cited in the discussion about whether modern recessions are different from earlier ones (Warnock and Warnock 2000; Stock and Watson 2003; Davis and Kahn 2008).

Underlying these patterns was not only an overall increase in the number of staffing services workers used in manufacturing in the 1990s but also a shift in the occupational distribution of those workers. Three occupations—production; helpers, laborers, and hand material movers; and office and

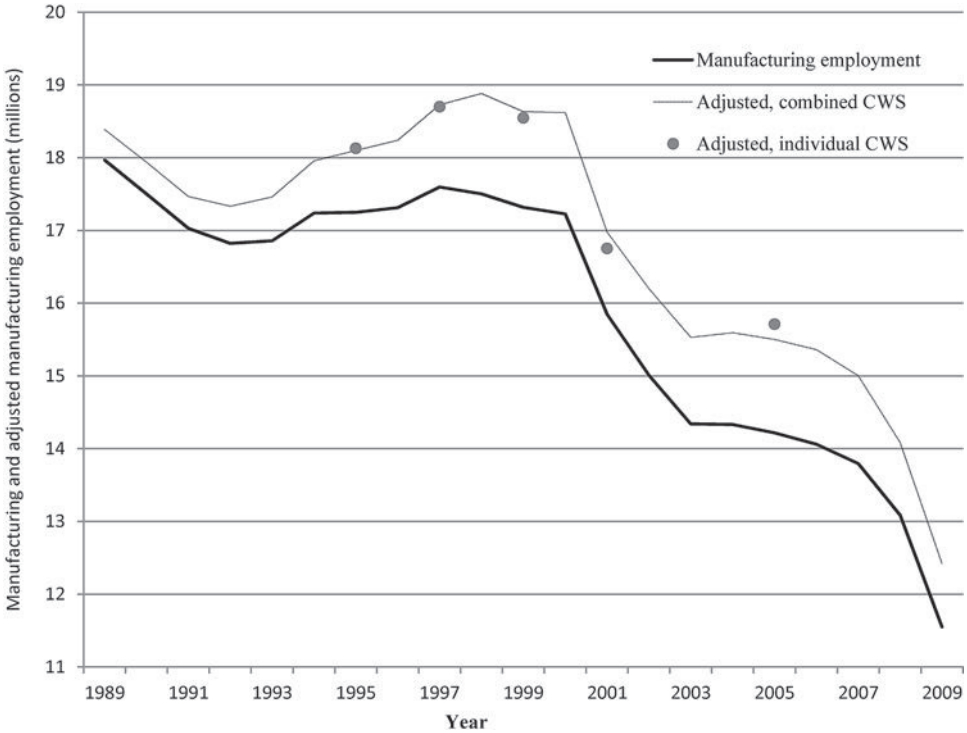
administrative support—account for an estimated 75% to 83% of all staffing services workers in manufacturing throughout the period. Most dramatic was the growth in staffing services workers in production occupations assigned to manufacturing. We estimate that in 1989 only about 80,000 staffing services workers in production occupations worked in manufacturing; that number peaked at approximately 600,000 in 2000 before dropping sharply during the 2001 recession. The rapid rise in staffing services workers in manufacturing production jobs reflects a strategy to utilize staffing agencies not just in unskilled or peripheral occupations but also in manufacturing's core production jobs.

The middle panel of Table 3 shows for selected years staffing services workers assigned to manufacturing as a percentage of all manufacturing employees and as a percentage of manufacturing employees in the three main occupations. Focusing first on the peak years, staffing services workers added an estimated 2.3% to total manufacturing employment in 1989, 8.2% in 2000, and 9.2% in 2006. While staffing services workers added only 1.0% to manufacturing production employment in 1989, by 2000 they added 6.9% to manufacturing production employment and 7.2% by 2006. Although by the mid-1990s production occupations was the largest category of staffing workers in manufacturing, relative use of staffing workers was the highest in less-skilled, manual positions. From 2000 to 2006, staffing workers added about a third to manufacturing employment in laborer, helper, and hand material mover positions, up from just 9.0% in 1989. The relative use of staffing workers in office and administrative occupations also showed strong growth in the 1990s, adding 14.8% to manufacturing office and administrative employment in 2000 compared with 6.3% in 1989.

During recessions, staffing services absorbed a disproportionate amount of employment reductions, as evidenced by the fact that staffing services workers as a percentage of manufacturing employment fell in the aggregate and for most occupations in 2001 and 2009. The bottom panel of Table 3 shows that the cyclical patterns for temporary help are similar to those for all staffing services. For example, temporary help workers added 5.4% to production manufacturing employment in 2000; the percentage dropped sharply to 3.7% in 2001, expanded to 6.1% in 2006, and dropped sharply again to 4.8% in 2009.

Our imputations of staffing services workers to manufacturing are based on the assumption that the fraction of staffing services workers assigned to manufacturing was constant over time within each occupational category. As discussed above, tests using pooled data from the five Contingent Worker Supplements support the hypothesis that the fraction of workers assigned to manufacturing did not vary over time within occupational categories. Figure 4, which compares imputations based on pooling data across CWS surveys with imputations based on a single CWS conducted in that year, provides further assurances that pooling data from the five CWS surveys has little impact on our findings. The fraction of temporary help workers reporting

Figure 4. Imputations of Staffing Services Workers to Manufacturing using Combined and Individual Year CWS Data



Source: Authors' estimates.

assignment to manufacturing establishments is somewhat lower than average in the CWS conducted in 2001, a recession year, and somewhat higher in 2005, indicating, if anything, that manufacturers use staffing services to adjust to cyclical fluctuations to a somewhat greater extent than suggested by our estimates based on pooled CWS data.

Implications for Manufacturing Productivity

Labor productivity is defined as output divided by labor input, Q_t/L_t, though the precise way in which output and labor is measured varies among productivity series published by BLS. In manufacturing, output indexes for the quarterly labor productivity as well as for the multifactor productivity measures are constructed by deflating the current-dollar industry value of production provided by the U.S. Bureau of the Census with price indexes from the Bureau of Economic Analysis, less product shipped by domestic manufacturers to other domestic manufacturers. Thus, the output measure used in manufacturing productivity calculations represents gross output less intra-sector transactions; note that unlike a value-added measure, inputs purchased from outside the domestic manufacturing sector are not subtracted from output. Labor input, L, is measured as the number of employees at

manufacturing establishments or, more commonly, as hours worked by employees of manufacturing establishments.

Although manufacturing labor productivity measures garner a great deal of attention, they have limitations that make them difficult to interpret. Increases in measured labor productivity may reflect the ability of workers to produce more with given amounts of other inputs or an increase in other inputs (capital, purchased services, energy, or nonmanufactured materials) relative to labor input. For example, labor productivity may increase because workers adopt more efficient practices in the existing production process or because the production process is automated and capital substitutes for labor. In the case of outsourcing to staffing services, staffing workers are counted as purchased business services rather than labor input in manufacturing productivity statistics. Consequently, all else being the same, the substitution of staffing agency workers for direct-hire employees will mechanically increase manufacturing labor productivity measures: The staffing services purchases are not subtracted from the output measure, and the staffing workers are not in the denominator of the labor productivity equation.[13]

To assess the effect that outsourcing to staffing services has had on labor productivity growth in manufacturing, we compute labor productivity first using measured labor and next adjusting labor for manufacturers' use of staffing services workers. We use BLS fourth-quarter output indexes for manufacturing to correspond to the timing of the employment data, which come from OES and CES fourth quarter data. Because we have estimated the number of staffing services workers assigned to manufacturing, our main productivity estimates are for output per worker, not output per hour. Our analysis could be sensitive to average levels differences in hours worked by manufacturing employees and staffing industry workers assigned to manufacturing, as well as to differences in the adjustment of average hours of these workers over the business cycle. To assess that possible sensitivity, we also report approximate measures of growth rates in output per hour worked, which were constructed using data from the November CPS on average hours worked by broad occupation for workers in the manufacturing and employment services sectors.[14]

Note that outsourcing to staffing services will only distort manufacturing's labor productivity growth rate if staffing services workers as a share of manufacturing employment are changing over time. To see this, consider the calculation of the growth in labor productivity between two periods, t and $t-1$:

[13]Offshoring will similarly result in a mechanical increase in measured labor productivity in manufacturing (Houseman 2007; Houseman et al. 2011).

[14]To compute total hours worked for manufacturing and staffing services workers, we use November CPS data on average hours worked by manufacturing and employment services employees in four occupational categories: production; helpers, laborers and material movers; office and administrative workers; and all others. Because of differences in data sources, our unadjusted labor productivity estimates do not correspond exactly to official estimates, though in most cases they are quite close.

$$\frac{\dfrac{Q_t}{a_t L_{mt}} - \dfrac{Q_{t-1}}{a_{t-1} L_{mt-1}}}{\dfrac{Q_{t-1}}{a_{t-1} L_{mt-1}}}$$

In our unadjusted measure of labor, a equals one. In the adjusted measure $a = 1 + (L_{st}/L_{mt})$, one plus the ratio of staffing services assigned to manufacturing (L_s) and measured manufacturing employment (L_m). If that ratio does not change over time, a cancels out in the numerator and denominator of the productivity calculation and has no effect on measured productivity growth. As shown in Table 3, however, the ratio of staffing services to manufacturing employment grew over time, particularly in the 1990s. In addition, because staffing services workers bear a disproportionate share of adjustment to fluctuations in demand, that ratio displays large swings over the business cycle and thereby may significantly affect measured labor productivity growth rates in recessions and recoveries.

Table 4 displays our estimates of the contribution that outsourcing to staffing services makes to manufacturing labor productivity over various time horizons. The first panel of Table 4 reports growth in output per worker productivity estimates, and the second panel reports estimates of the growth in output per hour worked. From 1989 to 2000, for example, the average annual growth rate of output per worker in manufacturing was 3.98, whereas the growth rate adjusted for use of staffing services workers was 3.46. Thus, outsourcing to staffing services added about a half a percentage point to the annual growth rate of measured manufacturing output per worker or approximately 13%. Similarly, using an output-per-hour measure, outsourcing to staffing services increased labor productivity by about 0.4

Table 4. Manufacturing Labor Productivity Unadjusted and Adjusted for Staffing Services

	Unadjusted	*Adjusted for all staffing*	*Adjusted for temp help*
Average annual percentage growth in output per worker			
1989–2000	3.98	3.46	n.a.
2000–6	4.03	3.84	3.80
2000–9	3.17	3.23	3.16
2000–1	1.72	2.63	2.54
2001–6	4.49	4.08	4.01
2006–9	1.47	2.00	1.88
Average annual percentage growth in output per hour			
1989–2000	3.89	3.46	n.a.
2000–6	4.11	3.96	3.93
2000–9	3.59	3.61	3.55
2000–1	4.25	4.93	4.86
2001–6	4.08	3.76	3.74
2006–9	2.56	2.92	2.79

Source: Authors' estimates.
Note: n.a. = not available

percentage point or 11%. The effect of outsourcing to staffing services on trend productivity growth in the first decade of the 2000s was less than in the previous decade, but still sizable. Between the business cycle peaks in 2000 and 2006, we estimate that manufacturers' outsourcing to staffing or temporary help services contributed about 0.2 percentage point to the measured average annual growth in output per worker or output per hour, which represented 4% to 6% of the average annual growth.

To place these figures in perspective, during the 1990s the information technology component of capital (computer software and hardware) accounted for 5% to 9% of labor productivity growth in manufacturing (BLS 2008). Although our estimates are not fully comparable with the BLS estimates, this comparison suggests that outsourcing to staffing services may have been as important or more important to measured labor productivity growth in manufacturing during the 1990s than increased use of information technology, which has received considerably more attention (Gordon 2000; Oliner and Sichel 2000).[15] The dramatic growth of manufacturers' outsourcing to staffing services during the 1990s also suggests that this practice may have significantly contributed to the observed acceleration of manufacturing productivity growth in the 1990s (Oliner and Sichel 2000; Eldridge and Sherwood 2001; Stiroh 2002). From 2000 to 2006 our estimate of staffing services' contribution to measured labor productivity growth was about the same as information technology's contribution, which was 5% (BLS 2008).

Staffing sector employment is more cyclically sensitive than manufacturing employment is, so the effects of manufacturers' outsourcing to staffing services on measured labor productivity growth are more pronounced during recessions and recoveries. Between 2000 and 2001, the reduced use of staffing services to achieve workforce reductions depressed measured output per worker growth by 0.9 percentage point, or by about 50%. Hours per worker tend to vary more over the cycle for manufacturing employees than for staffing workers assigned to manufacturing, and consequently outsourcing to staffing services has a proportionately smaller but nevertheless sizable effect on output per hour measures. We estimate that decreased outsourcing to staffing services depressed measured output per hour growth by 0.7 percentage point or about 16% between 2000 and 2001. From 2006 to 2009, decreased outsourcing to staffing services reduced measured average annual labor productivity by about a half a percentage point or about 36% for the output-per-worker measure and by 0.4 percentage point or 14% for the output-per-hour measure.

Conversely, manufacturers rely heavily on staffing services workers to increase labor input during expansions, particularly during the initial stages of the recovery, which has the effect of inflating labor productivity growth measures. During the expansion from 2001 to 2006, outsourcing to staffing

[15]Our productivity estimates are not fully comparable with those published by BLS largely because our data are for the 4th quarter, rather than the annual average of these years.

services contributed about 0.4 and 0.3 percentage point, respectively, to the growth rates of measured output per worker and output per hour, increasing average annual growth in these productivity measures by 8% to 9% over the period. By inflating measured labor productivity growth during expansions and depressing it during contractions, outsourcing to staffing services had the effect of raising the volatility of labor productivity (as measured by the standard deviation of the annual growth in real output per hour) by 9% between 2000 and 2009. As shown in Table 4, the estimated contributions of temporary help to productivity growth tend to be similar in magnitude to those for all staffing services for the various subperiods.

BLS acknowledges that greater use of workers from staffing agencies, as in other types of outsourcing and offshoring, will result in a mechanical and potentially misleading increase in measured labor productivity in manufacturing (BLS 2004). Multifactor productivity statistics, which are designed to account for all inputs to the production process, in theory would address this problem of interpretation. Their ability to do so, however, depends on the accuracy of measures of staffing services input to manufacturing, which are derived from the BEA benchmark input–output tables constructed every five years. These benchmark estimates are based on limited information and for manufacturing are imputed from data for other sectors.[16]

Estimates of manufacturers' use of staffing services in the BEA benchmark I-O tables appear inconsistent both in magnitude and in trend with the estimates presented in this article. The benchmark I-O tables assign only about 15% of the staffing services "commodity" output to manufacturing in the 1992 benchmark and just 5% of staffing services output to manufacturing in the 1997 and 2002 benchmarks.[17] These estimates contrast with our estimates that 29% of staffing services workers were assigned to manufacturing in 1992 and 35% were assigned to manufacturing in 1997 and 2002. Moreover, the large decline in the fraction of staffing services output imputed to manufacturing between the 1992 and 1997 benchmarks—and accompanying gain to the trade and services sectors—is striking given the large growth documented above in the number and the proportion of staffing services workers in production occupations. Consequently, although multifactor productivity measures should adjust for outsourcing, available evidence suggests that these measures do not fully capture the relatively large effects outsourcing is having on manufacturing productivity.

The BLS generates labor productivity statistics for manufacturing using a value-added concept for output only for the purposes of comparing them with foreign statistics. While in theory a value-added measure of output subtracts purchased services from the numerator, the accuracy of the value-added output measures also depends on the accuracy of the BEA I-O benchmark estimates. Therefore, any measurement error biasing a multifactor

[16]See Dey, Houseman, and Polivka (2010) for details on how BEA imputes employment services to manufacturing.

[17]The BEA 2007 benchmark estimates were not available at the time of this writing.

productivity measure will also bias a labor productivity measure that uses a value-added output concept.

Conclusion

Our findings illustrate the importance of taking outsourcing into account when interpreting employment and productivity trends in manufacturing. Through the construction of time series data from the OES, we document the dramatic rise of production workers as well as workers in other manual occupations within the staffing services sector, a fact indicative of manufacturers' increased use of staffing services.

We estimate that the number of staffing services workers assigned to manufacturing ballooned from about 400,000 workers in 1989 to 1.4 million in 2000. As a result, whereas measured employment in manufacturing declined by 4.1% from 1989 to 2000, if staffing agency workers (who typically work side-by-side with manufacturing employees and under the manufacturer's supervision) were counted, manufacturing employment would have actually risen by 1.3%. Although factoring in manufacturers' use of staffing agency workers does not erase the large declines in manufacturing employment since 2000, a growing share of manufacturing work in the United States is being performed by employees of staffing agencies. We estimate that staffing services added 9.2%, or about 1.3 million workers, to direct-hire manufacturing employment in 2006, compared with just 2.3% in 1989 and 8.2% in 2000.

This growing share reflects a dramatic increase in manufacturers' outsourcing of core production and low-skilled manual jobs to staffing agencies. By 2006 staffing services added an estimated 7.2% to manufacturing employment in production occupations and 35.0% to manufacturing employment in low-skilled manual occupations.

Because the hours that staffing agency employees work in manufacturing are not included in labor measures and the output measure used in official productivity calculations does not net out purchased services, the substitution of staffing services employees for manufacturing employees will mechanically increase manufacturing labor productivity. We estimate that the growth in the use of staffing services by manufacturers inflated the annual growth rate of manufacturing labor productivity by about 0.5 percentage point between 1989 and 2000 and by about 0.2 percentage point between 2000 and 2006, indicating that during these periods the contribution from this type of outsourcing to trend manufacturing labor productivity growth, as measured, may have been as important or more important than that of information technology.

The growth of staffing services workers in manufacturing also has implications for measures of the cyclicality of employment and productivity in that sector. Staffing services workers bear a disproportionate share of adjustment to cyclical fluctuations in demand. During the recent recession, for example, manufacturers reduced their staffing services workforce by about

a third, or 430,000 workers. Taking into account manufacturers' use of these workers substantially increases the measured volatility of employment growth and reduces the measured volatility of labor productivity growth in manufacturing.

Our findings suggest potentially important avenues for future research. The growth of staffing services workers in manufacturing, particularly in production and manual occupations, raises questions not fully addressed in the existing literature as to why manufacturing employers heavily utilize these third-party intermediaries and the implications for workers' wages and job stability. In addition, the staffing industry represents only part of the contract work performed in the United States, albeit an important part. More broadly, any growth in outsourcing to staffing services, other contract companies, and independent contractors may have significant implications for employment and productivity measurement in manufacturing as well as in other sectors.

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