Faculdade de Economia
da Universidade de Coimbra

Grupo de Estudos Monetários e Financeiros
(GEMF)
Av. Dias da Silva, 165 – 3004-512 COIMBRA,
PORTUGAL

gemf@fe.uc.pt
http://gemf.fe.uc.pt

JOHN T. ADDISON, LUTZ BELLMANN, ANDRE PAHNKE & PAULINO TEIXEIRA

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ESTUDOS DO GEMF
N.º 4 2008

PUBLICAÇÃO CO-FINANCIADA PELA FUNDAÇÃO PARA A CIÊNCIA E TECNOLOGIA

Impresso na Secção de Textos da FEUC
COIMBRA 2008

A Note on the Determinants and Consequences of Outsourcing Using German Data

John T. Addison,* Lutz Bellmann,** André Pahnke,*** and Paulino Teixeira****

*Department of Economics, University of South Carolina (USA), GEMF/University of Coimbra, and IZA Bonn
**Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit, Nürnberg (Germany)
***Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit, Nürnberg (Germany)
****GEMF/Faculdade de Economia, University of Coimbra (Portugal)

Abstract
Using German data from the Institute for Employment Research Establishment Panel, this paper constructs two main measures of outsourcing and examines their determinants and consequences for employment. There are some commonalities in the correlates of the two measures of outsourcing, as well as agreement on the absence of adverse employment effects across all industries. For one specification, however, some negative effects are reported for manufacturing industry, balanced by positive effects for the services sector for another. But there are no indications of survival bias. This is because the association between outsourcing and plant closings is predominantly negative, albeit poorly determined.

Keywords: outsourcing, organizational change, employment change, plant closings, value added

JEL Classification: F16, J23

Corresponding Author:
John T. Addison
Hugh C. Lane Chair of Economic Theory
Department of Economics
Moore School of Business
University of South Carolina
Columbia, SC 29208
U.S.A.
Email: ecceaddi@moore.sc.edu

I. Introduction

Research on the correlates and consequences of outsourcing using establishment data is uncommon in the literature, which has mostly relied upon industry-level data in discussing the phenomenon in an international trade context (see Amiti and Wei, 2005; Feenstra and Hanson, 1999; Hijzen et al., 2005).[1] The present paper follows a different tack in deploying detailed information on establishment characteristics to examine the determinants of outsourcing and its consequences for employment, where the concept of employment is widened to include plant survival. Our investigation uses German data from the Institute for Employment Research (*Institut für Arbeitsmarkt- und Berufsforschung*, or IAB) Establishment Panel to construct several measures of outsourcing that are then linked to establishment characteristics and employment.

II. Measuring outsourcing at establishment level

The IAB Establishment Panel was initiated in 1993 (1996 for eastern Germany). It was created to meet the needs of the Federal Employment Agency for improved information on the demand side of the labor market. It is based on a stratified random sample – the strata are for 16 (currently 17) industries, 10 employment-size classes, and 16 regions (the *Bundesländer*) – from the population of *all* German establishments with at least one employee covered by social insurance. To correct for panel mortality, exits, and newly founded units, the data are augmented regularly yielding an unbalanced panel. The first wave of the IAB panel in 1993 included some 4,265 west German plants, and in 1996 the east German establishment panel began with 4,313 plants. Overall, the IAB panel increased in size every year up to 2001 when it stabilized at around 16,000 establishments. In 2007, for example, it contained information on 15,644 plants, employing some 2.46 million workers.

[1] For studies using plant-level data, however, see Görg et al (2008), and Görg and Hanley (2004, 2005).

Data are collected in personal interviews with the owners or senior managers of the establishment by professional interviewers. The questions cover the number of employees, the qualifications of employees, the number of temporary and agency workers, working hours (every second year since 2002), coverage by a collective agreement at industry or firm level, establishment sales turnover, the expected development of turnover, the share of sales attributed to intermediate inputs and external costs (which we use to construct our first measure of outsourcing), export share, total investments (and the shares of that total made up of expansion investments and (until 2007) investments in information and communications technology), the total wage bill, profit sharing (irregularly in the five surveys since 1998 but comparably since 2000), the technological status of the establishment (except in 2004), its legal status and corporate form, age, and overall economic performance, reorganization measures undertaken and process/product innovations introduced (every third year), and company further training activities (every other year). Since 2000 the works council status of the plant has been asked every year after an hiatus in the 1990s, and (for 2006 alone) the quality of the works council from the perspective of the manager respondent. Further, the second outsourcing variable used in the present exercise is taken from a question on major organizational change including whether or not the establishment had increased its purchases of products/services from outside sources over the course of the preceding two years. This question was initiated in 1998 and has been asked every third year from 2001.

As we have intimated, the key outsourcing measures contained in the IAB Panel pertain to the *share of sales attributed to intermediate inputs and external costs* (in the year preceding the survey)[2] and organizational change over the course of the preceding two years

[2] The actual survey question is as follows: "What share of sales was attributed to intermediate inputs and external costs [in the previous year], i.e. all raw materials and supplies purchased from other businesses and institutions, merchandise, wage work, external services, rents and other costs (e.g. advertising and agency expenses, travel costs, commissions, royalties, postal charges, insurance premiums, testing costs, consultancy fees, bank charges, contributions to chambers of trade and commerce and professional associations)?

involving *a greater acquisition of goods and services* (i.e. from outside the firm).[3] Specifically, the former share is converted to an absolute (Euro) value and then expressed as a share of value added. (We also experimented with using the answers to this question directly and expressing the derived value of externally-sourced inputs as a percentage of the total wage bill after Görg and Hanley, 2005**.** Results of using these other measures are mixed and are available from the authors upon request.) We used the value of externally-sourced inputs as a share of value added in both levels and differences, while recognizing that changes in the ratio need not necessarily represent changes in outsourcing but instead reflect changes in either input or output prices – as well as how establishments manage their inventories of finished goods.

Our second measure of outsourcing is in principle unaffected by changes in either input or output prices since it merely inquires of the manager respondent whether or not there was increased reliance on bought-in products and services over a two-year interval. This measure though innovative has the downside that we do not know the magnitudes in question (the degree of outsourcing) merely the directional influence.

By way of summary, our two broad measures of outsourcing are not without blemish. The virtue of the former measure is that we can observe the current level of outsourcing, even if we must remain cautious about measured changes in outsourcing derived from differences in levels. The second measure allows us to identify outsourcing establishments without conveying any information about the extent of the process. Expressed differently, given the non-contiguous timing of the surveys, we cannot use information on increased reliance on

[3] Readers familiar with the IAB Firm Panel should note that another question in the survey (Q2) seemingly offers a more direct measure of outsourcing since it asks whether parts of the establishment were *closed down* or *relocated in other company units* or *hived off and operated as separate independent businesses*. Unfortunately, there are problems in using this question – as well as a separate follow-up *insourcing* question (Q3) – by virtue of a low response rate as well as certain inconsistencies involving the responses of single-plant firms. On closer inspection, it emerges that Q2 was never intended to inform on the outsourcing question.

outsourcing from the organizational change question to identify an acceleration or deceleration of outsourcing over time.

We use a common set of covariates for the determinants and consequences of outsourcing. These comprise sales per employee, the share of sales attributable to exports, expectations of rising future sales, gross investment, dummies for investment in information and communication technology and investment in production facilities, an advanced state of technology dummy constructed from a five-element question where the management respondent is asked to assess the plant's overall state of on technology relative to other establishments in the same industry, number of employees, wages per employee, the shares of high skilled workers and workers on fixed term contracts, the separation or labor turnover rate, works council presence,[4] coverage by a collective agreement at either sectoral or plant level, and whether the plant was located in western (as opposed to eastern) Germany. In addition, a number of plant characteristics were included, namely, dummies indicating if the plant was established before 1990, whether it was a single-establishment firm, and the exact legal form of the enterprise.[5] Finally, our regressions include in excess of 30 industry dummies, where the exact number depends on the dependent variable. We restricted our sample period mainly to the interval 2002-2004, extended to 2006 for the survival component of the analysis.[6]

[4] Since works councils may only be formed in establishments with at least five permanent employees, our sample excludes plants employing fewer than this number of employees.

[5] We distinguish between individually-owned firms (the omitted category), partnerships, limited liability corporations, companies limited by shares, public corporations/foundations, and other legal forms (e.g. cooperatives).

[6] We also investigated other time intervals (e.g. 1999-2001). Results are available from the authors upon request.

III. Findings

Results on the determinants of outsourcing are provided in Tables 1 through 2. Table 1 presents logit results for the 'organizational change' measure, namely, expanded usage of bought-in products over the two-year interval ending on June 30, 2004. It is apparent that plants with increasing recourse to outsourcing are disproportionately export-led, to have made investments in information and communications technology, to have expectations of expanded business volume over the course of the current year, and to be located in western Germany. They also record higher labor turnover. Outsourcing is also higher in limited liability corporations than other legal forms, but single-plant enterprises clearly engage in less outsourcing. Despite the importance of investments in information and communications technology, there is no indication that the technological status of the plant matters, or that mature plants outsource more. On this measure, neither industrial relations institution (viz. works councils and collective bargaining coverage) nor workforce characteristics seem to influence outsourcing.

(Tables 1 and 2 near here)

Material on the other measure of outsourcing is contained in Table 2. The first two columns give results for the ratio of externally sourced inputs to value added in levels form for 2002 and 2004. The third column presents findings for changes in that ratio between 2002 and 2004. Beginning with the levels results, the first observation to make is that, with the exception of number of employees, no variable is consistently statistically significant. Second, while a number of variables achieve statistical significance in either year – examples include investments in production facilities, state-of-the-art technology (not surveyed in 2004), location in western Germany, share of fixed-term contract workers, and single-firm establishments, there are also some sign reversals (e.g. export share in 2004 where the coefficient estimate changes from positive and statistically insignificant to negative and statistically significant). Third, there are few commonalities with Table 1; for example,

expectations of higher sales in 2002 and a higher export share in 2004 are now associated with a *reduced* ratio of externally-sourced inputs to value added. For their part, the results in the third column of the table indicate almost no statistically significant determinants of (changes in) the outsourcing ratio – and a disappointingly low coefficient of determination. The sole exceptions are companies limited by shares and the share of high-skilled employees, where the associations are positive and negative, respectively.

Summarizing our findings with respect to the determinants of outsourcing, there are few signs from the evidence on changes in outsourcing at least that the phenomenon is associated with reduced sales per employee, technological sluggishness, or low wage firms. Although there is some supporting evidence from the analysis in levels of variables (e.g. the positive influence of state-of-the-art technology and investments in production facilities), there are also some contrary indications (the negative and marginally statistically significant coefficient estimate for wages per employee in 2004). On balance, then, we might have expected to draw on more direct evidence than we have uncovered (i.e. beyond the positive associations with export share, expected sales, and investments in information and communications technology and here only for one of the outsourcing measures). And, although outsourcing might be viewed as an alternative form of workforce flexibility, note that the inverse association between the share of fixed-term workers and outsourcing was never statistically significant in the change in outsourcing equations (only for outsourcing in levels for 2002).

(Table 3 near here)

What of the consequences of outsourcing? To examine this question our principal focus is upon (two-year) changes in employment. But since employment changes can only be observed for survivors, we shall also consider a possible employment effect operating through plant closings. Table 3 contains OLS estimates of the effect of outsourcing on the change in employment between 2002 and 2004. Column (1) gives results for the organizational change

measure of outsourcing, column (2) for the ratio of externally-sourced inputs to value added in 2002, and column (3) for the change in this ratio between 2002 and 2004. As is apparent, the effects of outsourcing are (marginally) statistically significant only in the case of the last specification. As far as the other arguments are concerned, employment change is negatively associated with gross investments (albeit insignificantly so) – although the reverse is true for the dummies capturing investments in information and communications technology and investment in production facilities – and with establishment size, while it is positively associated with expectations of increased sales, advanced technology, location in western Germany and, interestingly, with the share of fixed-term contract workers.

(Tables 4 and 5 near here)

Tables 4 and 5 provide disaggregated results for services and manufacturing, respectively. For services, although the outsourcing coefficient estimates are unchanged (albeit statistically insignificant) for the ratio measures, we obtain a *positive* and statistically significant coefficient estimate for the organizational change measure of outsourcing. This is the first estimate of which we are aware that points to rising employment in association with outsourcing in this sector. The influence of the other regressors is broadly as observed for industry as a whole.

The results for manufacturing offer a further twist. Even if the signs are inconsistent, we obtain statistically significant coefficient estimates for both the level and the change in the ratio of externally-sourced inputs to value added, while the coefficient for the organizational change measure is now negative (albeit not statistically significant). The rest of the results are also somewhat different from before. For example, neither location in western Germany nor the share of workers on fixed-term contracts is statistically significant. Further, the employment consequences of mature plants and absence of state-of-the-art technology are now transparent: older plants with less up-to-date technology grow less. There is also some suggestion that lower wage plants may outsource more.

As a final exercise, we sought to determine whether our outsourcing measures had any effect on plant closings. Since the latest (publicly) available survey refers to 2006, this exercise amounts to examining the effects of outsourcing on plant failures over the interval 2004-2006.

Using the IAB panel we can identify plant closings in the following manner. As of 2006, we have data on the 'current' state of each establishment that participated in 2004. Of course not all plants 'missing' from the survey in 2006 are deaths: some are plants where the interviewer was unable to figure out what had happened to them, while others will simply be plants that have been rotated out of the sample. Additional information from the German Federal Employment Agency *establishment file* was then used to check on whether a 2004 participant was still extant in 2006. The file contains information on each German establishment with at least one employee covered by social insurance, and is used to draw the sample for the Establishment panel. The establishment identifiers of plants with missing data on survival in the panel were compared with the establishment identifiers in the file. A missing establishment was adjudged to have failed if no match could be found in the file. Alternatively put, former missing observations for which a match was found were added back in as survivors. In this way, we were able to obtain virtually complete information on survivals/deaths of all plants that were part of the establishment panel in 2004. After all such calculations, we arrive at a total of 199 plant failures for all industries as of 2006 for the organizational change measure of outsourcing. Corresponding plant failures for the ratio of externally-sourced inputs to value added are 185 and 120 for the levels and change measures, respectively.

The probability of failure was modelled using a logistic regression in which the RHS variables are identical to those used in the employment change equations. The dependent variable is assigned the value of 1 for those plants that failed between 2004 and 2006, 0 otherwise. All regressors have values set at the time of the 2004 wave.

(Table 6 near here)

The logit results are presented in summary form in Table 6. Beginning with the organizational change measure of outsourcing, we see that all the point estimates are negative, although none achieves statistical significance at conventional levels. The same results obtain for the change in the ratio of externally sourced inputs to value added between 2002 and 2004, that is, all coefficients are again negative and insignificant. For the level of externally sourced inputs in 2004, however, two out of three coefficient estimates are positive (for all for all sectors and for services). The results for manufacturing are opposite in sign but remain statistically insignificant. Although one might conclude from this evidence that outsourcing might weakly indicate a solution to problems of survivability rather than hinting at a source of competitive difficulty, we would instead incline to the view that there is nothing in the data to suggest that the employment change results reported earlier in Table 2 are subject to survivor bias.

IV. Conclusions

The results of this investigation into outsourcing and its employment consequences are mixed and may be summarized as follows. First, the correlates of outsourcing do not hint at any obvious pathology in the sense of identifying an unfavorable backdrop to exercises of this type. Second, across all industries, there is no convincing evidence that outsourcing costs jobs. Third, however, behind this latter result is the appearance of disparate effects for services on the one hand and manufacturing on the other, and in each case consistent with the aggregate findings these different results derive from different outsourcing measures. The disparate results for the two sectors offer sustenance to opponents and supporters of outsourcing alike. But if so, it remains rather thin gruel. Finally, it appears that we can reject the notion that the employment consequences are either more or less favourable by reason of survival bias. That is to say, there are no signs that outsourcing aggravates plant closings.

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Table 1: The Determinants of Outsourcing, Organizational Change Measure: Expanded Use of Bought-in Products and Services, 2002-2004, Logit Model

Variable	Coefficient (s.e.)
Sales per employee	-4.53e-07 (3.13e-07)
Export share	0.007 (0.002)***
Increasing sales expected	0.284 (0.111)**
Total of all investments	-4.92e-06 (4.43e-06)
Investments in ICT	0.377 (0.128)***
Investments in production facilities	0.160 (0.129)
State-of-the-art technology	-0.105 (0.106)
Number of employees	0.075 (0.052)
Wages per employee	0.0001 (0.0001)
Share of high skilled workers	0.260 (0.219)
Separation rate	0.650 (0.373)*
Share of fixed-term workers	-0.045 (0.498)
Works council	0.232 (0.144)
Collective agreement	-0.069 (0.116)
Western Germany	0.310 (0.127)**
Establishment founded before 1990	0.105 (0.118)
Single-establishment firm	-0.277 (0.117)**
Partnership	0.216 (0.225)
Limited liabilitiy corporation	0.296 (0.174)*
Company limited by shares	0.030 (0.273)
Public corporation	-0.396 (1.118)
Other legal form	-0.374 (0.521)
Log likelihood	-1525.1601
LR Chi-square (d.f.)	370.77 (53)***
Pseudo R^2	0.1084
N	4,504

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels**,** respectively. Robust standard errors are in parenthesis.
Notes: Right-hand side variables are base-year (2002) characteristics. The model also includes 31 industry dummies.

Table 2: The Determinants of Outsourcing, Ratio of Externally-Sourced Inputs to Value Added Measure in Levels (2002, 2004) and Changes in Levels (2002-2004), OLS Estimates

Variable	(1)	(2)	(3)
Sales per employee	4.74e-07	1.63e-06**	-2.38e-08
	(4.45e-07)	(6.49e-07)	(6.94e-08)
Export share	0.002	-0.007**	-0.001
	(0.005)	(0.003)	(0.006)
Increasing sales expected	-0.301*	-0.078	0.391
	(0.163)	(0.216)	(0.262)
Total of all investments	1.02e-06	-2.71e-06	-5.38e-06
	(2.29e-06)	(2.24e-06)	(3.33e-06)
Investments in ICT	0.0002	-0.278	0.017
	(0.239)	(0.212)	(0.306)
Investments in production facilities	0.376*	0.299	-0.233
	(0.217)	(0.206)	(0.307)
State-of-the-art technology	0.299*		-0.137
	(0.174)		(0.255)
Number of employees	0.146*	0.229**	-0.122
	(0.083)	(0.108)	(0.126)
Wages per employee	-0.0001	-0.0002*	0.00003
	(0.0001)	(0.0001)	(0.0001)
Share of high-skilled workers	0.284	-0.189	-1.195**
	(0.352)	(0.406)	(0.514)
Separations rate	0.026	0.239	-0.157
	(0.536)	(0.171)	(0.760)
Share of fixed-term workers	-0.969**	-0.167	0.278
	(0.389)	(0.668)	(0.571)
Works council	-0.429	-0.105	0.521
	(0.288)	(0.307)	(0.362)
Collective agreement	-0.045	0.023	0.084
	(0.248)	(0.213)	(0.300)
Western Germany	-0.050	0.294*	0.154
	(0.235)	(0.174)	(0.327)
Establishment founded before 1990	-0.006	-0.124	-0.141
	(0.211)	(0.169)	(0.307)
Single-establishment firm	-0.465*	-0.289	-0.069
	(0.255)	(0.225)	(0.334)
Partnership	0.424	-0.700***	-0.673
	(0.426)	(0.244)	(0.511)
limited liabilitiy corporation	-0.219	0.067	0.065
	(0.255)	(0.271)	(0.373)
Company limited by shares	-1.251**	0.794	2.959***
	(0.440)	(0.779)	(1.135)
Public corporation	-0.677	-0.638	0.048
	(0.411)	(0.420)	(0.468)
Other legal form	1.552	-0.659*	-2.285
	(1.450)	(0.363)	(2.130)
R^2	0.07	0.08	0.02
N	5,027	5,643	3,495

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels**,** respectively. Robust standard errors are in parenthesis.

Notes: See Table 1. The dependent variable in columns (1) and (2) is given by the ratio of externally-sourced inputs to value added in 2002 and 2004, respectively, and in column (3) by the 2002-2004 change in the ratio. The right-hand-side variables are measured as of 2002, 2004, and 2002, respectively.

Table 3: The Effect of Outsourcing on Employment Change, 2002-2004, OLS Estimates

	Specification		
Variable	(1)	(2)	(3)
Expanded use of bought-in products and services, 2002-2004	0.009 (0.014)		
Ratio of externally-sourced inputs to value added, 2002		0.001 (0.0004)	
Change in ratio of externally-sourced inputs to value added, 2002-2004			-0.001* (0.001)
Sales per employee	-1.02e-09 (9.21e-09)	-1.78e-09 (9.77e-09)	1.08e-09 (8.48e-09)
Export share	-0.0001 (0.0002)	-0.00004 (0.0002)	-0.0001 (0.0003)
Increasing sales expected	0.057*** (0.011)	0.058*** (0.011)	0.055*** (0.011)
Total of all investments	-4.79e-07 (3.34e-07)	-5.55e-07 (3.50e-07)	-1.49e-07 (1.39e-07)
Investments in ICT	0.051*** (0.010)	0.052*** (0.010)	0.049*** (0.011)
Investments in production facilities	0.041*** (0.010)	0.045*** (0.011)	0.040*** (0.011)
State-of-the-art technology	0.016* (0.009)	0.018* (0.010)	0.013 (0.010)
Establishment size 21-100	-0.007 (0.012)	-0.008 (0.012)	-0.003 (0.012)
Establishment size 101-1,000	-0.053*** (0.016)	-0.062*** (0.017)	-0047*** (0.018)
Establishment size 1,001 and more	-0.056** (0.022)	-0.069*** (0.022)	-0.038* (0.023)
Wages per employee	-3.83e-06 (6.18e-06)	-3.50e-06 (6.36e-06)	-0.00001 (7.62e-06)
Share of high-skilled workers	-0.022 (0.019)	-0.020 (0.020)	-0.009 (0.020)
Separations rate	0.056 (0.075)	0.054 (0.076)	-0.023 (0.079)
Share of fixed-term workers	0.092* (0.050)	0.113** (0.050)	0.119** (0.053)
Works council	-0.008 (0.013)	-0.001 (0.013)	-0.012 (0.013)
Collective agreement	-0.011 (0.010)	-0.013 (0.010)	-0.005 (0.010)
Western Germany	0.025** (0.011)	0.027** (0.011)	0.027** (0.011)
Establishment founded before 1990	-0.015 (0.010)	-0.011 (0.011)	-0.014 (0.011)
Single-establishment firm	-0.012 (0.011)	-0.015 (0.011)	-0.005 (0.012)
Partnership	0.004 (0.016)	0.005 (0.017)	-0.004 (0.017)
Limited liabilitiy corporation	0.015 (0.014)	0.016 (0.014)	0.008 (0.014)
Company limited by shares	0.007 (0.022)	0.006 (0.023)	-0.004 (0.023)
Public corporation	0.100** (0.039)	0.076** (0.035)	0.086** (0.039)
Other legal form	-0.003 (0.035)	-0.011 (0.035)	0.011 (0.034)

R^2	0.06	0.06	0.07
N	4,541	4,313	3,495

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels**,** respectively. Robust standard errors are in parenthesis.
Notes: See Table 1. The model includes 35 industry dummies.

Table 4: The Effect of Outsourcing on Employment Change in the Services Sector, 2002-2004, OLS Estimates

	Specification		
Variable	(1)	(2)	(3)
Expanded use of bought-in products and services, 2002-2004	0.057**		
	(0.028)		
Ratio of externally-sourced inputs to value added, 2002		0.001	
		(0.001)	
Change in ratio of externally-sourced inputs to value added, 2002-2004			-0.001
			(0.0005)
Sales per employee	7.91e-09***	7.29e-09***	9.33e-09***
	(2.06e-09)	(2.01e-09)	(1.37e-09)
Export share	-0.0003	-0.0003	-0.001
	(0.001)	(0.0001)	(0.006)
Increasing sales expected	0.061***	0.062***	0.062***
	(0.017)	(0.017)	(0.018)
Total of all investments	-8.76e-07*	-1.08e-06**	-2.49e-07
	(5.19e-07)	(5.00e-07)	(3.35e-07)
Investments in ICT	0.045***	0.044***	0.037**
	(0.015)	(0.016)	(0.017)
Investments in production facilities	0.024*	0.028*	0.027*
	(0.015)	(0.015)	(0.016)
State-of-the-art technology	-0.002	-0.003	0.0004
	(0.014)	(0.015)	(0.016)
Establishment size 21-100	-0.005	-0.001	0.007
	(0.016)	(0.016)	(0.017)
Establishment size 101-1,000	-0.061**	-0.064**	-0.045
	(0.026)	(0.027)	(0.029)
Establishment size 1,001 and more	-0.040	-0.048	-0.0004
	(0.036)	(0.037)	(0.043)
Wages per employee	2.08e-06	4.02e-06	-1.69e-06
	(7.47e-06)	(7.79e-06)	(9.38e-06)
Share of high-skilled workers	0.001	0.003	0.021
	(0.028)	(0.029)	(0.029)
Separations rate	0.103	0.123	-0.026
	(0.111)	(0.112)	(0.128)
Share of fixed-term workers	0.103	0.119*	0.185***
	(0.067)	(0.068)	(0.069)
Works council	-0.005	0.001	-0.0003
	(0.020)	(0.021)	(0.022)
Collective agreement	-0.003	-0.008	-0.015
	(0.015)	(0.015)	(0.016)
Western Germany	0.031*	0.034**	0.038**
	(0.017)	(0.017)	(0.018)
Establishment founded before 1990	-0.005	0.004	0.002
	(0.016)	(0.016)	(0.017)
Single-establishment firm	-0.014	-0.016	-0.008
	(0.017)	(0.018)	(0.019)
Partnership	-0.019	-0.020	-0.025
	(0.022)	(0.023)	(0.023)
Limited liabilitiy corporation	0.023	0.025	0.009
	(0.020)	(0.020)	(0.020)
Company limited by shares	0.034	0.035	-0.027
	(0.029)	(0.032)	(0.032)
Public corporation	0.101**	0.071	0.079
	(0.049)	(0.046)	(0.048)
Other legal form	-0.008	-0.024	-0.021
	(0.039)	(0.038)	(0.036)

R^2	0.07	0.07	0.06
N	2,018	1,880	1,493

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels**,** respectively. Robust standard errors are in parenthesis.
Notes: See Table 1. The model includes 18 industry dummies.

Table 5: The Effect of Outsourcing on Employment Change in the Manufacturing Sector, 2002-2004, OLS Estimates

	Specification		
Variable	(1)	(2)	(3)
Expanded use of bought-in products and services, 2002-2004	-0.012		
	(0.015)		
Ratio of externally-sourced inputs to value added, 2002		0.001*	
		(0.001)	
Change in ratio of externally-sourced inputs to value added, 2002-2004			-0.002*
			(0.001)
Sales per employee	-9.26e-08	-9.24e-08	-9.18e-08
	(6.03e-08)	(5.77e-08)	(6.10e-08)
Export share	0.0001	0.0001	0.0002
	(0.0003)	(0.0003)	(0.0003)
Increasing sales expected	0.055***	0.054***	0.053***
	(0.015)	(0.015)	(0.015)
Total of all investments	1.22e-08	8.77e-09	5.34e-08
	(1.57e-07)	(1.52e-07)	(1.58e-07)
Investments in ICT	0.057***	0.060***	0.060***
	(0.013)	(0.013)	(0.014)
Investments in production facilities	0.055***	0.057***	0.048***
	(0.014)	(0.015)	(0.016)
State-of-the-art technology	0.029**	0.032**	0.021*
	(0.012)	(0.013)	(0.013)
Establishment size 21-100	-0.012	-0.019	-0.011
	(0.015)	(0.018)	(0.017)
Establishment size 101-1,000	-0.044**	-0.061***	-0.045*
	(0.022)	(0.022)	(0.023)
Establishment size 1,001 and more	-0.040	-0.058**	-0.032
	(0.029)	(0.029)	(0.029)
Wages per employee	-0.00001	-0.00001	-0.00002*
	(0.00001)	(0.00001)	(0.00001)
Share of high-skilled workers	-0.041	-0.041	-0.037
	(0.026)	(0.027)	(0.027)
Separations rate	-0.021	-0.050	-0.034
	(0.087)	(0.089)	(0.099)
Share of fixed-term workers	0.050	0.064	0.036
	(0.077)	(0.078)	(0.085)
Works council	-0.009	0.002	-0.018
	(0.016)	(0.017)	(0.017)
Collective agreement	-0.011	-0.010	0.008
	(0.013)	(0.014)	(0.014)
Western Germany	0.023	0.023	0.022
	(0.014)	0.015	(0.015)
Establishment founded before 1990	-0.024*	-0.024*	-0.031**
	(0.014)	(0.014)	(0.013)
Single-establishment firm	-0.014	-0.015	-0.005
	(0.014)	(0.014)	(0.016)
Partnership	0.028	0.026	0.016
	(0.024)	(0.025)	(0.024)
Limited liabilitiy corporation	0.010	0.010	0.011
	(0.020)	(0.020)	(0.020)
Company limited by shares	-0.021	-0.023	0.012
	(0.032)	(0.033)	(0.033)
Public corporation	0.043	0.046	0.042
	(0.095)	(0.094)	(0.098)
Other legal form	0.025	0.035	0.126
	(0.080)	(0.090)	(0.092)

R^2	0.08	0.08	0.09
N	2,523	2,433	2,002

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels**,** respectively.
Notes: See Table 1. The model includes 17 industry dummies.

Table 6: Logit Estimates of the Effect of Outsourcing on Plant Closings, 2004-2006, Summary Results

	Sector		
Outsourcing measure	All industries	Manufacturing	Services
Expanded use of bought-in products and services, 2002-2004	-0.140 (0.281) [N=5,551]	-0.181 (0.346) [N=2,662]	-0.140 (0.477) [N= 2,772]
Ratio of externally-sourced inputs to value added, 2004	0.0003 (0.010) [N= 5,282]	-0.044 (0.038) [N= 2,561]	0.006 (0.012) [N= 2,609]
Change in the ratio of externally-sourced inputs to value added, 2002-2004	-0.004 (0.014) [N= 3,224]	-0.008 (0.022) [N= 1,701]	-0.002 (0.016) [N=1,405]

*, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively. Standard errors are in parenthesis.
Note: The fitted equations include the full set of regressors used in the previous tables.

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