SFB 649 Discussion Paper 2008-020

The Impact of International Outsourcing on Labour Market Dynamics in Germany

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This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".

http://sfb649.wiwi.hu-berlin.de
ISSN 1860-5664

SFB 649, Humboldt-Universität zu Berlin
Spandauer Straße 1, D-10178 Berlin

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February 14, 2008

Abstract

Using an administrative data set containing daily information on individual workers' employment histories, we investigate how workers' labour market transitions are affected by international outsourcing. In order to do so, we estimate hazard rate models for match separations, as well as for worker flows from employment to another job, to unemployment, and to out of the labour force. Outsourcing is found to have no significant impact on job stability in the manufacturing sector, but it is associated with increased job stability in the service sector. Furthermore, especially in the service sector the effect of outsourcing varies across skill levels. An analysis of the different labour market flows shows that labour market transitions are not affected symmetrically by international outsourcing.

Key words: Job stability; labour market transitions; worker flows; outsourcing; duration analysis.

JEL classification: F16; J63; J23

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†We are grateful to participants of a seminar at RWI Essen for helpful comments. We also thank the staff at the IAB for hospitality and for help with the data. Finally, we gratefully acknowledge the support of the German Science Foundation (DFG) and of the Collaborative Research Centre SFB 649.

1 Introduction

Fears of economic competition from low-wage countries are widespread among workers, trade unionists and politicians in many industrialized countries. The concern is that economies with relatively high labour costs are adversely affected by labour demand shifting towards economies with lower labour costs, thereby reducing job stability and increasing unemployment. One mechanism which is suspected of leading to such an evolution is international outsourcing, which occurs when a domestic firm subcontracts a (production) process to another firm in a foreign country.

While a number of theoretical papers has underlined the importance of international outsourcing for relative labour demand and factor prices (see, for instance, Feenstra and Hanson, 1996a; Arndt, 1997; Deardorff, 2001; Kohler, 2004) no consensus has yet emerged in this regard. Depending on the specific modelling approach, low-skilled workers may lose or benefit from outsourcing. More importantly, the theoretical contributions generally assume full employment and perfect factor mobility and are, hence, silent about the net employment effects of outsourcing, not to mention the impact on labour market dynamics in the short-run. While in the public debate international outsourcing is mainly associated with employment losses, it should be noted that outsourcing may also induce employment growth by increasing the competitiveness and the productivity of firms (cf. OECD, 2007).

In this paper, we analyse the effects of international outsourcing on the dynamics of the German labour market, i.e. on the stability of job matches, as well as on worker flows. The case of Germany is particularly interesting for several reasons. First, Germany is the largest economy in the European Union. Second, it is one of the most open economies in the world, regularly featuring the highest level of exports worldwide. Third, in Germany international outsourcing has grown substantially over recent years. While outsourcing is still more important in manufacturing, during the 1990s growth rates have been considerably higher in the service sector (cf. Horgos, 2007). Finally, there is evidence that West Germany experienced a significant increase in economic turbulence, defined as the pace of structural change, during the 1990s (cf. Bachmann and Burda, 2008). The acceleration of international outsourcing is a natural culprit for this development.

We are not the first to analyse the effects of international outsourcing on the German labour market.[1] However, in contrast to the existing literature, we investigate the effects of international outsourcing on labour market dynamics by looking at worker flows. In particular, we focus on the three flows resulting from the separation of an employer-employee match: direct job-to-job transitions, the flow from employment to unemployment, and the flow from employment to nonparticipation, i.e. out of the labour market. The distinction between these three labour market transitions is important because

[1] See the next section for a discussion of the literature.

a match separation can have very different reasons and consequences. For example, a separation may be initiated by the worker, who has found a better job. This will in all likelihood result in a direct job-to-job transition. A separation can also be the consequence of a lay-off, in which case the worker has a relatively high probability of becoming unemployed - this entails a transition from employment to unemployment. The worker may even become discouraged to the extent that he leaves the labour market altogether. These different transitions have very different welfare implications, both for the affected worker and for the economy as a whole. In order to assess the consequences of international outsourcing, the distinction between these three flows is therefore crucial.

Our analysis also takes into account the fact that international outsourcing increasingly affects sectors outside manufacturing, such as the service sector. In order to analyse the effects of outsourcing in manufacturing and services, we use a very large micro data set covering 2% of the dependent-status German employees. As it is derived from administrative records, the data set has the further advantage of featuring very little measurement error, as well as being exact to the day. It is thus possible to follow individual labour market transitions, including direct job-to-job flows, in a very exact way.

The plan of the paper is as follows. In the next section, we give a brief review of the relevant literature. The third section describes the data set used, while the fourth section presents the econometric method. The fifth section contains our estimation results. The last section summarizes the results and concludes.

2 Existing Literature

There now exists a sizeable empirical literature that investigates the labour market effects of international outsourcing. In particular, its impact on relative labour demand and the wage skill premium has been widely discussed (see, for instance, Feenstra and Hanson, 1996b, and Feenstra and Hanson, 1999, for the US; Geishecker and Görg, 2007, for Germany; Hijzen, Görg, and Hine, 2005, for the UK). However, the literature is much thinner when it comes to the effects on transitional labour market dynamics. On the micro-level the issue at hand has only been addressed by Munch (2005), Pfaffermayr, Egger, and Weber (2007), and Geishecker (2007).[2]

Pfaffermayr, Egger, and Weber (2007) examine the importance of outsourcing (and trade) for the year-to-year transition probabilities of employment between sectors. Using a random sample of Austrian males, the authors estimate a multinomial logit model with fixed effects. They distinguish between six labour market states: employment in four different sectors, unemployment, and out-of-

[2]In addition, Kletzer (2000) studies the effect of outsourcing on *industry-level* displacement rates. However, studies on the industry-level may suffer both from an aggregation and an endogeneity bias (see, for instance, Geishecker, 2007, for more details.)

the-labour-force. The individual data is matched with industry-level trade and outsourcing indicators that are, however, only available for the manufacturing sector. The study shows that the probability of staying in or changing into the manufacturing sector falls as the level of international outsourcing rises. This finding is more pronounced in manufacturing industries that have a comparative disadvantage.

Munch (2005) analyses the effects of international outsourcing on individual job separations. The paper concentrates on the Danish manufacturing sector and combines individual yearly spell data with indicators for international outsourcing at an industry-level. Provided that outsourcing is broadly defined, the estimation of a single risk model documents a (small) positive effect of outsourcing on the job separation rate.[3] Distinguishing between job-to-job and job-to-unemployment transition flows, the author also estimates a competing risk model. Outsourcing is found to increase both the unemployment risk and the job change hazard rate.[4] The former effect is stronger for low-skilled, the latter for high-skilled workers. Munch (2005) concludes that the quantitative impact of outsourcing on out-of-the-job transitions is relatively small.

In a related contribution, Geishecker (2007) analyses the effect of international outsourcing on work-to-non-employment transitions in the German manufacturing sector. Combining monthly individual-level spell data from the Socio-Economic Panel (SOEP) with industry-level outsourcing measures, the study estimates a discrete time hazard model. Geishecker (2007) finds outsourcing, when narrowly defined, to markedly increase the probability of leaving employment. In contrast to Munch (2005), the effect does not differ across skill groups but increases with employment duration.

The paper at hand contributes to the existing literature on the effects of international outsourcing on labour dynamics in several respects. First, instead of analysing yearly (Pfaffermayr, Egger, and Weber, 2007; Munch, 2005) or monthly (Geishecker, 2007) transitions, our data set contains information on the labour market status of workers on a *daily* basis. This allows us to consider also very short employment periods and permits a more thorough treatment of duration dependence. Second, to the best of our knowledge the present study is the first one that also considers the service sector. While international outsourcing is still relatively limited in the service sector, existing studies point to a very dynamic development in recent years (cf. Horgos, 2007, for the German economy). Furthermore, we distinguish between the competing risks of making job-to-job, job-to-unemployment, and job-to-non-employment transitions. While Munch (2005) has implemented a similar framework in his analysis of Danish data, no comparable study exists for Germany.

[3]However, the outsourcing term is rendered statistically insignificant when a narrow concept of outsourcing is employed instead.

[4]Narrow outsourcing has only a statistically significant effect on the unemployment hazard of low-skilled workers and the job change hazard of high-skilled workers.

3 The Data

3.1 The IAB Employment Sample

The data set used is the IAB Employment Sample 1975-2004 (IABS), which is provided by the Institute for Employment Research (IAB) of the German Federal Employment Agency. The data base covers 2% of all the persons who, between the 1st January 1975 (for western German employees) or the 1st January 1992 (for eastern German employees) and the 31st December 2004, worked in an employment covered by social security. The data source consists of notifications made by employers to the social security agencies, which include health insurances, statutory pension schemes, and the unemployment insurance agencies.[5] These notifications are made on the behalf of workers, employees and trainees who pay contributions to the social insurance system. This means that, for example, civil servants and the self-employed are not included. Overall, the subsample includes over 1.29 million people, of which 1.1 million are from western Germany. For 1995, the employment statistics, from which the IAB Regional File is drawn, cover nearly 79.4% of the employed persons in western Germany, and 86.2% of all employed persons in eastern Germany. As for the unemployed, only those entitled to unemployment benefits are covered.

For the labour market states of employment and unemployment, the following spell information is available: the starting and ending date of the spell, exact to the day; sex, year of birth, degree of education/training, and the region of the workplace (in case of an employment spell) or of the unemployment office paying benefits (in case of an unemployment spell). For employment spells, there is additional information on the occupation and the gross earnings of the worker, an establishment number, the size of the establishment, and the economic sector. Furthermore, the information for employment spells is updated on an annual basis. A third labour market state, "non-participation", is not directly recorded in the data set, but can be inferred. A worker is in this state if she does not work full time and does not receive unemployment benefits. This means that non-participation can coincide with the state "out-of-the-labour-force". However, it can also mean self-employment, civil service employment[6], retirement, or marginal employment.[7]

The advantages of the data set are thus as follows: first, it does not suffer from the problems inherent in most panel data sets, e.g. there is no sample attrition, and it follows workers over a long period of time because there is no need for rotation as in the CPS. Second, it offers observations at a very high frequency, which means that every actual transition is observed. Again, this is a distinct

[5] For a complete description of the data set, see Bender, Haas, and Klose (2000) and Drews (2007).

[6] This applies to "Beamte", public sector employees under a special, life-time form of civil service employment. Other workers in the public sector are included in the data set.

[7] Cf. Fitzenberger and Wilke (2004) for an in-depth analysis of this issue.

advantage over survey data like the CPS or the SOEP, which do not record multiple transitions that take place between two interview dates and, in the case of the SOEP, uses retrospective data and does not record all direct job-to-job transitions.

Worker transitions can be inferred from the employment and unemployment histories in the data set. We consider transitions between two labour market states (employment to unemployment or employment to nonparticipation), as well as transitions from one job to the other (direct job-to-job transitions).[8] It has to be taken into account that there might be measurement error in the data because of the way the data are collected. In particular, workers' notifications of becoming unemployed might not always correspond exactly to the actual change of labour market state. For example, this can arise when a worker gets laid off and does not report to the unemployment office immediately. We correct for this latter potential measurement error in the following way: If the time interval between two records (employment or unemployment) is smaller than 45 days, then this is counted as a direct transition between the two states recorded.[9] If the gap between two notifications is larger than 45 days, then this is counted as an intervening spell of non-participation.

3.2 Industry-level Data

The most important indicator on the industry level for our purpose is the outsourcing indicator, which measures international outsourcing. The latter is considered to be a make-or-buy decision. A firm can either produce a given (intermediate) input in-house or buy it from a (foreign) supplier. Outsourcing is then reflected in the foreign content of domestic production and can be measured by the share of imported intermediate inputs in total production. We concentrate on international outsourcing in a narrow sense and define it as the shift of a (two-digit) industry's core activities abroad. For instance, intermediate products that the textile sector in Germany imports from some foreign textile sector will count as international outsourcing. On the contrary, intermediates imported from a foreign food sector by the German textile sector will not be taken into account.[10] Consequently, the outsourcing intensity of an industry is measured by the value of intermediate inputs imported from the same industry abroad relative to the total production value of that industry. Following Feenstra and Hanson (1996b), the

[8] The notion of a job in the data set is establishment (not firm) based.

[9] We did the calculation for smaller intervals as well. This does not change the results significantly.

[10] Alternatively, a broader concept would account for the total sum of imported intermediate inputs. However, the narrow indicator should arguably better reflect international outsourcing. When the latter is considered to be the result of a make-or-buy decision, only those imported intermediate inputs that could be produced within the respective industry should correspond to international outsourcing. Hence, a wider definition is usually considered to be too broad (cf. Feenstra and Hanson, 1999).

outsourcing indicator is calculated as

$$OUT_{jt}^{narrow} = \frac{IMP_{jt}}{Y_{jt}}, \quad (1)$$

where IMP_{jt} indicates the value of imported intermediate inputs from industry j abroad and Y_{jt} gives the production value of industry j in period t.

Data on imported intermediates and production values are obtained from Input-Output tables of the German Federal Statistical Office (Statistisches Bundesamt, 2002). Information is provided at the NACE two-digit sector level (WZ93). Comparable figures are currently only available for the period 1991 to 2000. Figure A.1 shows the development of international outsourcing for the manufacturing as well as for the service sector.[11] While international outsourcing has increased significantly in both sectors, the service sector has displayed much stronger growth rates in the 1990s. Nevertheless, in absolute terms outsourcing still plays a much larger role in manufacturing.

Unfortunately, the industry classification WZ93 is used in the IABS data only from 1999 onwards. For the previous period, workers are assigned to industries according to the older WZ73 classification. Since no recoding scheme exists at present, the re-assignment of workers from WZ73 to WZ93 sectors was done manually. We used the finer three-digit WZ73 classification provided in the IABS dataset and assigned each WZ73 sector to one of the sectors distinguished between in the WZ93 classification.[12] The recoding was then tested for the years 1999 and 2000, for which both classification schemes exist in the data. Observations that could not be classified with a certain degree of precision had to be deleted from the dataset.[13] In the two years tested, the misclassification error amounted to approximately 5 per cent.[14]

Further industry-level measures used in the empirical analysis are the production value and the capital-output ratio. The former is again taken from the German Federal Statistical Office (Statistisches Bundesamt, 2002) while the latter is computed from data of the OECD STAN and the EUKLEMS data base (cf. Koszerek, Havik, Morrow, Röger, and Schönborn, 2007). Finally, we include regional unemployment rates as provided by the German Federal Employment Office (Bundesagentur für Arbeit, 2007).

[11] The manufacturing sector consists of the NACE sectors 15 to 37 while the service sector comprises NACE sectors 50 to 93. Sectors 50 to 74 are classified as private services.

[12] Some sectors had to be pooled to avoid ambiguous assignments.

[13] We deleted any WZ73 observation that could not be assigned to a WZ93 sector with a precision of at least 75 per cent. Increasing the threshold to 85 and 95 per cent, respectively, does not change our results in a qualitative sense.

[14] A detailed overview of the re-assignment can be obtained from the authors upon request.

4 Econometric Framework and Estimation Strategy

In order to analyse the effect of international outsourcing on the hazards of job separation and of experiencing different labour market transitions, we estimate hazard rate models. As our dataset contains *daily* information on individual workers' employment histories, we use a specification in continuous time. Since econometric theory offers little guidance on choosing a functional form for the hazard function, we opt for a semi-parametric approach and estimate a piecewise-constant exponential (PCE) model. In contrast to parametric approaches the PCE model allows for more flexibility in the shape of the hazard function and, unlike the Cox proportional hazards model, it provides explicit estimates of the baseline hazard function. The PCE model is an example of a proportional hazard model. Therefore, the conditional hazard rate of leaving employment $\theta(t, X)$ satisfies the separability condition:

$$\lambda(t|X) = \lambda_0(t)exp(\beta' X) \tag{2}$$

where X is a vector of individual characteristics, and λ_0 denotes the baseline hazard. The PCE model assumes that the baseline hazard is constant within a specified time interval but does not impose further functional form assumptions. The baseline hazard is then a step function with k segments

$$\lambda_0(t) = \lambda_m,\ a_{j-1} \leq t < a_j,\ j = 1, ..., k. \tag{3}$$

We specify five such segments: 0 to 182 days of employment duration, 183 to 365 days, 366 to 1095 days, 1096 to 2920 days, and more than 2920 days.

Even though we control for a wide array of observable characteristics, the hazard rate of observationally equivalent individuals may still differ from each other. Ignoring such unobserved heterogeneity in duration models produces incorrect results (cf. Lancaster, 1990). To account for unobserved heterogeneity, the proportional hazard model is extended to allow for a multiplicative unobserved heterogeneity term υ.[15] The hazard function then becomes

$$\lambda(t|X, \upsilon) = \lambda_0(t)exp(\beta' X)\upsilon, \tag{4}$$

where υ follows a Gamma distribution, a choice rationalised by Abbring and Van den Berg (2007), and is assumed to be independent of regressors and censoring time. The heterogeneity term is shared across different spells of a given individual, causing observations within groups to be correlated.

The hazard of job separation involves one single risk. In a first step, we can therefore simply estimate the above model for this hazard. In a second step, we distinguish between the different destination states of a worker leaving a job. We thus estimate the competing hazards of transiting

[15] This is called a mixed proportional hazard model. See Van den Berg (2001) for a survey of this model class.

from one job to another, from employment to unemployment, and from employment to nonparticipation. For continuous time models and in the absence of a correlation between the destination specific unobserved heterogeneity terms, the log-likelihood for a model with three destinations can be partitioned into the sum of three sub-contributions, each of which depends only on parameters of a single destination-specific hazard. The overall likelihood can then be maximised by maximising the three component parts separately (cf., for instance, Kalbfleisch and Prentice, 2002). Accordingly, the competing risk model is estimated as a number of single-risk duration models, one for each of the three destinations. Spells ending in any destination other than the one considered are treated as right censored. Thus, the above model is estimated separately for each of the three competing risks.

As described in Section 3.2, we use an outsourcing indicator measured at the industry level as an explanatory variable. Because this indicator is common to several individuals, the standard errors are potentially subject to a downward bias (cf. Moulton, 1990). This is due to the fact that such aggregate explanatory variables do not provide independent information for each individual. Following Geishecker (2007), we argue that the data do not allow us to correct for this problem directly, i.e. through clustering, because the number of clusters is small relative to the number of observations. Instead, we include industry and region fixed effects, as well as linear time trends for every industry. This corrects for residual correlation within clusters due to time-invariant, and, in the case of the industry trends, time-variant unobserved heterogeneity.

We also want to make sure that the outsourcing indicator does not capture effects which are industry-specific, but unrelated to international outsourcing. Therefore, in addition to fixed effects and time trends, we also include the production value and the capital intensity for every industry. Furthermore, monthly dummies are used to take seasonal effects into account. Finally, yearly dummies and regional unemployment rates capture differences in economic conditions over time and across regions.

5 Estimation Results

The results for the hazard of match separation, as well as for the hazards of the three transitions (EE, EU, EN) for the manufacturing sector are in Tables A.2 and A.3. The corresponding results for the service sector are in Table A.4 and A.5. Apart from the coefficients on outsourcing and interactions with outsourcing, the results are generally in line with the literature on labour market flows (cf. Mortensen and Pissarides, 1999). First, there is negative duration dependence, i.e. the hazard of separating or of making a specific labour market transition falls with match duration. This is generally attributed to the accumulation of human capital and sorting effects (cf. Machin and Manning, 1999). Second, men are considerably less likely to separate from their employer. As an

inspection of the individual flows reveals, this is despite the fact that they experience more direct job-to-job transitions than women. This is outweighed by the fact that they are much less likely to become unemployed or non-employed, which is probably to a large extent due to women playing a more important role for child care at home than men. Third, the match separation - age profile displays a U-shape. The jobs of young and old employees are much less stable than jobs of middle-aged employees. Young employees have a high probability of experiencing a direct job-to-job transition, as they engage in job-shopping at the beginning of their working lives (cf. Neal, 1999). Older workers, on the other hand, have a higher probability of leaving the labour market due to retirement, which implies an EN flow. Fourth, foreigners have a higher probability of separating than German nationals, which is entirely due to the fact that they leave the labour market more often. Fifth, employees with low skills and employees with high skills have less stable jobs than employees with medium skills. For the former, this is mainly due to higher inflows into unemployment and flows out of the social security work force. For the latter, lower inflows into unemployment are outweighed by higher job-to-job transitions and higher flows out of the social security work force. Finally, firm size is generally negatively correlated with the hazard of separating.

The coefficients on the outsourcing indicator as well as the interactions of this indicator with skill yield the result we are most interested in, the impact of international outsourcing on the different hazard rates. For the manufacturing sector, the results for the hazard of job separation indicate that international outsourcing has no statistically significant effect on overall job stability (cf. Table A.2). Indeed, no statistically significant effect can be established for any of the three skill categories as illustrated in the first column of Table A.3. However, the single risk model may mask important effects of outsourcing on the destination-specific hazards.

In fact, the estimation results for the different transition hazards show that international outsourcing increases the hazard of job-to-non-participation transitions in the manufacturing sector. Not distinguishing between different skill groups, the estimates imply that a one percentage point increase in the international outsourcing intensity increases the hazard of leaving the social security work force by about $exp(0.026) - 1 = 2.6$ per cent. Including interaction terms between skill and outsourcing shows that the effect is most pronounced for medium-skilled workers but also applies to workers with low and high skills (however, for these two groups the effect is only significant at the 10% level). In contrast, no effect is found for job-to-job and job-to-unemployment transitions for either skill group. Comparing our results to Geishecker (2007), the only comparable study for Germany, our results suggests that his finding of a negative effect of international outsourcing on individual employment security is mainly driven by the job-to-non-participation transitions. Interestingly, we generally confirm Geishecker's result that in the manufacturing sector the effect of international outsourcing

appears to be strongest for medium-skilled workers.

For the service sector, the regression result for the hazard of match separation is very different from the result obtained for the manufacturing sector (cf. Tables A.4). In particular, outsourcing *increases* job stability in the service sector. An inspection of the results for the different flows shows that this is due to the fact that outsourcing is strongly, and negatively, correlated with the hazard of experiencing a direct job-to-job transition.[16] A possible explanation for this at first sight surprising finding is that international outsourcing, by increasing the division of labour and thus the specialization of production, is likely to lead to higher levels of competitiveness and productivity of firms. This may translate into higher wages and better job prospects. If job-to-job transitions are to a certain degree voluntary,[17] international outsourcing, by allowing firms to offer more attractive jobs, increases job stability as it induces workers to stay with their employers.

Alternatively, and in sharp contrast to the previous explanation, the result may hint at declining employment prospects of industries that increase their outsourcing intensity. This should arguably also lower workers' inclination to leave their job voluntarily, which lowers direct job-to-job transitions. While the argument can not be conclusively dismissed, the results for the other two hazards do not support this view. In particular, for the service sector, we do not find any evidence for international outsourcing to decrease employment security, i.e. to increase the hazard of job-to-unemployment and job-to-non-employment transitions. On the contrary, including interaction terms between outsourcing and skill levels shows that employment security of high-skilled workers even increases with the outsourcing intensity of an industry: the hazards of making a transition to unemployment and to non-participation both fall for high-skilled workers (cf. Tables A.5). This may again point to a rise in firms' labour demand due to outsourcing boosting productivity and competitiveness. Neither of these two hazards are affected by international outsourcing for low-skilled and medium-skilled workers. Therefore, for these worker groups, the increase in job security that goes along with international outsourcing is entirely due to a decrease of the hazard of making a direct job-to-job transition.

The general result obtained is thus that the effects of international outsourcing on labour market dynamics in Germany differ markedly between sectors, across skill levels, and for destination-specific hazards. In the manufacturing sector, outsourcing appears to increase the risk of job-to-non-employment transitions, especially for medium-skilled workers. On the contrary, job stability

[16] The magnitude of the coefficients is high, suggesting that an increase in the outsourcing intensity by one percentage point will decrease the hazard of a job-to-job transition by 23.4 per cent. However, it has to be taken into account that such an increase would be massive in the service sector, since the average outsourcing intensity amounted to just 1.3 per cent in the year 2000.

[17] It should be stressed that by no means all job-to-job transitions reflect voluntary job changes. The protection against (instantaneous) dismissal in Germany allows workers to make direct job-to-job transitions even though they were laid off against their will in the first place.

increases in the service sector. In particular, international outsourcing has a sizeable negative effect on the hazard of experiencing a direct job-to-job transition.

6 Conclusion

In this paper, we investigated the impact of international outsourcing on job stability as well as on workers flows from employment to another job, to unemployment, and out of the labour force. Our analysis focussed on the German manufacturing and service sectors during the time period 1991-2000 and used a very large administrative micro data set covering 2% of German employees. Apart from the large size of the data set, one of its main advantages is that employment spells are measured on a daily basis, and that measurement error is likely to be very low. Using this panel data set, we estimated hazard rate models for the hazards of separating, and of experiencing the three transitions mentioned above. Outsourcing as measured by an indicator derived from input-output tables was included as an explanatory variable in the regressions. We found significant differences between sectors and between the different transitions. First, outsourcing was found to have no impact on overall in job stability in the manufacturing sector, but to be associated with an increase in job stability in the service sector. Second, our results indicate that the different transitions are affected asymmetrically by international outsourcing, which can also explain the differences between sectors. In the manufacturing sector, only the flow from employment to nonparticipation displayed a negative correlation with international outsourcing. In the service sector, on the other hand, one important factor for the increase in job stability is the decline in job-to-job transitions of low-skilled and high-skilled workers. Furthermore, in this sector an increase in international outsourcing is associated with a decline in transitions from employment to unemployment and from employment to nonparticipation for high-skilled workers.

The underlying reasons for the differences between sectors and labour market transitions remains a matter of further investigation. There are two competing forces at work: on the one hand, international outsourcing directly reduces labour demand by domestic firms, which reduces job stability, at least in the short run. On the other hand, firms that engage in outsourcing increase their competitiveness and their profitability. This has the potential of increasing employment, and leading to greater job stability and lower labour market flows. The question why these effects differ between sectors and skill groups is left for future research.

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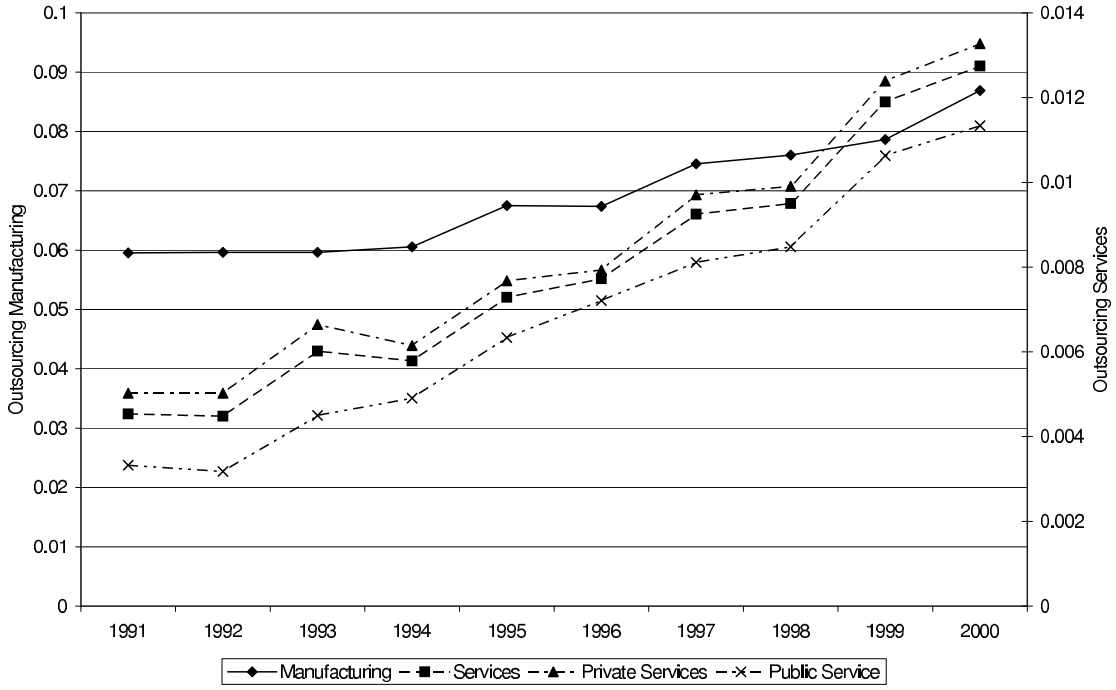
Appendix A Appendix

Figure A.1: The degree of outsourcing in manufacturing and services in Germany, 1991-2000



Source: Input-output tables provided by the Germany Statistical Office and authors' calculations.
Note: The outsourcing index is defined in equation 1.

Table A.1: Summary statistics

		Manufacturing		Service Sector	
		Mean	Std. Dev.	Mean	Std. Dev.
Employment duration 0 - 6 months	DD: 0-6	0.080	[0.271]	0.130	[0.337]
Employment duration 7-12 months	DD: 7-12	0.061	[0.239]	0.099	[0.298]
Employment duration 13-36 months	DD: 13-36	0.169	[0.375]	0.237	[0.425]
Employment duration 37-96 months	DD: 37-96	0.260	[0.439]	0.273	[0.446]
Gender	Male: yes	0.765	[0.424]	0.503	[0.500]
Age 18 to 24	Age 18-24	0.078	[0.268]	0.092	[0.289]
Age 25 to 29	Age 25-29	0.131	[0.337]	0.146	[0.353]
Age 30 to 34	Age 30-34	0.154	[0.360]	0.156	[0.363]
Age 35 to 39	Age 35-39	0.144	[0.351]	0.141	[0.348]
Age 40 to 44	Age 40-44	0.131	[0.337]	0.128	[0.334]
Age 45 to 49	Age 45-49	0.117	[0.322]	0.113	[0.317]
Age 50 to 54	Age 50-54	0.122	[0.328]	0.109	[0.312]
Age 55 to 59	Age 55-59	0.096	[0.295]	0.089	[0.284]
Age 60 to 65	Age 60-65	0.026	[0.150]	0.027	[0.161]
Foreign Nationality	Foreign: yes	0.088	[0.284]	0.041	[0.199]
Low-skilled Worker	Low skill	0.203	[0.403]	0.096	[0.294]
Medium-skilled Worker	Medium skill	0.723	[0.448]	0.790	[0.407]
High-skilled Worker	High skill	0.074	[0.262]	0.114	[0.318]
Establishment size 1 - 4 employees	ES: 1-4	0.031	[0.173]	0.121	[0.326]
Est. size 5 - 9 employees	ES: 5-9	0.038	[0.191]	0.086	[0.280]
Est. size 10 - 19 employees	ES: 10-19	0.052	[0.221]	0.091	[0.288]
Est. size 20 - 49 employees	ES: 20-49	0.093	[0.290]	0.147	[0.354]
Est. size 50 - 99 employees	ES: 50-99	0.094	[0.292]	0.117	[0.321]
Est. size 100 - 199 employees	ES: 100-199	0.120	[0.325]	0.113	[0.316]
Est. size 200 - 499 employees	ES: 200-499	0.177	[0.382]	0.133	[0.339]
Est. size 500 - 999 employees	ES: 500-999	0.123	[0.329]	0.079	[0.269]
Est. size 1000 - 4999 employees	ES: 1000-4999	0.156	[0.363]	0.093	[0.291]
Est. size $\geq$ 5000 employees	ES: $\geq$ 5000	0.113	[0.317]	0.016	[0.124]
Capital intensity	K/Y	0.449	[0.105]	1.981	[1.686]
Production Value [in 1000]	Prod. value	82.669	[46.818]	187.395	[152.308]
International Outsourcing	OUT	6.594	[5.433]	0.609	[1.059]
Regional unemployment	Unempl	9.420	[3.508]	10.652	[4.115]

Table A.2: Estimation results for the manufacturing sector (I)

	Sep		EE		EU		EN	
DD: 0-6	1.419	[0.015]***	1.011	[0.025]***	1.728	[0.026]***	1.411	[0.023]***
DD: 7-12	1.127	[0.015]***	0.943	[0.025]***	1.738	[0.027]***	0.747	[0.026]***
DD: 13-36	0.576	[0.013]***	0.612	[0.021]***	0.909	[0.026]***	0.312	[0.023]***
DD: 37-96	0.125	[0.012]***	0.252	[0.019]***	0.266	[0.025]***	-0.071	[0.021]***
Male: yes	-0.303	[0.010]***	0.283	[0.018]***	-0.462	[0.021]***	-0.782	[0.019]***
Age 18-24	0.402	[0.014]***	0.181	[0.023]***	0.362	[0.030]***	0.762	[0.025]***
Age 25-29	0.128	[0.013]***	0.071	[0.021]***	0.107	[0.028]***	0.264	[0.024]***
Age 35-39	-0.194	[0.015]***	-0.127	[0.021]***	-0.106	[0.030]***	-0.408	[0.028]***
Age 40-44	-0.294	[0.016]***	-0.198	[0.023]***	-0.123	[0.033]***	-0.660	[0.032]***
Age 45-49	-0.309	[0.017]***	-0.288	[0.025]***	-0.037	[0.034]	-0.636	[0.034]***
Age 50-54	-0.238	[0.016]***	-0.360	[0.025]***	0.177	[0.032]***	-0.456	[0.032]***
Age 55-59	0.531	[0.015]***	-0.597	[0.030]***	1.415	[0.029]***	0.755	[0.027]***
Age 60-65	1.447	[0.019]***	-1.012	[0.062]***	1.806	[0.044]***	2.558	[0.031]***
Foreign: yes	0.115	[0.014]***	-0.091	[0.026]***	0.119	[0.029]***	0.351	[0.024]***
Low skill	0.216	[0.011]***	-0.057	[0.020]***	0.326	[0.022]***	0.357	[0.020]***
High skill	0.103	[0.020]***	0.306	[0.028]***	-0.233	[0.047]***	-0.075	[0.041]*
ES: 5-9	-0.485	[0.021]***	-0.747	[0.033]***	-0.503	[0.039]***	-0.250	[0.040]***
ES: 10-19	-0.533	[0.020]***	-0.800	[0.031]***	-0.594	[0.038]***	-0.283	[0.038]***
ES: 20-49	-0.621	[0.018]***	-0.904	[0.028]***	-0.730	[0.035]***	-0.341	[0.035]***
ES: 50-99	-0.701	[0.018]***	-0.998	[0.029]***	-0.847	[0.035]***	-0.384	[0.035]***
ES: 100-199	-0.754	[0.018]***	-1.087	[0.028]***	-0.911	[0.035]***	-0.404	[0.035]***
ES: 200-499	-0.796	[0.017]***	-1.176	[0.027]***	-0.952	[0.034]***	-0.415	[0.033]***
ES: 500-999	-0.848	[0.019]***	-1.268	[0.030]***	-0.975	[0.037]***	-0.459	[0.036]***
ES: 1000-4999	-0.868	[0.019]***	-1.343	[0.030]***	-1.015	[0.038]***	-0.416	[0.036]***
ES: >5000	-0.989	[0.025]***	-1.789	[0.041]***	-1.340	[0.054]***	-0.203	[0.044]***
K/Y	1.254	[0.211]***	0.917	[0.347]***	1.739	[0.415]***	1.050	[0.367]***
Prod. value	-0.002	[0.001]*	-0.006	[0.002]***	-0.005	[0.002]**	-0.001	[0.002]
OUT	0.002	[0.005]	-0.012	[0.009]	-0.005	[0.010]	0.026	[0.009]***
Unempl	-0.015	[0.007]**	-0.052	[0.010]***	0.056	[0.012]***	-0.006	[0.013]
Failures	80939		28762		23278		28899	

Further dummies included for occupation, economic sector, trend per economic sector, region, month, year
Base categories: DD: >96 months, Age 30-34, Medium skill, ES: 1-4 employees, Industry: machinery and equipment, n.e.c., Occupation: (simple) manual labour, Year 2000, Month January
Significance levels: *: 10%, **: 5%, ***: 1%

Data: IABS 1975-2004 and authors' calculations.

Table A.3: Estimation results for the manufacturing sector (II)

	Sep		EE		EU		EN	
DD: 0-6	1.418	[0.015]***	1.011	[0.025]***	1.729	[0.026]***	1.409	[0.023]***
DD: 7-12	1.126	[0.015]***	0.943	[0.025]***	1.739	[0.027]***	0.746	[0.026]***
DD: 13-36	0.576	[0.013]***	0.612	[0.021]***	0.909	[0.026]***	0.312	[0.023]***
DD: 37-96	0.125	[0.012]***	0.252	[0.019]***	0.267	[0.025]***	-0.072	[0.021]***
Male: yes	-0.302	[0.010]***	0.283	[0.018]***	-0.462	[0.021]***	-0.780	[0.019]***
Age 18-24	0.402	[0.014]***	0.181	[0.023]***	0.362	[0.030]***	0.762	[0.025]***
Age 25-29	0.128	[0.013]***	0.071	[0.021]***	0.107	[0.028]***	0.264	[0.024]***
Age 35-39	-0.195	[0.015]***	-0.127	[0.021]***	-0.106	[0.030]***	-0.408	[0.028]***
Age 40-44	-0.294	[0.016]***	-0.198	[0.023]***	-0.123	[0.033]***	-0.659	[0.032]***
Age 45-49	-0.309	[0.017]***	-0.289	[0.025]***	-0.037	[0.034]	-0.635	[0.034]***
Age 50-54	-0.238	[0.016]***	-0.361	[0.025]***	0.177	[0.032]***	-0.455	[0.032]***
Age 55-59	0.531	[0.015]***	-0.597	[0.030]***	1.415	[0.029]***	0.756	[0.027]***
Age 60-65	1.446	[0.019]***	-1.012	[0.062]***	1.806	[0.044]***	2.559	[0.031]***
Foreign: yes	0.115	[0.014]***	-0.091	[0.026]***	0.119	[0.029]***	0.351	[0.024]***
Low skill	0.253	[0.016]***	-0.044	[0.030]	0.319	[0.031]***	0.447	[0.029]***
High skill	0.081	[0.027]***	0.267	[0.036]***	-0.233	[0.065]***	0.013	[0.056]
ES: 5-9	-0.485	[0.020]***	-0.748	[0.033]***	-0.503	[0.039]***	-0.250	[0.040]***
ES: 10-19	-0.533	[0.020]***	-0.800	[0.031]***	-0.594	[0.038]***	-0.283	[0.038]***
ES: 20-49	-0.622	[0.018]***	-0.904	[0.028]***	-0.730	[0.035]***	-0.343	[0.035]***
ES: 50-99	-0.702	[0.018]***	-0.998	[0.029]***	-0.847	[0.035]***	-0.388	[0.035]***
ES: 100-199	-0.755	[0.018]***	-1.087	[0.028]***	-0.910	[0.035]***	-0.408	[0.035]***
ES: 200-499	-0.797	[0.017]***	-1.175	[0.027]***	-0.952	[0.034]***	-0.420	[0.033]***
ES: 500-999	-0.848	[0.019]***	-1.267	[0.030]***	-0.975	[0.037]***	-0.463	[0.036]***
ES: 1000-4999	-0.869	[0.019]***	-1.343	[0.030]***	-1.014	[0.038]***	-0.421	[0.036]***
ES: >5000	-0.991	[0.025]***	-1.789	[0.041]***	-1.339	[0.054]***	-0.209	[0.044]***
K/Y	1.256	[0.211]***	0.922	[0.347]***	1.739	[0.415]***	1.045	[0.367]***
Prod. value	-0.000	[0.000]**	-0.000	[0.000]**	-0.000	[0.000]**	-0.000	[0.000]
OUT*low	-0.003	[0.005]	-0.015	[0.009]	-0.004	[0.010]	0.017	[0.009]*
OUT*med	-0.003	[0.005]	-0.013	[0.009]	-0.005	[0.010]	0.031	[0.009]***
OUT*high	0.006	[0.006]	-0.007	[0.009]	-0.005	[0.012]	0.018	[0.010]*
Unempl.	-0.015	[0.007]**	-0.052	[0.010]**	0.056	[0.012]***	-0.007	[0.013]***
Failures	80939		28762		23278		28899	

Further dummies included for occupation, economic sector, trend per economic sector, region, month, year
Base categories: DD: >96 months, Age 30-34, Medium skill, ES: 1-4 employees, Industry: machinery and equipment, n.e.c., Occupation: (simple) manual labour, Year 2000, Month January
Significance levels: *: 10%, **: 5%, ***: 1%
Data: IABS 1975-2004 and authors' calculations.

Table A.4: Hazard rate model for the service sector (I)

	Sep		EE		EU		EN	
DD: 0-6	1.184	[0.010]***	0.989	[0.015]***	1.975	[0.024]***	0.942	[0.015]***
DD: 7-12	1.135	[0.010]***	1.123	[0.015]***	2.295	[0.024]***	0.562	[0.015]***
DD: 13-36	0.620	[0.009]***	0.752	[0.014]***	1.414	[0.024]***	0.236	[0.014]***
DD: 37-96	0.249	[0.008]***	0.395	[0.013]***	0.658	[0.025]***	0.056	[0.013]***
Male: yes	-0.149	[0.006]***	0.228	[0.009]***	-0.230	[0.014]***	-0.522	[0.010]***
Age 18-24	0.176	[0.008]***	0.263	[0.013]***	0.140	[0.020]***	0.158	[0.014]***
Age 25-29	0.069	[0.007]***	0.142	[0.011]***	-0.004	[0.018]	0.031	[0.012]**
Age 35-39	-0.166	[0.008]***	-0.091	[0.012]***	-0.015	[0.019]	-0.327	[0.014]***
Age 40-44	-0.328	[0.009]***	-0.175	[0.013]***	-0.071	[0.021]***	-0.687	[0.017]***
Age 45-49	-0.397	[0.010]***	-0.255	[0.015]***	-0.027	[0.022]	-0.814	[0.018]***
Age 50-54	-0.399	[0.010]***	-0.341	[0.015]***	0.065	[0.022]***	-0.768	[0.019]***
Age 55-59	-0.056	[0.010]***	-0.525	[0.018]***	0.738	[0.022]***	-0.163	[0.017]***
Age 60-65	0.983	[0.012]***	-0.868	[0.037]***	0.888	[0.036]***	1.840	[0.019]***
Foreign: yes	0.251	[0.010]***	-0.074	[0.018]***	-0.026	[0.027]	0.693	[0.017]***
Low skill	0.287	[0.008]***	0.058	[0.014]***	0.317	[0.017]***	0.523	[0.014]***
High skill	0.009	[0.010]	0.117	[0.014]***	-0.249	[0.025]***	0.004	[0.018]
ES: 5-9	-0.257	[0.009]***	-0.255	[0.015]***	-0.351	[0.019]***	-0.221	[0.016]***
ES: 10-19	-0.280	[0.009]***	-0.249	[0.015]***	-0.450	[0.020]***	-0.233	[0.017]***
ES: 20-49	-0.305	[0.008]***	-0.246	[0.013]***	-0.535	[0.018]***	-0.248	[0.015]***
ES: 50-99	-0.296	[0.009]***	-0.227	[0.014]***	-0.637	[0.020]***	-0.198	[0.016]***
ES: 100-199	-0.331	[0.009]***	-0.260	[0.015]***	-0.734	[0.021]***	-0.224	[0.016]***
ES: 200-499	-0.384	[0.009]***	-0.302	[0.014]***	-0.848	[0.022]***	-0.285	[0.016]***
ES: 500-999	-0.436	[0.011]***	-0.331	[0.017]***	-1.013	[0.028]***	-0.316	[0.019]***
ES: 1000-4999	-0.470	[0.011]***	-0.365	[0.017]***	-1.125	[0.029]***	-0.300	[0.019]***
ES: >5000	-0.455	[0.022]***	-0.360	[0.033]***	-1.216	[0.064]***	-0.283	[0.037]***
K/Y	0.250	[0.059]***	0.717	[0.086]***	-0.017	[0.148]	-0.005	[0.103]
Prod. value	-0.003	[0.001]***	-0.005	[0.001]***	-0.002	[0.002]	-0.001	[0.001]
OUT	-0.113	[0.015]***	-0.266	[0.022]***	-0.002	[0.032]	0.003	[0.026]
Unempl.	-0.019	[0.003]***	-0.049	[0.005]***	0.043	[0.007]***	-0.020	[0.006]***
Failures	226,152		88,295		48,496		89,361	

Further dummies included for occupation, economic sector, trend per economic sector, region, month, year
Base categories: DD: >96 months, Age 30-34, Medium skill, ES: 1-4 employees, Industry: real estate, renting and business activities, Occupation: (simple) manual labour , Year 2000, Month January
Significance levels: *: 10%, **: 5%, ***: 1%

Data: IABS 1975-2004 and authors' calculations.

Table A.5: Hazard rate model for the service sector (II)

	Sep		EE		EU		EN	
DD: 0-6	1.183	[0.010]***	0.989	[0.015]***	1.974	[0.025]***	0.941	[0.015]***
DD: 7-12	1.135	[0.010]***	1.124	[0.015]***	2.294	[0.024]***	0.561	[0.015]***
DD: 13-36	0.620	[0.010]***	0.753	[0.014]***	1.413	[0.024]***	0.236	[0.014]***
DD: 37-96	0.249	[0.010]***	0.395	[0.014]***	0.657	[0.025]***	0.056	[0.013]***
Male: yes	-0.149	[0.006]***	0.228	[0.009]***	-0.230	[0.013]***	-0.524	[0.010]***
Age 18-24	0.177	[0.008]***	0.263	[0.013]***	0.138	[0.020]***	0.159	[0.0139]***
Age 25-29	0.069	[0.008]***	0.142	[0.011]***	-0.003	[0.019]	0.032	[0.012]**
Age 35-39	-0.166	[0.008]***	-0.091	[0.012]***	-0.016	[0.019]	-0.327	[0.014]***
Age 40-44	-0.329	[0.009]***	-0.175	[0.014]***	-0.071	[0.021]***	-0.687	[0.017]***
Age 45-49	-0.398	[0.010]***	-0.255	[0.015]***	-0.027	[0.022]	-0.814	[0.018]***
Age 50-54	-0.400	[0.010]***	-0.341	[0.015]***	0.064	[0.022]***	-0.767	[0.019]***
Age 55-59	-0.057	[0.010]***	-0.525	[0.018]***	0.738	[0.022]***	-0.162	[0.017]***
Age 60-65	0.982	[0.012]***	-0.868	[0.037]***	0.887	[0.036]***	1.841	[0.019]***
Foreign: yes	0.251	[0.010]***	-0.074	[0.018]***	-0.026	[0.027]	0.694	[0.017]***
Low skill	0.301	[0.009]***	0.048	[0.016]***	0.355	[0.020]***	0.521	[0.015]***
High skill	0.032	[0.011]***	0.093	[0.016]***	-0.168	[0.029]***	0.086	[0.020]***
ES: 5-9	-0.257	[0.009]***	-0.255	[0.015]***	-0.351	[0.019]***	-0.221	[0.016]***
ES: 10-19	-0.280	[0.009]***	0.015	[0.015]***	-0.450	[0.020]***	-0.233	[0.017]***
ES: 20-49	-0.305	[0.008]***	-0.246	[0.013]***	-0.535	[0.018]***	-0.247	[0.015]***
ES: 50-99	-0.296	[0.009]***	-0.227	[0.014]***	-0.636	[0.020]***	-0.197	[0.016]***
ES: 100-199	-0.330	[0.009]***	-0.260	[0.015]***	-0.732	[0.021]***	-0.222	[0.016]***
ES: 200-499	-0.384	[0.009]***	-0.302	[0.014]***	-0.846	[0.022]***	-0.283	[0.016]***
ES: 500-999	-0.436	[0.011]***	-0.332	[0.017]***	-1.012	[0.028]***	-0.313	[0.019]***
ES: 1000-4999	-0.470	[0.011]***	-0.365	[0.017]***	-1.125	[0.029]***	-0.299	[0.019]***
ES: >5000	-0.456	[0.022]***	-0.360	[0.033]***	-1.217	[0.064]***	-0.284	[0.037]***
K/Y	0.248	[0.059]***	0.719	[0.087]***	-0.020	[0.148]	-0.009	[0.103]
Prod. value	-0.000	[0.000]***	0.000	[0.000]***	0.000	[0.000]	0.000	[0.000]
OUT*low	-.129	[0.016]***	-0.257	[0.025]***	-0.052	[.035]	0.013	[0.028]
OUT*med	-0.107	[0.022]***	-0.271	[0.023]***	0.013	[0.032]	0.011	[0.026]
OUT*high	-0.141	[0.017]***	-0.238	[0.025]***	-0.117	[0.039]***	-0.129	[0.030]***
Unempl.	-0.019	[0.003]***	-0.049	[0.005]***	0.043	[0.007]***	-0.020	[0.006]***
Failures	226,152		88,295		48,496		89,361	

Further dummies included for occupation, economic sector, trend per economic sector, region, month, year
Base categories: DD: >96 months, Age 30-34, Medium skill, ES: 1-4 employees, Industry: real estate, renting and business activities, Occupation: (simple) manual labour , Year 2000, Month January
Significance levels: *: 10%, **: 5%, ***: 1%

Data: IABS 1975-2004 and authors' calculations.

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This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 "Economic Risk".