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Does fixed-term contract employment raise firms' adjustment-speed? Evidence from an establishment panel for West-Germany

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**Does Fixed-Term Contract Employment
Raise Firms' Adjustment-Speed?
Evidence from an Establishment Panel
for West-Germany**

Tobias Hagen

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Zentrum für Europäische
Wirtschaftsforschung GmbH

Centre for European
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Non-technical Summary

The regulation of fixed-term contracts (FTCs) in Germany has been in the focus of the political debate for many years. FTCs were liberalised in Germany in order to raise the flexibility of the labour market. The main feature of FTCs is that they constitute temporary employment relationships which do not raise any institutional firing costs when the contract runs out.

However, there is no empirical evidence which confirms that FTC employment raises the flexibility of the German labour market. Available empirical studies using industry level data find no significant effect of the deregulation of FTCs in 1985 on employment adjustment. Possible explanations for these findings are that institutional firing costs are of minor importance to adjustment, that works councils or unions are able to pressure firms into converting more FTCs into permanent jobs than they wish, that FTCs are rather used for screening prospective candidates than to promote adjustment or that the employment of FTCs reduces the turnover of permanent workers so that the flexibility of total employment is smaller than expected.

In this paper dynamic labour demand models are estimated with the IAB-Establishment Panel in order to investigate the impact of FTC employment on firms' flexibility. By comparing the adjustment of total employment to the adjustment of permanent employment (which is defined as total employment less FTC employment) it is found that the 4.3 percent FTCs in the dataset increase the median adjustment by 0.2 to 3.0 months, depending on the specification. These results imply that FTCs are used by firms as a measure for adjustment and not only as an instrument for screening candidates for permanent jobs.

The empirical analysis finds no evidence for a higher wage elasticity of FTC employment.

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Does Fixed-Term Contract Employment Raise Firms' Adjustment-Speed? Evidence from an Establishment Panel for West Germany

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Abstract

Fixed-term labour contracts were liberalised in Germany in order to raise the flexibility of the labour market. However, empirical studies using industry-level data find no significant effect of FTCs on employment adjustment. This paper investigates the impact of FTC employment on firms' flexibility by estimating dynamic labour demand models with the IAB-Establishment Panel for West Germany in 1996-2000. Using a GMM estimator and comparing the estimated adjustment of total employment to the adjustment of permanent contract employment some evidence is found that FTCs raise firms' adjustment-speed.

Key Words: Fixed-term employment, labour demand, adjustment-speed

JEL classification: C23, J23, J41

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1 *Introduction*

The regulation of fixed-term contracts (FTCs) in Germany has been in the focus of the political debate for many years. After the liberalisations in 1985 and 1996, the use of FTCs has been partially restricted in 2001. The main feature of FTCs is that they constitute temporary employment relationships which do not raise any institutional firing costs when the contract runs out.

Supporters of a deregulation of FTCs argue that they may increase average employment by raising firms' flexibility and weakening the wage setting power of insiders. Furthermore, FTCs may improve the chances of unemployed with low employment opportunities of finding a job since employers may be more willing to hire if they can easily fire. However, there are many objections raised to this view.¹ The use of FTCs may create a segmented labour market, where the employment stability of the insiders with permanent contracts increases (and therefore the adjustment of permanent contract workers is decreased) by using the FTC workers (outsiders) as a buffer against demand fluctuations.² Firms may use FTC workers to adjust to demand fluctuations and decrease the turnover of permanent contract workers simultaneously. For this reason the rise in firms' flexibility and the long-term employment prospects of the outsiders may be much lower than expected. Furthermore, the bargaining position of the insiders may be strengthened since dismissals provoked by excessive wage settlements may affect FTC workers first (Bentolila / Dolado, 1994).

Surprisingly, there is only little empirical evidence of the effects of the possibility to hire FTC workers in Germany. While some research exists on the supply side, i.e. multivariate analyses dealing with the characteristics of FTC workers³, little is known about the effect of FTCs on the flexibility and adjustment-speed of firms. Precisely this matter is the main argument for or against FTCs.

There exists some indirect empirical evidence for Germany, being based on the impact of the deregulation of FTCs on employment adjustment at the industry-level without observing the actual amount of FTC employment. Hunt (2000) using industry-level data, finds that the deregulation of FTCs in Germany in 1985 had no significant effect on employment adjustment in manufacturing. For this result she provides the following explanations: either institutional firing costs are less important than commonly thought or works councils and unions were able to pressure

1 See for example Blanchard / Landier (2001); Dolado et al. (2001).

2 However, this statement is based on the assumption, that the permanent workers are actually the insiders, i.e. that unions protect exclusively the interests of permanent workers in the wage bargain.

3 See for example Schömann et al. (1995).

firms into converting more FTCs into permanent ones than firms wanted. Another possible explanation, which is in line with the dual labour market theory, is that the employment of FTCs reduces the turnover of permanent contract workers so that the impact on total employment is smaller than expected. Using the same data Abraham / Houseman (1994) also find no evidence for an adjustment-speed-increasing effect of the deregulation of FTCs in Germany. The results in Kraft (1993) even suggest a reduction in flexibility for 1985-87.

Empirical analyses of the effects of FTC workers at the firm-level are available for France and Spain. Goux et al. (2001) find in an analysis of French data that it is far less costly for firms to adjust FTC workers to economic fluctuations than permanent contract workers. Furthermore, the transformation of FTCs into permanent contracts seems to be an important instrument for permanent, i.e. long-term, labour adjustment. Bentolila / Saint-Paul (1992) find with a panel of firms in Spain that the adjustment of employment is faster with FTCs.⁴

Indirect evidence on the relation of institutional firing costs and FTCs can be found in Boockmann / Hagen (2001). They show empirically for West German establishments that there might be a negative correlation between the dismissal protection for permanent contract workers and the probability of employing FTC workers. Therefore, institutional firing costs actually seem to be a reason for using FTC workers. Furthermore, the probability of employing FTC workers is positively influenced by positive demand shocks and the existence works councils. This may be explained by the possibility of works councils to raise firing costs of permanent contract workers by co-determination in case of dismissals.

However, the available results for Germany do not include direct effects of FTC workers on adjustment-speed. A natural approach to gain an insight into the role of FTC workers in the adjustment process of firms is to estimate a dynamic labour demand function at the firm-level. If FTC employment does not promote adjustment, other reasons, such as screening candidates for permanent jobs, may be more important for firms.⁵

The remainder of the paper is set out as follows. The following section describes the institutional background of FTCs in Germany and presents some descriptive statistics about FTC workers in Germany. Section 3 discusses FTCs as an instrument to cope with demand fluctuations by providing statistics about firms' adjustment strategies. Section 4 describes the specification and introduces the dataset. Section 5 contains the estimation results. Section 6 concludes.

4 See also Alonso-Borrego (1998) as well as Aguirregabiria / Alonso-Borrego (1999) for Spain.

5 This is a result found by Portugal / Varejão (2001) for Portugal.

2 *Fixed-Term Contracts in Germany*

2.1 *Institutional Background*

One possibility for firms to avoid firing costs due to dismissal protection is to enter FTCs with new employees.⁶ FTCs expire automatically without dismissal at the end of the agreed term. However, the use of FTCs is restricted by law. Until the Employment Promotion Act of 1985, the only possibility of employing FTC workers for a maximum duration of six months were the employers' justification that there are "objective reasons" in accordance with the civil code (*Bürgerliches Gesetzbuch – BGB*). Accepted reasons are seasonal fluctuations, temporary high volumes of work, deputising a person, temporarily carrying out of special tasks, periods of work experience or on-the-job-training, public employment measures and probationary periods. Renewals of FTC contracts (*Kettenarbeitsverträge*) are in general only possible if the new contract is again justified by these reasons. If an employment relationship is continued after the FTC has expired, the employment contract is automatically transformed into a permanent contract.

The use of FTCs was liberalised by the Employment Promotion Act in May 1985, without changing the possibility of using FTCs in accordance with the civil code. Under this Act employers now were free to hire new employees on FTCs without "objective reasons" for a duration of up to 18 months. Renewals of FTCs under this Act are possible up to the maximum fixed-term. Again, FTCs had to be converted into permanent contracts if, on expiry of the contract, the worker was to be retained. To prevent the opposite conversion from permanent into temporary employment contracts, FTCs are not permitted if the worker has been employed by the same employer (on either type of contract) during a period of four months before entering into the FTC. When the second Employment Promotion Act came into force in October 1996, the maximum duration of FTCs was extended to 24 months, and a maximum of three contract renewals were allowed.

Only in exceptional cases FTCs are subject to collective bargaining. Also, works councils have no mandate to negotiate with employers over the use of FTCs.

⁶ See Schömann et al. (1995) and Boockmann / Hagen (2001) for a further description of the institutional background in Germany.

2.2 Who Are the FTC Workers?

Information about the skill-levels of FTC workers in comparison to permanent contract workers can be found in the German Microcensus provided by the Federal Statistical Office. The analysis of Boockmann / Hagen (2001) for West Germany (without Berlin) in 1997 shows that, if the public service sector is excluded, 4.6 per cent of workers are employed under an FTC.⁷ The share of female FTC workers is 4.9 per cent and therefore slightly above the share of male FTC workers with 4.4 per cent. On average the FTC workers have a lower skill level than the workers employed under a permanent contract and FTC workers are more often unskilled. 23.1 per cent of the employees with FTCs have no vocational qualification compared to 18.1 per cent of the employees with a permanent contract. 59.9 per cent of the FTC workers and 71.3 per cent of the permanent contract workers have a vocational training, an A-level without vocational training or are master craftsmen. However, there is an exception to this trend: with 17.4 per cent the share of FTC workers with a university degree is significantly higher than the share of permanent employees with a university degree with 10.6 per cent.

As mentioned above, a legally accepted reason for the use of FTCs is the probationary period of a new employee. Information about the significance of this reason can also be found in the German Microcensus. Workers are questioned about the reasons for being employed under an FTC. The alternative answers for West Germany in 1997 are depicted in table 1.

Table 1: Workers' Reasons for Being Employed under an FTC in West Germany in 1997 (Percentages)

Reason	All	Men	Women	No vocational qualification	Vocational qualification
Cannot find a permanent job	19.1	19.7	18.3	21.3	15.9
Do not want a permanent job	5.0	3.8	6.5	4.0	7.3
Probationary period	20.7	22.7	18.0	24.2	14.5
Other reasons	55.3	53.7	57.2	50.6	62.4

Notes: Without public sector and employees in vocational training. The column "vocational qualification" includes college and university degrees as well as persons with A levels but without vocational training.

Source: German Microcensus 1997.

20.7 per cent of all FTC workers are in the probationary period. This relatively high share suggests that flexibility might not be the only reason for firms to hire

⁷ For a multivariate analysis see Schömann et al. (1995).

FTC workers. Women seem to have a higher preference for temporary contracts than men: 6.5 per cent answer that they do not want to be employed permanently whereas only 3.8 per cent of men give this reply. There are also significant differences between skilled and unskilled workers.

3 *FTC Employment as a Means of Adjustment*

Economic theory suggests that firms use temporary work to adjust more efficiently to demand fluctuations. When firms expect larger demand fluctuations they are more likely to use temporary work. By using temporary workers on the margin of adjustment firms can insulate permanent workers from these fluctuations. Temporary workers therefore help firms to avoid paying firing costs for permanent workers (Saint-Paul, 1996).

The comparative advantage of employing FTC workers rather than using other quantitative adjustment instruments depends on institutional and economic factors. For example, stock-keeping is often impossible in the service sector, implying that other instruments of adjustment like flexible working time or FTC workers are more important.

Other important points are the adjustment costs for permanent contract employees. The higher the firing costs of permanent employees, the higher are the incentives to employ FTC workers. The institutional firing costs of permanent workers are induced by the dismissal protection regulation. Also works councils and collective wage agreements can raise firing costs of permanent employees. Furthermore, works councils have to agree to the introduction of overtime or to the employment of temporary workers provided by temporary help agencies.

Besides these institutional factors the nature of the shock determines whether FTCs or other means of adjustment are used. In the 1996 survey of the IAB-Establishment Panel, establishments were asked whether they experienced rather expected or rather unexpected demand fluctuations during the year and which instruments of adjustment they used (Boockmann / Hagen, 2001). An interesting result is, that 10 per cent of the establishments, stating that they have expected demand changes during the year, hire or fire staff whereas this share is 15 per cent among the establishments with unexpected demand changes. This difference may be explained by the firms' strategy to avoid adjustment costs if the shocks can be anticipated. Establishments which experience more often anticipated shocks during the year adjust more frequently by shifting of holiday or free-time periods. FTCs seem to be the third important adjustment instrument after shifting of holidays or free-time periods and overtime. FTCs are used by 20 per cent of the establishments

which experience more often expected demand changes and by 15 per cent of establishments which experience more often unexpected demand changes.

In the 1993 survey of the IAB-Establishment Panel, the establishments were asked whether they had regular fluctuations and how they coped with them. The question distinguished between adjustment instruments for positive and negative changes in demand. In this way, asymmetric reactions of the firm may be taken into account. Unfortunately the questions did not differentiate between FTCs and other kinds of temporary employment. Table 2 contains the proportions of establishments using the specified instrument relative to all establishments which were subject to fluctuations in demand.

Table 2: Instruments of Adjustment to Increasing and Decreasing Demand in West Germany in 1993 (percentages)

Increasing demand	
Overtime hours / extra-shifts	49
Postponing holidays	24
Hiring temporary or FTC workers	29
Hiring new staff	11
Decreasing demand	
Reducing overtime / extra shifts	35
Giving earlier holidays	27
Short-time working	7
Not replacing labour turnover	8
Dismissing staff / termination of contracts	12

Notes: Weighted and extrapolated data for West Germany.

Source: IAB Establishment Panel 1993 for West Germany.

The most important adjustment instruments for increasing and decreasing demand seem to be overtime hours and extra-shifts. The employment of additional temporary workers is the second most frequently mentioned instrument of adjustment to positive changes in demand. In contrast, the hiring or firing of staff seems to be avoided by firms which may be explained by adjustment costs.

Since the IAB-Establishment Panel is an annual dataset it is unfortunately impossible to capture demand fluctuations during the year (seasonal demand changes) in the estimation of the dynamic labour demand models. Furthermore, the IAB-Establishment Panel (like most firm-level dataset) contains no information on the working hours and the overtime of the permanent contract and FTC workers re

spectively. For this reason, one important adjustment instrument is omitted. This may lead to an underestimation of firms' flexibility.

4 *Specification and Estimation Technique*

The adjustment-speed of firms can be measured by dynamic labour demand models. The hypothesis that FTC workers raise firms' adjustment is tested by an approach which is similar to the one in Bentolila / Saint-Paul (1992). A dynamic labour demand for permanent contract labour only is estimated and the coefficients are compared with those found for total labour demand. Permanent employment is defined as firms' total number of workers less the number of FTC workers.

As a starting point, a standard dynamic labour demand model is used. It is assumed that the adjustment costs are quadratic and symmetric. Equilibrium employment is determined by a Cobb-Douglas production function. According to the closed-form solution of the price-taking firms' optimisation problem the log of employment n of firm i in period t is (Nickell, 1986, 505),

$$n_{it} = \alpha_1 n_{i,t-1} + \beta_1 \ln Y_{it} + \beta_2 \ln (w/p)_{it} + v_{it} \quad (1)$$

with $0 < \delta < 1$, the anticipated output Y , the real wage rate w/p and an error term v_{it} .

The parameter α_1 is close to 1 if the costs of adjustment are much higher than the costs of being in disequilibrium, i.e. the situation when the actual employment does not equal the desired level of employment. The lower the parameter α_1 is, the higher is the adjustment-speed towards the desired level of employment. The validity of the Cobb-Douglas technology can be checked by testing the null hypothesis that $\beta_1 + \beta_2 = 0$. The used dataset contains sales as a measure of output. The wage rate is approximated by the total monthly wage bill divided by the total number of employees.

Equation (1) is compatible with static as well as rational expectations about the variables influencing the desired level of employment (Hamermesh, 1993). However, by using firms' expected instead of actual sales there will be no inference made about the formation of expectations. It is assumed that the desired level of employment depends on firms' expected sales in the current year ($sales_{it}^e$) rather than on actual sales.⁸ This approach helps reducing potential endogeneity problems

⁸ The establishments are interviewed by the 30th June. They are asked about an assessment of the expected sales for the current year.

which may exist with actual sales (Gorter et al., 1997). Endogeneity problems are very likely to occur in this case since the actual sales cover the whole year whereas the employment stock is measured by the 30th of June in the dataset. Besides, using expected sales has the advantage that the data has a longer time dimension since the actual sales of an establishment are asked in the following year, i.e. one cross-section would be lost if the actual sales were used. However, as Gorter et al. (1997) show, the estimated coefficients of the expected output are significantly lower than the coefficients for the actual output which may be explained by the fact that endogeneity of the actual output leads to an overestimation of the effect. According to Gorter et al. (1997) the adjustment parameter seems to be robust against the specification of the output variable.

Including these variables one obtains the estimation equation

$$n_{it} = \alpha_1 n_{i,t-1} + \beta_1 \ln sales_{it}^e + \beta_2 \ln wage_{it} + v_{it} . \quad (2)$$

Sales and wages are deflated with the price index of net output for different industries provided by the Federal Statistical Office.

The analysis is based on the IAB-Establishment Panel 1995 until 2000 for West Germany. This is a yearly survey of the demand situation of the labour market. The dataset has been available for research since 1999. However, due to data confidentiality laws in Germany, it is not possible for researchers outside the Federal Labour Service to access the data directly. For this reason, all data operations were carried out with the help of the IAB-Establishment Panel Data Service at the Federal Labour Service Offices.

The unit of observation of the data is not the company, but the establishment (Kölling, 2000). Since German regulation of the labour market often relates to the establishment (not the company), this principle of data collection is well-suited for the analysis. The population of the panel consists of all West German establishments with at least one employee covered by social security. Therefore, establishments without any employee covered by social security are excluded, in particular those establishments with only self-employed in the sense of the social security system (farmers, artists, publicists) and public sector offices exclusively employing civil servants. In each year, the establishments taking part in the survey are interviewed on the number and structure of their employees as of June 30th. The interviews contain questions regarding the number of FTC workers at this date.

The analysis excludes all establishments which do not report turnover as the measure of their business volume. Therefore, we exclude non-profit organisations, the government and agricultural sectors and financial institutions.

As already mentioned above, one equation is estimated for total employment and one for permanent employment only (total less FTC employment). By comparing the estimated coefficients it is possible to make inference about the impact of FTC workers on firms' adjustment-speed (Bentolila / Saint-Paul, 1992). An alternative approach would be to estimate a labour demand equation for FTC workers only and compare it with the equation for permanent employment. However, since only about 38 per cent of all establishments in the unweighted estimation sample employ FTC workers, this would require a sample-selection model. Although dynamic sample selection models for panel data are already available⁹, they have not been used in applied research yet.

Even though the IAB-Establishment Panel includes information on the establishments' wage bill for its labour force, the wages for FTC and permanent workers are not reported. Furthermore, there is no information on working hours available. Therefore, one has to include the total wage bill divided by total employment in the equation for total employment as well as in the equation for permanent employment (see for a similar approach Bentolila / Saint Paul, 1992). For this reason the estimated coefficients should be interpreted with care.

In order to obtain a reliable estimate of the adjustment parameter α_1 it is necessary to include other variables which may affect employment and adjustment. Therefore the share of women, skilled workers and part-time workers in firms' total labour force are included (see for a similar approach Kölling, 1998). Furthermore, dummy variables indicating whether the establishment has a works council or is bound to a collective wage agreement at industry-level or firm-level are included. In the IAB survey, establishments are asked whether they expect problems with the workforce due to sickness, maternity leave or problems concerning skill shortage or lack of new recruits. Accordingly four dummies are created and their lagged values are included. All these variables may affect adjustment and the level of (FTC and permanent) employment (see Abraham, 1988 as well as Boockmann / Hagen, 2001). Also dummy variables indicating whether the establishment has made any investments in the preceding year are included in some specifications. We differentiate between investment in information and communication technologies and other investments. These dummy variables may affect firms' levels of equilibrium employment and shall again control for skill shortage, which has been an important issue in West Germany during the last years of the estimation period.

The analysis is performed with the Arellano / Bond (1991) one-step dynamic panel data estimator since OLS is inconsistent in the presence of lagged dependent

⁹ See for example Kyriazidou (1999).

variables among the regressors (Greene, 2000).¹⁰ This Generalized Method of Moments estimator controls for individual fixed-effects by first differentiating the equations. Individual fixed-effects may include all variables without any within-variation such as industry affiliation and region. Also unobserved effects, such as inter-firm differences in technology may be captured (Nickell / Whadhwani, 1991). Furthermore, fixed time effects are included in order to capture the macroeconomic fluctuations affecting all firms. The first-difference of the lagged dependent variable $\Delta n_{i,t-1}$ is instrumented by its lagged levels $n_{i,t-2}, \dots, n_{i,t-T-1}$. Since wages may be determined simultaneously with employment, for example if trade unions bargain with employers over wages and employment, they are treated as predetermined and are instrumented by their lagged levels in some specifications in a similar way (see Nickell / Wadhvani, 1991).

Although the dataset contains the years 1995 until 2000 (i.e. $T=6$), the lagged endogenous as well as the estimation technique which is based on the first-difference and the instrumentation of $\Delta n_{i,t-1}$, imply that there are only those establishments included which are observed at least for 4 years. This means that the number of establishments in our sample decreases from 4300 to about 1600. Descriptive statistics for the estimation sample are depicted in table A1 in the appendix.

Bentolila / Saint-Paul (1992) slightly modify equation (2). In order to test the implications of their theoretical model empirically, they include changes in the logarithm (i.e. the growth rate) of sales instead of the logarithm of the level of sales as a proxy for demand shocks (see Nickell / Wadhvani, 1991, for a comparable approach). Here a similar specification is used but the actual change in sales is replaced by the expected change in sales again.

$$n_{it} = \alpha_1 n_{i,t-1} + \lambda (\ln sales_{it}^e - \ln sales_{i,t-1}) + \beta_2 \ln(wage_{it}) + v_{it} \quad (3)$$

This specification will also be estimated to compare it with the results of Bentolila / Saint-Paul (1992) for Spain.

¹⁰ For a Monte Carlo study comparing different dynamic panel data estimators see Judson / Owen (1999). For unbalanced panels with $T \leq 10$ they recommend the one-step GMM estimator proposed by Arellano / Bond (1991).

5 *Estimation Results*

The applied estimator is inconsistent in the presence of second-order autocorrelation in the differenced residuals, whereas first-order autocorrelation does not affect consistency (Arellano / Bond, 1991, 281-282). For this reason, the null hypothesis of no autocorrelation is tested (see table 3 and 4). The tests suggest the presence of first-order autocorrelation in many specifications whereas the null hypotheses of second-order autocorrelation are rejected in all specifications. All reported t-ratios are based on standard errors which are robust to general cross-section and time series heteroscedasticity. For each specification a Sargan specification test on the validity of the instruments is performed. The null hypothesis is that the over-identifying restrictions are valid. It is not rejected in any specification. The Sargan tests in table 3 and table 4 come from the corresponding homoscedastic estimator since the asymptotic distribution is only valid in the case of i.i.d. errors (Arellano / Bond, 1991, 290). The null hypothesis of a Cobb-Douglas production function could not be rejected in any specification.

In column (1) of table 3 the results for equation (2) are depicted. In this specification the dummy variables for the investments in the preceding year are excluded and wages are treated as exogenous, i.e. they are not instrumented. The estimated adjustment parameter for the total employment equation α_1 is 0.228 and therefore smaller than the adjustment parameter of the permanent employment equation with 0.341. This result is in line with the expectation, that FTC workers may increase the adjustment-speed of firms.¹¹

The values of the long-term output elasticities are unusually low. They are in all specifications between 0.045 and 0.055 and they are slightly larger for permanent employment.¹² Flaig / Rottmann (1998) find with firm-level data of the West German manufacturing sector in the period 1968-1995 a long-term output elasticity of 0.622, for example. The estimated low output-elasticity may be explained by the short time period which includes only 1996 until 2000. In order to estimate a correct output elasticity it may be necessary that the estimation sample includes a whole business. Also the use of first differences can bias the results. If there are measurement errors in expected sales, they are exaggerated by the time differences

11 Second lags of employment were tried as well. They were insignificant in all specifications. This is a surprising result since aggregation over labour with different adjustment costs may lead to at least two lags (Nickell, 1986, 510). If one of the two types of labour is not associated with any adjustment costs, then no second lag appears in Nickell's (1986) framework. However, stating that FTCs are not associated with any adjustment costs seems to be no plausible explanation. Astonishingly, Bentolila / Saint-Paul (1992) have a similar result for Spain.

12 The long-term output elasticity from a static labour demand model estimated with fixed-effects is 0.2. Results are available on request.

and bias the coefficient more towards zero than an estimation in levels (Roberts / Skoufias, 1997). Another possible explanation is that we can not control for variation in working hours and therefore underestimate the impact of output changes. Another already mentioned explanation is that the coefficient of the expected output in dynamic labour demand estimations is often lower than the coefficient for actual output (Gorter et al. 1997). However, Kölling (1998) uses actual sales instead of expected sales with the same dataset and estimation method for the period 1993 - 1996 and obtains also a long-term output-elasticity of 0.050. Possibly, these results may be explained by the fact that the IAB-Establishment Panel is only on an annual basis.¹³

In column (1) the short-term wage elasticity β_2 is -0.081 for total employment versus -0.077 for permanent employment, the corresponding long-term wage elasticity are -0.105 versus -0.106 . A more negative coefficient of the wages in the total employment equation could be interpreted as an indicator for a higher wage elasticity in the demand for FTC workers. However, it should be kept in mind that wages are not treated as predetermined in this estimation and that the wages may contain at least two measurement errors: We only observe the average wage and can not distinguish wages for permanent labour from wages for FTC labour. Furthermore, the used wage rate is just the wage bill divided by the total number of employees without taking working hours into account.

Accordingly, in column (2) the estimated coefficients are insignificant, if the wages are treated as predetermined and are therefore instrumented. Likewise, the estimated adjustment parameter for permanent employment is altered. The adjustment parameter for permanent employment is still larger than the parameter for total employment, but the difference is smaller. The specification in column (3) of table 3 includes dummy variables according to investment in the preceding year. It can be seen that the results are only slightly changed.

¹³ See for a further discussion about sources of misspecification Griliches / Mairesse (1998).

Table 3: Estimation Results of Equation (2)

	(1)		(2)		(3)	
	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>
log employment (t-1)	0.228 (2.09)	0.341 (2.82)	0.197 (2.18)	0.223 (2.13)	0.203 (2.22)	0.214 (1.98)
log expected sales for the current year	0.037 (1.77)	0.036 (1.68)	0.036 (1.70)	0.038 (1.89)	0.037 (1.73)	0.040 (1.98)
log (wages per worker)	-0.081 (-4.29)	-0.077 (-4.12)	0.004 (0.03)	0.094 (0.48)	0.016 (0.13)	0.121 (0.61)
Share of skilled workers	-0.050 (-2,54)	-0.050 (-2.22)	-0.062 (-2.22)	-0.074 (-1.97)	-0.065 (-2.35)	-0.079 (-2.11)
Share of female workers	0.070 (1.35)	0.052 (0.92)	0.065 (1.23)	0.044 (0.78)	0.067 (1.26)	0.043 (0.75)
Share of part-time workers	0.064 (1.63)	0.060 (1.21)	0.078 (1.63)	0.083 (1.27)	0.080 (1.67)	0.086 (1.33)
Wave 1999	-0.034 (-3.96)	-0.030 (-2.70)	-0.037 (-4.27)	-0.036 (-3.05)	-0.040 (-4.54)	-0.039 (-3.26)
Wave 2000	-0.044 (-3.44)	-0.044 (-2.36)	-0.049 (-3.80)	-0.053 (-2.93)	-0.054 (-4.17)	-0.059 (-3.21)
Expected problems due to general staff shortage (t-1)	-0.000 (-0.02)	0.009 (0.89)	0.001 (0.12)	0.010 (1.08)	0.004 (0.50)	0.012 (1.35)
Expected problems due to skill shortage (t-1)	0.003 (0.71)	-0.003 (-0.48)	0.002 (0.33)	-0.006 (-0.80)	0.004 (0.78)	-0.004 (-0.56)
Expected problems due to maternity leave (t-1)	-0.008 (-1.06)	-0.006 (-0.48)	-0.005 (-0.69)	-0.000 (-0.04)	-0.008 (-1.06)	-0.002 (-0.20)
Expected problems due to sickness (t-1)	-0.010 (-1.50)	-0.013 (-1.60)	-0.010 (-1.51)	-0.012 (-1.47)	-0.009 (-1.43)	-0.011 (-1.41)
Collective wage agreement: firm level	0.022 (1.57)	0.021 (1.41)	0.021 (1.49)	0.021 (1.41)	0.020 (1.44)	0.020 (1.33)
Collective wage agreement: industry level	-0.010 (-0.75)	-0.012 (-0.83)	-0.010 (-0.78)	-0.011 (-0.78)	-0.012 (-0.90)	-0.013 (-0.89)
Works Council	0.001 (0.09)	0.005 (0.25)	0.003 (0.22)	0.010 (0.50)	0.003 (0.22)	0.010 (0.46)
Investment in ICT (t-1)	-	-	-	-	-0.015 (-1.29)	-0.018 (-1.50)
Other Investments (t-1)	-	-	-	-	-0.018 (-1.69)	-0.020 (-1.62)
Constant	0.015 (3.12)	0.014 (2.12)	0.015 (2.93)	0.013 (1.90)	0.016 (3.05)	0.014 (1.95)
1 st order autocorrelation (p-value)	0.0095	0.0036	0.0076	0.0103	0.0081	0.0136
2 st order autocorrelation (p-value)	0.3985	0.4455	0.3115	0.4482	0.3535	0.4593
Sargan test (p-value)	0.9191	0.8931	0.9929	0.8420	0.8895	0.6380
Wald test (p-value)	0.0000	0.0000	0.0001	0.0004	0.0000	0.0006
Number of observations	2730	2701	2730	2701	2717	2688
Number of establishments	1472	1472	1472	1472	1466	1466

Notes: Values of the heteroscedasticity consistent t-ratios appear below the coefficients. The Wald test is a test on the joint significance of the regressors excluding the constant.

The finding that the difference between adjustment of total and permanent employment does not seem to be very important, should be interpreted with caution. One has to keep in mind that the average share of FTC workers in the (unweighted) estimation sample is only about 4.3 per cent. This share may be too small to obtain larger differences.

In table 4 the estimation results of equation (3) are shown, which involves the expected growth rates of sales instead of the levels of the logarithm of expected sales. This variable may be interpreted as a proxy for demand shocks (Bentolila / Saint-Paul, 1992). In the specification in column (1) the investment dummies are excluded and wages are not instrumented. It can be seen that the coefficient for the expected growth rates of sales is insignificant in the case of permanent employment whereas it is significant at the 10 per cent level in case of total employment. This result is compatible with the hypothesis that establishments use FTC workers to cope with demand shocks.

The short-term wage elasticity of total employment is again smaller than the elasticity for permanent employment. However, in column (2) can be seen that the coefficient for wages turns out to be insignificant if wages are instrumented. The result for the expected growth rates of sales is not altered, i.e. the coefficient for permanent employment is insignificant. In column (3) the variables for investment are included. It can be seen, that the coefficient of the expected growth rates of sales is now significant at the 5 per cent level in the equation for total employment whereas it is still insignificant for permanent employment.

Also the adjustment parameters have the expected magnitudes in all specifications. The differences between total and permanent employment are now more clear-cut than in table 3.

Table 4: Estimation Results of Equation (3)

	(1)		(2)		(3)	
	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>
log employment (t-1)	0.202 (1.90)	0.363 (3.05)	0.197 (2.21)	0.261 (2.59)	0.211 (2.33)	0.257 (2.50)
expected growth rate of sales for the current year	0.041 (1.83)	0.035 (1.38)	0.041 (1.91)	0.029 (1.27)	0.046 (2.08)	0.033 (1.38)
log (wages per worker)	-0.065 (-3.78)	-0.060 (-3.41)	0.025 (0.22)	0.082 (0.48)	0.025 (0.21)	0.089 (0.50)
Share of skilled workers	-0.055 (-2.86)	-0.055 (-2.44)	-0.069 (-2.56)	-0.077 (-2.18)	-0.070 (-2.54)	-0.079 (-2.20)
Share of female workers	0.097 (1.90)	0.071 (1.27)	0.088 (1.65)	0.060 (1.04)	0.092 (1.70)	0.061 (1.04)
Share of part-time workers	0.067 (1.83)	0.056 (1.14)	0.084 (1.90)	0.074 (1.25)	0.084 (1.88)	0.074 (1.25)
Wave 1999	-0.034 (-4.09)	-0.033 (-2.99)	-0.040 (-4.44)	-0.040 (-3.40)	-0.042 (-4.51)	-0.042 (-3.49)
Wave 2000	-0.043 (-3.54)	-0.045 (-2.51)	-0.052 (-3.91)	-0.056 (-3.18)	-0.056 (-4.11)	-0.061 (-3.37)
Expected problems due to general staff shortage (t-1)	0.000 (0.01)	0.010 (1.00)	0.002 (0.26)	0.012 (1.28)	0.003 (0.44)	0.013 (1.43)
Expected problems due to skill shortage (t-1)	0.003 (0.77)	-0.004 (-0.74)	0.002 (0.43)	-0.006 (-0.94)	0.004 (0.90)	-0.004 (-0.64)
Expected problems due to maternity leave (t-1)	-0.010 (-1.52)	-0.005 (-0.44)	-0.008 (-1.10)	-0.001 (-0.07)	-0.011 (-1.52)	-0.004 (-0.32)
Expected problems due to sickness (t-1)	-0.005 (-0.96)	-0.010 (-1.22)	-0.007 (-1.09)	-0.009 (-1.16)	-0.006 (-0.99)	-0.008 (-1.09)
Collective wage agreement firm level	0.019 (1.44)	0.012 (0.79)	0.019 (1.41)	0.012 (0.87)	0.019 (1.47)	0.013 (0.91)
Collective wage agreement industry level	-0.008 (-0.65)	-0.012 (-0.85)	-0.009 (-0.72)	-0.012 (-0.84)	-0.010 (-0.79)	-0.013 (-0.91)
Works Council	0.002 (0.12)	0.004 (0.18)	0.002 (0.18)	0.007 (0.35)	0.005 (0.36)	0.009 (0.43)
Investment in ICT (t-1)	-	-	-	-	-0.015 (-1.37)	-0.019 (-1.71)
Other Investments (t-1)	-	-	-	-	-0.016 (-1.62)	-0.020 (-1.64)
Constant	0.015 (3.29)	0.014 (2.19)	0.015 (3.29)	0.014 (2.26)	0.016 (3.49)	0.016 (2.41)
1 st order autocorrelation (p-value)	0.0117	0.0019	0.0056	0.0047	0.0050	0.0065
2 st order autocorrelation (p-value)	0.1822	0.4992	0.3256	0.4341	0.3492	0.4364
Sargan test (p-value)	0.9421	0.8436	0.9638	0.8669	0.9031	0.7242
Wald test (p-value)	0.0001	0.0017	0.0002	0.0091	0.0000	0.0088
Number of observations	3012	2982	3012	2982	2993	2963
Number of establishments	1601	1601	1601	1601	1593	1593

Notes: See Table 3.

From the estimated coefficients of the lagged endogenous variables it is possible to calculate the median length of the lag, i.e. the time it takes the establishment to move halfway to the new equilibrium in response to a shock (Hamermesh, 1993, 248). It is obtained by solving for t^* in $\alpha_1^{t^*} = 0.5$. We get the following median lags measured in months for the estimated adjustment parameters.¹⁴

Table 5: Median Lag (month)

	Specification					
	(1)		(2)		(3)	
	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>	<i>total</i>	<i>perm</i>
Equation (2)	5.6	7.7	5.1	5.5	5.2	5.4
Equation (3)	5.2	8.2	5.1	6.2	5.3	6.1

The values in column (3) for equation (4) mean that the median adjustment of total employment towards a new equilibrium takes 5.3 months whereas permanent employment needs 6.1 months. The difference may be explained by the use of FTC workers. Again it can be seen that the estimated differences between permanent and total employment are smaller in equation (3) than in equation (4).

6 Conclusion

The empirical analysis has found some evidence that FTC workers raise firms' adjustment-speed. Therefore one may conclude that FTC workers raise the flexibility of firms and that FTCs are not exclusively used to screen prospective permanent employees. For the interpretation it should be kept in mind that the share of FTCs is only about 4.3 per cent in the estimation sample. This amount of FTC employment explains, depending on the specification, between 0.2 and 3.0 months difference in median adjustment.

The ratios of the estimated coefficients for the expected changes of sales of the total and the permanent employment equations are smaller than the ratios of these coefficients found by Bentolila / Saint-Paul (1992) for Spain, even though they find

¹⁴ Although the dataset is annual it is possible to calculate the median lag in months. If (and only if) the true structure of the costs is symmetric and quadratic, changing the extent of temporal aggregation (for example from monthly data to annual data) does not produce any clear bias to the estimated length of the lag (Engle / Liu, 1972).

the adjustment-speed to be generally at a lower level. This may be explained by the fact that the protection against dismissal for permanent workers is more restrictive in Spain than in Germany, which implies generally lower adjustment-speed in Spain on the one hand and a greater impact of FTC workers on adjustment on the other.¹⁵

A critical point may be that the analysis is based on an annual dataset. As Hamermesh (1993) points out, this may be not appropriate to the estimation of dynamic labour demand models. This statement may be particularly relevant for our issue since the duration of FTCs in Germany is often shorter than one year (see Boockmann / Hagen, 2001). However, there is no other firm-level dataset available containing information on FTCs in Germany.

The hypothesis that FTC workers are stronger affected by dismissals due to excessive wage settlements (which is the starting-point for a version of the insider-outsider theory which defines FTC workers as outsiders and permanent workers as insiders, see Bentolila / Dolado 1994) could not be validated. However, one should keep in mind that the included measure of the wage rate is simply monthly wage costs divided by total employment and that this regressor is used in the equation for total as well as for permanent employment. The estimated coefficient may be biased by several measurement errors (see Bentolila / Saint Paul, 1992, 1032).

Further research is needed in this area. One should allow for asymmetries in the adjustment costs (hiring versus firing) and apply alternative functional assumptions. Furthermore, the fact that fixed-term contracts can be transformed into permanent ones should be taken into account (see Goux et al., 2001). Besides, also the wage elasticities of fixed-term contracts in comparison to permanent contracts, which have important theoretical and policy implications, have not been considered in Germany yet.

¹⁵ However, the share of FTC workers in the dataset of BENTOLILA and SAINT-PAUL (1992) is with 7.6 per cent higher than in the IAB-Establishment Panel.

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Appendix

Table A1: Descriptive Statistics for the Estimation Sample

Variable	Data	Mean	Std. Dev.	Min	Max
log (permanent employment)	<i>overall</i>	4.011	2.005	0.000	9.908
	<i>between</i>		2.026	0.000	9.875
	<i>within</i>		0.075	2.614	5.012
log (total employment)	<i>overall</i>	4.047	2.014	0.000	9.944
	<i>between</i>		2.035	0.000	9.917
	<i>within</i>		0.060	3.515	4.612
Permanent employment	<i>overall</i>	383.186	1325.045	1	20099
	<i>between</i>		1279.184	1	19458
	<i>within</i>		29.393	-257.814	1024.186
Total employment	<i>overall</i>	400.243	1374.45	1	20821
	<i>between</i>		1323.575	1	20279.67
	<i>within</i>		21.930	-197.257	977.743
FTC employment	<i>overall</i>	17.058	68.587	0	1663
	<i>between</i>		62.212	0	1432.667
	<i>within</i>		19.538	-433.609	419.724
log (expected sales) (deflated)	<i>overall</i>	16.088	2.541	10.269	24.264
	<i>between</i>		2.560	10.310	24.264
	<i>within</i>		0.126	13.851	17.228
log (wages per worker) (deflated)	<i>overall</i>	7.943	0.726	4.312	9.485
	<i>between</i>		0.719	4.750	9.485
	<i>within</i>		0.159	6.617	9.320
Share of skilled workers	<i>overall</i>	0.584	0.300	0	1
	<i>between</i>		0.284	0	1
	<i>within</i>		0.102	-0.050	1.180
Share of female workers	<i>overall</i>	0.404	0.294	0	1
	<i>between</i>		0.291	0	1
	<i>within</i>		0.054	-0.055	0.851
Share of part-time workers	<i>overall</i>	0.230	0.245	0	1
	<i>between</i>		0.239	0	1
	<i>within</i>		0.063	-0.187	0.691
Investment in ICT (t-1) (Dummy)	<i>overall</i>	0.604	0.489	0	1
	<i>between</i>		0.448	0	1
	<i>within</i>		0.241	-0.063	1.271
Other investments (t-1) (Dummy)	<i>overall</i>	0.175	0.380	0	1
	<i>between</i>		0.334	0	1
	<i>within</i>		0.217	-0.492	0.841
Expected problems due to general staff shortage (t-1) (Dummy)	<i>overall</i>	0.080	0.271	0	1
	<i>between</i>		0.247	0	1
	<i>within</i>		0.143	-0.587	0.746
Expected problems due to skill shortage (t-1) (Dummy)	<i>overall</i>	0.315	0.465	0	1
	<i>between</i>		0.426	0	1
	<i>within</i>		0.231	-0.351	0.982

Variable	Data	Mean	Std. Dev.	Min	Max
Expected problems due to maternity leave (t-1) (Dummy)	<i>overall</i>	0.082	0.274	0	1
	<i>between</i>		0.251	0	1
	<i>within</i>		0.128	-0.585	0.743
Expected problems due to sickness (t-1) (Dummy)	<i>overall</i>	0.130	0.337	0	1
	<i>between</i>		0.318	0	1
	<i>within</i>		0.153	-0.537	0.797
Collective wage agreement: firm level (Dummy)	<i>overall</i>	0.074	0.261	0	1
	<i>between</i>		0.238	0	1
	<i>within</i>		0.116	-0.593	0.740
Collective wage agreement: industry level (Dummy)	<i>overall</i>	0.612	0.487	0	1
	<i>between</i>		0.466	0	1
	<i>within</i>		0.164	-0.055	1.279
Works Council (Dummy)	<i>overall</i>	0.464	0.499	0	1
	<i>between</i>		0.496	0	1
	<i>within</i>		0.063	-0.203	1.131
Expected increase in sales (deflated)	<i>overall</i>	0.009	0.116	-1	2.8
	<i>between</i>		0.101	-1	1.55
	<i>within</i>		0.070	-1.241	1.259

Notes: The between data are generated by calculating the means over time by establishment \bar{x}_i . The within data are defined as $x_{it} - \bar{x}_i + \bar{\bar{x}}$, where the overall mean $\bar{\bar{x}}$ is added to equate the mean of all data (overall, between and within).

Source: IAB Establishment Panel waves 5 – 8 for West Germany.