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Flexibility, Dual Labour Markets, and Temporary Employment. Empirical Evidence from German Establishment Data**

The study examines, what forms and instruments firms use to react flexibly to demand-induced output fluctuations, and, if they are used in a complementary or substitutable way. Empirical evidence shows a rather complementary relationship. Moreover, the determinants of temporary employment (fixed-term contracts and temporary agency work) and the impact of these flexible employment forms on job security and job stability of regular employment are analyzed. One result is that positive developments of sales covary with a higher probability and more wide-spread use of temporary employment, which concurs with dual labour market theory. But estimations for job security and job stability indicate that temporary employment does not lower the number of layoffs and quits as is proposed by the core-periphery hypothesis.

Key words: **Flexibility, Dual Labour Markets, Fixed-term Contracts, Temporary Agency Work**

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1. Introduction

Economic, social, and technological changes make it necessary for firms to adjust flexibly to sustain their business. Technical progress and new demand structures do not only lead to new products and production methods, but also to even faster employment adjustments concerning the quantity and the quality of labour. Deindustrialisation and the knowledge-based economy go hand in hand with a higher labour force participation of women and a worse labour market position for low qualified workers. Globalization and European integration lead to more competitive pressure and a discussion about the choice of location for company plants. Of course, this has consequences for aggregate employment and employees, e.g., unemployment, new work practices, and new employment relationships (Walker et al. 2000; Charness/Levine 2002). Hence, much attention is devoted to labour market flexibility (Brodsky 1994). This paper will focus on three research questions, which are shortly discussed in the following paragraphs.

(1) What forms and instruments do firms use to react flexibly to demand-induced output fluctuation?

All the discussed changes are more or less related with the need to react flexibly to demand-induced output fluctuations in economies, industries, and firms. Research on organizational flexibility has emphasized the differentiation between internal and external flexibility as well as between numerical and functional flexibility (Kalleberg 2001). An important issue is the relationship between the different forms and instruments, which can be complementary or substitutable. According to Kalleberg (2001: 480), "relatively few studies have examined the interplay between functional and numerical flexibility". This study, therefore, aims at filling in part of this gap.

(2) What are the determinants of the use of temporary employment?

A firm can attain flexibility by utilizing flexible types of employment (Abraham 1988; Houseman 2001). Because of relatively high adjustment costs, regular employment is quasi-fixed. Therefore, fixed-term contracts and temporary agency work are analyzed as forms of flexible employment. We are specifically interested in the characteristics of a firm determining the use of temporary employment (Pfeifer 2005).

(3) What impact does temporary employment have on job security and job stabilty of regular employment?

According to dual labour market theory, temporary employment can be interpreted as a firm's peripheral workforce, while regular employment is the core workforce (Cappelli/Neumark 2004). The core-periphery hypothesis implies that the regular employees gain a higher degree of job security (probability of keeping the job) due to the use of a flexible workforce, since temporary employment is used as a "buffer", which is adjusted to demand fluctuations (Booth et al. 2002). Moreover, the core workforce has better working conditions including a higher income. This should lead to lower involuntary turnover (layoffs) and lower voluntary turnover (quits) among the regular employees, which results in a higher job stability (time spent on the job).

The paper is organized in the following way. First, I will present some theoretical and institutional background information about the forms of flexibility, the dual la-

bour market theory, and temporary jobs in Germany. In section three, the data and the methods are explained. Section four presents empirical evidence for forms and instruments of flexibility, temporary employment, job security, and job stability. The paper concludes with a short summary.

2. Theoretical and institutional background information

In recent decades, the need for firms to adjust flexibly to demand-induced output fluctuatons has been discussed in many economic and management studies (Atkinson 1987; Carlsson 1989; Bellmann et al. 1996; Kalleberg 2001; Cappelli/Neumark 2004). In the case of a temporary demand shock, a firm has to adjust its output, using internal or external forms of flexibility. Each form can be subdivided into numerical and functional flexibility. Instruments of internal numerical flexibility consist of working time flexibility (e.g., overtime, short time), while instruments of external numerical flexibility contain employment adjustments (e.g., layoffs, hiring). Functional flexibility comprises instruments, which can help to adjust output without numerical flexibility like layoffs. An example of internal instruments of functional flexibilty is the in-house transfer of employees and of external forms is subcontracting with other firms.

The relationships between the different forms of flexibility and the instruments within a given form can be complementary or substitutable. If there are advantages in specialization and decreasing marginal costs (economies of scales), the forms or instruments should be substitutes. In the case of increasing marginal costs and decreasing marginal revenue, which is more likely from an economic point of view, the utilisation of forms and instruments should be complementary. Furthermore, due to fixed employment costs, investments in firm specific human capital, and long-term work incentives, firms are often interested in stable employment relationships (Gerlach/Jirjahn 1999; Bellmann/Alda 2004). If this is true, strategies to avoid external adjustments are superior. Because of restrictions of internal flexibility (e.g., working hours, overtime premium), external flexibility can be necessary if the instruments of internal flexibility have been exhausted. Hence, there exists a logical complementary relationship between external and internal flexibility. Research on the relationship has found mixed empirical results (for a review of studies see for example OECD 1999: 178-221; Kalleberg 2001): Some studies found a positive, some a negative, and others no relationship between different forms of flexibility.

Instruments of external numerical flexibility are used to adjust employment to the profit maximizing level. Regular employment has relative high adjustment costs. In addition to fixed employment costs (e.g., administration costs for hiring), investments in firm-specific human capital, and long-term incentives (e.g., seniority wages), these adjustment costs include separation costs due to institutional employment protection (e.g., severance pay). This makes it attractive for firms to use a peripheral workforce, which has lower adjustment costs and can be adjusted faster than the core workforce (Bentolila/Saint-Paul 1992; Hagen 2003; Meyer/Pfeifer 2005). Typically, the peripheral workforce consists of contingent work with fixed-term and temporary agency

employment.[1] For example, the administration costs for temporary agency work are lower because the agency has to cover these costs and the firm only transfers a fee. Further, temporary employees generally have low levels of firm-specific human capital and weaker employment protection (OECD 2004: 61-125).

These insights are important for dual labour market theory (Biehler et al. 1979; Sengenberger 1979; Dickens/Lang 1992; Leontaridi 1998). Most models of dual labour markets have two things in common: (1) The labour market can be vertically divided into two segments. The primary labour market includes the core workforce with high wages, high promotion possibilities, good working conditions, high levels of firm-specific human capital, and employment security. The secondary labour market comprises the peripheral workforce lacking the privileges of the core workforce. The mobility between these two labour markets is limited. While the first labour market is characterized by job competition, there is wage competition in the second labour market. (2) Furthermore, the core workforce can be subdivided in an upper and lower segment. The employees in the upper segment are in general experts and managers. The typical workforce in the lower segment are the traditional industry jobs requiring firm-specific human capital.

This paper concentrates on internal dual labour markets (Rebitzer/Taylor 1991; Saint-Paul 1991; 1996) neglecting dual labour markets in an economy (Berger/Piore 1980; Bulow/Summers 1986). Models of dual labour markets are based on efficiency wage models (Shapiro/Stiglitz 1984), i.e., they emphasize the level of effort an employee is willing to provide (non shirking condition). In firms with high monitoring costs, a core workforce is employed, whereas firms with low monitoring costs prefer a peripheral workforce. This however, does not yet lead to an internal dual labour market, in which both workforces are employed by one firm. Such internal dual labour markets only emerge in the case of demand uncertainty. Because a firm can pay lower efficiency wages to get the same level of effort if it lowers the cyclical and structural layoff probability of the core workforce, it is profit maximizing to hoard the core workforce in bad economic states and to use a flexible peripheral workforce to adjust employment. Furthermore, good working conditions and employment security should lower quits among the core employees saving employment costs. Hence, the core workforce has higher employment stability due to the use of a peripheral workforce.

According to median voter models, unions and works councils shoud have an interest in protecting the core workforces' privileges. Therefore, they should favour an internal dual labour market and the use of temporary employment. However, because of a feasible substitution of core employees by peripheral employees and a loss of insider power, they are aware of a too intense utilisation of temporary employment (Watzka 2000: 43). Atkinson (1987: 99) reports evidence for England that national unions oppose a higher level of employment flexibility and local unions favour the initia-

[1] A broader discussion and definition of the peripheral workforce for the US can be found in Polivka (1996: 4): "Contingent work is any job in which an individual does not have an explicit and implicit contract for long-term employment." Therefore, the peripheral workforce can also include part-time employees and in Germany mini-jobs and midi-jobs, which are not part of this paper.

tives of a firm's management. In Germany the local presence is taken by works councils, while unions are actors on an industry, district, or economy level.

To complete the background of flexible employment, some information about the institutional settings of fixed-term contracts and temporary agency work in Germany is provided in the following paragraphs. In January 2001, the regulation of fixed-term contracts was renewed ("Gesetz über Teilzeitarbeit und befristete Arbeitsverträge") (Viethen 2001). The new legislation includes the prohibition of discrimination at the workplace, which refers to equal pay and treatment. Moreover, the abuse of consecutive fixed-term contracts is restricted to avoid a substitution of regular employment. Thus, fixed-term contracts without an objective reason are only allowed up to 24 months for newly hired employees, i.e., the employees must not to be in the firm at any time before this contract. Within these 24 months, only up to three renewals of a contract are allowed. If the contract is justified by an objective reason, the above restrictions do not apply. Furthermore, there are simplifications for older and unemployed individuals as well as for employees, whose salary is in excess of the agreed scale, and research assistants at universities and research institutes.

In 1967, the federal constitutional court repealed the employment agency monopoly of the Federal Labour Office ("Bundesanstalt für Arbeit"), which led to the regulation of temporary agency work in 1972 ("Arbeitnehmerüberlassungsgesetz") (Jahn/Rudolph 2002). The essence of this regulation, which is the full responsibility of the agency in all employer-side features (e.g., wage, employment protection), is still valid today. However, new legislations (e.g., "Job-Aqtiv-Gesetz", "Erstes Gesetz für moderne Dienstleistungen am Arbeitsmarkt") have repealed restrictions of the lending periods and introduced the principle of equal pay and treatment. Due to new collective agreements first enacted in 2003, the equal pay and treatment principle is undermined (Bispinck et al. 2004).

3. Data and method

The Hannover Establishment Panel is the sample for Lower Saxony from the German IAB establishment panel (Bellmann 2002; Gerlach et al. 2003). Every year approximately one thousand establishments from Lower Saxony with at least one employee covered by social security are interviewed in a panel design survey. The sample can be weighted for all of the nearly 200.000 establishments in Lower Saxony, which has approximately the same employment and establishment structure as West Germany. The empirical analysis is divided in three parts, one for every research question.

(1) Forms and instruments of flexibility

In 2003, the establishments were asked if they had demand fluctuations in the year before. The establishments, that answered yes, were then asked, what instruments they used to cope with the demand fluctuations. The default answers for internal numerical flexibility were (1) reduction/ extension of overtime or extra shift, (2) use of holidays and free days, (3) reduction/ extension of working time in flexible work schedules, (4) introduction of short time; for external numerical flexibility (5) use of fixed-term contracts, (6) use of temporary agency work, (7) layoff or hiring of employees; for internal functional flexibility (8) in-house transfer of employees, (9) reduction/ extension of

stock sales, (10) reduction/ extension of delivery time; and for external functional flexibility (11) reduction/ expansion of subcontracts.

In addition to weighted frequencies for the use and importance of the above instruments, unweighted probit estimates for the utilisation of the instruments in the subsample are presented. The dependent variable is a dummy, which takes the value one if the firm uses the instrument (or at least one instrument of a given flexibility form) and zero if the firm does not use it. For an easier interpretation of the coefficients, marginal effects are reported, i.e., the infinitesmal or discrete changes in the probability that the dependent variable takes the value one. The explanatory variables in all regressions are the other instruments in order to analyze the relationship between them. Furthermore, a set of control variables is included. Differences in the employment structure are taken into account by the variables: share of part-time employment, female employees, blue-collar workers, and qualified employees in total employment on 30 June. Institutional labour relations are considered with dummy variables for the existence of a works council and a collective agreement. Because of employer size and industry effects, the log number and squared log number of employees on 30 June, and industry dummies for manufacturing, building, trading and repairs, and service sectors are included in the estimates.[2]

(2) Determinants of temporary employment

In the period from 2002 to 2004, the establishments were asked if they employed fixed-term and temporary agency workers on 30 June. If they answered yes, they were asked, how many employees they have in each form. Firstly, some weighted descriptive statistics for fixed-term contracts and temporary agency work are presented. For the mulitvariate analysis, an unbalanced panel is used because more observations can be included and the self-selection problem for participation in the panel is lower. The probability of the use of each employment form is analyzed in probit estimates, where the dependent variable takes the value one if the firm has fixed-term contracts respectively temporary agency work and zero otherwise. Again the marginal effects are presented. The dependent variable for the estimations of the intensity is the share of employees in total employment in each form. Because of many censored observations, tobit estimations are usually the correct estimation technique. But the standard tobit model (tobit I) has quite restrictive assumptions, which are that (a) the instensity is explained by the same variables like the use of temporary employment and (b) the coefficients in both equations have the same sign (Verbeek 2000: 207). Because the second assumption is violated, tobit estimates for the total sample do not seem to be correct. Hence, OLS estimates for a restricted sample are presented, which only consists of firms with utilisation of the temporary employment form.[3]

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2 The reference group are other sectors. The non-profit and public sectors are excluded from the multivariate analysis.

3 An alternative would be Heckman's selection model (Heckman 1979), which is a so called tobit II model if maximum likelihood is applied. The sample selection model assumes that establishments with temporary employment are not a random sample and the decision of using temporary employment is different from the decision of how many temporary employees to employ. But there is an identification problem, which cannot be easily solved if you are interested in the same explanatory variables in both equations.

One explanatory variable is the share of the other employment form to explore the relationship between them. Because temporary employment is an instrument of external numerical flexibility, the firms' expected development of sales in the current year is included. Thus, dummy variables for a positive and a negative development of sales are generated. Furthermore, the same set of control variables for employment structure, institutional labour relations, employer size, and industry as in the regressions in (1) are taken into account. Because of aggregated influences, dummy variables for 2003 and 2004 are included.

(3) Job security and job stability

In the period 2002 to 2004, the establishments were also questioned about employment fluctuation in the first half of each year. The impact of temporary employment on job security and job stability is analyzed using estimations for layoffs, quits, and the separation rate, which is calculated by the proportion of layoffs and quits to non-temporary employees. For layoffs and quits, the dependent variable is the log number so that OLS can be applied. The separation rate is estimated by tobit because there are censored observations. The explanatory variables in all three regressions are the same as in (2). In addition, dummy variables are included for tremendous establishment changes (part of the establishment closed, hived off, or integrated within the last year).

4. Empirical evidence

4.1 Forms and instruments of flexibility

In the weighted sample, 26% of all establishments had output fluctuations in 2002 (32% in the unweighted sample). Table 1 informs about the utilisation and importance of the single instruments and forms of flexibility establishments used to cope with these fluctuations. While there were multiple answers possible for utilization, only a single instrument could be rated as the most important one. The dominant flexibility form is internal numerical flexibility. About 74% of the firms use at least one of the instruments within this form. The most important instruments of this type are overtime/ extra shifts and holidays/ free days, which are each used by half of the firms and rated by about 20% as the most important instruments overall. They are followed by flexible work schedules and short time. While the use of flexible work schedules is quite strong (21%) and important (11%), short time is only used by 7%. This is, because the introduction of short time is strongly regulated and can only be used in really bad economic states and if the federal employment agencies permit short time.

Nearly one third of the firms use at least one instrument of external numerical flexibility. Layoffs and hiring are used by 23% and rated as the most important instrument by 11%. There is quite a large gap between layoffs/ hiring and the use of temporary employment forms. Fixed-term contracts are used by 8% and temporary agency work by 5%. While 4% of the firms rate fixed-term contracts as the most important instrument, temporary agency work seems relatively unimportant (see section 4.2 for a further discussion of temporary employment).

About 40% of the firms use at least one instrument of internal functional flexibility. One quarter varies its stock sales, while 14% vary the delivery time. In-house transfers are used by only 12%, but it is rated as the most important instrument within

functional flexibility. Subcontracting as an instrument of external functional flexibility is used by 5% and only a few firms rate it as the most important instrument.

Table 1: Firms' use of forms and instruments of flexibility in Lower Saxony

	Numerical flexibility	**Functional flexibility**
Internal flexibility	overtime/ extra shift: 45% (17%) holidays/ free days: 53% (22%) flexible work schedules: 21% (11%) short time: 7% (4%) Firm uses at least one instrument of internal numerical flexibility: 74%	in-house transfer: 12% (6%) stock levels: 25% (4%) delivery time: 14% (1%) Firm uses at least one instrument of internal functional flexibility: 40%
External flexibility	fixed-term contracts: 8% (4%) temporary agency work: 5% (1%) layoffs/ hiring: 23% (11%) Firm uses at least one instrument of external numerical flexibility: 31%	subcontracting: 5% (1%) Firm uses at least one instrument of external functional flexibility: 5%

Weighted frequencies for utilisation (importance) of instruments.
Multiple mentions for utilisation of instruments so that they do not add to 100%.
Single mentions for importance of instruments so that they add to 100%.

Probit estimates for the utilisation of the different forms of flexibility (table 2), i.e., for the use of at least one instrument of one type, inform about the relationship among them. Internal numerical flexibility serves as a substitute for the other three forms. Only the correlation with internal functional flexibility is significantly negative. The relationship between external numerical flexibility and functional flexibility is rather complementary, even if it is not statistically significant. The correlation between internal and external functional flexibility is significantly positive, i.e., they are used complementary.

The estimates show also that the existence of a works council has positive influence on the probability of using flexibility, which is especially the case for internal flexibility. Works councils seem to support rather than hinder flexibility. However, this result should be interpreted with some caution, since it could be caused by the fact that firms with a works council are more likely to have output fluctuations. No significant effects are found for the existence of a collective agreement and for the employer size. Sector dummies indicate that firms in the production and building sector make stronger use of numerical flexibility, and that internal functional flexibility is more likely to be used in the production, trading, and repairing sector.

The following probit estimates address the implementation of the different instruments. The probabilities for using an instrument of internal numerical flexibility are presented in table 3. It can be seen that the correlations are positive among the instruments within this type. That is, they are used complementarily, even if only the links between overtime/ extra shifts and holidays/ free days respectively between flexible work schedules and short time are significant. For instruments of external numerical flexibility (table 4), the correlations are also positive between fixed-term

contracts and temporary agency work. But there is no significant correlation with layoffs/ hiring.[4]

Table 2: Utilisation of flexibility forms

	Internal numerical			External numerical			Internal functional			External functional		
internal numerical flexibility				-0.092	*0.087*		-0.154	*0.088*	*	-0.066	*0.059*	
external numerical flexibility	-0.037	*0.036*					0.005	*0.064*		0.015	*0.021*	
internal functional flexibility	-0.073	*0.038*	**	0.011	*0.065*					0.048	*0.027*	**
external functional flexibility	-0.048	*0.072*		0.049	*0.095*		0.207	*0.089*	**			
share part-time	0.004	*0.095*		-0.169	*0.184*		-0.044	*0.187*		-0.088	*0.127*	
share female employees	-0.027	*0.079*		0.055	*0.155*		-0.028	*0.156*		-0.189	*0.091*	**
share blue-collar employees	0.068	*0.074*		-0.101	*0.138*		-0.011	*0.139*		0.057	*0.056*	
share qualified employees	-0.022	*0.074*		-0.204	*0.133*		-0.253	*0.135*	*	0.135	*0.065*	***
works council	0.128	*0.051*	**	0.062	*0.085*		0.165	*0.088*	*	0.039	*0.036*	
collective agreement	0.005	*0.038*		-0.009	*0.070*		-0.048	*0.071*		-0.026	*0.030*	
log of employment	0.026	*0.052*		0.097	*0.088*		-0.019	*0.092*		0.035	*0.035*	
log² of employment	0.000	*0.007*		0.000	*0.011*		0.007	*0.011*		-0.003	*0.004*	
production sector	0.121	*0.074*	*	0.293	*0.152*	*	0.399	*0.142*	**	0.050	*0.064*	
building sector	0.121	*0.024*	**	0.372	*0.115*	**	0.111	*0.186*		0.034	*0.101*	
trading and repairing sector	0.052	*0.057*		0.262	*0.157*		0.470	*0.096*	***	0.078	*0.150*	
service sector	0.079	*0.055*		0.247	*0.157*		0.175	*0.170*		0.040	*0.087*	
number of observations	311			311			311			311		
LR Chi²(15)	39.93			40.50			62.26			65.23		
Pseudo R²	0.158			0.094			0.145			0.269		
Log Likelihood	-106.81			-195.13			-184.36			-88.63		

Marginal effects for change in probability. Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

[4] The probit estimation for layoffs/ hirings has a rather bad goodness of fit. Therefore, the estimations for layoffs, quits, and separation rates in section 4.3 are more illuminating.

Table 3: Utilisation of internal numerical flexibility instruments

	overtime/ extra shift			holidays/ free days			flexible work schedules			short time		
overtime/ extra shift				0.346	*0.062*	***	0.103	*0.069*		-0.098	*0.061*	*
holidays/ free days	0.330	*0.060*	***				-0.015	*0.068*		0.058	*0.045*	
flexible work schedules	0.112	*0.070*		0.002	*0.072*					0.129	*0.059*	**
short time	-0.134	*0.091*		0.124	*0.074*		0.249	*0.089*	***			
fixed-term contracts	-0.035	*0.085*		0.002	*0.081*		0.101	*0.081*		-0.078	*0.047*	
temporary agency works	0.180	*0.080*	**	0.000	*0.096*		0.266	*0.097*	***	-0.043	*0.057*	
Layoffs/ hiring	-0.005	*0.065*		-0.042	*0.064*		-0.018	*0.063*		0.099	*0.050*	**
in-house transfers	0.014	*0.078*		0.047	*0.074*		-0.058	*0.073*		0.081	*0.063*	
stock levels	0.014	*0.072*		0.038	*0.071*		0.144	*0.077*	*	0.006	*0.053*	
delivery time	-0.020	*0.086*		-0.024	*0.086*		0.024	*0.088*		0.011	*0.063*	
subcontracts	-0.142	*0.110*		0.034	*0.095*		0.085	*0.103*		-0.048	*0.055*	
share part-time	-0.004	*0.171*		0.044	*0.181*		0.221	*0.182*		-0.210	*0.176*	
share female employees	-0.070	*0.144*		-0.132	*0.153*		-0.149	*0.167*		-0.099	*0.130*	
share blue-collar employees	0.110	*0.133*		0.252	*0.131*	*	-0.259	*0.142*	*	0.107	*0.108*	
share qualified employees	0.286	*0.130*	**	-0.126	*0.129*		-0.035	*0.134*		0.104	*0.102*	
works council	0.043	*0.085*		-0.095	*0.086*		0.169	*0.082*	**	-0.060	*0.063*	
collective agreement	-0.049	*0.066*		-0.009	*0.068*		-0.021	*0.071*		-0.019	*0.054*	
log of employment	0.176	*0.086*	**	-0.126	*0.091*		-0.004	*0.094*		0.154	*0.075*	**
log² of employment	-0.017	*0.011*		0.020	*0.012*	*	0.011	*0.011*		-0.016	*0.008*	**
production sector	-0.048	*0.137*		-0.052	*0.151*		0.118	*0.186*		0.043	*0.106*	
building sector	0.116	*0.137*		0.026	*0.170*		0.258	*0.234*		0.110	*0.164*	
trading and repairing sector	-0.040	*0.175*		-0.075	*0.188*		0.029	*0.230*			*dropped*	
service sector	0.004	*0.146*		-0.002	*0.160*		0.175	*0.215*		0.014	*0.123*	
number of observations		311			311			311			283	
LR Chi²(22)		81.07			58.26			107.78			43.83	
Pseudo R^2		0.203			0.143			0.269			0.161	
Log Likeli-hood		-159.64			-174.10			-146.30			-114.56	

Marginal effects for change in probability. Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

The estimations for the utilisation of instruments of functional flexibility are presented in table 5. Instruments within the internal functional flexibility form (in-house transfers, stock levels, delivery time) are used complementarily. Moreover, they are positively correlated with subcontracting, which is assigned to external functional flexibility.

Table 4: Utilisation of external numerical flexibility instruments

	fixed-term contracts			temporary agency works			Layoffs/ hiring		
overtime/ extra shift	-0.017	*0.047*		0.045	*0.021*	**	-0.018	*0.066*	
holidays/ free days	-0.006	*0.042*		0.005	*0.020*		-0.041	*0.063*	
flexible work schedules	0.058	*0.046*		0.066	*0.034*	***	-0.006	*0.067*	
short time	-0.057	*0.041*		-0.032	*0.015*	*	0.166	*0.080*	**
fixed-term contracts				0.159	*0.063*	***	0.070	*0.077*	
temporary agency works	0.328	*0.085*	***				-0.012	*0.087*	
Layoffs/ hiring	0.035	*0.041*		-0.009	*0.018*				
in-house transfers	-0.023	*0.042*		0.052	*0.036*	*	0.094	*0.072*	
stock levels	-0.012	*0.044*		-0.030	*0.017*	*	0.073	*0.069*	
delivery time	-0.008	*0.051*		0.005	*0.025*		-0.060	*0.076*	
subcontracts	0.031	*0.064*		0.106	*0.066*	**	-0.064	*0.084*	
share part-time	0.096	*0.108*		-0.208	*0.085*	***	0.060	*0.178*	
share female employees	-0.004	*0.092*		0.071	*0.055*		-0.171	*0.150*	
share blue-collar employees	-0.065	*0.085*		0.047	*0.051*		-0.085	*0.130*	
share qualified employees	-0.029	*0.082*		-0.107	*0.051*	***	0.007	*0.126*	
works council	0.015	*0.050*		0.039	*0.032*		0.003	*0.080*	
collective agreement	0.003	*0.043*		0.023	*0.019*		0.033	*0.065*	
log of employment	0.053	*0.052*		-0.001	*0.033*		0.073	*0.081*	
log² of employment	-0.002	*0.006*		0.000	*0.003*		-0.006	*0.010*	
production sector	0.907	*0.056*	***	0.834	*0.087*	***	0.099	*0.147*	
building sector	0.948	*0.013*	***	0.990	*0.006*	***	0.238	*0.182*	
trading and repairing sector	0.949	*0.012*	***	0.987	*0.004*	***	0.161	*0.193*	
service sector	0.993	*0.006*	***	0.913	*0.090*	***	0.093	*0.165*	
number of observations		311			311			311	
LR Chi²(22)		71.25			146.21			21.93	
Pseudo R^2		0.222			0.479			0.056	
Log Likelihood		-125.12			-79.42			-185.82	

Marginal effects for change in probability. Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

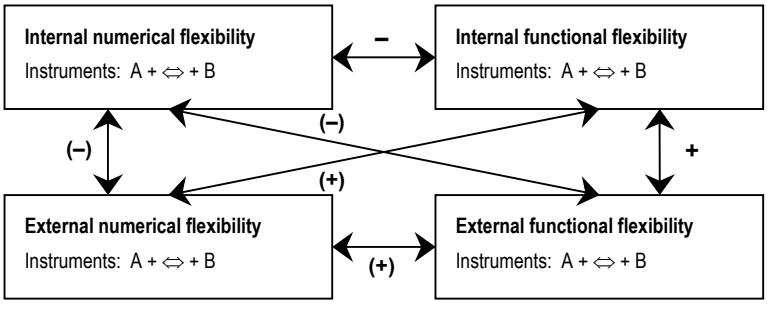
In addition to the result that instruments within a given flexibility form are used complementarily, the estimates show a rather complementary relationship among all instruments. Overall, there is strong empirical evidence for the complementary use of different flexibility forms and instruments. The only substitutable relationship could be found for internal numeric flexibility and the other types. The links between the forms are illustrated in figure 1. Within the forms, the relationships between the instruments are complementary.

Table 5: Utilisation of internal and external functional flexibility instruments

	in-house transfers			stock levels			delivery time			subcontracts		
overtime/ extra shift	0.003	*0.060*		-0.001	*0.064*		-0.003	*0.034*		-0.049	*0.031*	**
holidays/ free days	0.013	*0.055*		0.020	*0.059*		-0.003	*0.032*		0.012	*0.017*	
flexible work schedules	-0.034	*0.057*		0.118	*0.069*	*	0.020	*0.037*		-0.002	*0.019*	
short time	0.129	*0.079*	*	0.009	*0.074*		0.001	*0.039*		-0.015	*0.016*	
fixed-term contracts	-0.039	*0.059*		-0.019	*0.072*		-0.001	*0.038*		0.011	*0.024*	
temporary agency works	0.172	*0.091*	**	-0.098	*0.069*		-0.020	*0.037*		0.103	*0.065*	***
Layoffs/ hiring	0.060	*0.054*		0.050	*0.059*		-0.015	*0.029*		-0.015	*0.016*	
in-house transfers				0.104	*0.075*		0.086	*0.049*	**	0.026	*0.028*	
stock levels	0.092	*0.065*					0.067	*0.040*	*	0.032	*0.027*	
delivery time	0.146	*0.084*	*	0.154	*0.082*	**				0.098	*0.056*	***
subcontracts	0.160	*0.094*	*	0.089	*0.093*		0.159	*0.076*	***			
share part-time	0.159	*0.161*		-0.149	*0.178*		-0.128	*0.102*		-0.033	*0.101*	
share female employees	-0.242	*0.137*	*	0.188	*0.145*		0.101	*0.080*		-0.174	*0.078*	**
share blue-collar employees	-0.156	*0.115*		0.040	*0.131*		-0.010	*0.071*		0.059	*0.049*	
share qualified employees	-0.106	*0.114*		-0.277	*0.116*	**	0.021	*0.065*		0.138	*0.068*	***
works council	0.033	*0.072*		0.118	*0.080*		0.019	*0.042*		0.022	*0.028*	
collective agreement	0.056	*0.055*		-0.036	*0.064*		-0.059	*0.039*	*	-0.022	*0.026*	
log of employment	0.073	*0.080*		-0.016	*0.080*		-0.037	*0.041*		0.033	*0.028*	
log² of employment	0.003	*0.009*		-0.001	*0.009*		0.002	*0.005*		-0.003	*0.003*	
production sector	0.125	*0.200*		0.148	*0.128*		0.949	*0.034*	***	-0.007	*0.043*	
building sector	0.154	*0.288*		-0.161	*0.098*		0.973	*0.009*	***	-0.011	*0.037*	
trading and re-pairing sector	0.479	*0.290*	*	0.329	*0.198*	*	0.974	*0.008*	***	0.000	*0.056*	
service sector	0.403	*0.260*		-0.220	*0.104*	*	0.988	*0.014*	***	0.023	*0.061*	
number of observations		311			311			311			311	
LR Chi²(22)		84.09			84.55			56.39			89.53	
Pseudo R²		0.240			0.224			0.203			0.369	
Log Likelihood		-133.12			-146.59			-110.58			-76.48	

Marginal effects for change in probability. Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

Figure 1: Relationships between forms and instruments



4.2 Determinants of temporary employment

The development of fixed-term contracts in the weighted sample is moderately positive (table 6). In every year, more firms make use of fixed-term contracts. But the share of fixed-term employment in total employment is relatively constant over time. To summarize, nearly every fifth firm uses fixed-term employment, but only every twentieth employee has a fixed-term contract. The utilisation of temporary agency work is even lower. Only two to three percent of all firms use temporary agency work and only one percent of all employees are temporary agency workers. An explanation for the relatively minor utilisation in the last years could be the overall bad economic situation in Germany, which did not lead to the demand for additional employment.

Table 6: Temporary employment in Lower Saxony

	2002	2003	2004
Fixed-term contracts			
Share of firms with utilisation	12	15	18
Share of employees	5	5	6
Share of employees in firms with utilisation	11	9	11
Temporary agency work			
Share of firms with utilisation	3	2	2
Share of employees	1	1	1
Share of employees in firms with utilisation	4	5	5

Weighted shares in percent.

The determinants of fixed-term contracts are presented in table 7. An expected positive development of sales leads to a significantly higher share of fixed-term employees. In line with dual labour market theory, an expansion of employment is attained with more fixed-term contracts. If the expected development of sales is negative, the coefficient is also positive, but smaller and of weaker significance than in the case of a positive demand shock. However, this can be interpreted as a substitution effect between fixed-term employment and non-temporary employment.

Moreover, the results show that fixed-term contracts and temporary agency work are complements, which verifies the result in section 4.1. There is also a complementary relation with part-time employment, which can be seen as part of the peripheral workforce (Tilly 1992). The probability of using fixed-term contracts is positively related with the share of women in the firm because fixed-term employment can be used as temporary replacement during pregnancy and maternity leave (Hagen/Boockmann 2002). Because of shortcomings in qualifications, fixed-term employees are not good matches and not perfect substitutes for qualified workers. Hence, the finding is not surprising that a higher share of qualified employees is related with a less likely and intense use of fixed-term contracts.

The results also support the findings by Boockmann and Hagen (2003) and Pfeifer (2005) that the existence of a works council increases the probability of the utilisation of fixed-term contracts but lowers the intensity. This evidence corresponds with dual labour market theory, which predicts that the core workforce, represented by works councils, gains higher job security due to temporary employment. The works council also protects the core employees against substitution. Collective agreements

do not have any significant effects. The control variables demonstrate that the use of fixed-term employment is more likely and more intense in the service sector. The time trend in table 6 is also confirmed: significantly more firms use fixed-term contracts, but the intensity does not change.

Table 7: Determinants of fixed-term contracts

	Probit (TS)			OLS (RS)		
positive development of sales	-0.002	*0.029*		0.034	*0.010*	***
negative development of sales	-0.002	*0.027*		0.018	*0.011*	*
share temporary agency workers	0.487	*0.217*	**	0.040	*0.090*	
share part-time	0.077	*0.061*		0.083	*0.025*	***
share female employees	0.115	*0.057*	**	-0.055	*0.022*	**
share blue-collar employees	-0.018	*0.047*		-0.012	*0.019*	
share qualified employees	-0.151	*0.047*	***	-0.077	*0.018*	***
works council	0.148	*0.029*	***	-0.036	*0.012*	***
collective agreement	0.006	*0.027*		0.000	*0.011*	
log of employment	0.343	*0.031*	***	-0.137	*0.014*	***
log² of employment	-0.019	*0.003*	***	0.012	*0.001*	***
production sector	-0.179	*0.055*	***	-0.074	*0.021*	***
building sector	-0.217	*0.053*	***	-0.085	*0.029*	***
trading and repairing sector	-0.142	*0.058*	**	-0.075	*0.025*	***
service sector	-0.049	*0.060*		-0.027	*0.022*	
year 2003	0.027	*0.028*		-0.017	*0.011*	
year 2004	0.056	*0.028*	**	-0.002	*0.010*	
constant				0.599	*0.042*	***
number of observations		2554			1106	
LR Chi²(17) | F(17, 1088)		1082.70			21.33	
Pseudo R^2 | R^2/ adjusted R^2		0.310			0.250/0.238	
Log Likelihood		-1207.05				

Marginal effects for total sample probit. OLS for restricted sample.
Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

The determinants of temporary agency work are presented in table 8. The utilisation of temporary agency work is more likely in the case of positive expected sales. Even though there is no significant correlation with the share of temporary agency workers, this finding is in line with dual labour market theory. Furthermore, there is a somewhat complementary relationship with fixed-term employment. The relationship with part-time employment is substitutable. Both employment types can be used to react flexibly to short-term fluctuations. While temporary agency work is a form of employment adjustment (external numerical flexibility), part-time work can alternatively be used for working-time adjustments (internal numerical flexibility). As has already been discussed in section 4.1, internal numerical and external numerical flexibility are used as substitutes. Bellman (2004) found the same employment structure variables to be significant.

A significant influence of works councils and collective agreements as in Pfeifer (2005) cannot be found. The signs however, are in the (theoretically) correct direction, i.e., they make the utilisation more likely but decrease the intensity. The control variables show that temporary agency work is more likely to be used in the production sector and that the use in 2003 was more likely than in 2002 and 2004.

Table 8: Determinants of temporary agency work

	Probit (TS)			OLS (RS)		
positive development of sales	0.051	*0.017*	***	0.000	*0.011*	
negative development of sales	0.000	*0.014*		0.010	*0.012*	
share fixed-term employment	0.042	*0.056*		0.110	*0.062*	*
share part-time	-0.205	*0.043*	***	-0.031	*0.043*	
share female employees	-0.056	*0.034*	*	-0.010	*0.033*	
share blue-collar employees	0.021	*0.027*		0.036	*0.026*	
share qualified employees	-0.033	*0.025*		0.005	*0.021*	
works council	0.014	*0.016*		-0.022	*0.014*	
collective agreement	0.015	*0.014*		-0.003	*0.013*	
log of employment	0.080	*0.017*	***	-0.113	*0.015*	***
log² of employment	-0.002	*0.002*		0.008	*0.001*	***
production sector	0.122	*0.040*	***	0.022	*0.030*	
building sector	0.033	*0.044*		0.002	*0.037*	
trading and repairing sector	-0.004	*0.037*		0.010	*0.037*	
service sector	0.013	*0.035*		0.026	*0.032*	
year 2003	0.034	*0.016*	**	0.008	*0.012*	
year 2004	0.011	*0.014*		0.004	*0.011*	
constant				0.389	*0.058*	***
number of observations		2555			417	
LR Chi²(17) | F(17, 399)		703.01			9.35	
Pseudo R^2 | R^2/ adjusted R^2		0.291			0.285/0.254	
Log Likelihood		-854.57				

Marginal effects for total sample probit. OLS for restricted sample.
Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

Research on temporary employment emphasizes many reasons for the demand of such employment forms. Besides flexibility, the reasons could be lower labour costs (e.g., social security contribution), replacement in the case of unexpected absenteeism (e.g., sickness), and the use as a screening and motivation device (for a more extensive discussion see Pfeifer 2005). Even though reasons other than flexibility could cause the demand for temporary employment, the presented empirical results support the idea of dual labour markets. Temporary jobs are more likely to be used and to be more intense in firms with a positive development in sales. Works councils foster dualism to protect regular employment from demand and employment fluctuations. The consequences for job security and job stability of regular employment are discussed in the next section.

4.3 Job security and job stability

The core-periphery hypothesis predicts that the core workforce has a higher degree of job security and job stability if the firm uses the peripheral workforce as a buffer. Therefore, a higher share of fixed-term employment and temporary agency work should lead to fewer layoffs and quits. Hence, temporary employment lowers the separation rate among the regular employees. The results are presented in table 9.

Table 9: Estimates for layoffs, quits, and separation rate

	layoffs			quits			separation rate		
positive development of sales	0.093	*0.307*		0.193	*0.294*		0.013	*0.014*	
negative development of sales	0.958	*0.283*	***	0.211	*0.271*		0.067	*0.013*	***
share fixed-term employment	0.829	*1.040*		2.529	*0.996*	**	0.086	*0.047*	*
share temporary agency workers	2.801	*2.449*		0.584	*2.346*		-0.035	*0.115*	
share part-time	-0.268	*0.630*		0.923	*0.604*		0.015	*0.031*	
share female employees	-0.247	*0.576*		0.792	*0.552*		0.001	*0.028*	
share blue-collar employees	1.552	*0.474*	***	0.086	*0.454*		0.018	*0.023*	
share qualified employees	-0.188	*0.474*		-1.057	*0.454*	**	-0.047	*0.023*	**
works council	-1.250	*0.332*	***	-1.445	*0.318*	***	-0.047	*0.015*	***
collective agreement	-0.746	*0.284*	***	-0.343	*0.272*		-0.024	*0.013*	*
part integrated	0.139	*0.669*		-0.629	*0.640*		-0.002	*0.029*	
part hived off	0.119	*0.770*		1.271	*0.737*	*	0.024	*0.033*	
part closed	3.537	*0.678*	***	1.956	*0.650*	***	0.092	*0.028*	***
log of employment	0.640	*0.276*	**	1.081	*0.264*	***	0.048	*0.014*	***
log² of employment	0.114	*0.032*	***	0.169	*0.031*	***	-0.001	*0.001*	
production sector	2.088	*0.603*	***	0.450	*0.578*		0.089	*0.031*	***
building sector	2.475	*0.697*	***	1.300	*0.667*	*	0.124	*0.036*	***
trading and repairing sector	2.135	*0.673*	***	1.357	*0.645*	**	0.095	*0.035*	***
service sector	1.987	*0.628*	***	1.110	*0.602*	*	0.084	*0.033*	**
year 2003	-0.058	*0.295*		-1.446	*0.283*	***	-0.049	*0.014*	***
year 2004	-0.619	*0.287*	***	-1.581	*0.275*	***	-0.050	*0.013*	***
constant	-15.767	*0.819*	***	-15.050	*0.784*	***	-0.297	*0.044*	***
number of observations		2519			2520			2519	
F(21, 2497) | F(21, 2498) | LR Chi²(21)		23.55			52.59			195.05	
R^2 | Pseudo R^2		0.165			0.307			0.135	
adjusted R^2		0.158			0.301				
log likelihood								-622.61	
number censored observations								1445.00	

OLS for log number of layoffs and quits. Tobit for separation rate.
Standard errors in italics. Significant at the * 10%-, ** 5%-, or *** 1%-level.

Naturally, there are more employer-induced separations (layoffs) if the expected development of sales for the current year is negative. The impact of temporary employment on separations is only significant for fixed-term employment in the regressions for quits and the separation rate. Overall, the correlation is positive, i.e., temporary

employment and separations are used as complements.[5] Furthermore, there is evidence that blue-collar employees are more strongly exposed to layoffs and qualified employees are less likely to quit. This is plausible since blue-collar and low qualified employees are of less value to the firm and can be dismissed or replaced more easily. Works councils and collective agreements significantly reduce the number of layoffs. Both institutions try to protect the core workforce from job insecurity and are associated with higher adjustment costs. The number of quits is also lower if a works council or a collective agreement exists. However, the coefficient is only significant for works councils, which favours the view that the voice function in Germany is implemented by works councils rather than by unions (Frick 1996). The control variables for industries show that firms from the building sector have more layoffs and a higher separation rate. Firms in the production sector experience fewer quits. The time trend indicates fewer layoffs in 2004 than in the two prior years. The number of quits has also decreased.

Although the considerations of dual labour market theory could be confirmed in section 4.2, we found no support for the core-periphery hypothesis in this section. Layoffs and temporary employment are used complementary, which is in line with the results in section 4.1. Cappelli and Neumark (2004: 175-176) also report a positive correlation between involuntary turnover and the use of contingent work, which contradicts the core-periphery hypothesis. However, it cannot be rejected that firms make use of a core and a peripheral workforce in the sense of dual labour markets.

5. Conclusion

This paper shed some light on the use of flexibility and in particular on external numerical flexibility. The most frequently used instruments are assigned to internal numerical flexibility, i.e., working time flexibility. The relationships between the different forms are complementary, except for internal numerical flexibility. Within the given flexibility forms, the utilisation of instruments is rather complementary. Complementary relations can be explained by increasing marginal costs and decreasing marginal revenues, which make it cost efficient to use more than one form and instrument to accomplish flexibility. The determinants of temporary employment give some support for dual labour market theory since these employment types are more likely to be used and to be more intense in the case of positive demand shocks. But neither fixed-term contracts nor temporary agency work raise job security and job stability for regular employment. Therefore, the core-periphery hypothesis cannot be supported in the empirical analysis.

A limitation of the study is firstly the lack of information in the data in order to distinguish perfectly between core and peripheral employees (Kalleberg 2001: 488-489). A linked employer-employee dataset or extensive case studies could help to overcome this problem. Moreover, there are not many observations in the dataset for the analysis of flexibility forms and instruments (n=311), and no information about the strategic utilisation of flexibility (Hunter et al. 1993; Kalleberg 2001: 485-488). Fur-

[5] Regressions with dummy variables for the use of temporary employment did not change this result.

thermore, the study does not address the aspect of internal functional flexibility in form of flexible work practices (OECD 1999: 178-221; Cappelli/Neumark 2004). Work practices, which facilitate flexibility, are for example, flattening of management structures, job rotation, self-managed teams, and profit sharing. The exclusion in the empirical analysis is not due to the fact that these practices are not important, but because of data limitations. Nevertheless, this study presents some theoretical and – even more important – empirically based insights of the utilisation of flexibility and especially of external numerical instruments like temporary employment and layoffs.

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