Wirtschaftswissenschaftliches Zentrum (WWZ) der Universität Basel

April 2012

Task Allocation and Corporate Performance: Is There a First-Mover Advantage?

WWZ Discussion Paper 2012/07

Michael Beckmann, Kathrin Armbruster, Dieter Kuhn

The Authors:

Prof. Dr. Michael Beckmann
Department of Human Resources and Organization (WWZ)
University of Basel
Peter Merian-Weg 6
CH - 4002 Basel
phone: +41 (0) 61 267 32 24

michael.beckmann@unibas.ch

Kathrin Armbruster, Assistant
Department of Human Resources and Organization (WWZ)
University of Basel
Peter Merian-Weg 6
CH - 4002 Basel
phone: +41 (0) 61 267 27 57

kathrin.armbruster@unibas.ch

Dr. Dieter Kuhn
Formerly: Department of Human Resources and Organization (WWZ)
University of Basel
Peter Merian-Weg 6
CH - 4002 Basel

A publication of the Center of Business and Economics (WWZ), University of Basel.

Contact:
WWZ Forum | Peter Merian-Weg 6 | CH-4002 Basel | forum-wwz@unibas.ch | wwz.unibas.ch

Task Allocation and Corporate Performance: Is There a First-Mover Advantage?

Michael Beckmann*, Kathrin Armbruster†, and Dieter Kuhn‡

Abstract

Although the performance effects of multitasking were analyzed intensively in the past, little is known about the impact of the adoption time of multitasking on corporate performance. Possibly, the quantity of the reorganization is crucial and early movers experience a comparative competitive advantage; but also quality effects could dominate and late adoption is beneficial. The present paper examines the performance effects of the implementation time of teamwork and job rotation using two nationally representative Swiss firm-level datasets. To account for potential endogeneity, two separate two-stage estimation strategies are applied. According to the results, there are slight late-mover disadvantages when implementing teamwork. In contrast, the influence of the adoption of job rotation heavily depends on the observation time, though late adoption is mainly associated with lower performance. These findings indicate that there are both quantity and quality effects, dependent on how established and complex the multitasking instrument is.

JEL Classification: C21 – C24 – D24 – M12
Key Words: Task Allocation – First Mover – Late Adopter – Firm Performance – Switzerland
Acknowledgments: This work was financially supported by the Förderverein of the WWZ. We would like to thank Brigitte Guggisberg and Christine Bracher for their excellent support. The present work uses data from the KOF Organization Survey 2000 and the Innovation Survey 2008. We would like to thank the KOF Swiss Economic Institute of the ETH Zurich for the provision of the data, especially Spyridon Arvanitis and Marius Christian Ley for their generous support. The authors thank the seminar participants at the WWZ doctoral colloquium in May 2011 and at the German Economic Association for Business Administration (GEABA) conference in September 2011 for helpful comments. We are also grateful to George Sheldon, Istvàn Hegedüs, and Patric Diriwächter for helpful comments and discussion. All errors are ours.

*University of Basel, Center of Business and Economics (WWZ), Department for Human Resources and Organization, Peter Merian-Weg 6, CH - 4002 Basel, Switzerland, michael.beckmann@unibas.ch

†University of Basel, Center of Business and Economics (WWZ), Department for Human Resources and Organization, Peter Merian-Weg 6, CH - 4002 Basel, Switzerland, kathrin.armbruster@unibas.ch, corresponding author

‡Formerly: University of Basel, Center of Business and Economics (WWZ), Department for Human Resources and Organization, Peter Merian-Weg 6, CH - 4002 Basel, Switzerland, dieter.kuhn@unibas.ch

1 Introduction

Firstness is always beneficial - this view is usually hold in the context of firms. Due to cultural imprints and personal experiences managers often conclude that being first is generally advantageous. The academic literature, however, does not generally confirm this assumption. In contrast, moving first may also be harmful for firms (Bolton 2007). The present paper examines the assumption of first-mover advantages regarding the adoption of multitasking instruments. Since several decades, firms change its job design from a Tayloristic to a so-called holistic work organization. In this regard, also the allocation of tasks within a firm changes: Instead of task specialization that promotes a stringent separation of qualitatively different tasks between jobs, employees experience multitasking that is associated with an accumulation of heterogeneous tasks within jobs. Human Resource (HR) instruments belonging to this new job design are for example teamwork or job rotation (a systematic change of workplaces). Although the effects of these changes in job design on corporate performance were analyzed intensively in the last years, the impact of the timing of the implementation was neglected so far. Thus, the present paper examines whether the timing of reorganization within the firm towards multitasking influences corporate performance.

Analyzing the impact of the timing of reorganization, one can think of two possible effects. First, firms which have introduced multitasking faster than their competitors could achieve a comparative competitive advantage. According to this, first movers in implementing multitasking are likely to achieve a higher performance than late adopters. Second, one could also argue the contrary. Possibly late adopters, i.e., firms that take more time in reorganizing, experience a comparative performance advantage, because their implementation quality is superior to that of their competitors. Perhaps, a firm's performance has less to do with the time aspect involved in introducing multitasking and much more to do with the qualitative aspects involved.

Previous empirical investigations analyze on the one hand performance effects of multitasking and on the other hand first-mover and late-adopter effects in the context of market entry. Teamwork shows by trend positive effects on fim performance whereas job rotation exhibits no or even negative impact (e.g., Bacon and Blyton 2000, Banker et al. 1996, Chadwick 2007, Vlachos 2008, Zwick 2002). Concerning timing effects of reorganization, Cebon and Love (2002) find a poor performance of late adopters of "Best Practices" in manufacturing firms. Ben-Ner and Lluis (2011) and Jirjahn et al. (2011) find learning effects of codetermination and of adjustments in workplace organization. Investigating the timing of market entry the assumption of the preference of firstness is not confirmed generally. Moving first or late does not have clear positive or negative effects. Previous investigations also have shown that the costs of early adoption, the endogeneity of the choice to adopt, and the temporary nature of timing effects potentially lead to biased results.

However, to the best of the authors' knowledge, no paper has analyzed the performance effects of the adoption time of multitasking so far. This paper intends to fill this gap.

The aim of the present paper is therefore to analyze empirically whether there is a time effect when changing the task allocation. Particularly, it is analyzed whether quantity or quality effects dominate when firms implement multitasking. This research question is analyzed using two nationally representative Swiss firm-level datasets from 2000 and 2008. These surveys contain questions about the adoption time of teamwork and job rotation. According to this information, firms are assigned as first movers, average movers, late adopters, or no adopters at all. Data about productivity and profitability of each firm deliver information about firm performance.

The implementation of multitasking is likely an endogenous decision and firms self-select due to observed and unobserved characteristics. It is for example possible, that especially successful managers, who improve firm performance, also introduce multitasking earlier than their competitors. In this case, the resulting estimates would be biased and the effect of early moving would be overestimated. But it could also be that less successful managers reorganize early to improve. In that case, the estimates would underestimate the true impact of early implementation.

For that reason, the methodological procedure is as follows: At first, an OLS regression is estimated. These estimation results could be biased due to endogeneity. Therefore, in a second part an endogeneity correction introduced by Dubin and McFadden (1984) is implemented in order to account for the self selection of firms towards the implementation time of multitasking. The analysis contains firms with and without multitasking. Finally, an endogenous switching regression model is applied which accounts for the self selection towards the basic decision to use multitasking and which observes only firms that already use multitasking.

The paper proceeds as follows: Chapter 2 describes the theoretical background for the research question. After that, literature related to performance effects of the allocation of tasks as well as to first-mover and late-adopter effects is presented. Chapter 4 shows the empirical investigation with data, variables, descriptive statistics, and the econometric modeling. Afterwards, the results of the empirical analysis are presented. Finally, section 6 concludes.

2 Theoretical Considerations

2.1 Task Allocation and Corporate Performance

For a long time, HR practices were seen as a source of costs to be minimized. In the meantime, these practices shall also contribute to the scope of the firm business (Becker and Gerhart 1996). Multitasking instruments may have positive and negative effects on firm performance. In the following, the positive effects are described. Multitasking enables one a *better use of information* due to a simplified information transfer and decreased adjustment costs. Firms can use the specific local knowledge that employees have compared to management (cf. Levine 1995). As a result, the production process may be organized more effectively or the quality of services and products is improved. Working cooperatively in teams or changing the workplace regularly also yields superior communication channels (Jones and Svejnar 1985). A further information effect arises from the peer pressure which reduces monitoring and supervision costs (Jones and Svejnar 1985, Pfeffer 2005) and enables one the introduction of incentives. Furthermore, management can concentrate on strategic tasks instead of engaging in every-day business (Lazear and Gibbs 2009).

A diverse allocation of tasks *increases motivation* by decreasing boredom and creating a more diversified and interesting workplace. This motivates employees and brings them to show higher effort, by what productivity increases. They show more engagement, have higher job satisfaction, and lower absenteeism and turnover (Kling 1995). Employees having control develop a feeling of ownership for the organization and the job (Pierce et al. 2004). Participation increases the goal acceptance (Renn 1998), leads to a higher impression of perceived justice (Douthitt and Aiello 2001, Roberson et al. 1999), and therefore fosters task performance and satisfaction. Group-goal setting is seen as one possibility to constrain social loafing and finally to increase motivation and performance (Wegge and Haslam 2005).

Multitasking also exhibits a *training effect*. When changing the workplace regularly, the employees experience on-the-job cross-training (Zwick 2002) and can therefore get deployed flexibly. Employees who work in teams learn from each other. This training enables the firm reacting quickly to changes on the supply or demand market which in turn fosters firm performance (Chadwick 2007, Ichniowski and Shaw 1997, MacDuffie 1995).

Multitasking, however, may also have *negative effects on firm performance*. First, the reduced authority of managers and the increased decision power of employees may lead to *suboptimal decisions* because central information is used imperfectly. The need for a broad consensus in the decision process also increases communication costs. Second, employees have *discretionary effort* and potentially behave opportunistically and shirk. Monitoring costs, in turn, which shall prevent inefficient behavior of agents, have also a negative impact on firm performance. Third, a broad allocation of tasks *prevents to exploit increasing returns to scale and interdependencies*, which would decrease production costs. Finally, in general also *labor costs* are higher when multitasking is used (Alchian and Demsetz 1972, Jensen and Meckling 1976, Jones and Svejnar 1985).

2.2 Performance Effects of the Adoption Time

Regarding the effect of the timing of the implementation of reorganization on firm performance, two opposed effects may accrue: The quantity or the quality of the implementation might dominate. Because the effects of the reorganization time of job design were neglected so far, the argumentation is mostly transferred from strategic management research. Although the decision to reorganize is different from entering a market or introducing new products, several of the arguments can be adopted.

2.2.1 Quantity Effects

According to the first hypothesis, first movers in implementing multitasking and decentralization are likely to achieve a comparative performance advantage. This *quantity effect* suggests that first movers experience the highest benefits from reorganization. Lieberman and Montgomery (1988, p. 1) define first-mover advantages as the "ability of pioneering firms to earn positive economic profits."[1] As Addison and Belfield (2001, p. 357) phrase this idea in the context of employee involvement, "establishments that were early to adopt a particular employee involvement scheme may have experienced immediate gains to labor productivity not available to late adopters."

Below, the arguments in favor of a first mover advantage are illustrated. First movers benefit from an *experience or learning curve* and can therefore accumulate superior resources and capabilities faster than their competitors (cf. Ben-Ner and Lluis 2011, Jirjahn et al. 2011, Lieberman and Montgomery 1988, Lieberman and Montgomery 1998). The costs for the use of multitasking decrease with increasing time of usage like unit production costs. The introduction of teamwork and job rotation leads to adjustment costs: Employees need to learn their new tasks, to cooperate in a group, or to meet decisions independently. In addition, managers need to learn giving responsibility to subordinates, leading group sessions, or organizing the systematic change of workplaces. These adjustment processes, amongst others, need time for familiarization and lead finally to a learning curve effect (Lieberman and Montgomery 1988).

Due to this learning curve effect, firms may *accumulate superior resources and capabilities faster* than their competitors (cf. Lieberman and Montgomery 1988, Lieberman and Montgomery 1998). According to the resource-based view, Human Resource Management (HRM) supplies the firm with unique resources which are scarce or can badly be imitated by competitors and which therefore lead to a comparative advantage for the firm (e.g., Pfeffer 1994, Truss 2001). Resources are for example the firm's stock and intangible assets as well as employees' individual

[1] In the case of market entry, Suarez and Lanzolla (2005, p. 2) define a first-mover advantage as "a firm's ability to be better off than its competitors as a result of being first to market in a new product category."

skills; capabilities are the abilities of a firm to undertake a specific type of activity (Lieberman and Montgomery 1998).[2] In the present case, these resources could for example be better specific knowledge or the ability to react quickly to changing markets due to teamwork and job rotation. The faster accumulation of superior resources and capabilities increases firm performance.

Furthermore, *symbolic adoption* and *cultural incongruity* may benefit first movers and harm late adopters. When the early movement of firms is successful, further firms will adopt new job design. In contrast to first movers, these late adopters possibly implement multitasking practices due to institutional pressure. As a consequence, the instruments are adopted only symbolically and inconsistently. Hence, late adopters do not experience the same positive performance effect first movers have but perform poorer (Cebon and Love 2002). Firms that see the opportunity of new job design lately might also have more difficulties to implement these instruments. These sort of firms might not be suitable to a broad allocation of tasks because their culture is incongruent with multitasking. Consequently, late adopters might perform worse than other firms due to cultural incongruity (Cebon and Love 2002).

2.2.2 Quality Effects

On the contrary, there are also several reasons, why the *quality effect* is essential and late adopters of multitasking experience a comparative competitive advantage. Late adopters have a *shorter learning curve* and *less uncertainty* due to free-rider effects. Whether new and innovative HR instruments are performance-enhancing and which conditions are necessary for a successful implementation turns out after several firms adopted them. To wait and to observe experiences of early adopters can therefore be a rational way to save costs of failure (cf. Lieberman and Montgomery 1988). Late adopters may benefit from success and mistakes of the early implementers, so that their learning curve turns out to be much shorter.

On contrast, first adopters face *uncertainty* when implementing new instruments and fail to acquire the needed resources when the development goes on (cf. Lieberman and Montgomery 1998). This effect of resolved uncertainty is enforced by the non-protectable nature of innovative HR instruments. They cannot be secured by patents and can therefore be imitated easily by late adopters (cf. Lieberman and Montgomery 1988).[3] Thus, imitation costs may be smaller than invitation costs (cf. Lieberman and Montgomery 1988).

When multitasking is increasingly used, it is *less attractive for employees.* Thus, first movers loose a unique feature. In contrast, late adopters can employ personnel which are already used

[2] Lieberman and Montgomery (1998, p. 1112) pose the following questions in order to identify the accumulation of better resources and capabilites in strategic management: "First, under what conditions can early entry enhance the firm's accumulation of superior resources and capabilities?" and second, "Do the initial resources and capabilities of a firm affect its optimal (and actual) timing of entry?"

[3] Dutta et al. (1993) model a situation where a first mover enters the market with a low quality product. The later innovator has time to increase the quality and is later able to make higher profits when entering the market.

to innovative work practices and therefore *save adjustment costs.* This argumentation proceeds analogously to that of the free-rider effect in the labor market, where late entrants save screening and training costs (cf. Guasch and Weiss 1980).

Finally, an *incumbent inertia* may lead to an inability to react to changing conditions of first movers and may therefore benefit late adopters (Lieberman and Montgomery 1988). The argument of sunk costs of firms that entered new markets or introduced new products may also apply here: The introduction of holistic job design may cause high costs. These are partly direct costs, for example for the composition of new workplaces or training costs for employees. Partly, these are indirect costs like working time and productivity losses due to familiarization with the new practices. As a consequence, the firms are not willing or not able to return to the previous system even if the new job design is unsuccessful. Before changing the working system again, they want to benefit from their investments (cf. MacMillan 1983, Tang 1988). This effect is intensified by empirical findings, according to which the complete introduction of high performance work systems generates the highest positive impact. Firms are forced to implement an overall change in the job design which results in an even stronger lock-in.[4]

To sum, in the first case, first movers in implementing multitasking are likely to achieve a higher performance than late adopters due to quantity aspects. In the latter case, late adopters, i.e., firms that take more time in reorganizing, experience the comparative performance advantage, because their implementation quality is superior to that of their competitors. In the case that both quantity and quality aspects play a role, average adoption is beneficial for firms. The purpose of the present paper is to analyze which effect turns out to be stronger. In the next chapter, the related literature will be presented.

3 Related Literature

For the best of the authors' knowledge, timing effects of the implementation of multitasking were neglected so far. The presented literature therefore refers on the one hand to performance effects of multitasking and to previous research on timing effects on the other. Because the literature is very comprehensive in both cases, some selected studies are shown.

3.1 Performance Effects of Multitasking

The performance effects of *teamwork* are often analyzed in bundles or participative systems which contain also further high performance work practices. It is mainly found to influence performance positively (e.g., Guthrie 2001, Ichniowski and Shaw 1997, MacDuffie 1995). Some studies analyze the single performance effects of teamwork. Banker et al. (1996) find that the formation of

[4] However, Hannan and Freeman (1984) see this organizational inertia in a positive light, because incumbents are less capable to react to changing conditions outside. This leads to stable organizational structures which could be a factor of success for innovative HRM practices.

work teams increase quality and labor productivity over time. Decentralized teams influence time and flexibility positively (Jayaram et al. 1999). According to Bacon and Blyton (2000), "high road" teamworking has a positive impact on organizational performance like perceived plant competitiveness, customer care, and product quality as well as on HR outcomes. Bailey et al. (2001) find a positive effect of teamwork on earnings of employees in the apparel and steel industry. Working in teams can also lead to higher growth of sales and market share (Vlachos 2008).

Few studies observe the single effect of *job rotation* on corporate performance. Zwick (2002) uses the IAB establishment panel and estimates an extended Cobb-Douglas production function. Job rotation is here seen as a form of continuous training. In order to account for a selectivity bias, unobserved heterogeneity, and the omitted variable bias, an instrumental variables approach is combined with a fixed effects estimation. The results indicate no effect of job rotation on firm productivity in Germany. Chadwick (2007) examines the effects of the intensity of job rotation on establishment performance, expressed by the natural logarithm of value added. He evaluates data from 1212 private sector manufacturing establishments in 1997, surveyed by the U.S. Census Bureau. The author conducts a hierarchical regression analysis by including successively quadratic and cubed regression coefficients of the HR instruments. The results indicate a downward and then upward inflection of the job rotation coefficient.

3.2 Timing Effects

To the best of the authors' knowledge, a study from Cebon and Love (2002) is until now the only one which investigates timing effects of the adoption of internal firm practices. The authors analyze the effect of the adoption time of "Best Practices" like manufacturing-related practices and technologies. They use data from a mail survey conducted by the Australian Manufacturing Council and analyze 838 manufacturing sites in Australia and New Zealand with OLS. The performance variable is an average of six dimensions where respondents are asked to evaluate customer satisfaction, average process change over time, employee morale, productivity, cash flow, and relative technological competitiveness each on a five-item scale. Several variables control for further firm characteristics influencing firm performance. The results indicate that late adopters of "Best Practices" perform poorly. This effect results primarily from the cultural incongruity late adopters have compared to early movers.

Two recent studies analyze learning effects in firms. First, Jirjahn et al. (2011) find a dynamic dimension of codetermination which they assign to learning effects. They analyze data from the IfM Bonn Works Council Survey conducted by the Small and Medium Size Enterprise Research Institute with OLS and Tobit ML. An increase of the age of the works council is associated with a higher quality of industrial relations and better performance. The authors also find evidence for a codetermination life cycle such that the quality of the relationship with management and firm performance decrease after thirty years of codetermination. Second, Ben-Ner and Lluis (2011) investigate adjustments in workplace organization structures using data from 110 publicly traded firms with logit and multinomial estimations. Organizational learning is divided into learning-by-doing (experience), learning about the firms' capabilities (changes in recent financial performance), and social learning (distance of various sources of knowledge and observation of other firms' systems and performance). The authors find that learning-by-doing decreases incentives to switch to more complex systems. Complex, high performance work systems have initial positive performance effects which even out after several years. In contrast, in a less complex but unbalanced system the performance decreases from the start and levels off after several years. Additionally, recent performance improvements increase the likelihood that firms choose a more complex organization structure. Lastly, there is also evidence that social learning increases the probability to switch to a more complex system.

Evidence on timing effects in strategic management research is quite mixed. A summary already in 1988 led to the conclusion, that acting as first-mover has both positive and negative effects. An overall negative effect is conceivable (Lieberman and Montgomery 1988). In view of the present paper, several conclusions can be drawn. First, market share seems to be more influenced by timing than other performance measures due to *higher costs of early adoption*. Results suggest that first entrance comes along with a larger market share (Berger and Dick 2007, Boulding and Christen 2003, Whitten 1979) but leads not necessarily to higher profits (Boulding and Moore 1987, Boulding and Christen 2003). Durand and Coeurderoy (2001) find no evidence for a first mover advantage in terms of organizational performance when entering a market. In a meta-analysis VanderWerf and Mahon (1997) figure out that market share is clearly influenced by moving first in contrast to other performance measures.

Second, the *decision to move is likely endogenous*. The unconsidered heterogeneity between first and later entrants (e.g., Boulding and Christen 2003, Lieberman and Montgomery 1988, Robinson et al. 1992) potentially biases results. Kerin et al. (1992) state that many controllable and uncontrollable factors have eventually an impact on firm performance. They conclude that one has to cast doubt on the self-evident assumption that a first market entry is always positive. For example, customer loyalty can be a source for first-mover advantages (Chen and Xie 2007). VanderWerf and Mahon (1997) find evidence for the effect in only some industries and state that the decision to enter a market is endogenous. Suarez and Lanzolla (2005) note that the likeliness of a first-mover advantage depends on the pace of market and technological evolution. Dependent on the surrounding conditions, different key resources are necessary. According to Golder and Tellis (1993), the failure of first movers is a further potential source for biases. The unsuccessfulness of these firms may also result from unobserved characteristics.

Third, there is evidence for a *temporary nature of first-mover effects*. Lee et al. (2000) find that early and fast movers experience a gain advantage through shareholder wealth effects when entering a market, but this advantage decreases when new product imitations are made.

According to Suarez and Lanzolla (2005), a short-lived or durable first-mover advantage can result, dependent on surrounding conditions.

Fourth, *late-mover effects* were only considered *marginally* in the literature. Shankar et al. (1998) find empirical evidence for a late mover advantage. Luo and Peng (1998) detect first mover advantages in China as a transitional economy and state that late entry is less advantageous than early investment. First entrants with low technological capabilities have no advantages, but instead lower survival rates compared to followers or non-entrants (Franco et al. 2009).

In summary, teamwork shows by trend a positive impact on firm performance whereas job rotation has no or an even negative effect. The only known study investigating timing effects of the adoption of internal firm practices finds evidence for a late adopter disadvantage. For codetermination as well as for adjustments in workplace organization structure there is evidence for learning effects. Empirical results in strategic management research show that one has to cast doubt on the generally assumed advantageousness of firstness: Due to higher costs of early moving predominantly market share is effected, the endogeneity of the implementation decision influences the results, and timing effects may be temporary. Additionally, late-mover effects are mostly neglected. These results cannot be transfered to reorganization, but may serve as a reference point. The lack of investigations of the timing effects of the adoption of multitasking necessitates an empirical investigation. The next chapter contains data, variables, descriptive statistics, and the econometric modeling.

4 Data and Methodology

4.1 Data, Variables, and Descriptive Statistics

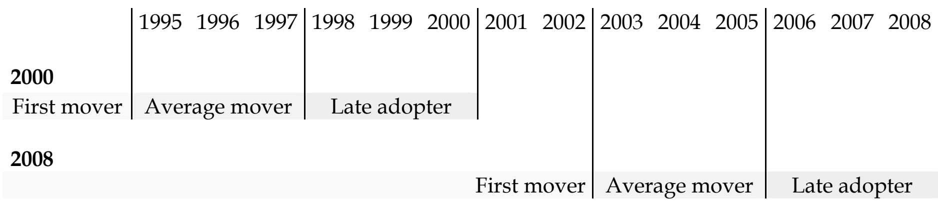
The empirical analysis is based on two nationally representative Swiss datasets from the KOF Swiss Economic Institute (KOF) ("Organizational Change and the Adoption of Information and Communication Technologies" [2000] and "Innovation Activities, Information Technologies, and Work Organization" [2008]). The underlying surveys contain comprehensive questions about firm characteristics and reorganization. The points in time of the surveys are far apart from each other, which enables one to analyze timing effects at different stages of the development of multitasking in Swiss firms. Both samples are based on the Business Register (BR) of the Federal Statistical Office and include manufacturing, construction, and the commercial section of the services sector. They are stratified with respect to sectors and sector-specific variables. For the present purpose, the samples are restricted to firms with at least 20 employees.

Although the observations can be identified according to a firm ID in both datasets, they cannot be merged due to two reasons: First, the surveys are not intended as panel, why the intersection of firms that are present in both points in time is very small. Second, relatively few firms answered the questions related to the implementation time of teamwork and job rotation. So, the number of firms for cross sectional estimation in one year is already relatively small. As a consequence of these limitations, an insufficient number of firms is present in both years and the analyses of the present paper must be restricted to cross sectional models. Panel methods or approaches that use lagged variables do not satisfy the model requirements and would therefore lead to unreliable results.[5]

As dependent variables two performance measures are used: Logs of value added as the share of sales not belonging to purchasing (*lnvaladd*) reflect firm productivity. Additionally, value added is divided by aggregate wages. Taking logs, the profitability measure *lnvaladdwage* results.

The surveys contain information about the implementation time of teamwork and job rotation as key explaining variables. At first, firms specify whether there are permanent teams which handle task areas collectively or discuss topics. After that, they are also asked to specify whether the introduction was before 1995 (in 2008: 2000), between 1996 (2001) and 1998 (2003), or since 1998 (2003). The surveys contain the same questions for the implementation time of job rotation. Using these information, dummy variables for first movers (*team.first* and *jobrot.first*), average movers (*team.avge* and *jobrot.avge*), and late adopters (*team.late* and *jobrot.late*) are built. They take the value 1 if the firm introduced teamwork and job rotation early, averagely, or lately, respectively, 0 otherwise. The reference category are firms that did not introduce teamwork and job rotation yet. Figure 1 clarifies the time structure of these variables.

Abbildung 1: Variables indicating the adoption time of teamwork and job rotation in 2000 and 2008



Source: KOF Organization Survey 2000, KOF Innovation Survey 2008, own calculations.

To measure the performance effects, an augmented Cobb-Douglas production function is estimated. Therefore the equations contain logs of gross investments without sales tax (*lnK*), which reflects

[5] The authors tried to apply such models. As expected, the number of cases decreases clearly when using two periods, which prevents to merge the datasets.

the capital stock. In 2000 no information about investments is available. Therefore an approximation according to Arvanitis (2005) is used, where labor costs are subtracted from value added and the result is divided by value added. Additionally, logs of the number of employees in Switzerland including apprentices (*lnL*) are inserted in all equations (e.g., Arthur 1994, Brynjolfsson and Hitt 1998, Caroli and Van Reenen 2001).

The controls correspond to former studies on performance effects. First, a dummy variable which takes the value 1 if the firm is foreign-controlled, 0 otherwise (*foreign*) controls for ownership (cf. Addison and Belfield 2001). Because a high share of skilled employees is often associated with superior firm performance (e.g., Black and Lynch 2001, Zwick 2002), the share of graduates and employees with a degree higher than apprenticeship as a percentage of the whole employment (*highedu*) is integrated. Furthermore, investments in information and communication technologies and modern technical equipment increase productivity (e.g., Black and Lynch 2001, Zwick 2002). For that purpose the share of total gross investments invested in information and communication technologies (ICT) (*ictshare*) as well as the share of employees that use computers (*compushare*) indicate the importance and development of ICT use in each firm.

Further control variables account for the influence of environmental conditions on firm performance. Export firms, which are in international competition, tend to be more productive (Zwick 2002), why the share of exports as a percentage of sales (*exportshare*) is included. Generally, the degree of competition may influence firm performance (Addison and Belfield 2001). Therefore, a variable from the 2008 survey is taken, which evaluates the degree of price competition on the prime market on a five-point Likert-scale (*compprice*).

Additionally, variables that indicate the use of high performance work practices are integrated. The firms declare the importance of flexible working hours monthly and annually as well as variable annual working time. These answers, each asked on a five-point Likert-scale, are added up and standardized. They indicate the relevance of flexible working (*stdflextime*), which can influence performance positively (Shephard III et al. 1996). Furthermore, a variable controls for incentive compensation (cf. Delaney and Huselid 1996, Zheng et al. 2006). The importance of individual, team, and firm performance for the determination of earnings are each asked on a five-point Likert scale. The answers are added up and standardized (*stdperfwage*). Finally, dummy variables for six regions (*reg1-reg6*) and six sectors (*sec1-sec6*) are inserted into all equations. Due to data availability the controls differ between 2000 and 2008. Table 1 in the appendix contains an overview of all used variables.

In the following, some descriptive statistics are provided. Tables 2 and 3 in the appendix report means, standard errors, minima and maxima of the variables in 2000 and 2008. The final datasets contain 925 firms in 2000 and 936 firms in 2008. Table 1 shows more detailed distributions regarding the key explaining variables. In 2000, about 71% of the firms use teamwork; about 23%

use job rotation. In 2008, the percentage that uses teamwork remains about the same, but the percentage of firms that apply job rotation decreases slightly to 19.3%. This decline could be due to the sample, but it could also indicate that the fashion of job rotation fades away. In 2000, nearly half of all firms had already adopted multitasking. In 2008, about 70% had implemented multitasking before 2003. A minority of firms are average or late adopters both in 2000 and 2008. Hence, the use of multitasking seems to have recrossed the peak already in Switerland. The statistics also show that teamwork is more widely-used than job rotation.

Tabelle 1: Incidence and time of multitasking adoption

Variable	**2000**	**%**	**2008**	**%**	**Time variables**	**2000**	**%**	**2008**	**%**
team = 1	653	70.6	657	70.2					
					team.first = 1	310	47.7	460	70.0
					team.avge = 1	156	24.0	110	16.7
					team.late = 1	187	28.3	87	13.3
jobrot = 1	212	22.9	181	19.3					
					jobrot.first = 1	95	44.8	122	67.4
					jobrot.avge = 1	49	23.1	29	16.0
					jobrot.late = 1	68	32.1	30	16.6
N	925		936						

Note: Calculations are restricted to firms which do not provide item non-response for the regression analyses. *N* indicates the sample size.
Source: KOF Organization Survey and KOF Innovation Survey 2008, own calculations.

Tables 2 and 3 show average characteristics of the outcome variables *lnvaladd* and *lnvaladdwage* separately for first movers, average movers and late adopters compared to non-users in 2000 and 2008. At a first glance, that data show several tendencies: First, in 2000 the outcome variables show generally higher values for users of teamwork compared to non-users, whatever implementation time is regarded. This suggests a performance-enhancing effect of teamwork in 2000. By contrast, first movers and average adopters of job rotation are better but late adopters are worse off than non-users. Second, in 2008 users of teamwork and job rotation always perform better than non-adopters (except profitability of teamwork use, which is equal for non-users and late adopters). These observations call for further investigations, where other firm characteristics are accounted for.

4.2 Performance Effects of the Incidence of Multitasking

To begin with, generally the performance effects of multitasking are estimated using an augmented Cobb-Douglas production function, following earlier studies (e.g., Black and Lynch 2001, Zwick 2002). Additionally to the input factors capital and labor controls that also have an impact on firm performance are included (in 2000: *foreign*, *highedu*, *ictinvest*, *compushare*, *exportshare*, *stdflextime*, *stdperfwage*; in 2008: *foreign*, *highedu*, *ictinvest*, *compushare*, *exportshare*, *compprice*, *stdflextime*; *reg1*-*reg6* and *sec1*-*sec6*). The Cobb-Douglas function is additionally augmented by two dummy

Tabelle 2: Comparison of means for the outcome variables in 2000

Variables	*team = 0*	*team.first = 1*	*team.avge = 1*	*team.late = 1*
lnvaladd	16.02	16.71	16.53	16.43
lnvaladdwage	0.54	0.60	0.58	0.59
Variable	*jobrot = 0*	*jobrot.first = 1*	*jobrot.avge = 1*	*jobrot.late = 1*
lnvaladd	16.38	16.47	16.99	16.37
lnvaladdwage	0.57	0.61	0.64	0.55

Note: Calculations are restricted to firms which do not provide item non-response for the regression analyses. The sample size is $N = 925$.
Source: KOF Organization Survey 2000, own calculations.

Tabelle 3: Comparison of means for the outcome variables in 2008

Variable	*team = 0*	*team.first = 1*	*team.avge = 1*	*team.late = 1*
lnvaladd	16.23	16.97	16.63	16.38
lnvaladdwage	0.53	0.56	0.63	0.53
Variable	*jobrot = 0*	*jobrot.first = 1*	*jobrot.avge = 1*	*jobrot.late = 1*
lnvaladd	16.64	16.79	16.68	16.70
lnvaladdwage	0.55	0.57	0.70	0.60

Note: Calculations are restricted to firms which do not provide item non-response for the regression analyses. The sample size is $N = 936$.
Source: KOF Innovation Survey 2008, own calculations.

variables which take the value 1 if the firm uses teamwork and job rotation, respectively, 0 otherwise (*team* and *jobrot*). This yields the following equation for firms i=1,. . . , N:

$$lnY_i = \beta_0 + \beta_1 lnK_i + \beta_2 lnL_i + \beta_3 team_i + \beta_4 jobrot_i + x_i'\delta + u_i, \tag{1}$$

where lnY_i is the outcome of interest for firm i. x is a vector of controls. *team* and *jobrot* indicate whether teamwork and job rotation are used in firm i. The β and δ are the regression coefficients to be estimated, where β_3 and β_4 are the key parameters of interest. They measure the association of the existence of multitasking with firm performance. The error term u is assumed to be IID with an expected value of zero and variance σ^2.

4.3 Performance Effects of the Adoption Time

4.3.1 OLS Estimation

The estimation strategy for the timing effects proceeds in three steps. First, a production function is augmented by dummy variables which indicate whether the firm is an early mover (*team.first* and *jobrot.first*), an average mover (*team.avge* and *jobrot.avge*), or a late adopter (*team.late* and *jobrot.late*). The reference category refers to firms, which did not introduce multitasking yet. This yields the following OLS regression model for teamwork:

$$lnY_i = \beta_0 + \beta_1 lnK_i + \beta_2 lnL_i + \beta_3 team.first_i + \beta_4 team.avge_i + \beta_5 team.late_i + x_i'\delta + u_i. \quad (2)$$

The x is a vector which contains the same controls as in equation (1). The β and δ are the parameters to be estimated. β_3, β_4, and β_5 are the key parameters of interest indicating the relationship between the implementation time of multitasking and firm performance. The equation for job rotation is analogous to equation (2).

In equation (2), β_3, β_4, and β_5 are likely to be biased effects on firm performance due to endogeneity of the implementation choice.[6] Firms potentially self-select towards the adoption of multitasking dependent on observed and unobserved firm characteristics. In the case that these characteristics simultaneously effect firm performance and the implementation choice, the time variables are no more exogenous, potentially leading to biased results. For example, very successful, high-quality managers could increase firm performance and also have a tendency to introduce advanced work organization practices earlier than others. In this case, a significant positive coefficient of β_3 would possibly overestimate the effect of early implementation on performance. However, it could also be that less successful managers reorganize early because they see an opportunity to improve. In that case, the estimates would underestimate the true effect of early implementation. The same applies for late adoption: Managers that are in general less innovative and therefore less successful, could introduce multitasking later, leading to a negative bias. Yet, firms that adopt a high quality strategy successfully potentially wait with reorganization in order to ensure high quality, which would bias the effect of late adoption upward. The above mentioned examples show that the choice and time of adoption is likely endogenous. One can think of diverse and opposite effects, so that the resulting potential bias cannot be predicted.

4.3.2 Endogeneity Correction for Self Selection towards the Adoption Time

In the second step, this selectivity bias is addressed using an endogeneity correction introduced by Dubin and McFadden (1984). The two-stage procedure works in the following way: In a first step the probability of being a first or an average mover, a late adopter, or no adopter is estimated. Using these estimates the endogeneity in the productivity estimation is considered. For this purpose a new categorical variable is built (*time*) which takes the value 1 if *team.first* = 1, a value of 2 if *team.average* = 1, a value of 3 if *team.late* = 1 and 0, if the firm has not yet introduced teamworking or job rotation, respectively.

[6] In the case of a market entry, the present resources and capabilities a firm already has influence whether and when the firm introduces products. Here, the relative skills are of vital importance. When a firm is relatively capable in product innovation it will enter earlier than a firm which has a comparative advantage in marketing or manufacturing and which waits until the difficulties with technology or market are dealt with (e.g., Lieberman and Montgomery 1988, Moore et al. 1991, Robinson et al. 1992, Thomas 1995, Thomas 1996).

Due to the nature of the resulting time variable, a mulitnomial logit model can be estimated (Cameron and Trivedi 2005, Greene 2008), where

$$\text{Prob}[time_i = j|z_i] = \frac{exp(z_i'\alpha_j)}{\sum_{j=0}^{3} exp(z_i'\alpha_j)}, j = 0, \ldots, 3. \tag{3}$$

The variable $time_i$ is the multinomial dependent variable which takes the values 0 to 3, and the α are the parameters to be estimated. Furthermore, z is a vector of the observable variables which are assumed to explain the firm decision concerning the time of the implementation of teamwork and job rotation. This vector $z = [x\ \tau]$ includes all explaining variables x used in equation (2) as well as an identification variable τ. This variable is used as an exclusion restriction in order to not only draw upon the functional form for identification. It shall be significantly correlated with the classification of the firms concerning the introduction of teamwork and job rotation, but shall not directly influence the outcome variables (Beckmann et al. 2009, Origo and Pagani 2009). In order to identify the multinomial logit model (3), one of the four possible outcomes serves as the reference category, so that this equation is not estimated.

Using the predicted probabilities $\widehat{P}$ gained from the multinomial logit one correction term similar to inverse Mills ratios for each endogenous variable can be computed (Beckmann et al. 2009, Origo and Pagani 2009):

$$c_j = E(\epsilon/time_i = j) = \sum_{j \neq l}^{3} \left(\frac{\widehat{P}_l \ln \widehat{P}_l}{1 - \widehat{P}_l} + \ln \widehat{P}_j \right). \tag{4}$$

Here $\widehat{P}_l$ is the predicted probability of the l-th choice from the first stage multinomial logit model (Beckmann et al. 2009). ϵ is the error term of equation (3). The three correction terms for first movers, average movers, and late adopters are inserted into the production function in equation (2), which then becomes:

$$lnY_i = \beta_0 + \beta_1 lnK_i + \beta_2 lnL_i + \beta_3 team.first_i + \beta_4 team.avge_i + \beta_5 team.late_i + x_i'\delta + c_j'\lambda + u_i. \tag{5}$$

The reference category are firms that do not use multitasking. The β do not have to be significant to show timing effects. Even when the coefficients differ significantly from each other, this indicates that the timing variables have different effects. The correction terms shall control for the possible correlation of the unobservable firm characteristics and performance. If the estimated λ are not statistically significant in equation (5), endogeneity due to time-varying unobserved factors is not a big problem in the present case and the estimation of the linear OLS model leads to unbiased results. However, if the correction terms are significant, endogeneity is a serious problem and the insertion of the correction terms leads to unbiased estimates of the parameters of interest (Beckmann et al. 2009, Origo and Pagani 2009).

4.3.3 Endogeneity Correction for Self Selection Towards Multitasking Use

The endogeneity correction above considers the self selection towards the adoption time. It also determines the performance effects compared to non-users of multitasking. However, firms potentially also self-select generally towards the use of multitasking instruments. Sample selection of the general choice to use or not use multitasking could also bias the true impact of the time of introduction. An estimation approach accounting for this type of self selection is an *endogenous switching regression model*. In this model, different production functions for firms with and without multitasking are estimated, such that the reference group changes (Alene and Manyong 2007, Maddala 1983).

In this model in the first stage the choice of a multitasking adoption is determined using a probit model due to the dichotomous decision to apply multitasking. The firms introduce multitasking only if they assume that the difference between the marginal net benefit of introducing multitasking compared to not introducing is positive. Multitasking is adopted if this difference $m^* \succ 0$. However, the true difference m^* is not observed (Alene and Manyong 2007).

What can be seen instead is the observed adoption decision of the firms with respect to the other observed firm characteristics m. Therefore

$$\begin{aligned} m^* &= z'\upsilon + \epsilon_c \\ m = 1 &\quad \text{if } m^* > 0, \\ m = 0 &\quad \text{if } m^* \leq 0, \end{aligned} \tag{6}$$

where z is a vector of firm characteristics, which contains the same control variables as the previous estimations (firm characteristics and an exclusion restriction). υ is a vector of the parameters to be estimated and ϵ_c is a random error term which is expected to have mean zero and variance σ_c^2 (Alene and Manyong 2007).

As mentioned above, the endogenous switching regression model uses separate production functions for firms with and without multitasking:

$$lnY_m = x_m'\beta_m + \epsilon_m \quad \text{if } m = 1, \tag{7}$$

$$lnY_s = x_s'\beta_s + \epsilon_s \quad \text{if } m = 0.$$

lnY_m is productivity of multitasking firms and lnY_s is productivity of firms that do not adopt multitasking (singletasking firms). Because only lnY_m and lnY_s are actually observed, the OLS estimates might be biased if the error terms of equation (7) have non-zero expected values conditional on the sample selection criterion (Lee 1978, Maddala 1983).

Furthermore, it is assumed that the error terms ϵ_c, ϵ_m, and ϵ_s are jointly normal distributed. Under the assumption that $\sigma_c^2 = 1$ the vector z can be clearly defined (Wolf and Zwick 2002).

Based on these assumptions, the expected values of the truncated error terms $(\epsilon_m|m = 1)$ and $(\epsilon_s|m = 0)$ can be computed (Alene and Manyong 2007, Wolf und Zwick 2002):

$$E(\epsilon_m|m = 1) = E(\epsilon_m|\epsilon > z'\upsilon) = \sigma_{mc}\left(-\frac{\phi(z'\upsilon)}{\Phi(z'\upsilon)}\right) \equiv \sigma_{mc}\lambda_m, \tag{8}$$

$$E(\epsilon_s|m = 0) = E(\epsilon_s|\epsilon \leq z'\upsilon) = \sigma_{sc}\left(\frac{\phi(z'\upsilon)}{1-\Phi(z'\upsilon)}\right) \equiv \sigma_{sc}\lambda_s. \tag{9}$$

In equations (8) and (9) ϕ and Φ are the probability density and cumulative distribution functions of the standard normal distribution; σ_{mc} is the covariance of ϵ_m and ϵ_c; and σ_{sc} is the covariance of ϵ_s and ϵ_c. The λ are the inverse Mills ratios (Alene and Manyong 2007).

Estimating in a first stage a probit model of the criterion equation (6) and in the second stage the regression equations (7) leads to heteroscedastic residuals (Maddala 1983). In order to gain efficient estimates, a full information maximum likelihood (FIML) method proposed by Lokshin and Sajaia (2004) is applied. It simultaneously estimates the selection and the regression equations and therefore yields consistent standard errors (Alene and Manyong 2007). The estimation is carried out by the *movestay* command in STATA (Lokshin and Sajaia 2004).[7]

The inverse Mills ratios can now be inserted in a performance equation which contains only firms that use multitasking. Early and late adoption are the key explaining variables and average moving is the reference group:

$$lnY_{mi} = \beta_0 + \beta_1 lnK_i + \beta_2 lnL_i + \beta_3 team.first_{mi} + \beta_4 team.late_{mi} + x'_{mi}\delta + \sigma_{mc}\lambda_{mi} + u_{mi}. \tag{10}$$

The $_m$ indicates that only adopters of multitasking are in the equation. λ_{mi} is the inverse Mills ratio for users of multitasking. A significant coefficient of λ_{mi} would indicate that endogeneity due to the self selection towards multitasking use is a serious problem in the present case.

5 Empirical Results

This section contains the empirical results. To start with, the results of the performance estimation of the existence of multitasking are shown. Continuing to the main research question of the paper, the separate effects of first and average movers and of late adopters are investigated using OLS estimations as well as two approaches to account for endogeneity. Each analysis is carried out using a productivity (*lnvaladd*) and a profitability measure (*lnvaladdwage*) as dependent variables.

[7] The *movestay* command to estimate the full information maximum likelihood model is used e.g., in the studies from Alene and Manyong (2007), Lokshin and Beegle (2006), Ohnemus (2007), and Wahlberg (2008).

5.1 Performance Effects of the Incidence of Multitasking

The performance effects of the presence of multitasking are estimated with a usual OLS regression. This allows one to get a first impression of the general impact of teamwork and job rotation. Table 4 contains the performance effects of the incidence of teamwork and job rotation. The coefficient for the use of teamwork is not significant in any of the models. In contrast, job rotation shows a significant positive effect on profitability in 2008. There is no productivity effect of job rotation.

Tabelle 4: Performance estimates for the incidence of teamwork and job rotation

Estimation method: OLS	2000		2008	
Dependent variable	Value added	Profitability	Value added	Profitability
	C1	C2	C3	C4
team	0.019	0.008	-0.001	0.014
	(0.029)	(0.019)	(0.035)	(0.026)
jobrot	-0.022	-0.009	0.074	0.055*
	(0.027)	(0.019)	(0.049)	(0.030)
lnK	0.312***	0.317**	0.083***	0.041***
	(0.090)	(0.126)	(0.019)	(0.012)
lnL	1.019***	0.005	0.899***	-0.042**
	(0.014)	(0.010)	(0.023)	(0.019)
Controls				
foreign	0.064	0.025	0.220***	0.105***
	(0.040)	(0.028)	(0.046)	(0.035)
highedu	0.005***	0.002**	0.005***	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
ictinvest	-0.036**	-0.035**	0.001	-0.001
	(0.015)	(0.014)	(0.001)	(0.001)
compushare	0.088***	0.012	0.064***	0.034***
	(0.015)	(0.011)	(0.016)	(0.011)
exportshare	0.001	0.000	0.001**	0.001**
	(0.000)	(0.000)	(0.001)	(0.000)
compprice			-0.003	0.004
			(0.015)	(0.012)
stdflextime	-0.012	-0.008		
	(0.012)	(0.009)		
stdperfwage	0.016	0.013	-0.040*	-0.012
	(0.015)	(0.012)	(0.023)	(0.014)
Regions & sectors	yes	yes	yes	yes
F test	336.32***	11.80***	284.76***	6.36***
R^2	0.907	0.294	0.840	0.154
N	925		936	

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. N indicates the sample size.
Source: KOF Organization Survey 2000 and KOF Innovation Survey 2008, own calculations.

Capital is significantly positive in all equations. Additionally, foreign ownership and the exportshare are significant positive in 2008. The share of highly educated employees and the share of employees that use computers partly have also significant positive impact. Most variables that have significant impact on productivity have a clearly lower, no, or an even negative effect on profitability. This finding is obvious, since the profitability measure includes negative wage effects. For example, it seems rational that a larger share of well educated employees is accompanied by a higher wage level in a firm. Moreover, ICT investments show a significant negative effect in 2000 on both performance measures. At that time, ICT potentially generated higher costs but caused little benefits. Surprisingly, the indicator for performance pay has a negative impact on productivity in 2008. This might possibly be seen as an indication for the motivation crowding out (e.g., Frey and Jegen 2001).

The results for the incidence of teamwork contradict most previous studies which find mainly positive effects on firm performance (e.g., Banker et al. 1996, Vlachos 2008). The result for job rotation is in line with Zwick (2002) who finds no effect of job rotation on value added. In contrast, Chadwick (2007) examines no respectively a negative effect of job rotation on value added minus labor costs. The next section considers the effects of the adoption time of team work and job rotation.

5.2 Performance Effects of the Adoption Time

In the following part, the effects of the adoption time are analyzed. After estimating OLS, in the second stage the endogeneity correction according to Dubin and McFadden (1984) is applied. In a third step, an endogenous switching regression model is estimated. Tables 4 to 6 in the appendix contain the complete regression results for OLS, the approach of Dubin and McFadden (1984), and the endogenous switching regression model exemplarily for profitability and job rotation in 2008. Also the multinomial logit estimates for the correction according to Dubin and McFadden (1984) and the full information maximum likelihood estimates for the endogenous switching regression model are shown there.[8]

In the present case, it is difficult to find an adequate exclusion restriction for the endogeneity correction methods. Since the likelihood function using the full information maximum likelihood model does not converge if relying on identification through nonlinearities, however, it is necessary to find an identifying variable. A closer examination of the data shows that teamwork and job rotation are highly correlated with each other. Estimating the determinants of teamwork and job rotation, the respective other multitasking instrument is always significant on the 1%-level. This is not surprising since firms often use bundles of high performance work practices, which also include teamwork and job rotation (cf. e.g., MacDuffie 1995). Therefore, the respective other multitasking instrument is used to identify the other one. Since, in the case of no valid exclusion restriction, the models shall be identified by non-linearities (cf. Lokshin and Sajaia 2004, Origo and Pagani 2009), the choice of the identifying instrument is not seen as essential for the analyses.

[8] The other complete regression equations are similar and therefore not shown here. They are available from the authors upon request.

Teamwork and job rotation are successful in identifying the respective other multitasking instrument. Applying the endogeneity correction according to Dubin and McFadden (1984), the exclusion restrictions are highly significant in all multinomial logit estimations.[9] When estimating the full information maximum likelihood model teamwork and job rotation work well too as identifying instruments and are mainly significant.[10]

Tables 5 and 6 include the results where one of the performance measures *lnvaladd* or *lnvaladdwage* is regressed on the adoption time of teamwork and job rotation, respectively. The first column contains OLS estimates, the second and third ones contain estimates that correct for endogeneity. The regressions include the controls that were presented above.

As Table 5 shows, the late implementation of teamwork does have a significant negative effect on value added in 2008 applying the approach according to Dubin and McFadden (1984). Furthermore, using the endogenous switching regression model, first and late adoption are harmful for profitability in 2008. Additonally, in 2008 the coefficients of first and late adoption of teamwork for the determination of value added are significantly different from each other applying OLS and the method proposed by Dubin and McFadden (1984) (see columns C11 and C12 at the bottom). Since first implementation of teamwork has a positive and late implementation has a negative sign, moving first has a rather positive and moving late has a rather negative effect on value added.

Table 6 contains the effects of the implementation time of job rotation. In 2000, late implementation of job rotation influences profitability negatively when estimating OLS, the approach according to Dubin and McFadden (1984) and the endogenous switching regression model (see columns C20 to C22). Additionally, the coefficients of average and late, first and late (OLS) and first and late (D-McF) adoption of job rotation are significantly different from each other. In 2008, average adoption of job rotation has a significant positive effect on productivity and profitability when estimating OLS (see columns C23 and C26). When applying the method proposed by Dubin and McFadden (1984) this variable is only significant when determining profitability. Additionally, the differences between the positive coefficients for average and the negative coefficient for late implementation of job rotation for productivity are significant when estimating OLS and the method proposed by Dubin and McFadden (1984).

[9] The test statistic for the exclusion restriction *jobrot* is in C6 and C9: $\chi^2_{(3)} = 13.60$, p-value=.004; and in C12 and C15: $\chi^2_{(3)} = 21.37$, p-value=.000. The test statistic for the exclusion restriction *team* is in C18 and C21: $\chi^2_{(3)} = 11.24$, p-value=.011; and in C24 and C27: $\chi^2_{(3)} = 18.34$, p-value=.000.

[10] Job rotation is significant in C7 with p-value=.023 and in C13 and C16 with p-value=.000. The variable is not significant in C10 with p-value=.270. Teamwork is significant in C19 with p-value=.023 and in C25 with p-value=.000. The variable is not significant in C22 with p-value=.417 and in C28 with p-value=.830

Tabelle 5: Estimates for teamwork

	2000						2008					
Dependent variable	Value added			Profitability			Value added			Profitability		
Estimation method	**OLS** C5	**D-McF** C6	**ESRM** C7	**OLS** C8	**D-McF** C9	**ESRM** C10	**OLS** C11	**D-McF** C12	**ESRM** C13	**OLS** C14	**D-McF** C15	**ESRM** C16
Coefficients												
team.first	0.028	0.031	0.003	0.012	0.013	-0.007	0.023	0.006	0.055	0.001	-0.005	-0.080*
	(0.032)	(0.033)	(0.033)	(0.022)	(0.023)	(0.014)	(0.040)	(0.038)	(0.087)	(0.030)	(0.030)	(0.047)
team.avge	0.041	0.044		0.021	0.021		-0.076	-0.087		0.046	0.046	
	(0.036)	(0.037)		(0.026)	(0.027)		(0.085)	(0.084)		(0.044)	(0.044)	
team.late	0.021	0.025	0.005	-0.002	0.003	0.003	-0.072	-0.088*	-0.030	-0.037	-0.044	-0.111**
	(0.037)	(0.038)	(0.038)	(0.025)	(0.026)	(0.017)	(0.052)	(0.053)	(0.098)	(0.039)	(0.039)	(0.055)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Correction terms												
E(ϵ/ $Time$ = first)		-0.070			-0.364			-0.209			-0.176	
		(0.301)			(0.263)			(0.207)			(0.150)	
E(ϵ/ $Time$ = avge)		0.121			0.890			-0.445			-0.365	
		(0.738)			(0.572)			(0.345)			(0.653)	
E(ϵ/ $Time$ = late)		-0.071			-0.572			0.743			0.540	
		(0.432)			(0.398)			(0.553)			(0.406)	
Joint significance of E		0.27			1.08			1.43			2.06	
		(0.845)			(0.359)			(0.232)			(0.105)	
Inverse Mills ratio			0.652**			4.814***			-0.423*			-0.224
			(0.309)			(0.411)			(0.240)			(0.155)
F test/Wald test	323.94***	323.40***	279.22***	11.41***	10.92***	74.63***	272.92***	242.73***	191.09***	6.04***	5.64***	4.14***
R^2	0.907	0.907	0.923	0.464	0.469	0.852	0.840	0.841	0.812	0.153	0.158	0.139
N	925	925	653	925	925	653	936	936	657	936	936	657
Tests for equality of coefficients												
test [*team.first* = *team.avge*]	0.13	0.13		0.12	0.09		1.34	1.20		1.13	1.45	
test [*team.avge* = *team.late*]	0.25	0.24		0.62	0.39		0.00	0.00		2.78*	3.22*	
test [*team.first* = *team.late*]	0.04	0.04	0.01	0.31	0.16	0.40	3.28*	3.23*	2.37	1.05	1.09	0.69

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. N indicates the sample size. The lower part of the table contains tests for the equality of the coefficients. The values represent the F statistics.
Source: KOF Organization Survey and KOF Innovation Survey 2008, own calculations.

Tabelle 6: Estimates for job rotation

	2000						2008					
Dependent variable	Value added			Profitability			Value added			Profitability		
Estimation method	**OLS** C17	**D-McF** C18	**ESRM** C19	**OLS** C20	**D-McF** C21	**ESRM** C22	**OLS** C23	**D-McF** C24	**ESRM** C25	**OLS** C26	**D-McF** C27	**ESRM** C28
Coefficients												
jobrot.first	-0.024	-0.029	0.019	0.006	0.002	-0.036	0.073	0.061	-0.241**	0.034	0.030	-0.151**
	(0.042)	(0.042)	(0.059)	(0.025)	(0.025)	(0.025)	(0.060)	(0.053)	(0.116)	(0.034)	(0.035)	(0.067)
jobrot.avge	-0.013	-0.041		0.039	0.003		0.172*	0.168		0.131**	0.125*	
	(0.050)	(0.047)		(0.049)	(0.047)		(0.102)	(0.103)		(0.067)	(0.066)	
jobrot.late	-0.028	-0.026	0.006	-0.063***	-0.057**	-0.046**	-0.058	-0.085	-0.283**	0.053	0.038	-0.182**
	(0.040)	(0.041)	(0.057)	(0.022)	(0.023)	(0.023)	(0.089)	(0.088)	(0.134)	(0.069)	(0.068)	(0.085)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Correction terms												
E(ϵ/$Time$ = first)		-0.022			-0.049			-0.220			-0.287	
		(0.137)			(0.126)			(0.323)			(0.232)	
E(ϵ/$Time$ = avge)		0.241			0.353			-0.361**			-0.179*	
		(0.408)			(0.391)			(0.179)			(0.098)	
E(ϵ/$Time$ = late)		-0.278			-0.379			0.267			0.364	
		(0.239)			(0.241)			(0.407)			(0.292)	
Joint significance of E		0.94			1.51			1.43			1.25	
		(0.423)			(0.210)			(0.234)			(0.289)	
Inverse Mills ratio			0.287			6.309***			-0.386			-3.006
			(0.385)			(0.800)			(0.289)			(2.053)
F test/Wald test	324.93***	215.81***	109.03***	11.16***	12.67***	46.99***	270.33***	242.89***	111.00***	6.12***	5.57***	2.85***
R^2	0.907	0.869	0.948	0.466	0.474	0.883	0.840	0.842	0.854	0.155	0.159	0.364
N	925	925	212	925	925	212	936	936	181	936	936	181
Tests for equality of coefficients												
test [*jobrot.first* = *jobrot.avge*]	0.03	0.04		0.37	0.00		0.79	0.95		1.81	1.77	
test [*jobrot.avge* = *jobrot.late*]	0.07	0.06		3.79*	1.40		3.07*	3.65*		0.70	0.92	
test [*jobrot.first* = *jobrot.late*]	0.01	0.00	0.06	5.02**	3.49*	0.24	1.66	2.09	0.14	0.07	0.01	0.20

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. N indicates the sample size. The lower part of the table contains tests for the equality of the coefficients. The values represent the F statistics.
Source: KOF Organization Survey and KOF Innovation Survey 2008, own calculations.

When restricting the analysis to firms that already use job rotation and accounting for endogeneity towards the use of job rotation, early and late adoption are highly significant negative compared to average adoption (see columns C25 and C28).

Finally, the importance of endogeneity in the empirical analyses is examined. All in all, there is mixed evidence for the existence of endogeneity in the present case. Applying the endogeneity correction introduced by Dubin and McFadden (1984), none of the correction terms are jointly significant. In case of the endogenous switching regression model, the Wald test of independent equations in the full maximum likelihood estimates indicates whether the decision to adopt teamwork and job rotation is endogenous. Accordingly, there is evidence for a selection bias in C7 ($\chi^2_{(3)} = 106.50$, p-value=.000) and C19 ($\chi^2_{(3)} = 122.08$, p-value=.000). Additionally, the inverse Mills ratios in the separate production functions in C7, C10, C13, and C22 are statistically significant. In 2000, for teamwork with productivity and profitability as well as for job rotation with profitability these inverse Mills ratios are significant positive, which indicates, that rather firms that perform worse choose multitasking. In contrast, the inverse Mills ratio in the equation for teamwork and productivity is significant negative in 2008. In that case, firms that already perform well more likely choose teamwork.

According to the indication of endogeneity in the case of the endogenous switching regression model, C7, C10, C13, C19, and C22 are the preferred estimations. In the case that no endogeneity is indicated, OLS is the preferred specification. This is the case in C14, C23, and C26. Potentially there is relatively few evidence for endogeneity because the multitasking variables are lagged and therefore relatively far away in the past. Possibly OLS is a suitable estimation method in the present case.

Since the results using the full information maximum likelihood method have a different reference group than results gained with OLS and the approach according to Dubin and McFadden (1984) (average adopters versus no adopters), additionally OLS regressions are estimated that contain only firms that use multitasking. Now the reference category are average adopters. The results are summarized in Table 7.[11]

In 2000, only the coefficient for late adoption of job rotation on profitability is significant negative. In 2008, the coefficients between first and late adoption of teamwork determining productivity differ from each other. Furthermore, late adopters of teamwork perform worse in terms of profitability. Additionally, first and late adopters of job rotation have significant negative effects on productivity and profitability. These results are equivalent to the estimates gained with the full information maximum likelihood model.

[11] The complete results are available from the authors upon request.

Thus, there is some evidence for the importance of endogeneity due to self selection towards multitasking use, but it does not lead to strongly differing results compared to OLS.

Tabelle 7: Time effects restricted to firms that use teamwork and job rotation

Estimation method		2000 OLS	2008 OLS
Value added	*team.first*	n.s.	n.s.[a]
	team.late	n.s.	n.s.
Profitability	*team.first*	n.s.	n.s.
	team.late	n.s.	neg.**
Value added	*jobrot.first*	n.s.	neg.*
	jobrot.late	n.s.	neg.*
Profitability	*jobrot.first*	n.s.	neg.**
	jobrot.late	neg.**	neg.*

Note: ***/**/* indicates significance at the 1/5/10%-level. The standard errors are robust. n.s. indicates that the coefficient is not significant. neg. indicates that the coefficient is negative and significant.
[a] Difference between *team.first* and *team.late* is significant with p-value = .094.
Source: KOF Organization Survey and KOF Innovation Survey 2008, own calculations.

Taking into account the indicators for endogeneity, the results in Tables 5, 6, and 7 can be summarized as follows: The implementation time of teamwork does not have significant impact on firm performance in 2000. In 2008, however, first adopters perform rather good and late adopters perform rather bad with regard to productivity. Additionally, the profitability differs between average and late adopters of teamwork. Thus, first and average movers experience a comparative advantage and late movers perform slightly worse due to quantity effects. In 2008, teamwork is already well-established in Swiss firms and new users have disadvantages. It seems that quantity is crucial for a beneficial adoption of teamwork.

In contrast, the implementation time of job rotation has noticeable effects on firm performance. In 2000, late adoption influences profitability negatively. It yields ceteris paribus a negative profitability differential of -6.3% and -4.6%, respectively. This indicates that job rotation comes along with higher wages in 2000. In 2008, average adoption is beneficial compared to all firms. It leads to a positive differential of 17.2% for productivity and 13.1% for profitability. Restricting the analysis to firms that use job rotation, early as well as late adoption of job rotation is harmful for firms. Early and late adoption involve ceteris paribus negative productivity differentials of 21.1% and 25.2%; profitability is decreased by 13.6% and 15.9%.[12] From this it follows that both quality and quantity effects apply when adopting job rotation. Finally, the use of job rotation includes higher wages and late adoption is worse.

[12]The performance effects stem from the OLS regression restricted to users of job rotation in 2008 in Table 7.

The performance effects of job rotation are unusually high. As Table 1 shows, relatively few firms use job rotation. For example, in 2008 only 29 firms are average movers and 30 are late adopters. Thus, there is possibly not enough variation in the data to ensure reliable results. Therefore, one has to cast doubt on these unexpected high performance effects of job rotation.

Three robustness checks are performed. First, the analyses are repeated taking the importance of individual, team, and firm performance for the determination of earnings as exclusion restriction for the endogeneity correction methods. The results are qualitatively the same, with the exception that teamwork shows significant first-mover advantages regarding productivity in 2000. The descriptive statistics support this finding (see Table 2). Therefore, it is assumed that the results of the present paper are a rather cautious estimate of the effects of teamwork adoption. Furthermore, logs of sales and logs of (sales over wages) are taken as additional performance measures. Some of the standard errors are higher, but the results do not differ significantly. Thus, the findings of the present paper do not crucially depend on the choice of the exclusion restriction and the performance measures.

According to the results, there seems to be a late adopter disadvantage as Cebon and Love (2002) find for Best Practices. Furthermore, the positive effect of average and the negative one of late implementation of job rotation in 2008 suggest the evidence of life cycles which is in line with the findings of Jirjahn et al. (2011) and Ben-Ner and Lluis (2011). Ben-Ner and Lluis (2011) also found initial positive effects of complex high performance work practices which even out over time. This finding is to some extent confirmed by the fact that job rotation is a rather complex HR instrument and shows the clearest negative impact of late adoption.

Limitations of the study partly arise from the data characteristics. All in all, the number of observations is relatively small, especially when it comes to the estimation of separate production functions. Single firms could then largely drive the results. Furthermore, the data do not provide information about whether the multitasking instruments were only implemented in some areas or all over the firm. A further drawback is the relatively late determination of timing effects in 2000 and 2008, since reorganization towards holistic job design is under way for several decades. Analyzing timing effects further ago would make sense, but is, however, not possible due to lack of data. Additionally, due to the data structure the findings mainly show temporary effects, especially when observing average and late adoption. The data only allow drawing conclusions regarding short term effects, because average and late adoption were at most five and two years ago, respectively. Long term effects could be analyzed when combining information about adoption in 2000 with performance in 2008, which is not possible due to few overlapping of the datasets. It is, however, questionable whether the implementation of multitasking leads to performance effects that are determinable after years or even decades. Finally, one could argue, that reverse causality is a further source of endogeneity in the data. This is, however, rather unlikely, because the questions regarding the adoption time are related to earlier points in time and therefore include a time lag.

6 Conclusion

The present paper investigates the performance effects of the timing of the adoption of multitasking using nationally representative Swiss corporate data from 2000 and 2008. Particularly it is analyzed whether the quantity or the quality effects are stronger when a firm implements teamwork and job rotation. Information about the time of the adoption of teamwork and job rotation enable classifying firms as early or average movers or late adopters of multitasking, respectively. To account for potential endogeneity due to the self-selection of firms two separate two-step estimation strategies are applied. The results suggest that there is endogeneity due to the general self selection of firms towards multitasking use.

The results can be summarized as follows: Teamwork shows a slightly positive first-mover and negative late-adopter effect both on productivity and profitability. An explanation for the only small effects might be that teamwork is so well-established in firms that it does not generate significant comparative advantages anymore. This is supported by the fact, that in 2000 already about 70% of all asked Swiss firms used teamwork.

In contrast, in 2000 late implementation of job rotation influences profitability negatively, but has no significant effect on productivity. This indicates, that the use of job rotation involves higher wages. In the year 2008, average implementation of job rotation is beneficial both in terms of productivity and profitability. When considering only users of job rotation, early and late introduction of job rotation is harmful for firms. Thus, both quantity and quality effects appear when implementing job rotation.

In general, the clearest evidence is found when observing only users of multitasking. In that case, late and partly also early adoption is harmful compared to average adoption. All other effects are rather small. According to that, less the general decision to implement multitasking and more the implementation time is important.

Possibly, the effects of teamwork and job rotation differ due to its varying complexity: The adoption of teamwork is rather easy, why an early implementation is favorable and a quantity effect applies. Contrary, job rotation is less widely used and its implementation is more complex why quantity as well as quality effects play a role. All in all, there seems to be a life cycle for the performance effects of the implementation of teamwork as well as for job rotation due to learning effects.

The data do not allow investigating potential complementarities between teamwork and job rotation due to a small number of cases. Furthermore, the results reflect only short-term effects of multitasking adoption.

It would be interesting to see if first-mover and late-adopter firms experience performance effects in the long run.

Overall, the results of the present paper show that firms indeed may benefit or suffer from the chosen time of multitasking adoption. Dependent on complexity and establishment of the instrument, mainly quantity or quality of the adoption or both influence corporate performance. Late adoption of multitasking instruments tends to have negative effects on firm performance. Firms should therefore analyze potential HR instruments and choose the corresponding adoption time. All in all, this confirms the previous academic literature, which also does not find a consistent first mover or late adopter effect.

References

Addison, J. T. & Belfield, C. R. (2001): Updating the Determinants of Firm Performance: Estimation using the 1998 UK Workplace Employee Relations Survey. British Journal of Industrial Relations, 39 No. 3, 341-366.

Alchian, A. A. & Demsetz, H. (1972): Production, Information Costs, and Economic Organization. American Economic Review, 62 No. 5, 777-795.

Alene, A. D. & Manyong, V. M. (2007): The effects of education on agricultural productivity under traditional and improved technology in northern Nigeria: an endogenous switching regression analysis. Empirical Economics, 32 No. 1, 141-159.

Arthur, Jeffrey B. (1994): Effects of Human Resource Systems on Manufacturing Performance and Turnover. Academy of Management Journal, 37 No. 3, 670-687.

Arvanitis, S. (2005): Modes of labor flexibility at firm level: Are there any implications for performance and innovation? Evidence for the Swiss economy. Industrial and Corporate Change, 14 No. 6, 993-1016.

Bacon, N. & Blyton, P. (2000): High road and low road teamworking: Perceptions of management rationales and organizational and human resource outcomes. Human Relations, 53 No. 11, 1425-1458.

Bailey, T., Berg, P. & Sandy, C. (2001): The Effect of High-Performance Work Practices on Employee Earnings in the Steel, Apparel, and Medical Electronics and Imaging Industries. Industrial & Labor Relations Review, 54 No. 2, 525-543.

Banker, R. D., Field, J. M., Schroeder, R. G. & Sinha, K. K. (1996): Impact of Work Teams on Manufacturing Performance: A Longitudinal Field Study. The Academy of Management Journal, 39 No. 4, 867-890.

Becker, B. & Gerhart, B. (1996): The Impact of Human Resource Management on Organizational Performance: Progress and Prospects. Academy of Management Journal, 39 No. 4, 779-801.

Beckmann, M., Cornelissen, T. & Schauenberg, B. (2009): Fixed-term employment, work organization and job satisfaction: Evidence from German individual-level data. WWZ Discussion Paper 08/09, Basel.

Ben-Ner, A. & Lluis, S. (2011): Learning: What and How? An Empirical Study of Adjustments in Workplace Organization Structure. Industrial Relations, 50 No. 1, 76-108.

Berger, A. N. & Dick, A. A. (2007): Entry into Banking Markets and the Early-Mover Advantage. Journal of Money, Credit and Banking, 39 No. 4, 775-807.

Black, S. E. & Lynch, L. M. (2001): How to compete: The Impact of Workplace Practices and Information Technology on Productivity. Review of Economics & Statistics, 83 No. 3, 434-445.

Bolton, L. E. (2007): Believing in first mover advantage. Working Paper, Wharton School, University of Pennsylvenia.

Boulding, W. & Christen, M. (2003): Sustainable Pioneering Advantage? Profit Implications of Market Entry Order. Marketing Science, 22 No. 3, 371-392.

Boulding, W. & Moore, M. J. (1987): Pioneering and profitability: structural estimates from a nonlinear simultaneous equations model with endogenous pioneering. Research Paper, Fuqua School of Business, Duke University.

Brynjolfsson, E. & Hitt, L. M. (1998): Information technology and organizational design: evidence from micro data. MIT Working Paper. Massachusetts Insitute of Technology, Cambridge (MA).

Cameron, A. C. & Trivedi, P. K. (2005): Microeconometrics: Methods and Applications. Cambridge (NY): Cambridge University Press.

Caroli, E. & Van Reenen, J. (2001): Skill-biased Organizational Change? Evidence from a Panel of British and French Establishments. Quarterly Journal of Economics, 116 No. 4, 1449-1492.

Cebon, P. & Love, E. G. (2002): Why do late adopters perform poorly: Symbolic adoption, or cultural incongruity? Academy of Management Proceedings & Membership Directory, 11- 16, New York.

Chadwick, C. (2007): Examining non-linear Relationships between Human Resource Practices and Manufacturing Performance. Industrial & Labor Relations Review, 60 No. 4, 499-521.

Chen, Y. & Xie, J. (2007): Cross-Market Network Effect with Asymmetric Customer Loyalty: Implications for Competitive Advantage. Marketing Science, 26 No. 1, 52-66.

Delaney, J. T. & Huselid, M. A. (1996): The Impact of Human Resource Management Practices on Perceptions of Organizational Performance. Academy of Management Journal, 39 No. 4, 949-969.

Douthitt, E. A. & Aiello, J. R. (2001): The Role of Participation and Control in the Effects of Computer Monitoring on Fairness Perceptions, Task Satisfaction, and Performance. Journal of Applied Psychology, 86 No. 5, 867-874.

Dubin, J. A. & McFadden, D. L. (1984): An Econometric Analysis of Residential Electric Appliance Holdings and Consumption. Econometrica, 52 No. 2, 345-362.

Durand, R. & Coeurderoy, R. (2001): Age, order of entry, strategic orientation, and organizational performance. Journal of Business Venturing, 16 No. 5, 471-494.

Dutta, P. K., Lach, S. & Rustichini, A. (1993): Better Late Than Early: Vertical Differentiation in the Adoption of a New Technology. National Bureau of Economic Research Working Paper Series No. 4473, Cambridge (MA).

Franco, A. M., Sarkar, M. B., Agarwal, R. & Echambadi, R. (2009): Swift and Smart: The Moderating Effects of Technological Capabilities on the Market Pioneering–Firm Survival Relationship. Management Science, 55 No. 11, 1842-1860.

Frey, B. S. & Jegen, R. (2001): Motivation Crowding Theory. Journal of Economic Surveys, 15 No. 5, 589-611.

Golder, P. N. & Tellis, G. J. (1993): Pioneer Advantage: Marketing Logic or Marketing Legend? Journal of Marketing Research, 30 No. 2, 158-170.

Greene, W. H. (2008): Econometric Analysis. 7th edition. Upper Saddle River (N.J.): Prentice Hall.

Guasch, J. L. & Weiss, A. (1980): Adverse Selection by Markets and the Advantage of Being Late. Quarterly Journal of Economics, 94 No. 3, 453-466.

Guthrie, J. P. (2001): High-Involvement Work Practices, Turnover, and Productivity: Evidence from New Zealand. Academy of Management Journal, 44 No. 1, 180-190.

Hannan, M. T. & Freeman, J. (1984): Structural Inertia and Organizational Change. American Sociological Review, 49 No. 2, 149-164.

Ichniowski, C. & Shaw, K. (1997): The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines. American Economic Review, 87 No. 3, 291-313.

Jayaram, J., Droge, C. & Vickery, S. K. (1999): The impact of human resource management practices on manufacturing performance. Journal of Operations Management, 18 No. 1, 1- 20.

Jensen, M. C. & Meckling, W. H. (1976): Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3 No. 4, 305-360.

Jirjahn, U., Mohrenweiser, J. & Backes-Gellner, U. (2011): Works Councils and Learning: On the Dynamic Dimension of Codetermination. Kyklos, 64 No. 3, 427-447.

Jones, D. C. & Svejnar, J. (1985): Participation, Profit Sharing, Worker Ownership and Efficiency in Italian Producer Cooperatives. Economica, 52 No. 208, 449-465.

Kerin, R. A., Varadarajan, P. R. & Peterson, R. A. (1992): First-Mover Advantage: A Synthesis, Conceptual Framework, and Research Propositions. The Journal of Marketing, 56 No. 4, 33–52.

Kling, J. (1995): High performance work systems and firm performance. Monthly Labor Review, 118 No. 5, 29-36.

Lazear, E. P., & Gibbs, M. (2009). Personnel Economics in Practice. 2nd edition. New York et al.: Wiley.

Lee, H., Smith, K. G., Grimm, C. M. & Schomburg, A. (2000): Timing, order and durability of new product advantages with imitation. Strategic Management Journal, 21 No. 1, 23-30.

Lee, L.-F. (1978): Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables. International Economic Review, 19 No. 2, 415-433.

Levine, D. I. (1995): Reinventing the workplace: how business and employees can both win. Washington (DC): Brookings Institution Press.

Lieberman, M. B. & Montgomery, D. B. (1988): First-Mover Advantages. Strategic Management Journal, 9, Special Issue: Strategy Content Research, 41-58.

Lieberman, M. B. & Montgomery, D. B. (1998): First-mover (dis)advantages: Retrospective and link with the resource-based view. Strategic Management Journal, 19 No. 12, 1111-1125.

Lokshin, M. & Beegle, K. (2006): Forgone Earnings From Smoking: Evidence For A Developing Country. World Bank Publications, Washington (DC).

Lokshin, M. & Sajaia, Z. (2004): Maximum likelihood estimation of endogenous switching regression models. Stata Journal, 4 No. 3, 282-289.

Luo, Y. & Peng, M. W. (1998): First mover advantages in investing in transitional economies. Thunderbird International Business Review, 40 No. 2, 141-163.

MacDuffie, J. P. (1995): Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry. Industrial & Labor Relations Review, 48 No. 2, 197-221.

MacMillan, I. C. (1983): Preemptive Strategies. Journal of Business Strategy, 4 No. 2, 16-26.

Maddala, G. S. (1983): Limited-Dependent and Qualitative Variables in Econometrics. Cambridge (UK): Cambridge University Press.

Moore, M. J., Boulding, W. & Goodstein, R. C. (1991): Pioneering and Market Share: Is Entry Time Endogenous and Does It Matter? Journal of Marketing Research, 28 No. 1, 97-104.

Ohnemus, J. (2007): Does IT Outsourcing Increase Firm Success? An Empirical Assessment using Firm-Level Data. ZEW Discussion Paper No. 07-087, Mannheim.

Origo, F. & Pagani, L. (2009): Flexicurity and job satisfaction in Europe: The importance of perceived and actual job stability for well-being at work. Labour Economics, 16 No. 5, 547-555.

Pfeffer, J. (1994): Competitive advantage through people: unleashing the power of the work force. Boston: Harvard Business Press.

Pfeffer, J. (2005): Producing sustainable competitive advantage through the effective management of people. Academy of Management Executive, 19 No. 4, 95-106.

Pierce, J. L., O'Driscoll, M. P. & Coghlan, A.-M. (2004): Work Environment Structure and Psychological Ownership: The Mediating Effects of Control. Journal of Social Psychology, 144 No. 5, 507-534.

Renn, R. W. (1998): Participation's Effect on Task Performance: Mediating Roles of Goal Acceptance and Procedural Justice. Journal of Business Research, 41 No. 2, 115-125.

Roberson, Q. M., Moye, N. A. &Locke, E. A. (1999): Identifying a Missing Between Participation and Satisfaction: The Mediating Role of Procedural Justice Perceptions. Journal of Applied Psychology, 84 No. 4, 585-593.

Robinson, W. T., Fornell, C. & Sullivan, M. (1992): Are Market Pioneers Intrinsically Stronger Than Later Entrants? Strategic Management Journal, 13 No. 8, 609-624.

Shankar, V., Carpenter, G. S. & Krishnamurthi, L. (1998): Late Mover Advantage: How Innovative Late Entrants Outsell Pioneers. Journal of Marketing Research, 35 No. 1, 54-70.

Shephard III, E. M., Clifton, T. J. & Kruse, D. (1996): Flexible Work Hours and Productivity: Some Evidence from the Pharmaceutical Industry. Industrial Relations, 35 No. 1, 123-139.

Suarez, F. & Lanzolla, G. (2005): The half-truth of first-mover advantage. Harvard Business Review, 83 No. 4, 121-127.

Tang, M.-J. (1988): An economic perspective on escalating commitment. Strategic Management Journal, 9 No. S1, 79-92.

Thomas, L. A. (1995): Brand Capital and Incumbent Firms' Positions in Evolving Markets. The Review of Economics and Statistics, 77 No. 3, 522-534.

Thomas, L. A. (1996): Brand Capital and Entry Order. Journal of Economics & Management Strategy, 5 No. 1, 107-129.

Truss, C. (2001): Complexities and Controversies in Linking HRM with Organizational Outcomes. Journal of Management Studies, 38 No. 8, 1121-1149.

VanderWerf, P. A. & Mahon, J. F. (1997): Meta-Analysis of the Impact of Research Methods on Findings of First-Mover Advantage. Management Science, 43 No. 11, 1510-1519.

Vlachos, I. (2008): The effect of human resource practices on organizational performance: evidence from Greece. International Journal of Human Resource Management, 19 No. 1, 74-97.

Wahlberg, R. (2008): The Part-Time Penalty for Natives and Immigrants. Working Papers in Economics No 314, School of Business, Economics and Law, University of Gothenburg.

Wegge, J. & Haslam, S. A. (2005): Improving work motivation and performance in brainstorming groups: The effects of three group goal-setting strategies. European Journal of Work & Organizational Psychology, 14 No. 4, 400-430.

Whitten, I. T. (1979): Brand performance in the cigarette industry and the advantage to early entry, 1913-74. Washington (DC): Federal Trade Commission, Bureau of Economics.

Wolf, E. & Zwick, T. (2002): Produktivitätswirkung von Mitarbeiterbeteiligung: Der Einfluss von unbeobachtbarer Heterogenität. Mitteilungen aus der Arbeitsmarkt- und Berufsforschung 35, 123-132.

Zheng, C., Morrison, M. & O'Neill, G. (2006): An empirical study of high performance HRM practices in Chinese SMEs. International Journal of Human Resource Management, 17 No. 10, 1772-1803.

Zwick, T. (2002): Continuous Training and Firm Productivity in Germany. ZEW Discussion Paper No. 02-50, Mannheim.

Appendix

Tabelle 1: Description of the variables

Variable	**Description**
Incidence and implementation time of multitasking	
Teamwork (*team*)	Dummy variable indicating whether or not a firm uses teamwork
Job rotation (*jobrot*)	Dummy variable indicating whether or not a firm uses job rotation
First mover (*team.first*/*jobrot.first*)	Dummy variable indicating whether or not a firm introduced teamwork/job rotation before 1995/2003
Average mover (*team.avge*/*jobrot.avge*)	Dummy variable indicating whether or not a firm introduced teamwork/job rotation between 1995/2003 and 1997/2005
Late adopter (*team.late*/*jobrot.late*)	Dummy variable indicating whether or not a firm introduced teamwork/job rotation between 1998/2006 and 2000/2008
Outcome variables	
Productivity (*lnvaladd*)	Logs of value added in 1999/2007
Profitability (*lnvaladdwage*)	Logs of (value added over wages) in 1999/2007
Firm characteristics and environment	
Log capital (*lnK*)	Natural logarithm of a firm's gross investments in 2007 in 2008 and (Value added - labor costs)/value added in 2000
Log labor (*lnL*)	Natural logarithm of a firm's number of employees in 1998/2007
Foreign-controlled (*foreign*)	Dummy variable indicating whether or not a firm is foreign-controlled
Highly educated employees (*highedu*)	Share of employees who have an education higher than apprenticeship or are graduates
ICT investments (*ictinvest*)	Variable indicating investments in ICT as share of total sales 1998−2000/2006−2008
Computer use (*compushare*)	Variable indicating the share of computers users
Exportshare (*exportshare*)	Share of exports on sales in 1999/2007
Competition (*compprice*)	Variable indicating the degree of price competition on the prime market[a]
Importance of flexible working hours (*stdflextime*)	Variable indicating the importance of flexible working hours[b]
Importance of performance for wage determination (*stdperfwage*)	Dummy variable indicating the importance of individual, team, and firm performance for wage dedetermination
Regional dummies (*reg1*-*reg7*)	Seven dummies indicating the regional affiliation of the firm
Sector dummies (*sec1*-*sec7*)	Seven dummies indicating the sector affiliation of the firm

Note: [a] Variable only used in 2008. [b] Variable only used in 2000.
Source: KOF Organization Survey and KOF Innovation Survey 2008, own calculations.

Tabelle 2: Descriptive statistics in 2000

Variable	Mean	Std.Dev.	Min	Max
lnvaladd	16.42	1.22	13.77	2.10
lnvaladdwage	0.58	0.40	0.00	3.42
team	0.71	0.45	0	1
team.first	0.33	0.47	0	1
team.avge	0.17	0.38	0	1
team.late	0.20	0.40	0	1
jobrot	0.23	0.42	0	1
jobrot.first	0.10	0.30	0	1
jobrot.avge	0.05	0.22	0	1
jobrot.late	0.07	0.25	0	1
lnK	-1.04	0.77	-16.61	-0.03
lnL	4.59	1.04	3.00	10.68
foreign	0.15	0.36	0	1
highedu	16.56	16.50	0.00	100
ictinvest	1.93	1.10	0	5
compushare	2.64	1.41	0	5
exportshare	23.86	33.84	0.00	100
stdflextime	0.00	1.00	-1.40	2.28
stdperfwage	0.00	1.00	-3.22	1.95

Note: Calculations are restricted to firms which do not provide item non-response for the regression analyses. The sample size is $N = 925$.
Source: KOF Organization Survey 2000, own calculations.

Tabelle 3: Descriptive statistics in 2008

Variable	Mean	Std.Dev.	Min	Max
lnvaladd	16.66	1.33	11.42	22.76
lnvaladdwage	0.56	0.39	0.00	4.01
team	0.70	0.46	0	1
team.first	0.49	0.50	0	1
team.avge	0.12	0.32	0	1
team.late	0.09	0.29	0	1
jobrot	0.19	0.40	0	1
jobrot.first	0.13	0.33	0	1
jobrot.avge	0.03	0.17	0	1
jobrot.late	0.03	0.17	0	1
lnK	13.74	1.81	3.22	20.28
lnL	4.72	1.14	3.04	10.55
foreign	0.20	0.40	0	1
highedu	21.63	18.84	0.00	100
ictinvest	19.12	21.83	0.00	100
compushare	3.04	1.50	0	5
exportshare	26.76	35.24	0.00	100
compprice	3.90	0.98	1	5
stdperfwage	0.00	1.00	-3.25	1.96

Note: Calculations are restricted to firms which do not provide item non-response for the regression analyses. The sample size is $N = 936$.
Source: KOF Innovation Survey 2008, own calculations.

Tabelle 4: Complete estimates for profitability and job rotation (2008)

Dependent variable: ***lnvaladdwage***			
Estimation method	**OLS**	**D-McF**	**ESRM**
jobrot.first	0.034	0.030	-0.151**
	(0.034)	(0.035)	(0.067)
jobrot.avge	0.131**	0.125*	
	(0.067)	(0.066)	
jobrot.late	0.053	0.038	-0.182**
	(0.069)	(0.068)	(0.085)
lnK	0.042***	-0.014	-0.196
	(0.012)	(0.061)	(0.166)
lnL	-0.042**	-0.037	0.169
	(0.019)	(0.069)	(0.142)
foreign	0.102***	-0.612	0.446
	(0.036)	(0.708)	(0.306)
highedu	-0.001	0.030	0.002
	(0.001)	(0.023)	(0.004)
ictinvest	-0.001	-0.031	-0.007**
	(0.001)	(0.024)	(0.004)
compushare	0.034 ***	0.199	0.266
	(0.011)	(0.152)	(0.175)
exportshare	0.001**	-0.001	0.005***
	(0.000)	(0.002)	(0.002)
compprice	0.004	0.110	0.046
	(0.012)	(0.077)	(0.047)
stdperfwage	-0.011	0.335	-0.242
	(0.014)	(0.257)	(0.172)
constant	0.146	8.403	5.472
	(0.133)	(10.432)	(3.531)
Regions and sectors	yes	yes	yes
Correction terms			
$E(\epsilon / Time = \text{first})$		-0.287	
		0.232	
$E(\epsilon / Time = \text{avge})$		-0.179*	
		0.098	
$E(\epsilon / Time = \text{late})$		0.364	
		0.292	
Inverse Mills ratio			-3.006
			(2.053)
F test/Wald test	6.12***	5.57***	2.85***
R^2	0.155	0.159	0.364
N	936	936	181

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. N indicates the sample size. The coefficients of the sector and regional dummies are available from the authors upon request.
Source: KOF Innovation Survey 2008, own calculations.

Tabelle 5: Multinomial logit estimates for profitability and job rotation (2008)

	Time of implementation (reference group: no job rotation)		
	jobrot.first	*jobrot.avge*	*jobrot.late*
team	1.237***	0.168	1.041*
	(0.310)	(0.490)	(0.614)
lnK	0.139	0.106	0.205
	(0.109)	(0.175)	(0.156)
lnL	-0.085	-0.274	-0.200
	(0.171)	(0.305)	(0.217)
foreign	-0.592**	0.632*	0.474
	(0.297)	(0.375)	(0.489)
highedu	0.003	0.006	-0.021
	(0.007)	(0.012)	(0.014)
ictinvest	-0.007	0.001	0.021**
	(0.007)	(0.013)	(0.009)
compushare	-0.035	-0.108	-0.224
	(0.097)	(0.187)	(0.150)
exportshare	-0.002	0.003	0.002
	(0.004)	(0.006)	(0.007)
comppprice	0.056	0.065	-0.021
	(0.112)	(0.230)	(0.207)
stdperfwage	0.280**	0.170	-0.013
	(0.113)	(0.208)	(0.220)
constant	-3.737***	-17.471***	-19.125***
	(1.376)	(1.880)	(2.083)
Regions and sectors	yes	yes	yes
Pseudo R^2		0.103	
N		936	

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. N indicates the sample size. The coefficients of the sector and regional dummies are available from the authors upon request.
Source: KOF Innovation Survey 2008, own calculations.

Tabelle 6: Full information maximum likelihood estimation of the endogenous switching regression model for profitability and job rotation (2008)

	Time of implementation (reference group: no job rotation)		
	lnvaladdwage		
	without job rotation	with job rotation	selection
team			0.022
			0.100
lnK	0.027*	0.042**	0.104**
	(0.015)	(0.019)	(0.046)
lnL	-0.048**	-0.022	-0.081
	(0.023)	(0.032)	(0.064)
foreign	0.124***	0.021	-0.193
	(0.043)	(0.079)	(0.132)
highedu	-0.001	-0.003	-0.002
	(0.001)	(0.002)	(0.004)
ictinvest	-0.001	-0.002	0.003
	(0.001)	(0.002)	(0.002)
compushare	0.040***	0.013	-0.113***
	(0.014)	(0.023)	(0.035)
exportshare	$3*10^{-5}$	0.003***	-0.001
	(0.001)	(0.001)	(0.002)
comppprice	$4*10^{-4}$	-0.007	-0.025
	(0.015)	(0.024)	(0.040)
stdperfwage	-0.037**	0.010	0.113*
	(0.018)	(0.027)	(0.061)
constant	0.195	0.142	-1.265***
	(0.170)	(0.429)	(0.487)
Regions and sectors	yes	yes	yes
Wald test of indep. eqns.		0.11	
Wald test		107.89***	
N		936	

Note: ***/**/* indicates significance at the 1/5/10%-level. The values in parentheses represent the robust standard errors of the coefficients. *N* indicates the sample size. The coefficients of the sector and regional dummies are available from the authors upon request.
Source: KOF Innovation Survey 2008, own calculations.