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Scale effects in workplace innovations

Are the prevalence and effects of workplace innovation related to firm size?

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Summary

Workplace innovation can be defined as the implementation of new and combined interventions in work organisation, HRM and supportive technologies, and strategies to improve performance of organisations and quality of jobs. Previous research confirms the presence of a positive relationship between workplace innovation and firm performance. Within this study we are interested in the scale effects in workplace innovation. Does firm size moderate the relationship between workplace innovation and organisational performance?

Within this research workplace innovation is measured through four different factors: strategic orientation, flexible work, smart organising and product-market improvement. These four factors of workplace innovation reflect two dimensions: an external and an internal dimension. Strategic orientation and product-market improvement focus on external conditions and developments, whilst in contrast, smart organising and flexible work focus more on internal organisational issues. We argue that the direction of the scale effects may differ between these two dimensions. This is captured by the following two hypotheses:

H1: The effect of internal and more HRM focused types of workplace innovation (smart organising and flexible work) on firm performance is moderated by firm size, with increasing returns to scale.

H2: The effect of external and more market orientated types of workplace innovation (product-market improvement and strategic orientation) on firm performance is moderated by firm size, with decreasing returns to scale.

To test these hypotheses, we use a sample of 1,125 profit and non-profit organisations. Our database consists of variables from The Netherlands Employers Work Survey (NEWS) gathered in 2010 and administrative data collected by Statistics Netherlands (CBS) for the years 2010 and 2011. Organisational performance is operationalized as labour productivity growth and employment growth. Firms are categorised into four size classes: micro firms (≤9 employees), small and medium firms (10-≤249 employees) and large firms (≥250 employees).

Our hypotheses have been tested by estimating several regression equations (using OLS). It turns out that none of our hypotheses can be confirmed. Even though there are indications that firm size might moderate the effect of flexible work on labour productivity, we have to conclude that the data do not support our hypothesis regarding the presence of scale effect in workplace innovation. There is some support for the presence of positive effects of workplace innovation, but this support is only indirect and cannot differentiate between the four different factors of workplace innovation under investigation.

1 Introduction

Background

Innovation is about renewal of something that already exists or the introduction of something completely new. Technical developments are very important for the innovation process. This applies particularly for the development of something completely new. However, especially in later innovation phases, non-technical innovation can also be of great importance. Changes within the organisation can be important for fruitful implementation of inventions. Moreover, a good marketing strategy is meaningful for successful diffusion of new services and products (De Kok, 2012). During the past years more and more attention is given to workplace innovation (The Advisory Council for Science and Technology Policy, 2014). Workplace innovation is important because of its positive effect on social- and economic developments and on labour market, which is now being widely acknowledged among European policymakers (Totterdill, 2012). The European Commission has made workplace innovation a priority and launched the European Workplace Innovation Network (EUWIN) in 2013. EUWIN aims at raising awareness about workplace innovation and its benefits.[1] In the Netherlands, workplace innovation is also known as social innovation and has been supported for over a decade by the Structural Funds[2]. Since workplace innovation is important for economic growth, research regarding this topic is very meaningful for the implementation of successful policy measures.

Objective and research questions

The business community is very heterogeneous and the prevalence and added value of workplace innovation could therefore vary between different types of enterprises. An important enterprise characteristic in this respect is the scale of the operations (firm size). Difference in the behaviour and performance of enterprises is often related to scale effects and this may also apply to the prevalence and effectiveness of workplace innovation. The prevalence of scale effects has been studied before (Oeij, Klein Hesselink and Dhondt, 2012), and the main findings of this study are presented in Chapter 2. We continue this line of research and look into scale effects in effectiveness.

Within this study we are interested in scale effects in workplace innovation. Our research question is whether firm size moderates the relationship between workplace innovation and organisational performance. If scale effects exist, policy measures aimed at stimulating workplace innovation should differentiate between size classes.

Scale effects in workplace innovation have seldom been examined empirically. However enough arguments can be made that scale effect may be present. We expect that types of workplace innovation that are more HRM orientated and more focussed on the internal side of organising are more beneficial for large firms. Whereas, we expect that types of workplace innovation that are more market orientated and more focussed on the external side of organising are more beneficial for the smallest firms.

Structure

Following this introduction we first discuss the concept and several definitions of workplace innovation, and why workplace innovation is expected to affect organisational performance. In particular, we discuss theoretical rationales for the presence of scale effects. This results in a research framework with the hypotheses under investigation. Next, the research methodology is described. The results are presented in Chapter 4 followed by the last chapter with the discussion and conclusions.

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1 http://ec.europa.eu/enterprise/policies/innovation/policy/workplace-innovation.

2 Structural funds are financial tools for the implementation of the regional policy of the European Union.

2 Workplace innovation

2.1 Defining workplace innovation

Different labels and definitions

A number of interchangeable labels are used for non-technical innovations, such as "organisational innovation" (Hage, 1999; Lam, 2004), "workplace innovation" (Totterdill, 2010; Pot, 2011; Dortmund/Berlin Position Paper, 2012) and "social innovation in the workplace" (EU DG Enterprise and Industry, 2012; Eeckelaert, Dhondt and Oeij., 2012; Pot, Dhondt and Oeij, 2012). In this article we will use the label workplace innovation.

Several definitions have been used for workplace innovation. For example, the Dutch Centre for Social Innovation ("Nederlands Centrum voor Sociale Innovatie" or NCSI) defines social innovation (i.e. workplace innovation) as renewal in the organisation of work and labour relations leading to improved performance of the organisation and development of talents (The Definition diagram of the Dutch Centre for Social Innovation/ "De Definitiekaart van het Nederlands Centrum voor Sociale Innovatie", 2009). Pot (2011) defines workplace innovation as "the implementation of new and combined interventions in the field of work organisations, human resource management and supportive technologies." He considers workplace innovation to be complementary to technological innovation. This definition is very similar to the one used by EU DG Enterprise and Industry. In the Netherlands Employers Work Survey (NEWS) of 2010, workplace innovation is defined as the strategy to implement interventions in the field of organising and organisational behaviour and is seen as a capability of the organisation itself (Oeij, Klein Hesselink and Dhondt, 2012). Recently, an international seminar on workplace innovation resulted in the following definition: "a social, participatory process which shapes work and working life, combining their human, organisational and technological dimensions. The participatory process simultaneously results in improved organisational performance and enhanced quality of working life" (Dortmund/Brussels Position Paper on workplace innovation, 2012).

Workplace innovation is multidimensional

The various definitions of workplace innovation already suggest that it is a very broad concept that is difficult to measure on a single scale. Empirical studies and initiatives to measure or monitor workplace innovations explicitly recognise the multidimensional nature of workplace innovations, by distinguishing different dimensions. According to Volberda, Jansen, Tempelaar and Heij (2011) workplace innovation composes four dimensions:

1. **Dynamic management**: the development of new management skills.
2. **Flexible organising**: making use of flexible organisational principles
3. **Smart working and development of talent**: the realisation of high quality forms of employment.
4. **Co-creation** through external collaboration.

By using workplace innovation in management, organising and employment, enterprises can improve competitiveness and productivity and can make better use of their technological knowledge to improve firm performance.

The Netherlands Employers Work Survey (NEWS) of 2010 also distinguished four factors of workplace innovation (Oeij et al., 2012):

1. **Strategic orientation**. In order to be innovative organisations need to react to developments in their environment. For example client and competitor behaviour, new technological developments and legalisation and regulation. This requires bringing in new knowledge from outside the organisation, networking and cooperation with external partners.
2. **Smart organising** concerns the ability to come up with new combinations of organising, staff deployment and technical applications with a focus on renewal or improvement of the work processes.
3. **Flexible work** on the one hand refers to flexibilisation of work through increasing the employability of the staff, facilitating flexible working time and/or contracts and self-scheduling. On the other hand it refers to tailor made employment relations with attention to individual arrangement on working time, work performance, personal development and flexible work.
4. **Product-market improvement** concerns innovation by searching for new markets and clients, and the improvement of products and services.

These four factors of workplace innovation reflect two dimensions. Strategic orientation and product-market improvement focus on external conditions and developments, whilst in contrast, smart organising and flexible work focus more on internal organisational issues. In other words, strategic orientation and product-market improvement are more market orientated and smart organising and flexible work are more Human Resource Management orientated (Oeij et al., 2012).

2.2 Theoretical framework: how workplace innovation should work

The NEWS-definition of workplace innovation is related to the resource-based view of the firm (Wernerfelt, 1984; Barney 1991). The resource-based view (RBV) argues that firms possess unique and valuable resources, which enable them to achieve a high performance. The RBV acknowledges the heterogeneity that exists within the business community and relates this primarily to the heterogeneity of the resources that are available for individual enterprises. RBV has its origin in economics and is translated to other scientific disciplines, including management and organisational science.

Two related theories, which are relevant for workplace innovation, are the theory of "dynamic capabilities" (DC) and "high performance work systems" (HPWS). DC emphasizes the strategic and external aspects of organising, whereas HPWS focuses more on organisational embedding (Oeij, Kraan and Vaas, 2010). DC is more about economical strategic management and relates to the market orientated types of workplace innovation (strategic orientation and product-market improvement). In contrast, HPWS relates to the Human Resource Management focused types of workplace innovation (smart organising and flexible work).

Dynamic capabilities

The premise of the RBV is that organisations gain competitive advantage, besides sales of competitive products and services, through exploiting scarce internal resources in a unique way. Adding value for costumers may be obtained, for example, through a unique way of managing, organising and knowledge and competence development. However, the possession of resources alone is not enough. This brings us to the strategic theory of "dynamic capabilities" (Teece, Pisano and Shuen, 1997; Eisenhardt and Martin, 2000). Teece et al. (1997) defined dynamic capability as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." In order to perform, organisations should react to their rapidly changing environment.

High Performance Work Systems

In contrast the "high performance work systems" (HPWS) theory is focused on the internal side of organising. HPWS argues that a specific set of Human Resource Management practices enables employees to exercise decision making, leading to flexibility, innovation, improvement and skill sharing which will lead to high competitive performance. HPWS can be seen as an offshoot of RVB, because such a "HR-bundle" is a unique set of human resource practices which can lead to a competitive advantage for enterprises. The emphasis here is on the effect of such work systems on various aspects of firm performance and practices, such as retaining good employees and investing in employees. The result of the studies on HPWS and performance indicate advantages from effectively managing human resources (De Kok and Den Hartog, 2006; Oeij, Kraan and Vaas, 2010).

Scale effects: RBV versus nimbleness view

Irrespective of the exact definition, workplace innovation is about improving the organisation of the work process and human resource management. It is a stylized fact that the organisation of work processes and human resource management are strongly related to the size of the firm. Given that small and large firms are organised and managed in different ways, it seems plausible to assume that the effects of changes in their way of organising and managing may also differ. Theoretically speaking, two types of scale effects can be distinguished (Gelles & Mitchell, 1996):

- *Increasing returns to scale*: occurs if the positive effect of workplace innovation increases with firm size.
- *Decreasing returns to scale*: occurs if the positive effect of workplace innovation decreases with firm size.

These scale effects primarily refer to moderating effects of firm size on effectiveness. Indirectly, these scale effects may also affect prevalence of workplace innovation. It stands to reason that prevalence of certain practices will be higher when effects are higher. Hence, in the case of increasing (decreasing) returns to scale, prevalence may be higher amongst larger (smaller) firms.

We know of no prior empirical studies that examine whether firm size moderates the effect of workplace innovation on performance indicators of enterprises. However, a few studies are available that discuss the possibility of scale effects in the context of workplace innovation.

Authors using the RBV perspective have argued that larger firms are likely to have more slack human resources, and consequently, have the advantages of greater management capacity. This capacity can be used to enhance growth (Penrose, 1959; Barringer and Jones, 2004).

In contrast, other authors have argued that, smaller firms are less burdened by bureaucracy and therefore can react more quickly. Furthermore, in smaller firms, the CEO will have more influence on his or her staff, directly and indirectly via internal procedures and practices, which allow a firm to react more quickly. This is referred to as the nimbleness view (Miller and Toulouse, 1986).

These are two examples of studies which confirm that the effects of organisation of work processes and human resource management is related to firm size. However, whether increasing or decreasing returns to scale applies depends on the type of measure taken by the organisation.

2.3 Empirical findings regarding the prevalence of workplace innovation

Oeij et al. (2012) compared the prevalence of workplace innovation for different firm sizes using data from the NEWS 2010. Testing the differences in prevalence for firms with 10 or more employees (between firms with 10-49, 50-99 and 100 employees) and for firms with more than 2 employees (between firms with 2-4, 5-9, 10-49 and 50-99 employees) indicated significant differences between firms size classes for all

four factors of workplace innovation. Table 2.1 presents the differences in prevalence of workplace innovation between size classes in 2010. Differences are presented in terms of size classes' mean score on the four workplace innovation scales and with regard to the percentage of firms that can be categorized as workplace innovative firms.

table 2.1 Workplace innovation by firm size (NEWS 2010)

	2-4	*5-9*	*10-49*	*50-99*	*100+*	*Total*	*Sign. 10+*	*Sign. 2+*
Mean score								
• **Workplace innovation total**	**3,37**	**3,40**	**3,41**	**3,44**	**3,44**	**3,39**	*	*
• strategic orientation	3,53	3,59	3,62	3,67	3,66	3,57	*	*
• flexible work	3,10	3,10	3,02	3,01	3,07	3,08	**	**
• smart organising	3,09	3,18	3,26	3,34	3,37	3,16	*	**
• product-market improvement	3,75	3,74	3,76	3,74	3,67	3,75	*	
Percentage of workplace innovative firms								
• **Workplace innovation total**	**11,9%**	**8,3%**	**9,8%**	**7,2%**	**7,7%**	**10,4%**		**
• strategic orientation	34,3%	40,3%	39,1%	43,1%	40,0%	37,0%		**
• flexible work	12,6%	9,2%	5,4%	3,9%	4,0%	9,9%		**
• smart organising	19,6%	22,5%	26,2%	29,2%	30,6%	22,2%	**	**
• product-market improvement	58,1%	60,3%	59,4%	58,4%	53,4%	58,8%		

** = p<0.05, ** = p<0.01*
Scores are on a scale from 1 to 5
Source: Oeij, Klein Hesselink and Dhondt, 2012

For product-market improvement only small differences between size classes were found. The mean scores and percentages of the four smallest size classes (2-4, 5-9,10-49 and 50-99 employees) are very similar. However large firms (100 or more employees) have lower mean score and percentage of high achievers for product-market improvement. This indicates that large firms are least likely to implement product-market improvements. The mean score for strategic orientation and smart organising increases with firm size. Likewise, the percentage of firms that can be categorized as workplace innovative firms with regard to strategic orientation and smart organising increases with firm size. In contrast, larger firms are on average less innovative in terms of flexible work and the percentage of firms that can be characterised as working flexible decreases with firm size. This indicates that smaller workplace innovative firms are workplace innovative through flexibilisation whereas large workplace innovative firms are workplace innovative through smart organising and strategic orientation.

2.4 Empirical evidence regarding the effects of workplace innovation

General effects

Several studies demonstrate the positive effects of workplace innovation on firm performance. Workplace innovation helps technological and economic innovations to take effect. Previous investigation on investments in organisational change show that these "intangible" investments influence up to some ten percent of the economic growth in the past decade (Corrado, Hulten and Sichel, 2005). The results of the Erasmus Competition and Innovation Monitor (2009) indicate that technological innovation by means of R&D and ICT investments is responsible for only 25% of innovation success, whereas workplace innovation determines 75% of innovation success (Volberda, Jansen, Tempelaar and Heij, 2011).

Gibcus et al. (2014) studied technological innovation and workplace innovation among firms in the nine Dutch Top sectors identified by the Dutch government. Workplace innovation was measured according to the four dimensions defined by Volberda et al. (2011) (dynamic managing, flexible organising, smart working and co-creation). Workplace innovative firm were defined as the top 25% with the highest scores on workplace innovation. Non-workplace innovative firms were defined as the 25% with the lowest scores on workplace innovation. Firm performance was measured on the basis of four statements. Respondents could indicate on a scale from 1 (much worse) to 7 (much better) if they performed better or worse than competitors over the past three years with respect to sales growth, profit growth, growth in market share and

the attraction of new customers. The results showed a positive correlation between workplace innovations and technical innovations: within the top sectors workplace innovative firms have 36% more radical innovations and 29% more incremental innovations compared to non-workplace innovative firms. Moreover, the results indicated that workplace innovative firms perform relatively better (21%) than their non-workplace innovative counterparts.

Data from the European Community Innovation Survey (CIS) shows that organisational innovation is the only innovation type that results in higher contemporaneous Total Factor Productivity (TFP) levels. TFP indicates the effects in total output not caused by traditionally measured inputs of labour and capital and is an important factor in the process of economic growth. Product and process innovation only lead to higher TFP if it is combined with workplace innovation. This is the case for industry, but especially for the service sector (Polder, Leeuwen, van Mohnen and Raymond, 2010). In addition, analysis of the European Working Condition Survey (EWCS; Eurofound, 2012) demonstrated that workplace innovation results in "active work situations": workplaces and jobs in which workers have sufficient autonomy to control their work demands coupled to more discretionary capacity for learning and problem-solving ("Dortmund/ Brussels position paper", 2010).

A study by Oeij, Dhondt, Kraan, Vergeer and Pot (2012) based on the NEWS 2010 measured workplace innovation with a workplace innovation index among 2,550 Dutch organisations. Four subscales were constructed (autonomy, self-directed teamwork, internal flexibility and innovation) and dichotomised indicating the presence or absence of a particular dimension of workplace innovation. The sum of the dichotomised subscales represented the total number of measures taken by an organisation. The study revealed a positive relationship between workplace innovation and self-reported quantitative and qualitative organisational performance.

Pot (2011) discusses three studies which also found a positive relationship between workplace innovation and performance. A first study, among 650 Dutch SMEs indicated that companies with workplace innovation projects accomplish higher productivity and financial results compared to companies that do not implement this kind of projects (van der Hauw, Pasaribu and van der Zeijden, 2009). Secondly, a study among 932 Dutch companies of different sizes in different private business sectors found that workplace innovative companies perform better regarding their increase in turnover, profit and market share, and regarding innovation, productivity, new clients and reputation. Within this study workplace innovation are activities related to either dynamic management, flexible organisation, working smarter or external cooperation (Jansen, Volberda and van den Bosch, 2009). Thirdly, a study based on the NEWS 2008, looked into workplace innovation (measured as strategic orientation, product-market improvement, working flexibly and smart organising) among 3,468 Dutch employers with 10 or more employees. Firm performance was measured as a combination of an increase in turnover, profit and labour productivity during the last two years. Organisations with more activities in workplace innovation perform significantly better. The same results were found for the four individual aspects of workplace innovation. In addition, employers in workplace innovative companies were more content with the terms of employment and HR practices in their organisations, compared to those in non-innovative organisations (Oeij, Dorenbosch, Klein Hesselink and Vaas, 2010).

At the same time workplace innovation can result in improvement in quality of working life and productivity, in particular in the case of strong employee participation. Several studies indicated a positive relation between workplace innovation and quality of work of employees (Pot and Koningsveld, 2009; Pot, 2011; Pot, Dhondt and Oeij, 2012; Oeij et al., 2012).

Scale effects

De Kok and den Hartog (2006) examined the relationship between HPWS and different firm performance indicators (firm profit, labour productivity and labour turnover) in a sample of Dutch SMEs. Furthermore, they investigated whether or not this effect was moderated by firm size. The results indicate that the effect of HPWS on profit per full-time equivalent is strongly related to firm size. The study suggested that HPWS are more profitable for larger firms than for smaller firms.

Uhlaner, van Stel, Duplat and Zhou (2012) investigated the drivers of SME sales growth related to knowledge and innovation. Building on previous DC literature they tested whether two organisational capabilities, namely external sourcing (buying goods from third parties at the lowest cost for operations) and employee involvement in renewal activities, predict sales growth, and whether this effect is mediated by process and/or product innovation. Using the survey data from a panel study of Dutch SMEs, and controlling for several firm characteristics, they found that external sourcing has direct effects on both product and process innovation, with an indirect effect (mediated by process innovation) on sales growth. In addition, they found that firm size moderates the effect of external sourcing and product innovation, with more positive effects found for the smallest firms. This suggests that whereas slack human resource may be beneficial, they can also disadvantage a firm that is trying to innovate and operate fast in changing markets. This in contrast with the prediction of the RVB and more in line with the nimbleness view.

2.5 Research framework and hypothesis

The current knowledge on workplace innovations amongst SMEs suggests that scale effects in the prevalence of workplace innovation will be very limited, while scale effects in the effects of workplace innovation have hardly been examined. Given the arguments presented in the previous section, we expect that scale effects in the effects of workplace innovation will be present. The question that remains is the direction of these scale effects: whether workplace innovations show increasing or decreasing returns to scale. Available studies suggest that the directions of these scale effect may vary between types of workplace innovation (e.g. De Kok and den Hartog, 2006; Uhlaner et al., 2012).

De Kok and den Hartog (2006) examined internal and HRM related measures and found that these are more beneficial for larger firms. Accordingly, we propose the following hypothesis:

H1: The effect of internal and more HRM focused types of workplace innovation (smart organising and flexible work) on firm performance is moderated by firm size, with increasing returns to scale.

This hypothesis is based on the assumption that the impact of internal and HRM related innovation types is more beneficial for large firms. The added value of flexibilisation of the work, new combinations of organising, staff deployment, technical applications and improvement of the work processes might greater if a large number of employees starts working according to the renewed work approach. In addition, smaller firms are less likely to use formalised HRM practices than larger firms, and therefore implementing these two types of innovation could be less fruitful within small organisations.

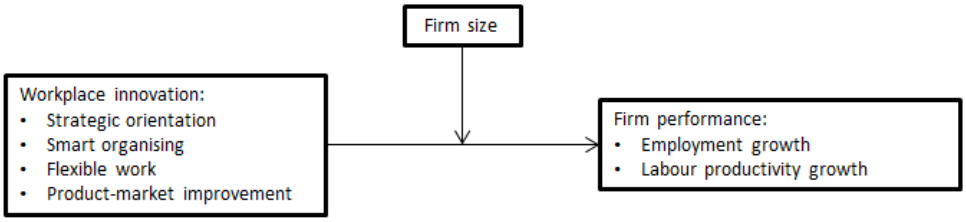
Uhlaner et al. (2012) found a moderating effect of firm size for the effect of more external and market orientated measures on performance and suggest that these are more profitable for small firms. In line with this result we propose the following hypothesis:

H2: The effect of external and more market orientated types of workplace innovation (product-market improvement and strategic orientation) on firm performance is moderated by firm size, with decreasing returns to scale.

The market, the client group and the range of products are most of the time smaller for small firms. Hence, the impact on performance of finding new markets and clients and improvement products and services could be relatively large. The same holds for bringing in new knowledge from outside the organisation, networking and cooperation with external partners. Frequently, the scope of a small firm is mostly smaller to begin with, and therefore the impact of an expansion could be relatively large.

The relationships that we want to examine are illustrated in figure 2.1 The implementation of workplace innovation by means of strategic orientation, smart organising, flexible work and product-market improvement is thought to increase employment growth and labour productivity growth. In addition, we expect that firm size will moderate this effect.

figure 2.1 Research framework



3 Research methodology

3.1 Data

We tested our hypothesis on data of 1,125 Dutch firms. Our database consist of variables from four sources:

1. The Netherlands Employers Survey (NEWS, in Dutch: "Werkgevers Enquête Arbeid", WEA) gathered in 2010.
2. Data on job characteristics ("Baankenmerken") collected by Statistics Netherlands (CBS) for the years 2010 and 2011.
3. Labour statistics ("Baansommen") collected by CBS for the years 2010 and 2011.
4. Statistics from wage-tax registrations ("Polisadministratie") collected by CBS for the years 2010 and 2011.

The NEWS-data are based on a survey that was carried out among a sample of 5,518 establishments of profit and non-profit organisations. The NEWS uses a cross-sectional random sample of Dutch establishments, stratified by sector and establishment size. The respondents are either the director-owner or the HR-manager of an establishment. The response rate of this survey is 37%. This dataset is matched with the CBS data through a chain of pairing keys that identify the company.

The analyses are performed on a sub-sample of organisations that have observations on all relevant measurement variables and that are not considered as outliers with respect to the firm performance variables (an observation is considered an outlier if it is more than 5 standard deviations from the mean value). Table 3.1 presents the descriptive statistics regarding the final dataset used.

table 3.1 N by sector and firms size

	Firm size (number of employees)				
Sector	*≤9*	*10-≤249*	*≥250*	***Total***	
Agriculture	2	18	0	20	2%
Construction	49	220	3	272	26%
Manufacturing	44	104	4	152	14%
Wholesale and retail trade	59	104	12	175	17%
Accommodation and food services	4	32	11	47	4%
Transport	16	80	4	100	10%
Financial institutions	4	13	0	17	2%
Business services	82	165	15	262	25%
Public sector	2	0	0	2	0%
Education	9	18	3	30	3%
Medical and social care	5	15	5	25	2%
Other service activities	4	23	3	30	3%
Total	**200**	**792**	**60**	**1052**	**100%**

Source: NEWS 2010 and Statistics Netherlands (CBS)

3.2 Construction of variables

Workplace innovation

The NEWS data allow us to assess four factors of workplace innovation. We constructed an indicator for **strategic orientation**, consisting of three variables (Cronbach's α = .64)[3]. The three variables measure to what extend the respondent

[3] This Cronbach's α is rather low. However, we decided to still use this set of variables to measure strategic orientation in order to maintain comparability with previous research using the same measures for workplace innovation (e.g. Oeij et al., 2012).

agrees or disagrees with a particular statements about the firms' policy: "our firm reacts instantly to developments affecting us", "Our firms is consciously bringing in new knowledge from outside the firm" and "our firm cooperates with third parties and/or is participating in networks" (1= "totally agree" – 5="totally disagree").

In addition, an indicator for **smart organising** has been constructed, consisting of two variables (r = .41, p <.001). The two variables measure to what extend the respondent agrees or disagrees with a particular statements about the firms' policy, namely: "our firms is constantly combining different ways of organising the work process" and "at our firm the work process is regularly updated" (1= "totally agree" – 5="totally disagree").

An indicator for **flexible work** is constructed, consisting of five variables (Cronbach's α = .73). Two out five variables were derived from the space perceived by respondents in making tailor-made arrangements with employees regarding, namely: "working times of employees" and "work performance of employees" (1="very little/no space" – 5="very much space"). The remaining three items refer to flexibilisation of work and measure to what extend an organisation apply certain forms of flexible work, namely: "multi-functional use of personnel", "flexible working times" and "self-scheduling" (1="to a very large extend" – 5= "not at all").

Moreover, an indicator for **product-market improvement** is constructed, consisting of two variables (r = .51, p <.001). The two variables measure to what extend the respondent agrees or disagrees with a particular statements about the firms' policy, namely: "our firm is regularly searching for new costumers/markets" and "at our firm existing products/services are regularly improved and/or fine-tuned" (1= "totally agree" – 5="totally disagree").

Employment growth

The growth rate of an individual firm can be calculated by dividing the employment change during a period by the employment level at the beginning of that period. However, especially when comparing the employment growth of small enterprises with that of bigger enterprises, there are various methodological problems with using this standard growth rate as an explanatory variable in a regression analysis. For example, the minimum possible employment growth of an enterprise with 5 employees is 20% (from 5 to 6 employees), where the minimum possible growth of an enterprise with 100 employees is 1% (from 100 to 101 employees). A growth from 5 to 6 employees results in the same relative growth rate as a growth from 50 to 60 employees, but it seems not very sensible to treat these enterprises in a similar way.

A common solution to this problem is to use an alternative growth rate, for example by dividing the employment change by the average employment level during the period. This measure can be applied to incumbent firms as well as entry and exits. By definition, the outcomes of this alternative growth rate are restricted to the interval between -2 (in case of exit) and +2 (in case of entry), which means that there are no outliers that could distort the regression results (see for example: Shiferaw and Bedi, 2010; Aterido, Hallward-Driemeier and Pagés, 2007). This is quite similar to a logarithmic transformation of the growth rate (see for example: Ayyagari, Dermirguc-Kunt and Maksimovic, 2011). According to this approach we calculate employment growth as follows:

$$SEG_{2010-2011} = \frac{(E_{2011} - E_{2010})}{((E_{2011} + E_{2010})/2)}$$

Where $SEG_{2010-2011}$ denotes the symmetrical employment growth and E_{year} denotes the number of employees in that year.

Labour productivity growth

The CBS data allow us to construct a variable for the labour productivity growth between 2010 and 2011. To this end, we calculate the firm's value added from the balance sheet data in the NFO, and divide this by total FTE. Based on the value added per FTE for 2010 and 2010 we computed the percentage growth over the period 2010-2011:

$$LPG_{2010-2011} = \left(\frac{LP_{2011}}{LP_{2010}} - 1\right) * 100\%$$

Where $LPG_{2010-2011}$ denotes labour productivity growth and LP_{year} denotes the value added per FTE in that year.

In addition to the standard growth rate we computed a symmetrical labour productivity growth rate. This is done in order to overcome the same problems discussed for employment growth. Similar to employment growth we calculated the symmetrical labour productivity growth rate as follows:

$$SLPG_{2010-2011} = \frac{(LP_{2011} - LP_{2010})}{((LP_{2011} + LP_{2010})/2)}$$

Where $SLPG_{2010-2011}$ denotes the symmetrical labour productivity growth and LP_{year} denotes the value added per FTE in that year.

3.3 The model

Our hypotheses are tested by estimating linear regression equations using OLS. The dependent variables in the equations are the two available indicators of firm performance growth between 2010 and 2011 (employment growth and labour productivity growth).

The independent variables include:

- Two firm size dummy variables (this allows us to distinguish between three size classes: ≤9 employees (micro sized firms), 10-≤249 employees (small and medium sized firms) and ≥250 employees (large sized firms)).
- Four indicators on workplace innovation (strategic orientation, flexible work, smart organising and product-market improvement).
- Eight interaction effects, obtained by multiplying each of the four workplace innovation indicators with the two firm size dummy variables. Before multiplying the workplace innovation indicators and firm size dummies have been centralised (i.e. the mean value has been subtracted from all observations).
- Control variables (including firm structure, sector, firm age, the percentage of male employees, the percentage of employees aged 45-55 years and aged 55 years or older and the percentage of intermediate and high educated employees).

We use firm size dummy variables (rather than actual firm size), because this allows for a greater flexibility in modelling the effect of firm size on performance. Using dummy variables in the model will yield information about the effect of the firm performance for each size class separately. This is especially an advantage if it is not clear whether the effects on firm performance are linear or not.

To test for the presence of interaction effects, we will estimate three different models for each dependent variable: first a model with only control variables, then a second model that includes firm size dummies and the workplace innovation indicators (but not yet the interaction effects), and thirdly a model that also includes the interaction effects. This allows us not only to determine the significance level of each of the separate interaction effects, but also to test whether the explanatory power of the model improves significantly by including the interaction effects all together.

4 Results

4.1 Descriptive statistics

An overview of the main descriptive statistics for the innovation indicators and the dependent variables is presented in table 4.1. More statistics can be found in table A.2 in Appendix 3.

table 4.1 Descriptive statistics (mean, standard deviation) of variables and Pearson correlations (r) (N=1,125)

	M	*S.d.*	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
1. ICT innovation	2,869	1,047	1							
2. Strategic orientation	3,659	0,622	**0,30**	1						
3. Flexible work	3,041	0,697	**0,14**	**0,35**	1					
4. Smart organising	3,286	0,704	**0,31**	**0,60**	**0,34**	1				
5. Product-market improvement	3,900	0,623	**0,25**	**0,50**	**0,25**	**0,51**	1			
6. Labour productivity growth rate	10,5%	31,2%	-0,02	-0,02	0,03	-0,01	-0,04	1		
7. Symmetrical labour productivity growth rate	0,053	0,327	-0,01	-0,02	0,02	-0,01	-0,03	**0,96**	1	
8. Symmetrical employment growth rate	-0,066	0,216	*0,07*	0,09	0,05	**0,10**	0,08	**-0,43**	**-0,38**	1

Source: NEWS 2010 and Statistics Netherlands (CBS)
Note: Text in *italics*: p <.05; underlined text p <.01; **bold** text: p <.001

First of all, al four types of workplace innovation are positively related with each other, and also with ICT innovation. Enterprises that are more innovative in one aspect, are also more likely to be innovative in other aspects of innovation. In Chapter 2 we mentioned that the four types of workplace innovation under investigation may reflect two different dimensions. We expected strategic orientation and product-market improvement to reflect a more external focused dimension, and smart organising and flexible work to reflect a more internal focused dimension. If this is the case, we should find that the correlations between types of workplace innovation on the same dimension are higher than the correlations between types of workplace innovations from different dimensions. However, this is not the case (see table 4.1).

Instead, the results suggest that a distinction can be made between flexible work on the one hand, and the three other indicators on the other hand. Correlations are highest for the relationships between strategic orientation, smart organising and product-market improvement (r's≥.50). In comparison the correlations for flexible work and the other types of workplace innovation are, though significant, less pronounced (r's≤.35). Likewise, the correlation between ICT innovation and flexible work (r=.14) is smaller than the correlations between ICT innovations and the other three types of workplace innovation (r's≥.25).

Looking at the relationships between the firm performance indicators and workplace innovation we see that symmetrical employment growth is (weakly) correlated with the presence of strategic orientation (r=.09, p<.01), smart organising (r=.10, p<.001) and product-market improvement (r=.08, p<.01). However, none of the workplace innovation types are significantly correlated with symmetrical labour productivity growth.

Furthermore, we find significant correlations between firm size classes and some of the workplace innovation types. Flexible work is (weakly) positively correlated with micro sized firms (r=.08, p<.01) and (weakly) negatively correlated with small and medium sized firms (r=-.08, p<.01). Smart organising is (weakly) positively correlated with large sized firms (r=.07, p<.05). Product-market improvement is (weakly) negatively correlated with micro sized firms (r=-.06, p<.05). Strategic orientation is related to none of the four workplace innovation types.

4.2 Results of multivariate analysis

The estimation results for the various models are presented in table 4.2. First, from the models without interaction effects (M2), two results are interesting. With respect to firm size class the results indicate a non-linear relationship between firm size and the performance indicators. Labour productivity growth is highest for small and medium-sized enterprises (10-≤249). Consistent with this, employment growth is lowest for small and medium-sized enterprises (10-≤249).

Regarding workplace innovation we found that none of the workplace innovation types are significantly directly related to labour productivity growth or employment growth. Nevertheless, there is some support that workplace innovation matters: when compared to the models M1 with only the control variables, the inclusion of the four workplace innovation variables significantly increases the explained variance of the regression equations (for employment growth, the R-square increase is only marginally significant); for symmetrical employment growth, the R-square increase is strongly significant.

table 4.2 Results of multiple regression analyses of dependent variables Symmetrical labour productivity growth rate 2010-2011, Symmetrical employment growth rate 2010-2011 (*N*=1,125)

	Symmetrical labour productivity growth				*Symmetrical employment growth*			
	M2		M3		M2		M3	
	β	p	*β*	p	*β*	p	*β*	p
Size class (≤9 employees = reference category)								
• 10-≤249 employees (dummy)	0,11	***	0,12	***	-0,13	***	-0,13	***
• ≥250 employees (dummy)	0,05		0,04		-0,06	†	-0,06	†
Strategic orientation	0,00		0,00		0,01		0,01	
Flexible work	0,05		0,05		-0,03		-0,03	
Smart organising	0,01		0,01		0,06		0,06	
Product-market improvement	-0,04		-0,04		0,03		0,03	
Interaction (strategic orientation * ≤9 employees = reference category)								
• Strategic orientation * 10-≤249 employees			0,00				-0,02	
• Strategic orientation * ≥250 employees			0,00				-0,02	
Interaction (flexible work * ≤9 employees = reference category)								
• Flexible work * 10-≤249 employees			-0,07	*			0,00	
• Flexible work * ≥250 employees			-0,03				0,01	
Interaction (smart organising * ≤9 employees = reference category)								
• Smart organising * 10-≤249 employees			0,05				-0,02	
• Smart organising * ≥250 employees			0,04				0,01	
Interaction (smart organising * ≤9 employees = reference category)								
• Product-market improvement * 10-≤249 employees			0,02				-0,02	
• Product-market improvement * ≥250 employees			0,02				-0,02	
R^2	0,04		0,046		0,053		0,056	
R^2 *change*	0,01	†	0,006		0,017	***	0,003	
F	1,68	*	1,49	*	2,29	***	1,86	**

† $p < 0,10$ * $p < 0,05$, ** $p < 0,01$, *** $p < 0,001$
Source: NEWS 2010 and Statistics Netherlands (CBS)
Note: Parameter estimates for the control variables (firm structure, sector, firm age and gender, age and education distribution of employees) and for M1 are not included in this table. *β* and *p* for these parameter estimates are presented in table A.1 in Annex 1.

Second, from the models with interaction effects (M3), the results show one significant effect: a combined effect of firm size and flexible work on symmetrical labour productivity growth. The presence of flexible work is significantly more beneficial for the labour productivity of micro firms (≤9 employees) than that of small and medium sized firms (10-≤249 employees) (β = -.07; p<.05) (see figure A.1 in Appendix 2).[4] This is however the only significant interaction effect, for a total of 16

[4] We found the similar results for the model with the standard relative labour productivity growth rate. The result of this model are presented in table A.1 in Appendix 1

different interaction effects. In comparison to the model (M2) without interaction effects, the inclusion of the interaction effects does not result in a significant increase in the explained variance of the regression equations. Hence we conclude that there is no empirical evidence that firm size moderates the effects of workplace innovation. More specifically, we find no support for our two hypotheses.

5 Discussion and conclusions

5.1 Discussion

Even though there are indications that firm size might moderate the effect of flexible work on labour productivity, we have to conclude that the data do not support our hypothesis regarding the presence of scale effect in workplace innovation. There is some support for the presence of positive effects of workplace innovation, but this support is only indirect and cannot differentiate between the four different factors of workplace innovation under investigation. These results are in contrast with the results of previous studies that did find positive effects of specific types of workplace innovation. There are a number of possible explanations why the results of the current study deviate from these previous studies.

First of all, if different indicators on workplace innovation are used, this might yield different results regarding its effect on firm performance. It turns out that only one of the previous studies (Oeij et al., 2010) uses indicator for workplace innovation similar to the indicators used in the current study. The other studies all use different indicators to measure workplace innovation. Although Oeij et al. (2012) based there research on the same survey data (the NEWS 2010) and partly on the same questions, a different indicator was constructed to operationalise workplace innovation. Gibcus et al. (2014) and Jansen et al. (2009) measure workplace innovation through four different constructs (dynamic managing, flexible organising, smart working and co-creation). Van der Hauw et al. (2009) distinguish workplace innovation in broad and narrow terms. In broad terms workplace innovation was operationalised as changes regarding management, internal communication, HRM, division of tasks, workplace design, working times and external cooperation. In narrow terms workplace innovation was operationalised as changes regarding the business organisation, division of tasks and working times.

Secondly, if different indicators for firm performance are used, this might also yield different results regarding the effect of workplace innovation. It turns out that the variety in performance indicators is even larger than the variety in workplace innovation indicators. We have looked separately at the effects on employment growth rates and labour productivity growth rates. Whereas, some of the other studies have used combined measures. Gibcus et al. (2014) used a combination of growth in turnover, profit, market share and new clients and Oeij et al. (2010) used a combination of growth in turnover, profit and labour productivity. Oeij et al. (2012) measured qualitative performance by combining self-reported improvement of the quality of the products and services and improvement of client satisfaction in addition to the same indicator used by Oeij et al. (2010) for quantitative performance. Jansen et al. (2009) looked separately at indicators for turnover growth, profit growth, innovation, productivity, attracting new customers, growth in market share and reputation. Van der Hauw et al. (2009) operationalised firm performance as relative growth of profit, turnover, productivity and employment. The studies also differs in the period of time over which firm performance is measured. These differences in measures may also partly explain the contradictory results.

Moreover, different data sources on firm performance are used. In the current study we have used administrative data regarding financial performance and employment levels, to obtain objective measures of actual growth rates. In contrast, other studies have obtained firm performance through surveys, for example asking respondents about the growth in several performance indicators (Oeij et al., 2012; Oeij et al., 2010, Van der Hauw et al., 2009 and Jansen et al., 2009), or whether they believe they perform better than their competitors (Gibcus et al., 2014). Using a more objective indicator may yield different firm performance result than self-reported indicators. With self-reported firm performance from representatives of enterprises

the results might be biased because of for example wrong estimations and socially desirable answers.

In our opinion, our study had access to more rigorous, objective and precise measures on firm performance than the identified previous studies. It may be the case that the relative more positive findings from previous studies are due to the relative imprecise measurement of performance indicators. This would suggest that workplace innovations do not have such a strong effect on firm performance as has so far been concluded.

Another possible explanation for the lack of positive effects in our study is that it takes more time before workplace innovation takes effect. In the current study workplace innovation is measured in 2010 and growth in employment and productivity was measured between 2010 and 2011. Investigating the impact of workplace innovation after one year might be too soon to identify any effects. Additionally, a disadvantage of the workplace innovation variables in the NEWS is that they do not give any insight in when the workplace innovative practices were introduced. It could be that a firm has been using a workplace innovative approach for years, but it could as well be that they just started working in that way. Consequently, we do not know if we are investigating the effect of recently introduced workplace innovations or the effect of years of working in a workplace innovative manner.

Another interpretation is that workplace innovations do have a positive effect, but that this does not manifest itself as a simple linear relationship between workplace innovation indicators and precise measures on firm performance. The positive effect can be identified, but only if relatively broad performance indicators are used. The problem is not that we need more precise performance indicators, but that we need a better model to explain the underlying processes. In a way, what we encounter within this study is similar to difficulties experienced in research on effectiveness of strategic HRM. Also here, arguments in favour of the positive effects of strategic HRM on firm performance indicators are compelling. However, not every study can find empirical support for this effect, and if they are identified "the relationships are often statistically weak and the results ambiguous" (Paauwe and Boselie, 2006). Another example in favour of this interpretation is a study of Bartelsman, Dobbelaere and Peters (2013). Bartelman et al. found non-linearities in the productivity effects of investing in product innovation in the majority of industries. Frontier firms experience the highest returns to product innovation whereas the most negative returns to process innovation are found for the best-performing enterprises. The lack of results in our study may therefore also be explained by a lack of non-linearities in our model.

5.2 Conclusions

Are there scale effects in the prevalence and effects of workplace innovations? Previous studies provide evidence supporting scale effects in prevalence, but our study cannot find support for scale effects regarding the effects of workplace innovations. Our results did not indicate that the effect of smart organising and flexible work on firm performance is indeed moderated by firm size, with increasing returns to scale (H1). Moreover, we found no evidence that firm size moderates the effect of product-market improvement and strategic orientation on firm performance, with decreasing returns to scale (H2). Consequently, both our hypothesis cannot be confirmed.

Strictly speaking, our study finds only indirect support for positive effects of workplace innovations on employment and productivity growth rates, and no support for the presence of scale effects within the framework imposed by our linear regression model.

Two opposing explanations are possible for this lack of results: either there are no scale effects of workplace innovations on employment and productivity growth, or our model does not reflect the underlying relationships. If we would have found direct support for the presence of general effects (in line with the results of previous

studies), it might be justified to conclude that the first explanation is most likely (i.e., there are no scale effects). However, since our study cannot find direct support for the presence of main effects of specific indicators workplace innovation, which have been found by other studies, the other explanations becomes more likely. In our opinion it would be premature to conclude that there are no effects of workplace innovation. This raises the question of how we can identify the intricate relationship between firm performance and workplace innovation and what would be a better way of operationalising workplace innovation? This is still open for debate.

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Appendices

Appendix 1

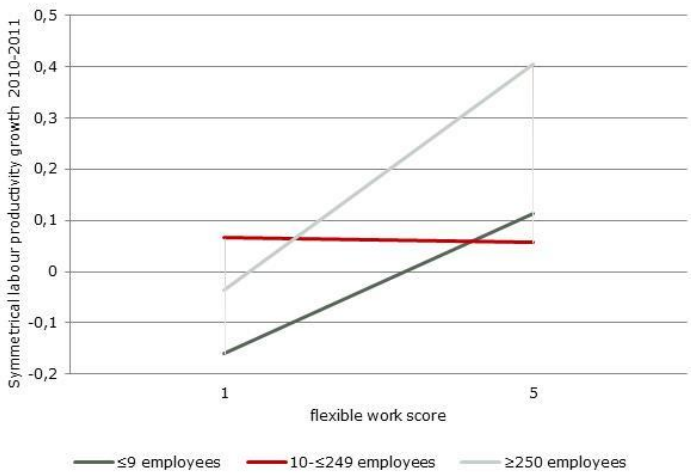
table A.1 Results of multiple regression analyses of dependent variables Labour productivity growth rate 2010-2011, Symmetrical labour productivity growth rate 2010-2011, Symmetrical employment growth rate 2010-2011 (*N*=1,125)

	Labour productivity growth						*Symmetrical labour productivity growth*						*Symmetrical employment growth*					
	M1		M2		M3		M1		M2		M3		M1		M2		M3	
	β	p	*β*	p	*β*	p	*β*	p	*β*	p	*β*	p	*β*	p	*β*	p	*β*	p
Structure (independent firm = reference category)																		
- Headquarters (dummy)	0,00		0,00		-0,01		0,01		0,00		0,00		0,02		0,03		0,03	
- Establishment (dummy)	0,02		0,01		0,01		0,02		0,01		0,02		-0,06	†	-0,04		-0,04	
- Other firm structure (dummy)	0,04		0,03		0,03		0,04		0,04		0,04		0,01		0,02		0,02	
Sector (construction = reference category)																		
- Agriculture (dummy)	0,01		0,00		0,00		0,01		0,01		0,00		-0,01		-0,01		-0,01	
- Manufacturing (dummy)	0,04		0,04		0,04		0,03		0,02		0,02		0,02		0,03		0,02	
- Wholesale and retail trade (dummy)	0,11	**	0,11	**	0,12	**	0,10	*	0,10	*	0,11	*	-0,01		-0,02		-0,02	
- Accommodation and food services (dummy)	0,14	***	0,13	***	0,13	***	0,12	***	0,11	**	0,11	***	-0,05		-0,04		-0,04	
- Transport (dummy)	0,07	†	0,06		0,06		0,06	†	0,05		0,05		0,01		0,01		0,01	
- Financial institutions (dummy)	0,06	†	0,06	†	0,06	†	0,06	†	0,06	†	0,06	†	-0,05		-0,05		-0,05	
- Business services (dummy)	0,12	*	0,10	*	0,11	*	0,12	*	0,11	*	0,11	*	-0,07		-0,06		-0,07	
- Public sector (dummy)	0,01		0,01		0,01		0,01		0,02		0,02		0,02		0,01		0,01	
- Education (dummy)	0,01		0,00		0,01		0,00		0,00		0,00		-0,01		-0,01		-0,01	
- Medical and social care (dummy)	0,02		0,01		0,01		0,02		0,02		0,02		0,01		0,02		0,02	
- Other service activities (dummy)	0,04		0,03		0,04		0,03		0,01		0,02		0,00		0,01		0,01	
Firm age (ln)	-0,01		-0,03		-0,03		0,02		0,00		0,00		-0,14	***	-0,10	***	-0,10	**
ICT innovation	-0,02		-0,03		-0,03		-0,01		-0,03		-0,02		0,07	*	0,07	*	0,07	†
Gender of employees (%females = reference category)																		
- %males	-0,05		-0,05		-0,06	†	-0,04		-0,05		-0,05		0,00		0,00		0,00	
Age of employees (%aged ≤ 44 years = reference category)																		
- %aged 45 to 55 years	0,01		0,01		0,01		-0,01		-0,01		-0,01		-0,03		-0,03		-0,03	
- %aged ≥ 55 years	-0,02		-0,01		-0,02		-0,02		-0,01		-0,02		0,01		0,00		0,00	
Education of employees (%primary educated = reference category)																		
- %intermediate educated	-0,09	*	-0,08	*	-0,08	*	-0,08	*	-0,07	*	-0,07	†	0,06	†	0,04		0,04	
- %high educated	-0,07	†	-0,07		-0,07	†	-0,10	*	-0,09	*	-0,10	*	0,06		0,04		0,04	
Size class (≤9 employees = reference category)																		
- 10-≤249 employees (dummy)			0,08	*	0,09	*			0,11	***	0,12	***			-0,13	***	-0,13	***
- ≥250 employees (dummy)			0,04		0,03				0,05		0,04				-0,06	†	-0,06	†
Strategic orientation			-0,01		-0,01				0,00		0,00				0,01		0,01	
Flexible work			0,05		0,04				0,05		0,05				-0,03		-0,03	
Smart organising			0,01		0,02				0,01		0,01				0,06		0,06	
Product-market improvement			-0,04		-0,04				-0,04		-0,04				0,03		0,03	
Interaction (strategic orientation * ≤9 employees = reference category)																		
- Strategic orientation * 10-≤249 employees					0,02						0,00						-0,02	
- Strategic orientation * ≥250 employees					0,01						0,00						-0,02	
Interaction (flexible work * ≤9 employees = reference category)																		
- Flexible work * 10-≤249 employees					-0,07	*					-0,07	*					0,00	
- Flexible work * ≥250 employees					-0,04						-0,03						0,01	
Interaction (smart organising * ≤9 employees = reference category)																		
- Smart organising * 10-≤249 employees					0,04						0,05						-0,02	
- Smart organising * ≥250 employees					0,05						0,04						0,01	
Interaction (smart organising * ≤9 employees = reference category)																		
- Product-market improvement * 10-≤249 employees					0,02						0,02						-0,02	
- Product-market improvement * ≥250 employees					0,01						0,02						-0,02	
R Square	0,03		0,04		0,04		0,03		0,04		0,05		0,037		0,053		0,056	
R Square Change	0,03		0,01		0,01		0,03		0,01	†	0,01				0,017	***	0,003	
F	1,62[a]	*	1,55[b]	*	1,39[c]	†	1,59[a]	*	1,68[b]	*	1,49[c]	*	2,01[a]	**	2,29[b]	***	1,86[c]	**

† $p < 0{,}10$ * $p < 0{,}05$, ** $p < 0{,}01$, *** $p < 0{,}001$
[a] This *F*-value has 21, 1.104 *df*, [b] This *F*-value has 27, 1.098 *df*, [c] This *F*-value has 35, 1.090 *df*
Source: NEWS 2010 and Statistics Netherlands (CBS)

Appendix 2

figure A.1 Interaction effect of flexible work and firm size class on symmetrical labour productivity growth 2010-2011: Mean symmetrical labour productivity growth rate 2010-2011 of a score of 1 and 5 on the strategic orientation scale by firm size class.



Source: NEWS 2010 and NFO 2010 and 2011

Appendix 3

table A.2 Descriptive statistics (mean, standard deviation) of variables and Pearson correlations (*r*) *(N*=1,125*)*

	M	S.d.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.
1. Independent firm (dummy)	0,675	0,469	1																																			
2. Headquarters (dummy)	0,144	0,351	**-0,59**	1																																		
3. Establishment (dummy)	0,159	0,366	**-0,63**	**-0,18**	1																																	
4. Other firm structure (dummy)	0,022	0,147	**-0,22**	*-0,06*	*-0,07*	1																																
5. Agriculture (dummy)	0,018	0,132	0,02	0,00	-0,02	-0,02	1																															
6. Manufacturing (dummy)	0,249	0,432	0,03	-0,08	0,04	0,01	-0,08	1																														
7. Construction (dummy)	0,133	0,340	**0,11**	-0,04	-0,09	-0,01	-0,05	**-0,23**	1																													
8. Wholesale and retail trade (dummy)	0,147	0,355	-0,03	-0,01	0,05	0,02	-0,06	**-0,24**	**-0,16**	1																												
9. Accommodation and food services (dummy)	0,040	0,196	0,03	0,01	-0,03	-0,03	-0,03	**-0,12**	-0,08	-0,09	1																											
10. Transport (dummy)	0,088	0,283	*-0,06*	0,05	0,01	0,04	-0,04	**-0,18**	**-0,12**	**-0,13**	*-0,06*	1																										
11. Financial institutions (dummy)	0,014	0,118	0,00	0,06	-0,05	-0,02	-0,02	*-0,07*	-0,05	-0,05	-0,02	-0,04	1																									
12. Business services (dummy)	0,230	0,421	-0,04	0,08	0,00	-0,05	*-0,07*	**-0,31**	**-0,21**	**-0,23**	**-0,11**	**-0,17**	*-0,07*	1																								
13. Public sector (dummy)	0,002	0,042	-0,02	0,04	-0,02	-0,01	-0,01	-0,02	-0,02	-0,02	-0,01	-0,01	-0,01	-0,02	1																							
14. Education (dummy)	0,028	0,166	-0,04	0,04	0,03	-0,03	-0,02	-0,10	*-0,07*	*-0,07*	-0,04	-0,05	-0,02	-0,09	-0,01	1																						
15. Medical and social care (dummy)	0,020	0,138	-0,05	-0,02	*0,06*	*0,07*	-0,02	-0,08	-0,06	*-0,06*	-0,03	-0,04	-0,02	-0,08	-0,01	-0,02	1																					
16. Other service activities (dummy)	0,031	0,174	0,03	-0,03	-0,02	0,04	-0,02	**-0,10**	*-0,07*	*-0,07*	-0,04	-0,06	-0,02	**-0,10**	-0,01	-0,03	-0,03	1																				
17. Firm age (ln)	3,046	1,010	0,02	0,04	*-0,07*	0,01	0,05	**0,20**	0,09	0,01	0,00	0,05	0,01	**-0,27**	-0,02	-0,04	**-0,12**	-0,04	1																			
18. ICT innovation	2,869	1,047	**-0,16**	**0,13**	0,08	0,01	-0,09	0,05	**-0,15**	*0,08*	-0,09	-0,05	0,04	0,09	-0,02	0,00	-0,01	0,01	0,01	1																		
19. % males	70,2%	26,2%	*0,07*	-0,03	-0,04	*-0,06*	0,09	*0,07*	**0,29**	0,00	**-0,17**	**0,11**	-0,04	-0,08	-0,02	**-0,16**	**-0,26**	**-0,20**	**0,15**	-0,05	1																	
20. % females	29,9%	26,2%	*-0,07*	0,03	0,04	*0,06*	-0,09	*-0,07*	**-0,29**	0,00	**0,17**	**-0,11**	0,04	0,08	0,02	**0,16**	**0,26**	**0,20**	**-0,15**	0,05	**-1,00**	1																
21. % aged ≤ 44 years	63,4%	23,8%	-0,08	0,05	0,02	0,05	0,04	**-0,15**	-0,02	0,03	0,05	-0,01	0,00	**0,13**	0,04	-0,08	-0,02	0,04	**-0,28**	0,09	-0,04	0,04	1															
22. % aged 45 to 55 years	25,1%	19,3%	0,01	-0,01	0,02	-0,05	-0,02	**0,11**	0,01	-0,04	-0,03	0,01	0,02	**-0,11**	-0,02	*0,06*	0,04	-0,03	**0,18**	-0,02	0,03	-0,03	**-0,79**	1														
23. % aged ≥ 55 years	11,6%	14,5%	**0,12**	-0,08	*-0,06*	-0,03	-0,03	0,09	0,01	0,01	-0,04	0,00	-0,03	*-0,08*	-0,03	0,05	-0,02	-0,02	**0,22**	**-0,13**	0,02	-0,02	**-0,59**	-0,02	1													
24. % primary educated	35,7%	32,8%	0,09	-0,03	-0,08	0,00	**0,10**	**0,14**	**0,26**	0,00	*0,07*	**0,13**	-0,02	**-0,41**	-0,05	**-0,10**	**-0,10**	-0,03	**0,29**	**-0,17**	**0,25**	**-0,25**	**-0,13**	**0,11**	*0,07*	1												
25. % intermediate educated	39,0%	28,1%	0,04	*-0,06*	0,01	0,01	-0,01	0,02	*-0,06*	**0,16**	0,01	-0,04	0,02	-0,09	-0,03	0,01	0,05	-0,01	-0,04	0,05	**-0,11**	**0,11**	-0,02	-0,01	0,05	**-0,48**	1											
26. % higher educated	25,4%	31,2%	**-0,12**	0,09	*0,07*	0,00	**-0,10**	**-0,16**	**-0,22**	**-0,14**	*-0,08*	**-0,10**	0,00	**0,52**	*0,07*	0,09	0,06	0,04	**-0,27**	**0,14**	**-0,16**	**0,16**	**0,15**	**-0,10**	**-0,11**	**-0,62**	**-0,39**	1										
27. ≤9 employees (dummy)	0,246	0,431	**0,21**	**-0,15**	**-0,10**	-0,06	-0,05	*-0,07*	0,03	*0,07*	*-0,07*	*-0,06*	0,00	*0,08*	*0,07*	0,01	0,01	-0,04	**-0,22**	**-0,22**	-0,03	0,03	-0,09	0,02	**0,12**	**-0,16**	*0,07*	**0,11**	1									
28. 10-≤249 employees (dummy)	0,703	0,457	**-0,10**	0,08	0,03	0,05	0,06	**0,11**	-0,01	-0,09	-0,01	*0,07*	0,01	*-0,07*	*-0,07*	-0,03	-0,05	0,03	**0,23**	**0,17**	0,10	**-0,10**	*0,08*	-0,01	**-0,11**	**0,17**	-0,09	**-0,10**	**-0,88**	1								
29. ≥250 employees (dummy)	0,052	0,221	**-0,19**	**0,12**	**0,12**	0,02	-0,03	-0,10	-0,04	0,04	**0,16**	-0,02	-0,03	0,01	-0,01	0,03	0,08	0,03	-0,03	*0,08*	**-0,15**	**0,15**	0,02	-0,02	-0,01	-0,04	*0,06*	-0,02	**-0,13**	**-0,36**	1							
30. Strategic orientation	3,659	0,622	*-0,08*	0,09	0,03	-0,04	0,00	-0,06	**-0,12**	-0,08	-0,01	-0,02	0,02	**0,18**	-0,01	0,05	0,04	0,04	**-0,17**	**0,30**	-0,04	0,04	**0,14**	**-0,11**	-0,09	**-0,23**	0,00	**0,24**	-0,02	0,01	0,03	1						
31. Flexible work	3,041	0,697	-0,02	0,02	0,03	-0,03	0,00	-0,08	**-0,23**	-0,09	*0,06*	-0,01	-0,01	**0,27**	0,02	0,01	0,02	**0,10**	**-0,28**	**0,14**	**-0,21**	**0,21**	**0,10**	*-0,07*	*-0,07*	**-0,31**	-0,03	**0,36**	0,08	-0,08	0,00	**0,35**	1					
32. Smart organising	3,286	0,704	-0,09	**0,10**	0,03	-0,04	-0,01	-0,03	**-0,12**	-0,04	-0,02	0,00	0,02	**0,15**	0,01	0,01	0,04	-0,01	**-0,17**	**0,31**	-0,04	0,04	**0,16**	**-0,10**	**-0,13**	**-0,16**	0,01	**0,16**	-0,05	0,01	*0,07*	**0,60**	**0,34**	1				
33. Product-market improvement	3,900	0,623	-0,06	**0,11**	0,00	*-0,07*	0,03	0,02	**-0,10**	-0,03	0,04	-0,05	0,01	0,09	-0,01	0,03	-0,03	0,00	**-0,16**	**0,25**	*-0,07*	*0,07*	**0,12**	-0,08	-0,09	**-0,12**	0,02	**0,10**	*-0,06*	0,04	0,04	**0,50**	**0,25**	**0,51**	1			
34. Labour productivity growth rate	10,5%	31,2%	-0,02	0,00	0,01	0,03	-0,01	-0,05	-0,05	0,04	**0,10**	0,03	0,03	0,01	-0,01	-0,05	-0,03	0,00	-0,01	-0,02	0,03	-0,03	0,02	0,00	-0,03	*0,07*	-0,06	-0,02	*-0,07*	*0,06*	0,02	-0,02	0,03	-0,01	-0,04	1		
35. Symmetrical labour productivity growth rate	0,053	0,327	-0,03	0,02	0,01	0,03	0,00	-0,05	-0,04	0,04	0,09	0,03	0,03	0,00	0,00	-0,05	-0,02	-0,02	0,02	-0,01	0,03	-0,03	0,03	-0,01	-0,03	0,08	-0,04	-0,04	**-0,11**	0,09	0,02	-0,02	0,02	-0,01	-0,03	**0,96**	1	
36. Symmetrical employment growth rate	-0,066	0,216	0,01	0,02	-0,04	0,02	-0,02	0,02	-0,02	0,01	-0,05	0,00	-0,04	0,01	0,03	0,01	0,04	0,02	**-0,13**	*0,07*	-0,03	0,03	0,05	-0,05	-0,02	-0,09	0,05	0,05	**0,12**	**-0,11**	-0,01	0,09	0,05	**0,10**	0,08	**-0,43**	**-0,38**	1

Source: NEWS 2010 and Statistics Netherlands (CBS)
Note: Text in *italics*: *p* <.05; underlined text *p* <.01; **bold** text: *p* <.001

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