Labour Relations, Flexibility, and Management Intensity in Dutch Firms

An Investigation Using the OSA/SCP Labour Panel Database

Master Thesis

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Title Page

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Abstract

'High-road' Human Resource Management practices (often associated with rigid labour markets) differ from 'low road' practices (flexible labour markets) in terms of employment protection, earnings differentials among employees and amount of direct employees' supervision. Firms employing 'low road' practices tend to rely heavily on supervision, as consequence of the lack of trust among employees, hence leading to higher management intensity. In earlier research, this phenomenon was observed at country-level. However, the evidence was based on highly aggregated data. The focus of this study is therefore to explore whether the same observation exists at firm level. The 'low-road' HRM practice is represented by an external flexibility measure i.e. the intensity of the use of flexible workers. Besides the labour flexibility variable, the influences of various factors associated with firms' internal and external environment are also investigated. The analysis is done using multiple regression analysis on the OSA/SCP database for year 2007-2008.

Shares of workers hired from manpower agency are shown to have a small, yet positively significant impact on levels of management intensity in the firm. Firm size, on the other hand, has a significantly negative impact on management intensity. Extent of research and innovation activities in the firm is also found to exert significant influence on management intensity. Firms that are more research intensive and innovative tend to have higher management intensity as compared to the non-innovating firms. Lastly, substantial sectoral variations are also observed, which might be explained by firm-level factor such as firm size and level of technical complexity.

Keywords: *Labour flexibility, labour-management relations, management intensity, labour economics, HRM econometrics*

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Lilyana Budyanto

Delft, June 2012

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1. INTRODUCTION

Globalization, market deregulations, ever-changing customer demands and increasing market competition are some examples of phenomena that shaped today's economic landscape. As such, firms and organizations are facing increased pressures and tremendous challenges in coping with rapid changes and increases in uncertainty. Subsequently, firms and organizations continuously try to improve their performance and gain competitive advantages by reducing costs, engaging in innovation processes and/or improving their overall productivity (Becker & Gerhart, 1996).

Labour associated costs are one of the largest operating expenses in many firms (Higgins & Cooperstein, 2012), and for that reason they have continued to be the major aspect of firms' strategies for reducing the overall overheads. At the same time, Human Resource Management (HRM) practices play an important role in influencing organizational performance (Arvanitis, 2005), especially in today's knowledge-based economy. Due to its primary function of managing labour relations in the firm, the choice of HRM strategies may make or break the business. Hence it is important to understand the factors influencing firms' choice of HRM practices and the subsequent impacts on employee-management relations.

1.1. Anglo-Saxon' versus 'Rhineland' Labour Relations

Stepping into the second decade of the 21st century, it seems evident that the great ideological debate, which covered the headlines in the past 100 years, has settled down with the collapse of communism and the victory of capitalism. Nevertheless, as raised by Michel Albert in his book of 'Capitalism vs. Capitalism', the current global capitalism seems to be divided into two different personalities; representing two opposing approaches to various specific issues (Albert, 1993). The situation has inevitably led to the emergence of two different economic models or 'schools', which continually challenge each other. The first one is known as the 'Anglo-Saxon' model, which is focused on the individual success, market flexibility and short-term financial gain. The second one is often referred to as the 'Rhineland' model, which places high importance on collective success, consensus and long-term commitment instead (Jackson & Deeg, 2006). This can be illustrated, for example, by contrasting the two employment models associated to each of the economic 'schools'.

There are two Human Resource Management (HRM) practices identified in the literatures; each of which is associated with the two different economic models mentioned above (Michie & Sheehan-Quinn, 2001) (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006) (Naastepad & Storm, 2005):

1. **'Low Road' practices** (or 'low trust' or 'low involvement' practices)
   This set of practices is associated to the more flexible 'Anglo-Saxon' model and reflect the features of '***conflictual***' (or 'competitive) labour relations systems. Some of the characteristics of this system include relatively large earnings inequality, low employment protection (and strong investor protection), weak workers' rights, low levels of training and close employee supervision or monitoring.

2. **'High Road' practices** (or 'high trust' or high involvement' practices)
   These practices are related to the rigid 'Rhineland' model and reflect the features of '***cooperative***' (or 'coordinated') labour relations systems. High dismissal protection, strong workers' rights (and weak investors' rights), high levels of training, relatively small earnings differentials and high employee autonomy/less direct supervision are some of the characteristics identified with this system.

In summary, the 'Anglo-Saxon' model tends to be less regulated and exhibits more flexibility in the labour market as compared to the 'Rhineland' model. Labour market flexibility, however, can be categorized into two distinct strategies of external (or numerical) and internal (or functional) flexibility (Arvanitis, 2005).

Labour Relations	HRM Practices	Labour Market Flexibility
'Anglo-Saxon' Model	'Low-Road' Practices	External Flexibility
'Rhineland' Model	''High-Road' Practices	Internal Flexibility
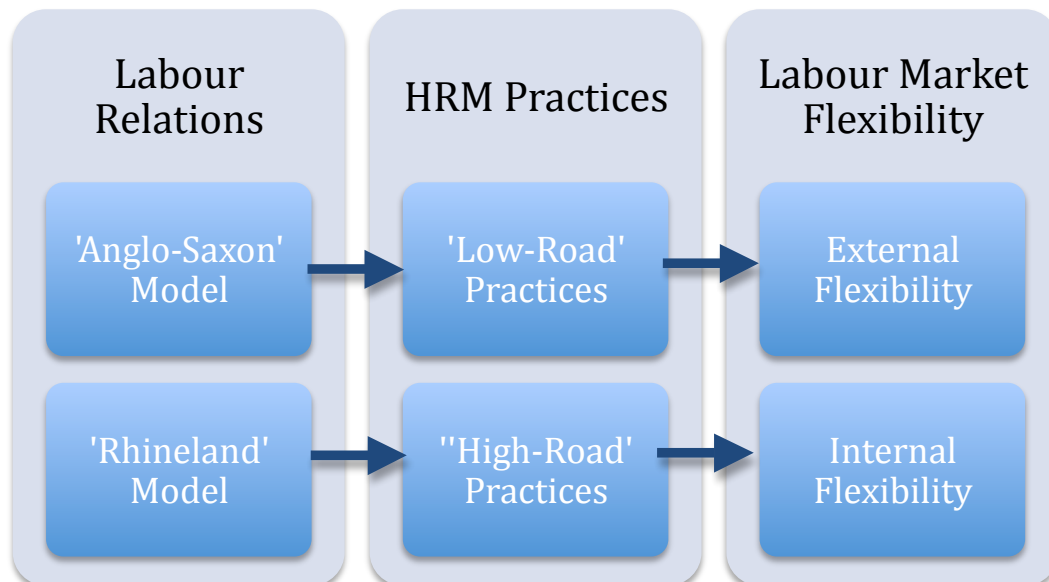
Figure 1. Overview of 'Anglo-Saxon' and 'Rhineland' Labour Relations

External or numerical flexibility can be defined as the process through which firms attempt to respond to the changes in the demand for their products or services by quantitatively adjusting the amount of labour employed (Arvanitis,

2005). This strategy is directed towards the objective of cost minimization and is achieved through easy hiring and firing or through the use of external labour market. Examples of numerical or quantitatively flexible types of employment include workers based on temporary or fixed-duration contracts and workers hired through manpower agencies. The objective of cost reduction is therefore achieved through the significant savings on firm's wage bill both directly and indirectly, since flexible workers are only hired and paid as and when they are needed. In addition to that, such workers also earn lower wages in general since they tend to be low skilled and recruited among less favored people (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006). Inevitably, this strategy will lead to higher turnover of personnel, larger earnings inequality and higher shares of people hired on temporary contracts, which resonate the features of 'low-road' practices. Such actions seemed to be at the core of 'Anglo-Saxon' employment model, which encourage the use of an external/numerical flexibility strategy (Zhou, Dekker, & Kleinknecht, 2011).

Internal or functional flexibility, on the other hand, is one of the characteristics of a 'Rhineland' employment model, which focuses on the investment in trust and loyalty of their workers by facilitating and providing them with long-term career opportunities (Zhou, Dekker, & Kleinknecht, 2011). The term itself can be defined as the process employed by the firms to adapt to their changing needs through qualitative adaptation of their labours. The success of the strategy is highly dependent on the multiple competencies of the firms' employees. Subsequently, firms opting for such strategy often attempt to facilitate the preconditions of high average level of employees' skills and educational qualifications through job-related training, team-working opportunities and worker involvement in decision making process (Arvanitis, 2005). Such a concept of internal/functional flexibility strategy highly resembles what defined as 'high-road' HRM practices and some studies have claimed their positive contribution on labour productivity growth in the organization (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006). Nevertheless, it is important to note that such strategy does not come cheaply and requires additional resources from the firm. Hence, it is deemed unsuitable for cost minimization objectives.

1.2. Implications for Organizational Strategy

Labour flexibility is often associated with productivity growth and technological progress, even though opinions in how to achieve growth and innovation differ. While HRM and administrative science literatures generally agree that high road practices is beneficial for overall organizational performance (Cooke, 2001) (Michie & Sheehan-Quinn, 2001) (Gill, 2007), it still remains a debatable issue among the economists on which economic model is better for the success in competitive and innovative economies.

Mainstream economists argue that rigid labour markets characterized by strong unemployment benefits, strong labour protection legislation (and weak investor protection) as well as strong trade unions ('Rhineland' model), are the reasons behind high unemployment and limited flexibility to adapt to changes in market demand and supply (Corsi & Roncaglia, 2002) (Agell, 1999) (Bassanini & Ernst, 2002). Labour market flexibility is considered as the key asset and strategic reason behind the low unemployment rate and the competitive success of 'Anglo-Saxon' economies in countries like US and UK (Michie & Sheehan-Quinn, 2001) (Michie & Sheehan, 2003). Similar messages have also been expressed repeatedly by various institutions like European Commission, International Monetary Fund (IMF) and the OECD (European Commission, 2003) (IMF, 2007) (OECD, 2002) (OECD, 2003).

Critics of the rigid 'Rhineland' markets argue that strict labour market regulations have many disadvantages, which include the reluctance of long-tenured employees to adapt to new process and technology ('lock-in' effects) (Ichniouwski, Shaw, & Crandall, 1995), as well as difficulties in replacement of less productive personnel and reallocation of workers from old/declining industries to newly emerging industries (which may subsequently prevent adoption of labour-saving process innovations and lead to 'investment hold-up') (Bassanini & Ernst, 2002) (Scarpetta & Tressel, 2004) (Malcomson, 1997).

In addition to that, arguments favoring higher numerical flexibility and more flexible labour markets will often include labour cost as part of the reasoning. In general, stronger worker rights will increase workers' bargaining power, hence allowing them to demand for higher wages and subsequently lead to higher labour cost (Buchele & Christiansen, 1999). However, in view of current process of globalization, an intensified competition from low-wage countries together with the increasing unemployment rate, create tremendous pressure for directing the labour market towards more flexibilization (Agell, 1999). Stringent labour regulations are blamed for increasing the cost of workforce adjustment (i.e. hiring and firing decision under adverse environment), which is necessary and often inevitable to adjust to the changing market conditions (Scarpetta & Tressel, 2004) (Bassanini & Ernst, 2002). As mentioned earlier, firms often choose to adopt 'low road' practices for cost minimization reason, which is achieved either directly through low employee wages or indirectly through the use of fixed-term /casual/seasonal/temporary employees (numerical flexibility) (Michie & Sheehan-Quinn, 2001). On the contrary, 'high-road' practices with high internal flexibility rates do not lead to cost savings, but increase the overall costs instead (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006).

Proponents of flexible labour relations will argue that 'more flexibility' (higher labour turnover) is actually favourable to firms' innovative potential (the static Walrasian view), as larger influx of new workers will expand the firms' network, hence enhancing their pool of innovative ideas (Dew-Becker & Gordon, 2008). On top of that, it is argued that firms will have the ability to replace less productive people by more productive ones, hence resulting in higher sales and productivity growth (Scarpetta & Tressel, 2004). From a HRM management perspective, higher threat of dismissal in 'Anglo-Saxon' labour market (due to lower protection against layoff) may actually prevent the work-shirking problem (Zhou, Dekker, & Kleinknecht, 2011).

However, it should be noted that high labour flexibility also comes with drawbacks. In the study of Dutch firms, Kleinknecht et al. (2006) found that even though the practices of flexible 'hiring and firing' ('Anglo-Saxon' model) may indeed lead to higher job creation, this is achieved at the expense of labour productivity growth (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006). This is also in line with the earlier macro-level study by Buchele and Christiansen (1999), which conclude that while less regulated US style labour markets ('Anglo-Saxon' model) may promote employment growth, they also inhibit productivity growth at the same time (Buchele & Christiansen, 1999).

The reasoning behind these findings might be attributed to the problem of diminishing trust and social cohesion among the employees as the consequence of high flexibility of labour (high labour turnover) in the long run. Consequently, the probability of the employees engaging in opportunistic behaviors increases (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006). All basic determinants of productivity growth (i.e. innovation rate, worker's competence and skill development) rely upon close cooperation and active involvement of the employees. High flexibility and low job security impose higher risk for workers to cooperate, since they view cooperation as a threat that may undermine their bargaining power (Buchele & Christiansen, 1999).

As an illustration, in today's knowledge-based economy, workplace training and skills upgrading play an even more important role than ever before. Based on the human capital approach, firms are more likely to provide and workers are more likely to invest in job-specific training if the post-training period over which they can amortize their respective investment is considered long enough (Auer, Berg, & Coulibaly, 2005). If either the worker or the employee expect the employment relationship to be short-term, such training will either not be offered (by the firm) or will not be accepted (by the worker), depending on where the training cost burden lies on (Arulampalam & Booth, 1998). Strict labour regulations i.e. high firing costs incorporated in the 'Rhineland' model, further encourage the firm to invest in employees' job-specific training (since the required skills is no longer

easily obtainable from external labour market) and put effort in retaining the workers as long as possible for avoiding the costly turnover. This subsequently leads to compensation structures and promotion model that are based on employee qualifications and seniority, which serve as incentives for employee loyalty (Albert, 1993). On top of that, workers who received work-related training are shown to earn higher wages subsequently and higher wages seem to actually further increase employer's motivation to invest in training. This cycle of continuing training provides some explanation on the reasoning behind the emphasis of long-term employment relations in the 'Rhineland' model, which benefits both the firm (from high-skilled and loyal employees) and the workers (from higher wages and job security).

Such emphasis will not be found in 'Anglo-Saxon' model whose short-term focus tends to opt for higher numerical flexibility by facilitating work-related skills acquisition in the external labour market i.e. hiring more temporary workers. Since employment terms are expected to be of shorter duration, both employers and employees tend to be reluctant to invest into labour relations. On one hand, employers may hesitate to invest in the training of 'flexible' workers, while on the other hand employees will also invest less in firm-specific skill (Agell, 1999) (Malcomson, 1997) (Belot, Boone, & Van Ours, 2002).

From a research and innovation point of view, the lack of trust and loyalty in 'Anglo-Saxon' labour relations model contributes to a higher likelihood for leakage of trade secrets or technological knowledge to the firms' competitor, and this risk may subsequently discourage firms' investment in R&D and innovation. Lastly, high labour turnover induced by the flexible labour relations prevent the accumulation of (tacit) knowledge in the firms, hence weakening the firm's historical memory (Zhou, Dekker, & Kleinknecht, 2011). This is particularly damaging for the firms in 'routinized' innovation regimes (Kleinknecht, Oostendorp, Pradhan, & Naastepad, 2006) (Vergeer & Kleinknecht, 2008).

Hence, it seems that even though firms may benefit from cost reduction in the short term through the use of numerical flexibility, they may suffer in the long-run in terms of both innovation potential and productivity growth. Stronger workers' rights and stringent labour regulations foreclose firms' option to opt for 'low-road' practices and focus instead on 'high-road' practices, which emphasize the importance of investment in employees' trust and loyalty. This may serve as encouragement for labour-management cooperation and active involvement of workers, which is extremely crucial in further improving productivity and stimulating innovation activities in the organization. Only when workers feel that they have a secure stake in the firm's long-run success, they will be willing to cooperate and actively involve in further advancing the organizational performance i.e. invest in job- or firm-specific skills and sharing their tacit

knowledge with the firm (Buchele & Christiansen, 1999). The impact of labour regulations on employee's trust and loyalty, together with its correlation with management intensity, will be further discussed in details below.

1.3. Implications for Management Intensity

Countries like US and UK that employ the 'Anglo-Saxon' model of employment, highly depend on wage differentials as the main incentive and motivation for workers. Firms in those countries tend to gain their competitive advantage by promoting competition among the employees and attempting to retain the employees by paying them according to the ongoing market wage rate. On the other hand, countries like Germany that is known by its 'Rhineland' employment model has different priorities such as ensuring certain level of job security and providing training opportunities for the employees as means for obtaining loyalty to the companies. In other words, while job mobility and frequent career changes are considered as proof of individual excellence and initiative in the view of 'Anglo-Saxon' model, company loyalty and employee training are viewed as top priorities in the 'Rhineland' model, which is based on close cooperation between management and employees in the firm. Since qualifications and seniority serve as the basis for promotion in the companies employing 'Rhineland' approach, the workers are motivated to be loyal to their company and further upgrade their skills through training for improving their career opportunities (Albert, 1993).

HIGH

Employee Loyalty and Trust Level

LOW

'RHINELAND' STRATEGY
- Emphasizing internal flexibility
- Focusing on long-term employment relations
- Providing firm-specific training
- Seniority-based promotions

'ANGLO-SAXON' STRATEGY
- Emphasizing external flexibility
- Focusing on short-term employment relations
- Promoting competition and mobility
- Use of flexible workers to reduce labour costs

Figure 2. Overview of Labour Strategy Implications on Employee Loyalty and Trust Level

In the study of 20 OECD countries, Naastepad and Storm (2005) argue that flexible labour relations tend to lead to the growth in firms' management bureaucracies as more supervisory control and monitoring of employees is needed (Naastepad & Storm, 2005). This is in line with previous study by Gordon (1994), which showed that countries with rigid labour market tend to rely less heavily on supervisory monitoring as a mechanism for enhancing labour effort (Gordon, 1994). Both studies made a reference to the efficiency wage model in their analysis, which is often used as the foundation of the microeconomic analysis of the impact of labour-management relations on productivity

The efficiency wage theory takes on several assumptions (Yellen, 1984) (Akerlof & Yellen, 1986) (Naastepad & Storm, 2005):
- An inherent conflict of interest exists between employers and employees (since employers intend to extract as much work as they can from the employees for as little pay as necessary to retain them, whereas the employees wish to do as little work as necessary for as much pay as they can obtain).
- There is an information asymmetry between employers and employees (employers have incomplete information about employees' efforts and productivity, thereby creating the need for employee supervision and monitoring).
- Employees' level of effort is positively correlated with their wage payment, which is strongly associated with the level of labour productivity as well.

Subsequently, the theory suggests that there exists a trade-off between wage incentives and management supervision. The popular reasoning behind the trade-off is the higher the wage remuneration (the higher the cost of job loss for the employee), the more effective is the threat of firing and the less the need for direct monitoring of the employee (Kruse, 1992). Workers gauge the effort levels they have to put into their work based on the marginal cost/benefit analysis of working hard. Hence, workers who are monitored less have to be paid high wages in order not to shirk, and conversely, workers who are under intense/close supervision do not need high remuneration as incentives for not shirking (Allgulin & Ellingsen, 2002). To put it differently, wages and supervision can be viewed as substitute instruments for motivating workers, and firms have to trade one against another at a given level of productivity. In other words, an organization has the option to choose between paying higher employee wage while lowering the intensity of management supervision (and reducing the monitoring cost) or vice versa (Rebitzer, 1995).

The analysis by Naastepad & Storm shows that the existence of the trade-off between wage incentives and management supervision seems to differ across the countries. Figure 3 shows the relationship between real wage growth and supervision intensity in 19 OECD countries. Here, management ratio (percentage of firm's labour force working in administrative and managerial position) is used as an indicator of supervision or monitoring intensity by the management (Naastepad & Storm, 2005).
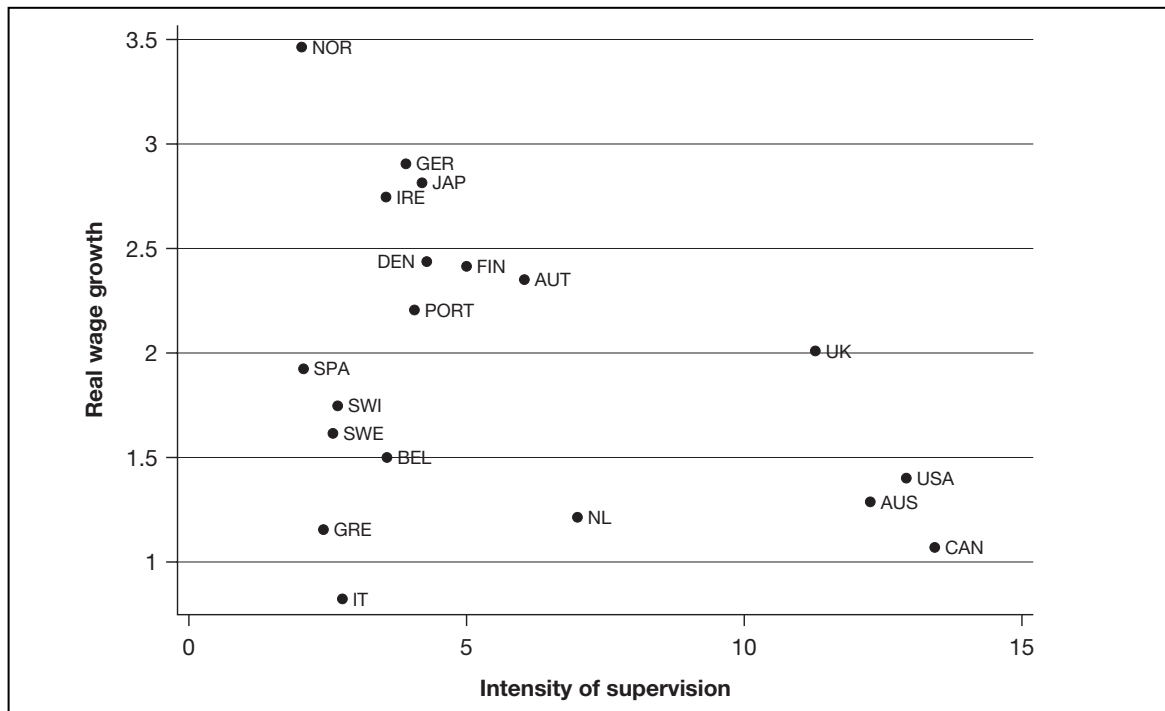
Figure 3. Scatter Plot of Intensity of Supervision and Average Annual Real Wage Growth: 19 OECD Countries (1984-1987) (Naastepad & Storm, 2005)

Three different groups of countries have been identified subsequently. The first group consists of countries like Australia, Canada, UK and US ('low-trust' economies), which are characterized with low real wage growth and very high management ratios. The second group represents the 'high-trust' economies, which feature relatively high real wage growth and low management ratios, such as observed in countries like Austria, Denmark, Germany, Japan, etc. The Netherlands, together with countries like Belgium, Greece, Italy, etc. belongs to the third group that displays both relatively low management ratios and low rates of real wage growth. This group of countries serves as an anomaly in the efficiency wage theory, as it implies that the proposed trade-off between wage and supervision intensity may not exist. This finding implies that there should be other determining factors for the level of supervision/monitoring (or management intensity) in the firms, besides the level of remuneration received by the employees (Naastepad & Storm, 2005) (Gordon, 1994).

One explanation could be offered by interpreting supervision/monitoring intensity as the extent of management trusts on the employees and the degree of the autonomy owned by the employees in conducting their work activities (Buchele & Christiansen, 1999) (Gordon, 1994). Workers may associate the rise in supervision intensity with an understanding that the employers do not really trust them. Consequently, workers' motivation, effort, loyalty and productivity decline (Drago & Perlman, 1989). At the same time, the firms will have to incur higher monitoring cost due to the high supervision intensity (more managers need to be hired) (Gordon, 1996). This suggests that international variations in supervision or management intensity are actually influenced by various dimensions of labour relation system. So, besides wage and management supervision, firms also have another option to invest in trust and loyalty as an instrument for motivating employees.

Instead of relying on the proposition of the efficiency wage theory alone, the variations in three different groups of 19 OECD countries observed in Figure 3 can be better explained by referring to three basic control approaches in organization's management identified in a classic paper by Ouchi (1980), namely Markets, Bureaucracies and Clans. These control mechanisms are used to manage labour relations in the firms, especially as means for obtaining employees' cooperation in order to achieve organizational objectives under the same first two assumptions of efficiency wage theory (rephrased differently in Ouchi's paper as 'goal incongruence' and 'performance ambiguity' for the first and second assumption respectively). Market-based mechanisms rely on the competitive market to develop a price mechanism for accurate measurement and evaluation of individual contributions. Bureaucracies make use of legitimate authority (i.e. managers) and rules for facilitating close supervision and gearing towards acceptance of common objectives among employees. Clans rely heavily on socialization processes to direct the employees towards common values and beliefs that encourage them to act at the best interests of the firm. Each mode of control requires different normative and informational preconditions for it to work. And since pre-requisite conditions for a pure market, bureaucracy or clan are inexistent, various combinations of these control mechanisms are employed. The combination is not balanced across three types of control mechanism; most firms tend to favor one mechanism more than the other, depending on its perceived effectiveness in managing their labour relations under certain specifiable conditions (Ouchi, 1980). Coming back to the group classifications in Figure 3, it seems that while the second and the third group rely more on market and clan mechanisms, the first group tends to depend more on bureaucracies that is reflected by their relatively higher management ratio.

It is therefore suggested that employees' motivation and effort level does not solely depend on their wage remuneration or supervision intensity on the

assumption that they have a notion of a fair effort level for what they are paid. The emphasis was that workers will only be willing to cooperate i.e. sharing or disclosing their (tacit) knowledge if they have sufficient trust on the firms to commit on the 'long-term employment relations' (Naastepad & Storm, 2005). This is supported by the study finding of Gordon (1994) that countries employing cooperative labor relations (high income, high job security and strong worker rights) rely less on direct supervision as control mechanism (and invest on building employee trust and loyalty instead) as compared to those countries with conflictual labor relations (Gordon, 1994). Some other studies defend the argument and further show the positive contribution (ceteris paribus) of 'high-road' HRM practices (cooperative labour relations) on productivity as well as on the innovation activities of the firms (Huselid, 1995) (Michie & Sheehan, 2003) (Appelbaum, Bailey, Berg, & Kalleberg, 2000).

Eventually, it is then expected that 'low road' practices, which is characterized by the lack of employer commitment to job security, lead to heavy reliance on direct monitoring as control instrument and result in higher management intensity in the firm. Since high numerical flexibility is not compatible with long-term employment relations, firms have no choice but to hire more managers for facilitating closer and more intensive direct monitoring of the employees in order to compensate for the lack of trust in their labour environment dominated by short-term and temporary employment. This is the essence of the findings by Gordon (1994) and later by Naastepad & Storm (2005). Nevertheless, these outcomes are based on empirical evidence from highly aggregated data at country level. This thesis is focused to analyze the interrelations between labour flexibility and firm's management intensity at the firm level. It seems both interesting and relevant to investigate whether the patterns observed at country level would also hold at firm level. Moreover, data on industry averages are more likely to create multicollinearity problems due to the covariance of variables across industries (Pondy, 1969). Hence, this research attempts to fill in this knowledge gap in the literature and contribute towards better understanding of the determinants of management bureaucracies in firms.

1.4. Research Objectives and Research Questions
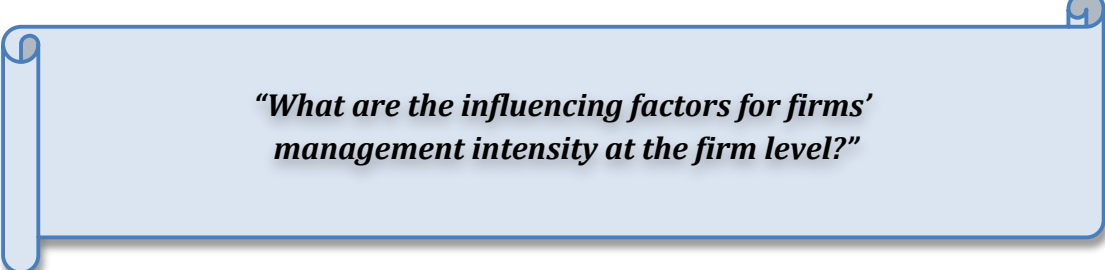
The objective of this research is to explore the determining factors of management intensity in Dutch firms. More specifically, the main interest is to investigate the significance of factors concerning labour relations and flexibility in influencing the extent of management bureaucracies in firms.

The Netherlands is chosen as the country of focus for this study, in view of the wide spectrum of labour contract patterns employed by Dutch firms; some still employ a fairly rigid 'Rhineland' labour relations model, while some others

employ a highly flexible 'Anglo-Saxon' model (Zhou, Dekker, & Kleinknecht, 2011). By limiting the research scope to firms in a single country, it also helps to hold constant relevant labour market regulations and environmental conditions, as well as some other institutional influences presumed to shape organizational structures (Baron, Hannan, & Burton, 1999).

Based on the objectives, the following main research question is formulated:

> *"What are the influencing factors for firms' management intensity at the firm level?"*

Referring back to the research problem outlined in section 1.1 – 1.3, this study is particularly interested to investigate the impact of (numerical) labour flexibility on management intensity at the firm level. In addition to that, influence of the firm's internal and external environment on management intensity, as suggested in existing organizational and administrative science literatures, also have to be taken into account. Lastly, since previous studies on management intensity tend to limit the research scope on specific industry i.e. manufacturing industries, educational institutions, etc., it would be interesting to investigate whether sectoral variances would also contribute to the differences in firm's level of management intensity. Hence, the main research question can be broken down into several sub-questions as follow:

- *What is the interrelation between **labour flexibility** and firms' management intensity? Are these in line with earlier results at country level?*

- *What are the determinants of management intensity from the context of firm's **internal environment**? What are the interrelations between these indicators and firms' management intensity based on empirical data? Are these in line with the literatures?*

- *What are the determinants of management intensity from the context of the firm's **external environment**? What are the interrelations between these indicators and firms' management intensity based on empirical data? Are these in line with the literatures?*

- *Do levels of management intensity differ across **sectors**? Can the differences be explained by firm-level factors?*

Together, these questions are expected to improve the general understanding on the determinants of management intensity at the firm level and to provide insight on the relationship between labour flexibility and management intensity specifically.

1.5. Scientific, Policy and Management Relevance

The topic of this research is important to fill the gap in the existing literature. There has been an evolving debate as to whether deregulation of labour markets and flexible labour relation systems are beneficial for productivity and the economy in general. However, research on the correlations of such practices with the firms' management intensity is still lacking. In addition to that, there seems to be an unaddressed perspective gap between the field of economics and administrative/organizational science in this issue. While economists tend to base their analyses on the interrelations between wages, supervision and labour relations, management scientists choose to focus on the influence of firms' internal and external environment on the level of management intensity. This study will therefore try to integrate perspectives from these two fields and fill the identified gap in the current knowledge of the determinants of management bureaucracies in the firms.

From a managerial point of view, this research topic is important, both at the policy level and at the firm level. At the policy or national level, this research is relevant in view of the current trends, in which various international institutions, such as European Commission, International Monetary Fund (IMF) and the OECD, are calling for deregulation of labor markets in Europe (European Commission, 2003) (IMF, 2007) (OECD, 2002) (OECD, 2003). This is done in the belief that more flexible labour markets will subsequently lead to higher productivity growth. Consequently, the industrial relation systems in the OECD countries have become increasingly less cooperative and more conflictual as a result of labour market deregulation, even though the expected high productivity performance has yet to be achieved.

At the firm level, this research will contribute towards understanding the impacts of different labour-management relation practices on the management intensity. This is important, as labour relations and management intensity has strong implications for productivity growth and innovativeness, which are essential for the firms to maintain their competitive advantages in the increasingly globalized and competitive markets. This research will provide insights into organizational structures that generate efficient use of labour within the firms.

1.6. Source of Data: OSA/SCP Database

Labour Demand Panel (Arbeidsvraagpanel) is a biannual survey designed to provide more insights into the nature and size of demand for labour at the enterprise level, which started in 1989. These longitudinal firm-level data are collected by OSA (Organization for Strategic Labour Market Research) since 1989 and taken over by SCP (The Netherlands Institute for Social Research) in August 2010. The two years cycle of data collection always starts in the odd years, for which the data are gathered by written questionnaires and telephone interviews (replacing face to face interviews, since 2003). Details on the fieldwork of data collection during the 1989-2010 periods are presented in Appendix A.

The Labour Demand Panel samples all organizations in the Netherlands with five or more employees, stratified by industries and firm size classes. The sample size for each wave accounts for approximately 3,000 organizations in the first data collection round, yet it is important to note that overall participation responses tend to decrease by each round of questionnaires/interviews. Some participants in the first round telephone interviews do not participate in the written questionnaire and/or in the other two telephone interview rounds due to various reasons i.e. lack of time or closure of establishment. The expected sample loss is approximately 30% per round. Figure 4 illustrates the participation responses and overlap in various questionnaires for 2005/2006 survey.
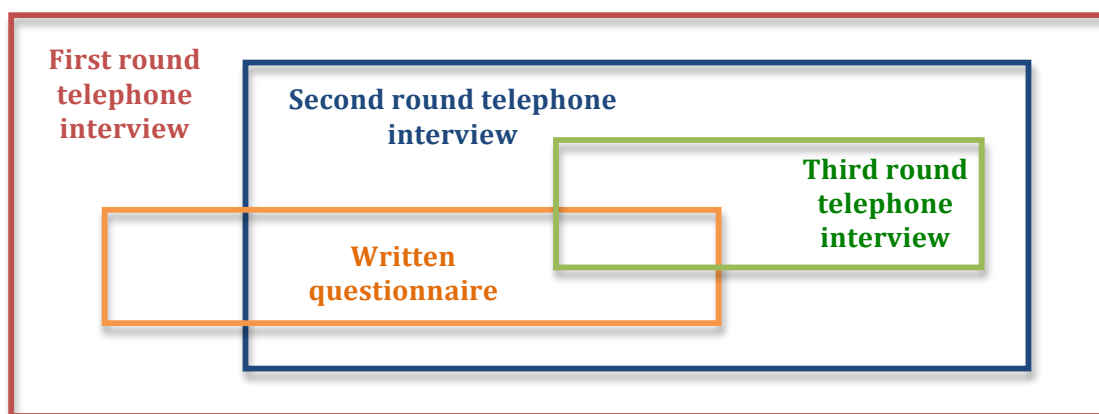
Figure 4. Participation Responses in Various Questionnaires for 2005/2006 Surveys (DANS, 2010)

Organizations that participated in the previous wave are approached to take part again in the subsequent wave. The average rate of renewed responses from the previous participants is between 41% and 51%. New organizations are subsequently added to each wave to compensate for the sample fall out and maintain the targeted number of observations. Table 1 provides an overview of participation in each wave for 1989-2009 period. The database contains information about the labour force (inflow and outflow, type of contract, recruitment and dismissal, etc.), as well as R&D and innovation related activities.

Year of First Participation	Year of Survey										
	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009
1989	*2041*	1343	965	674	468	291	121	70	36	23	22
1991		*608*	445	296	193	120	48	26	17	12	12
1993			*578*	407	252	152	68	38	25	19	14
1995				*1311*	794	449	191	96	50	35	22
1997					*824*	438	170	94	52	33	26
1999						*1272*	546	274	120	93	67
2001							*1996*	975	446	259	183
2003								*3107*	1186	687	434
2005									*1198*	576	344
2007										*1124*	530
2009											*1183*
TOTAL	2041	1951	1988	2688	2531	2722	3140	4680	3130	2861	2837

Table 1. Overview of Firms Participation in Each Wave (1989-2009) (DANS, 2010)
Note: Numbers of newly participating firms are given in italics

For the purpose of this study, the OSA/SCP database for the years 2007-2008 and 2009-2010 are going to be used, which cover 2861 and 2837 firms respectively, coming from all sectors of manufacturing, services, agriculture and even from non-commercial services, including the government sector.

In the OSA/SCP database, sectors are divided into nine categories based on the Standard Industrial Classifications (SIC). All companies registered at the Dutch Chamber of Commerce have an industry classification code; often referred to as SBI (Standard BedrijfsIndeling) code. The first four digits of the SBI code are equal to the International SIC code, whereas the fifth digit applies specifically to Dutch companies. Information on the SBI code for each company is available in the restricted access of the OSA/SCP database (supplementary information package I). The classification of the nine sectors is described below:

Sector	SBI Code - 1974	SBI Code – 1993
Agriculture, industry	00 – 39	00 – 37
Construction	50 – 52	45
Trade, catering and repairs	60 – 68	50 – 55
Transportation	70 – 77	60 – 64
Business services	80 – 85	65 – 74
Care and welfare	93, 94	85
Other Services	40 – 91, 95 – 99	40 – 41, 90 – 99
Government	40 – 90	40 – 41, 75
Education	92	80

Table 2. Sector Classifications in the OSA/SCP Database (DANS, 2008)

In this study, only the data from the first telephone interview round is going to be analyzed. The reason being that the written questionnaire round suffered from low response rates, which may dramatically lower our confidence in the results. The decision to exclude data from the other telephone interview rounds and written questionnaire has drawbacks on the inability to include other measures, which may offer additional explanations to management intensity. Fortunately, the data from the first round of telephone interview has sufficiently covered main aspects that are the focus on this study; labour relations and HRM practices (especially the external/numerical flexibility indicators), innovation data and information about percentages of managers in a firm's total working population (i.e. our proxy for management intensity).

1.7. Report Overview

This thesis report is organized into four chapters. Chapter one provides introductory background to the thesis project, which includes an explanation on the research problem, research objectives and research questions, scientific and management relevance as well as the source of research data. Chapter two reviews the previous studies and relevant findings from the existing literature, based on which relevant hypotheses are formulated and a conceptual framework is developed. Chapter three explains the research methodology and variable operationalization, which is followed by the presentation of results from the descriptive and multiple regression analysis. And lastly, chapter four discusses and concludes main findings of the research results.

2. CONCEPTUAL FRAMEWORK

This chapter presents literature review on management intensity based on the results of previous research. The literature review begins by defining the concept of management intensity, which is followed by identifying the corresponding determinants from internal environment, external environment and labour relations perspective for the purpose of the analysis. Relevant hypotheses on the interrelation between each determinant and management intensity are then developed. These hypotheses are subsequently used as the basis for developing the conceptual framework.

2.1. Review of Management Intensity

Management intensity is one of the frequently studied dimensions of organizational structure. The term 'management intensity' can be defined as share or proportion of managerial occupational employment in a firm (Gander, 1991) (Baron, Hannan, & Burton, 1999). High management intensity is one of the characteristics often used to describe bureaucratic organizational structure. Management bureaucracy is often blamed for negatively influencing the attitudes and conducts of the employees i.e. by stifling initiative and creativity (Blau, 1968). Consequently, such structure is increasingly considered outdated and inappropriate for surviving in the current economy characterized by constantly changing and highly competitive environment.

Some other studies have referred to this subject with alternative phrases, such as 'administrative intensity' or 'supervision intensity' with slight differences in definition and operationalization. 'Administrative intensity' can be described as "the number of managers, professionals and clerical workers divided by the number of craftsmen, operatives, and laborers employed by the organization" (Pondy, 1969). While the term 'supervision intensity' shares more or less similar definition as "the ratio of administrative and managerial workers (supervisory inputs) to the sum of clerical service, and production workers (production worker inputs)" (Gordon, 1994) (Gordon, 1990). These terms differ in their operationalization due to varying specifications of the numerator and denominator parts of the ratio used as the primary dependent variables in the analysis. The numerator may include employment under the administrator function only, the managerial function only, or both (including or excluding the clerical staff), not to mention that the definition for each of the term may vary as well. Likewise, the denominator may cover only the production/non-supervisory employees or include a broader scope of the total employees of the firms. It is

also important to take note that most of the previous research cited below, made use of aggregated data of management/administrative intensity at industry level, due to the lack of firm-level data.

Nevertheless, since the number of previous studies that focus only on managerial personnel (the administrative and the clerical personnel were strictly excluded in the numerator) are rare; not to mention the ones using firm-level data, all relevant findings in the existing literatures will be reviewed and used as guidance to develop the relevant hypotheses in this study.

2.2. Review of Factors Determining Management Intensity

An overview of the relevant factors influencing the level of management or administrative intensity at industry level and firm level, as identified in the earlier works, will be listed and explained in this section. This would include factors from the internal and external environment of the firm as identified in 'classical' organizational and administrative science literatures, as well as labour relations related factors that are predicted (mainly by the economists) to have impacts on management intensity. The discussions will be focused on the aspects covered by the OSA/SCP database.

2.2.1. Determinants from the Internal Environment

The internal environment of the firm has some influence on the extent of management intensity observed within. More specifically, the determinants from internal firm environment can be generated from the organizational context or the corporate strategy chosen by the firms.

ORGANIZATIONAL CONTEXT

Contextual dimensions of an organization can be described by factors such as size, growth and age. The measures for each of these variables can be constructed directly or indirectly based on the information available in the OSA/SCP database.

Early study by Graicunas (1933) suggested that administrative intensity would increase with size (number of employees in an organization) (Graicunas, 1933). The result of this classic paper found supports in subsequent studies in the following years (Bossard, 1945) (Kephart, 1950) (Terrien & Mills, 1955) (Caplow, 1957). The explanation behind these findings was commonly attributed to the structural complexity and coordination problems generated by the relative size of firm (Rushing, 1967) (Hall, 1982) (McKinley, 1987). 'Complexity-administrative growth hypothesis' by Anderson and Warkov suggested that administrative intensity would increases disproportionately as organizations become increasingly complex (Anderson & Warkov, 1961). The assumptions were that

expanding organizational size leads to an increase in structural complexity (more differentiated subunits or occupations) to cope with the large-scale operations. This would create coordination problems (more time and supervisory/monitoring attention are required for managing the diverse activities), and since administrative/managerial personnel are the ones responsible for coordination function (Pondy, 1969)(Freeman, 1973), this will subsequently lead to higher administrative/management intensity (Rushing, 1967) (Blau,1970). This argument often serves as the basis of explanation behind the traditional belief that large firms and organizations tend to be burdened with overbureaucratization (Lioukas & Xerokostas, 1982).

However, some more recent studies showed opposite findings and argued that firm size is actually negatively related to administrative intensity instead. While the original hypothesis proposed that expanding organizational size would promote structural complexity thereby leading to subsequent increases in the total number of administrators; the recent hypothesis follow the opposite reasoning that increase in size would lead to economies of scale instead and thereby reducing the need for administrators (Freeman, 1973). The first argument was that larger organizational size is not necessarily accompanied by an increase in complexity of the relationship among its employees; it may merely involve addition of already existing activities. Administrators hence only need to perform essentially the same duties with the possibility of transmitting their services to a larger number of people (Pondy, 1969). Secondly, economies of scale are also reflected in the application of technology that potentially alters the control and coordination requirements. Empirical evidence has shown that large firms are more likely to extensively adopt and utilize ICT in reducing their administrative burden, hence indirectly lowering the need for more administrators (Hollenstein, 2004) (Ruel, Bondarouk, & Looise, 2004). The presence of economies of scale indicated that administrative component may grow but at much slower rate than the size of the organization (Rushing, 1967) (Baron, Hannan, & Burton, 1999).

Even though the direction of relationship between firm size and management/administrative intensity seems to be inconclusive, it is safe to suggest from the previous research that firm size indeed have significant influence on the level of management intensity in the firm.

Hypothesis 1: Larger firms have <u>higher or lower</u> management intensities

Growth or decline of the organization has been suggested to serve as moderating variable on the positive relationship between organizational complexity and administrative/management intensity (Gander, 1991). Here, organizational decline (growth) can be defined as a downturn (surge) in organizational size or performance and measured by the percentage change in total number of employees (firm size). It was argued that most organization theories were based on the assumption of growth, which includes the hypothesis regarding positive correlation between organizational complexity and administrative intensity. Growth assumption expected firms to increase their administrative intensity for responding to increase in internal complexity. However, it is important to note that such adjustment requires resources (large overhead costs for expansion of the high paid administrators/managers) that are more likely to be available under growth conditions. It is subsequently showed that the greater the tendency toward decline, the less positive the relationship between organizational complexity and administrative intensity (McKinley, 1987). Hendershot and James (1972) investigated the administrative intensity in US School Districts (in this case, ratio of supervisors and principals to teachers) and found that rapid growth tend to increase and slow growth rates tend to decrease administrative intensity levels (Hendershot & James, 1972). Based on these explanations, it is therefore suggested that growth of firm size would have positive effects on level of management intensity.

Hypothesis 2: Growing firms have <u>higher</u> management intensities

Company age is often mentioned as one of the determinants of firm's management intensity. However, detailed discussion on how it may influence the level of administrative/management intensity is infrequent. Other than large size, the traditional and intuitive beliefs also often associate bureaucracy with older, more mature company. The argument follows the logic that older (and larger) firms tend to be more complex and diversified (Miller, 1991). And since complexity is positively associated with management intensity, it is therefore expected that company age also share the same positive correlations with management intensity.

Hypothesis 3: Older firms have <u>higher</u> management intensities

CORPORATE STRATEGY

Increased foreign competition and changing customer preferences have created tremendous pressure for firms to continuously improve their performance. Various strategies are employed by the firms to obtain competitive advantage, which include corporate reorganization, as well as involvement in research and innovation activities.

Some firms attempted to enhance their competitive position by exercising organizational restructurization, mergers & acquisitions or downsizing strategy. These strategies inevitably have some impact on various dimensions of organizational structure, including the level of administrative/management intensity. DeWitt (1993) examined the structural consequences of downsizing and arrived at the conclusion that the effects on management intensity are highly dependent on type of downsizing strategy chosen by the firms. Four different downsizing strategies were identified based on the types and levels of challenges faced by the organization i.e. high/low level of environmental or organizational decline, and illustrated in Figure 5 below.
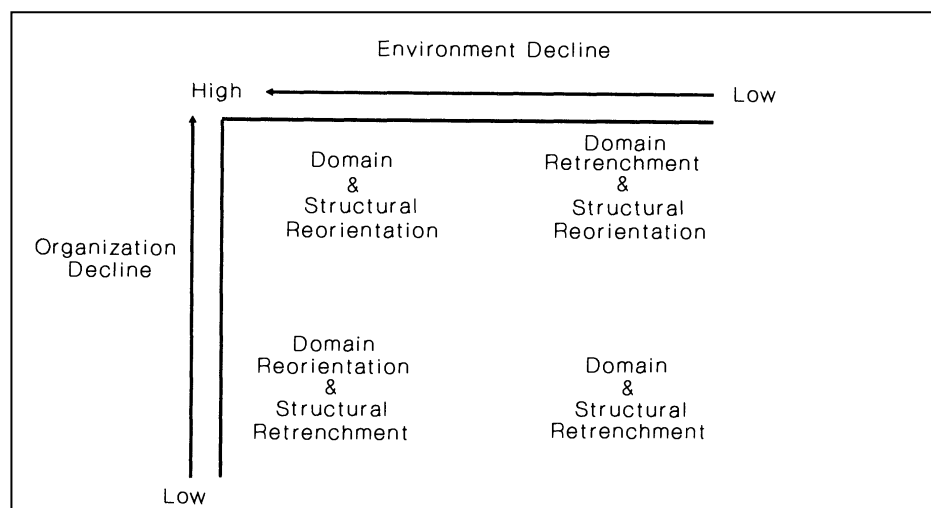
Figure 5. Downsizing Strategies (DeWitt, 1993)

Basically, when challenges originated from mismanagement (organizational decline), firms attempt to correct the mishaps through structure-oriented actions. On the other hand, when organizations are confronted with competitive threats from the environment, domain-oriented strategy is normally preferred. Two different types of actions are identified: reorientation and retrenchment, in which retrenchment is usually chosen when the challenges are considered relatively low. Both structural and domain retrenchment were found to enlarge the relative size of firm's administrative component. Decrease in administrative intensity was only observed in the limited case when structural orientation reduced the amount of administrative work in the firm (DeWitt, 1993). Therefore, it is suggested that firms who experience any restructuring or reorganization activities tend to have higher level of management intensity.

During the past few decades, research and innovation has increasingly become an essential activity in firms. Rapid technological development and ever-changing customer demands force the firms to continue develop new unique products/services and introduce new production/organizational process. Both product and process innovation play substantial roles in enhancing firms' overall profitability and productivity. Subsequently, innovative firms were associated to higher profits and significant contribution to economic growth (Trott, 2008).

Involvement in research and innovation activities is positively associated with the level of technical complexity in the firm. Even though technical complexity is considered as the less frequently studies aspect of complexity (compared to structural complexity), technological factor (mechanism employed by the organizations to turn out their products/services) still remains one of the most important explanatory variables to explain variations in organizational structure (Harvey, 1968)(McKinley, 1987). The term 'technical complexity' itself pertains to the characteristics of the production process i.e. level of technological sophistication and degree of controllability/predictability (Woodward, 1965). Technical complexity measures are also closely related to the extent of mechanization or automation in firms' production systems (Freeman, 1973).

The general preposition was that the higher the level of technical complexity (the more automated/mechanized the production process is), the larger the relative size of administrative component in the firm would be (the higher the management/administrative intensity) (Woodward, 1965)(Chester, 1961) (Hickson, Pugh, & Pheysey, 1969). The explanation behind the positive relationship between technical complexity and management intensity lies (partly) in the coordination and management problem, as in the case with structural complexity. As production process becomes more complicated (and increasingly relies on mechanization/automation), long-term planning and inter-unit coordination becomes more and more important. In manufacturing industries, complex production systems tend to be more capital intensive, which eventually creates the need for supervision/monitoring for the workers' use of equipment (quality control). Since the administrators/managers are the ones accountable for planning, coordination and supervision/monitoring function, increasing the number of administrators/managers in the firm are seen as one way to cope with the challenges raised by technically complex production process(Harvey, 1968) (McKinley, 1987).

Another proxy for technical complexity is the technical specificity or technical diffuseness of the firms' technology, which is measured by either the number of product changes experienced or the average number of product types offered by the firm over certain period of time. Technically diffused firms can be described as those whose production systems consist of a wide range of process i.e. electronics industry, while technically specific firms are those characterized with less product changes and variations i.e. oil refinery industry. In this aspect, management intensity in the firm tends to increase as technical specificity increases. This is also related to the facts that technically specific firms tend to deal with routine decisions in their day-to-day operations, as compared to technically diffuse firms are more likely to deal with a larger number of innovative decisions that requires more flexibility and less bureaucracy (hence, lower management intensity) in the organizational structure (Harvey, 1968). Management/administrative intensity is therefore influenced by organizational technology, which potentially alters the needs for information, coordination and control (Pugh, Hickson, Hinigs, & Turner, 1968) (Baron, Hannan, & Burton, 1999).

Based on the assumptions that research-intensive and innovative firms are more likely to make use of mechanization/automatization in their production process and tend to introduce more product changes (higher technical complexity), it is expected that extent of firms' research and innovation will positively influence level of management/administrative intensity.

> **Hypothesis 5**: Firms that are more research intensive and innovative have <u>higher</u> management intensities

2.2.2. Determinants from the External Environment

Other than factors associated with the internal firm environment, external environment is also noted as one of the important variables in explaining firms' management intensity and other dimensions of organizational structure. Firm's external environment can be defined along the stable-changing continuum. Organizational structure is highly dependent on the type of environment the firm is dealing with, since firm would only be able to perform well if firm's internal structure fits the environmental requirements. In addition to that, different organizational subunits may face different environmental challenges. For example, sales and production divisions tend to face relatively stable and predictable as compared to research and development divisions (Pondy, 1969). Firms would therefore create divisions or subunits to deal with the respective environmental challenges in the effort to reduce external uncertainty and improve overall performance (Pfeffer & Leblebici, 1973).

Nevertheless, relationship between environmental stability/predictability and management/administrative intensity were shown to be inconsistent in the previous studies. For instance, Harvey (1968) suggested that administrative intensity is lower in firms or organizational subunits facing unstable and unpredictable environments, to allow for flexibility in responding to the ever-changing situations. The assumption was that having more administrators would lead to more lengthy and time-consuming decision making process, hence limiting the speed and the effectiveness of the responsive actions. Freeman (1973), on the other hand, suggested the opposite on the argument that under condition of uncertainty, the number of non-routine decisions that falls under managerial discretions will substantially increase, hence more managers are required to cope with the uncertainty and to maintain quality of the decision making process. The reason behind this inconsistency perhaps lies on the different measures used in each study. While Harvey (1968) viewed environment in the context of competition and organizational technology, Freeman (1973) focus on environmental factors that influence the amount of administrative works i.e. labor unrest, proportion of local sales, importance of advertising, instigation of sales (whether or not the selling activities was performed by salesman) and the presence or absence of manufacturer's representatives.

Despite the lack of consensus on the effect of environmental stability/predictability, the external environment in which firm operates is indeed shown to have influence on firm's management intensity. Since the concept of external environment influence covers a lot of aspects, it will be useful to focus on specific external factors and investigate their respective influence on management intensity. In the OSA/SCP database, measures on external factors that may serve as indicators of environmental stability/predictability are information on whether firms are operating in competitive market and firms' sensitivity to economic fluctuations.

Market competition is an example of external factors that exert pressure on the organization and contributed to the variations in internal firm structure. Industry concentration ratio is often used as a measure for extent of competition. The larger the concentration ratio, the less the degree of competition and the higher the likelihood for x-inefficiency to happen (failure for the firms to achieve efficiency due to lack of competitive pressure) (Leibenstein, 1966). Competitiveness is reported to increase the need for control and coordination in the organization due to relatively higher reporting frequency of the employees to the managers/supervisors, importance of long-term planning (advanced decision-making process) and thicker structural hierarchy (Pfeffer & Leblebici, 1973). And since research has shown positive correlation between coordination needs and management intensity, it is logical to deduce that extent of competition is also positively associated with management intensity.

General economy conditions are other external factors that may have an effect on firm's recruitment decision and eventually influence firm's level of administrative intensity (Freeman, 1973). Since overall economic situations in the current globalized world are highly subjected to various unpredictable factors, it is expected that firms' sensitivity to business cycles and overall economic fluctuations would influence the level of management intensity to certain extent.

2.2.3. Determinants from the Labour Relations Perspective

While the proposed hypotheses on the influence of various internal and external environment variables on management intensity are supported by ample empirical evidences from previous organizational theory research, the formulation of hypotheses based on determinants from the labour relations perspective tend to be more explorative.

The concept of labour relations can be broadly defined as the relationship between employees and their employers (i.e. the firm or the organization). As emphasized earlier, the focus of this study is on the labour practices related to external/numerical flexibility and its interrelation with the management intensity. External labour flexibility can be achieved in three different ways: by reducing employment duration (i.e. hiring flexible workers under short-term contracts), externalizing administration responsibility (i.e. outsourcing), or externalizing work location (i.e. telecommuting) (Pfeffer & Baron, 1988). Among these three types, the first type of employee externalization has been the largest and most rapidly growing form of externalization, which is reflected from the continuous increase in share of flexible workers employed by organizations (Davis-Blake & Uzzi, 1993). Flexible workers can be divided into three main categories: workers hired under temporary contracts, workers hired through manpower agencies, and independent freelancers (Commission of the EU Communities, 2006).

In view of the short-term nature of flexible employment, firms do not have sufficient time and incentive to invest on 'high-road' HRM practices necessary for building trust and loyalty among these flexible workers. Subsequently, firms would have to rely on direct supervisory monitoring as control instrument, which subsequently lead to higher management intensity. Detailed explanation on this issue has been discussed in section 1.3 of this report. This is the key hypothesis to be investigated in this study.

Hypothesis 8: Firms that employ more flexible workers have <u>higher</u> management intensities

Besides labour flexibility, the conditions of workplace environment in which the employees perform their work are also expected to exert certain influence on the level of management intensity in the firm. Working situations can be explained by numerous indicators, such as average exposure time for new employees and level of workload pressure in the organization, among others. These are the two measures available in the OSA/SCP database that represented overall working environment from the labour relations perspective.

When the pressure level in the organization is high due to the heavy workload, the employee-management relationship will be negatively affected. Continuously high workload pressure may increase the employees' stress level, which subsequently leads to lower loyalty and job satisfaction level among them. Earlier study suggested that when employees perceive deterioration in their workplace, they may respond by shirking from work or leaving the organization (Davis-Blake, Broschak, & George, 2003). These actions will lower the morale in the organization, and therefore firms would require more managers to monitor the employees and ensure that they perform job accordingly. Therefore, it is expected that higher workload pressure in the firms would lead to higher level of management intensity.

Hypothesis 9: Firms with high workload pressure have <u>higher</u> management intensities

Lastly, the average exposure time for newly hired employees is expected to affect level of management intensity as well. This exposure time can be regarded as 'on the job' or 'learning by doing' training period provided by the firm for their new recruits. However, the relationship between the average length of job-specific training period and management intensity is still not clear since the expected direction of influence may be positive or negative based on two different views. Firstly, the average training period for new employees may be expected to positively influence the level on management intensity, based on the fact that other than control and coordination functions, managers are also responsible for providing relevant guidance and training to their subordinates (Blau, 1968). However, on the other hand, as discussed in section 1.2 of this report, firms are more likely to invest on job-specific training if they expect the employment relationships to be long-term, such that they will have enough time to amortize their investment (Auer, Berg, & Coulibaly, 2005). In addition to that, firms tend to accompany the training with qualifications- and seniority-based compensation structure and/or promotion model as incentives for employees' loyalty. Hence, the longer the average exposure time for new employees (i.e. the longer the job-specific training period), the more the employees would expect their employment relationship to be long-term in nature. This would positively affect level of employees' trust and loyalty to the firm, which is then expected to result in lower management intensity in the firm itself.

Hypothesis 10: Firms with longer average exposure time for new employees have <u>higher or lower</u> management intensities

2.3. Proposed Conceptual Framework

Based on the hypotheses formulated in the previous section, the conceptual framework for this research study is developed subsequently and presented in Figure 6 on the next page. The conceptual framework can be summarized as follow: based upon the literature search (and the availability of relevant measures in the OSA/SCP database), this research is aimed to investigate the influences of internal firm environment (firm size, firm growth, firm age, restructurization, research and innovation), external environment (competitive market and economic sensitivity), as well as labour relations and HRM practices (intensity of use of flexible workers, workload pressure in organization and average exposure time for new employees) on the firm level of management intensity.

INDEPENDENT VARIABLES

Internal Firm Environment
- Firm size
- Firm growth
- Firm age
- Restructurization
- Research and innovation

DEPENDENT VARIABLE

External Firm Environment
- Competitive market
- Economic sensitivity

Firm Level of Management Intensity

Labour Relations & HRM Practices
- Intensity of use of flexible workers (external flexibility)
- Workload pressure in organization
- Average exposure time for new employees

Figure 6. Proposed Conceptual Framework

*Note: The **blue** boxes represent determinants based on the organizational science literatures; The **purple** box represents determinants based on the economic and labour relations literatures*

3. DATA ANALYSIS AND RESULTS

This chapter is dedicated for presenting the research methodology and results of the analyses performed based on the conceptual framework and hypotheses developed in the previous chapters. The procedural approach employed in analyzing the data, as well as details on variables operationalization are explained. Descriptive statistics, inter-variable correlations and regression models are summarized and presented as the results.

3.1. Research Approach and Methodology

Based on the conceptual framework and hypotheses formulated in the previous chapter, a list of (dependent and independent) variables are selected from the database and defined subsequently. The dependent variable of interest in this study focuses in measuring level of management intensity in the firm, which is measured in OSA/SCP database as the number of employees occupying managerial positions in the firm.

Table 3 below summarizes the hypotheses developed in the previous chapter and presents the selected independent variables associated with each hypothesis, together with the description and measurement level.

Concept	Hypothesis	Measure(s) in OSA/SCP Database	Measurement Level
Firm size	Larger firms have <u>higher or lower</u> management intensities	Total number of firm's employees	Numerical (Scale)
Firm growth	Growing firms have <u>higher</u> management intensities	No direct measure. Indirect measure is represented by % change in total number of employees within 2 years	Numerical (Scale)
Firm age	Older firms have <u>higher</u> management intensities	Year in which the firm is founded	Numerical (Scale)
Restructuring activities	Firms that undergo restructuring activities have <u>higher</u> management intensities	Did the firm undergo restructuring activities within the past 2 years?	Nominal

Concept	Hypothesis	Measure(s) in OSA/SCP Database	Measurement Level
Extent of research and innovation	Firms that are more research intensive and innovative have <u>higher</u> management intensities	% of products/services that are radically/partly/not changed within the past 2 years	Numerical (Scale)
		Is there any major change or innovation in production process within the past 2 years?	Nominal
		Does the firm engage in any R&D activities in year 2006?	Nominal
External environments	Firms that operate in competitive market have <u>higher</u> management intensities	Does the firm operate in competitive market?	Nominal
	Firms that are sensitive to economic fluctuations have <u>higher or lower</u> management intensities	Is the firm sensitive to economic fluctuations?	Nominal
Flexible employment contracts	Firms with more flexible workers have <u>higher</u> management intensities	% of temporary workers	Numerical (Scale)
		% of manpower agency workers	Numerical (Scale)
Working environment	Firms with high workload pressure have <u>higher</u> management intensities	Workload pressure in the firm	Nominal
	Firms with longer average exposure time have <u>higher or lower</u> management intensities	Average exposure time for a new employee	Nominal

Table 3. Summary of Hypotheses, Concepts and Measurements

*Note: The **blue** cells represent literature-based determinants from the internal environment;*
*The **green** cells represent literature-based determinants from the external environment;*
*The **purple** cells represent explorative determinants from the labour relations perspective*

Since the dependent variable for management intensity in the OSA/SCP database is continuous, analyses will be done mainly by multiple regression analysis. SPSS will be the main research tool to be used in this study. The outcome will be a statistical model, with measures of significance attached to the tested determining factors, based on which conclusions about the significance of these factors can be drawn. In addition to that, the multiple regression analysis will also illustrate how significant these factors are in influencing the management intensity in Dutch firms. Additional checks for outliers and tests for

multicollinearity will be performed to improve the relevancy and validity of the model. The robustness of the model will also be checked by including several non-linear combinations of the independent variables, for which several versions of the model will be compared subsequently. In the series of regression analysis performed for this research, industrial sector will serve as one of the control variable. Therefore, at least one version of the statistical model will include industry/sector dummies.

One of the possible drawbacks from the multiple regression analysis method lies in examining the direction of causality from various determining factors (including the flexibility of labour relations) to the management intensity. Since the main objective of this research is to explore the determining factors of the management intensity in the firm, it is very important to make sure that the hypothesised factors are the one causing or influencing the firms' management intensity and not the other way around. In response to this concern, additional robustness tests will be conducted to investigate the reverse causality effects. This can be done, for example, by utilizing data from the earlier wave for the determining factors (independent variables) and running the regression analysis against the management intensity data (dependent variable) of the more recent wave (e.g. taking 2006 database for the determinants and 2008 database for management intensity proxy). Hence, at least two different rounds of analysis will be conducted in this study; the first one will make use of management intensity data from the 2007-2008 wave, while data for the second one is taken from the 2009-2010 wave.

3.2. Descriptive Statistics and Statistical Correlations

The measures available in the OSA/SCP database may need to undergo some transformations to enable appropriate interpretation and to support the main objective of this study. Detailed explanation on the variables operationalization is presented in this section. Results of descriptive and bivariate correlation analysis will also be presented, which may provide useful insights that can be used in structuring the subsequent econometric analysis.

Management Intensity
The dependent variable is measured as the percentage of managers employed in the organization (number of managers divided by total employments), or simply Management Ratio (MR). Descriptive information on this variable for 2007-2008 and 2009-2010 database are shown below.

Management Ratio in Year 2008 (mgmtratio2008)			
Valid N	2828		
Missing N	33	Range	100
Mean	13.19	Minimum	0 %
Standard Deviation	9.52	Maximum	100 %

Management Ratio in Year 2010 (mgmtratio2010)			
Valid N	2804		
Missing N	33	Range	100
Mean	12.99 %	Minimum	0 %
Standard Deviation	9.09	Maximum	100 %

Next, since OSA/SCP database provide information on the variable for the past two decades, it is also interesting to check the changes in average management ratio over the time. Data on 1989 is reported in different format; employees are categorized into product/service oriented, process oriented or geographical oriented, and therefore it is excluded from the comparison below.
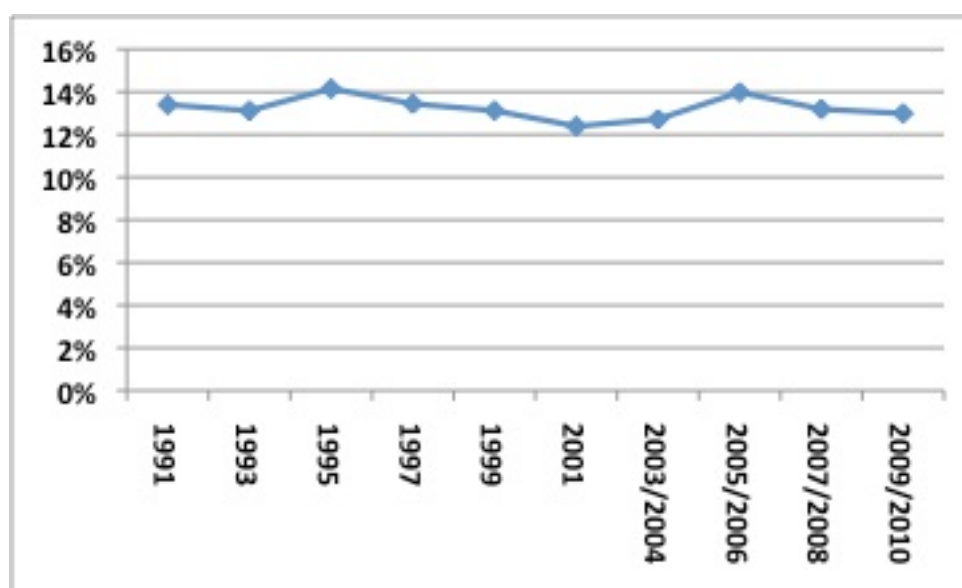
Figure 7. Average Management Ratio (1991-2010)

Year	Valid N	Mean of Management Ratio
1991	1941	13.40 %
1993	1947	13.12 %
1995	2661	14.15 %
1997	2503	13.44 %
1999	2712	13.12 %
2001	3096	12.39 %
2003/2004	3143	12.72 %
2005/2006	1306	13.98 %
2007/2008	2828	13.19 %
2009/2010	2804	12.99 %

Table 4. Average Management Ratio (1991-2010)

Based on Table 4 and Figure 7, it can be seen that the management intensity seems more or less remained stable within the range of 12-14% during the past 2 decades.

The OSA/SCP database provides information on total number of employees in the organization by 1 January 2007 (employees with temporary contract are included, but those hired from manpower agency are excluded). This is used as the direct measure for firm size.

Total Number of Employees in Year 2007 (size2007)			
Valid N	2825		
Missing N	36	Range	11999
Mean	150.89	Minimum	1
Standard Deviation	420.62	Maximum	12000

Descriptive analysis on this variable showed that the data is strongly skewed to the right with large standard deviation and wide data range. The common approach in this case is to apply log transformation for improving the normality of the data. Literatures suggested that the use of log-transformed variable is preferred when the standard deviation is proportional (or far exceed) the mean value (Keene, 1995), as observed in this case.

Log Total Number of Employees in Year 2007 (logsize2007)			
Valid N	2825		
Missing N	36	Range	4.08
Mean	1.61	Minimum	0
Standard Deviation	0.67	Maximum	4.08

To investigate the possibility that the relationship between firm size and management intensity may be non-linear, new variable is also created by applying square transformation on the data.

Square Total Number of Employees in Year 2007 (squaresize2007)			
Valid N	2825		
Missing N	36	Range	108.54
Mean	8.88	Minimum	1
Standard Deviation	8.49	Maximum	109.54

Nevertheless, the effect of using either one of the variables will be explored later by looking at its correlation with other variables and the results of regression analysis. The Pearson correlation coefficients with Management Ratio are -0.175, -0.494 and -0.35 for Firm Size, Log Firm Size and Square Firm Size respectively (all are significant at 0.01 level).

In addition to that, further analysis to rule out non-linearity is conducted by dividing the firms into different size groups. A closer look into the average management ratio within each class suggested a linear negative relationship between firm size and management intensity. The general trend of decreasing average management ratio as the size increases can be observed.

Size Group	Valid N	Average Management Ratio
1-9 employees	587	22.39 %
10-19 employees	545	14.78 %
20-99 employees	771	11.06 %
100-499 employees	706	8.15 %
>500 employees	216	8.29 %

Table 5. Average Management Ratio in Different Size Group (2007-2008)

Firm Growth

There is no direct measure on firm or organizational growth in the OSA/SCP database. However, it can be measured by calculating the percentage change in organization's total number of employees (year 2005-2007). This is calculated by dividing the change in organization's total employment within 2 years (total number of employees in 2007 minus those in 2005) by the total number of employees in year 2005. And finally, the result is multiplied by 100 to obtain the percentage number.

Change in Total Number of Employees (Year 2005-2007) (growth0507)			
Valid N	2443		
Missing N	418	Range	1289.71
Mean	6.78 %	Minimum	-89.71
Standard Deviation	40.61	Maximum	1200

Similar to the firm size variable, the standard deviation and range for this variable is relatively high. Log transformed variable is therefore created by following the formula of log10 (x + 90.71). Adding the number 90.71 is required as the data contain negative number with -89.71 being the minimum.

Log Change in Total Number of Employees (Year 2005-2007) (loggrowth0507)			
Valid N	2443		
Missing N	418	Range	3.11
Mean	1.97	Minimum	0
Standard Deviation	0.12	Maximum	3.11

The Pearson correlation coefficients with management ratio are .003 and -0.025 for Firm Growth and Log Firm Growth respectively (both are not significant at 0.05 level). Likewise, the effect of using either one of the variables will be explored later by looking at its correlation with other variables and the results of regression analysis. Even though these two variables seem to have limited correlation with the dependent variable, it would be interesting to investigate whether this variable has any mediating/moderating effect as suggested in the literature.

Firm Age

The OSA/SCP database provides information on the organization's founding year. Based on this, company age can be calculated by subtracting the founding year from the reference year (year 2008).

Firm Age in Year 2008 (age2008)			
Valid N	2551		
Missing N	310	Range	107
Mean	25	Minimum	1
Standard Deviation	28.82	Maximum	108

For the same reasons of improving data normality and investigating non-linearity, log- and square-transformations are also applied to the original firm age variable.

Log Firm Age in Year 2008 (logage2008)			
Valid N	2551		
Missing N	310	Range	2.03
Mean	1.36	Minimum	0
Standard Deviation	0.42	Maximum	2.03

Square Firm Age in Year 2008 (squareage2008)			
Valid N	2551		
Missing N	310	Range	9.39
Mean	5.32	Minimum	1
Standard Deviation	2.37	Maximum	10.39

The Pearson correlation coefficients with management ratio are -0.085, -0.064 and -0.077 for Firm Age, Log Firm Age and Square Firm Age respectively (all are significant at 0.01 level), which indicates weak negative relationship between firm age and management intensity. However, descriptive examination on different age groups suggested that there is no significant difference on average management ratio between firms in each age group.

Age Group	Valid N	Average Management Ratio
≤ 5 years old	194	13.91 %
6-10 years old	313	14.17 %
11-20 years old	597	14.07 %
21-50 years old	868	13.70 %
>50 years old	556	12.23 %

Table 6. Average Management Ratio in Different Age Group (2007-2008)

Restructuring Activities

This is measured based on binary information on whether the organization has undergone restructuring activities or significant changes within the past two years. This may include reorganization, acquisition by/of another organization, mergers, downsizing/retrenchment, organization expansion (new locations), etc. Dummy variable is subsequently constructed with those firms experienced restructurization during the past two years are coded as 1 and those not as 0 ('*dumreorg2008*').

Out of 2861 firms, 30.5 % of them experienced certain restructurization within their organizations during the past two years of their operations. The Pearson's correlation coefficient with management ratio is -0.169 (significant at 0.01 level).

Research & Innovation

There are several measures on research and innovation available in the OSA/SCP database:

- Information on percentage of firm's products/services that are more or less unchanged, partly changed, or radically changed/renewed (product innovation)
- Binary information on whether there has been a major change or innovation in the production process within the past two years i.e. introduction of new technology (process innovation)
- Information on percentage of employees involved with the process innovation in their daily work
- Binary information on whether the organization engaged in any R&D activities in year 2006.
- Information on percentage of budget/turnover that the organization spent on R&D in year 2006 (R&D intensity)
- Information on whether the R&D budget in the organization is of temporary/occasional (once in several years) or permanent nature

Even though continuous variable on R&D intensity may offer richer information on firm's research activities, this question is badly responded to in the OSA/SCP database. For the 2007/2008 wave, only 527 out of 2861 firms gave answer to this question. Similarly, the questions on the percentage of employees involved in process innovation and the nature of R&D activities (permanent or temporary) are also badly filled; only 581 and 871 (out of 2861 firms) responded to these two questions respectively. Hence, in order to ensure sufficient number of observations in the subsequent regression analysis, only three variables (all converted into dummies) are going to be used as direct measures for the extent of research and innovation activities in the firms: product innovation, process innovation and R&D activities.

Measure for '**Product Innovation**' is based on the share of the products/services that undergone changes during the past two years. The extent of changes is distinguished into three different categories: more or less unchanged, partly changed/renewed and totally/radically changed/renewed. To simplify the interpretation, this data is then turned into dummy variable: those answered 100% for more or less unchanged category are coded as 0 and those answered differently (within 0-99 % range) are coded as 1 ('*dumprodinnov2008).* Approximately half of the firms (54.1 %) made some changes in their products/services within the past two years. '**Process Innovation**' is measured

based on whether the production process has undergone significant change or innovation during the past two years. Dummy variable is constructed with firms engaged in process innovation are coded as 1 and those not are coded as 0 ('*dumprocinnov2008*'). It turned out that only 21 % of the firms in the survey introduced process innovation within the past two years. Lastly, the data on '**R&D Activities**' is turned into dummy variable with firms conducting R&D activities are coded as 1 and those not are coded as 0 ('*dumrnd2008*'). About one third of the firms (32.5 %) did perform R&D activities. All the research and innovation variables are negatively and weakly correlated (significant at 0.01 level) with management ratio. The Pearson correlation coefficients with management ratio are -0.062, -0.083 and -0.052 for product innovation, process innovation and R&D activities dummy variables respectively.

Alternatively, indirect measures for research and innovation concept can be constructed by categorizing firms into non-innovators, medium-innovators and strong innovators. This categorization will allow investigation on whether there is any significance difference on the level of management intensity between the groups that differ on the extent of innovativeness. Criteria for the categorization are based on the three research and innovation variables (product innovation, process innovation and R&D activities) as follow:

Category	Definition	N (%)
Strong innovators ('*stronginnov2008*')	conducting at least 2 of the research and innovation activities	1017 (35.5%)
Medium innovators ('*medinnov2008*')	conducting only 1 of the research and innovation activities	967 (33.8%)
Non innovators ('*dumnoninnov2008*')	conducting none of the research and innovation activities	877 (30.7%)

External Environment
There are two measures of external environment in the OSA/SCP database: involvement in competitive market and sensitivity to fluctuations in economic conditions.

'Competitive Market' is measured based on binary information on whether the organization operates in the market where competition occurs between multiple providers. Dummy variable is subsequently constructed with those firms facing competition with multiple providers are coded as 1 and those not as 0 ('*dumcomp2008*'). This may be used to differentiate commercial firms with the governmental or educational institutions, since the latter tend to have no or less competitors in comparison. In the 2008 survey used in this study, 2854 firms provide this information, in which 76.3 % face competition with multiple providers in their operational activities. The variable is weakly and positively correlated with management ratio (Pearson correlation coefficient is 0.09, significant at 0.01 level).

The OSA/SCP database also provides information on whether the organization is strongly, somewhat, slightly or not at all sensitive to economic fluctuations or business cycles, which is used as the measure for the influence of '**Economic Sensitivity**'. The data is then turned into dummy variable: those answered strongly or somewhat sensitive are coded as 1 and those answered slightly or not at all are coded as 0 ('*dumsens2008*'). The relationship with management ratio turned out to be weakly positive (Pearson correlation coefficient is 0.07, significant at 0.01 level).

Flexible Workers

Two direct measures of flexible workers are available in the OSA/SCP database:
- Number or percentage of employees hired under temporary contracts
- Number or percentage of employees hired from manpower agencies (including those hired under independent freelance contracts)

71.3 % and 58.9 % of the firms in the OSA/SCP Database indicated that they make use of temporary workers and manpower agency workers respectively. The Pearson correlation coefficients for these two dichotomous variables are both negative and significant at 0.01 level. However, this should not be interpreted such that management intensity is negatively correlated with the use of flexible workers. The binary information may not capture the intended purpose in studying the significance of flexible employment in influencing the extent of firms' management bureaucracy, since the use of a single or a limited number of flexible or manpower agency worker may not render the firm eligible to be considered as flexible. Hence, the continuous variables reflecting the shares of flexible workers employed in the firm are considered more appropriate and will be used in the subsequent analyses instead.

Percentage of Temporary Workers in Year 2008 (temp2008)			
Valid N	1984		
Missing N	877	Range	180
Mean	17.27 %	Minimum	0
Standard Deviation	17.35	Maximum	180

Percentage of Manpower Agency Workers in Year 2008 (manp2008)			
Valid N	1458		
Missing N	1403	Range	100
Mean	10.71 %	Minimum	0
Standard Deviation	13.41	Maximum	100

The maximum percentage of temporary workers of 180% seems doubtful, since the expected maximum percentage is 100%. It is assumed that this may be caused by the error in interpreting the question by the interviewee or in reporting the data by the OSA/SCP staff.

Nevertheless, the data is cleaned by removing those exceeding 100% range and left the data with a total valid N of 1981 (3 cases are removed). The revised descriptive statistics for the percentage of temporary workers without the outliers are presented below.

Percentage of Temporary Workers in Year 2008 (cleanedtemp2008)			
Valid N	1981		
Missing N	880	Range	100
Mean	17.07 %	Minimum	0
Standard Deviation	16.56	Maximum	100

The Pearson correlation coefficients with management ratio are 0.167 and 0.191 for (cleaned) temporary workers and manpower agency workers respectively (both significant at 0.001 level). This serves as an indication of strong positive relationship between management intensity and share of flexible workers employed in the firm.

And since the main focus of this study is to investigate the influence of flexible employment on firm's management intensity, it would also be interesting to look at the trend of flexible employment for the past two decades using the OSA/SCP database. Data from year 1989 is excluded from the comparison due to the format incompatibility mentioned earlier in the 'Management Intensity' section. Manpower agency workers data are only available from year 1995 onwards.
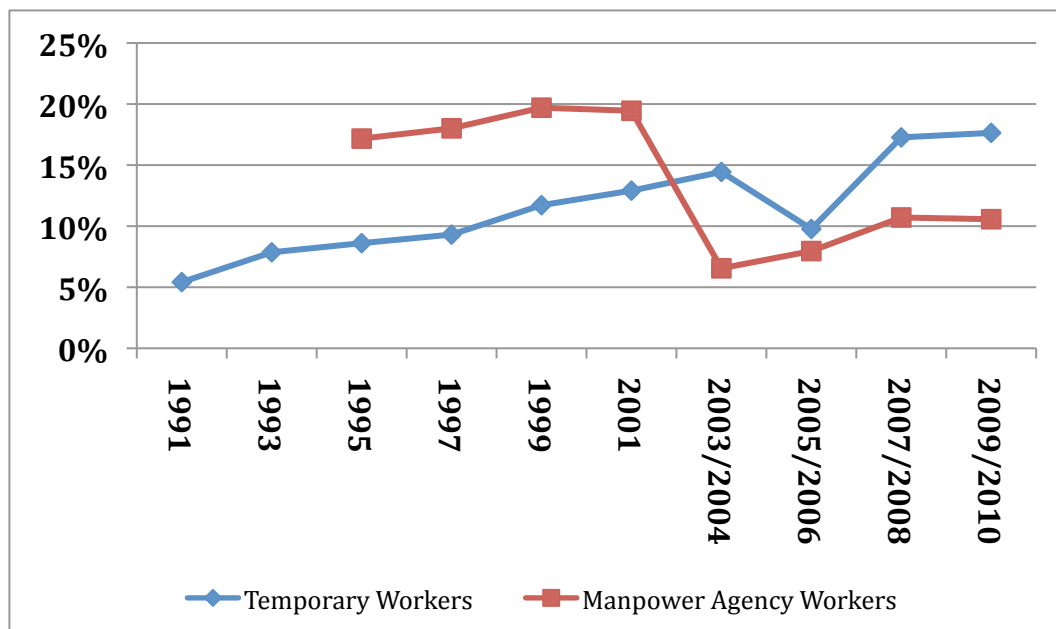
Figure 8. Average Temporary Workers (1991-2010) and Manpower Agency Workers (1995-2010)

Year	Temporary Workers		Manpower Agency Workers	
	Valid N	Mean	Valid N	Mean
1991	1448	5.42 %	-	-
1993	906	7.86 %	-	-
1995	812	8.61 %	840	17.17 %
1997	1032	9.31 %	1119	18.01 %
1999	1044	11.72 %	987	19.70 %
2001	704	12.91 %	506	19.45 %
2003/2004	1998	14.44 %	1391	6.55 %
2005/2006	2128	9.77 %	980	7.96 %
2007/2008	1984	17.27 %	1458	10.71 %
2009/2010	2051	17.64 %	1478	10.57 %

Table 7. Average Temporary Workers (1991-2010) and Manpower Agency Workers (1995-2010)

As shown in Table 7 and Figure 8, except the decline in year 2005/2006, there seemed to be a trend of increasing use of temporary workers over the past 2 decades. On the other hand, average percentage of manpower agency workers employed by the firm seemed to increase incrementally over the period of 1995-2001, continued by a drastic drop in year 2003/2004, then it was shown to increase again for the next four years.

Workplace Environment

The OSA/SCP database also provides information that can be used as measures for working environment in the organization, such as workload pressure in the organization and average exposure time for new employee.

Firms were asked to describe '**Workload Pressure'** in their workplace into the following category: high, not high/not low, low or alternating between high and low. The data is then turned into dummy variable: those answered high and alternating between high and low are coded as 1 and those answered not high/not low and low are coded as 0 ('*dumworkload2008*'). Majority of the firms (74.2%) characterized their workplace as relatively high in terms of pressure, and the Pearson correlation coefficient of -0.046 (significant at 0.05 level) indicates weak negative relationship with management ratio.

The average exposure time for new employees may serve as indirect measure of the '**Extent of Training'** provided by the firms. Dummy variable is created with those answered more than 3 months are coded as 1 and those answered less than 3 months are coded as 0 ('*dumexptime2008*'). Among the 2861 firms surveyed, 42.3 % of them indicated that their new employees in average have more than three months of exposure time since they join the firm. The Pearson correlation

coefficient is -.002 (non-significant), which may suggest that 'extent of training' may have no relationship to firms' level of management intensity.

Sectors

As mentioned in section 1.7 of this report, the OSA/SCP database categorizes the sector into nine different groups based on the SBI code. Restricted access of the OSA/SCP database provides the information on the complete five digits SBI code. To provide more detailed insight into sector variations on management intensity, the sectors are regrouped into more refined categories based on the first two digits SBI code, as follow:

Sector Division	SBI Code	N	%
Agriculture	1, 2, 5, 14	33	1.2 %
Traditional Industry	15-22, 26, 36	24	0.8 %
Chemicals	23-25	45	1.6 %
Metals	27-28	91	3.2 %
Machines & Apparatus	29-33	252	8.8 %
Automobiles	34-35	248	8.7 %
Commercial Services	37, 65-71	254	8.9 %
Public Services	40, 64	283	9.9 %
Construction	45	97	3.4 %
Trade Services	50-55	71	2.5 %
Transportation	60-63	220	7.7 %
Knowledge Intensive Services	72-74, 90	238	8.3 %
Public Administration	75	52	1.8 %
Education	80	532	18.6 %
Healthcare	85	211	7.4 %
Non-Commercial Services	91-93	210	7.3 %
TOTAL		**2861**	**100%**

Table 8. Sector Classification for Multiple Regression Analysis

Dummy variables based on these new 16 sector categories are created correspondingly. Details on the sector reclassification i.e. industry titles belong to each division, are presented in Appendix B.

Variations in management intensity, as well as in shares of flexible workers in total firm's employment (main focus of this study), across the sectors can therefore be investigated based on the classification defined above. The mean value for management ratio and percentage of flexible workers (temporary and manpower agency workers) for each of the 16 sectors are shown on Table 9.

Sector Division	% of Managers	% of Temporary Workers	% of Manpower Workers
Agriculture	21.60%	18.31%	15.31%
Traditional Industry	13.56%	12.20%	9.50%
Chemicals	12.08%	5.36%	11.20%
Metals	13.62%	13.51%	15.40%
Machines & Apparatus	13.60%	11.14%	10.27%
Automobiles	14.54%	15.22%	18.56%
Commercial Services	13.27%	12.61%	8.61%
Public Services	8.44%	23.85%	12.53%
Construction	16.63%	11.03%	16.30%
Trade Services	15.78%	23.01%	10.59%
Transportation	12.44%	19.46%	13.84%
Knowledge Intensive Services	14.22%	19.23%	11.74%
Public Administration	9.00%	9.22%	8.30%
Education	8.40%	16.95%	4.95%
Healthcare	10.60%	15.79%	5.45%
Non-Commercial Services	14.47%	24.65%	9.01%

Table 9. Average Management Ratio, Share of Temporary Workers and Manpower Agency Workers across Sectors
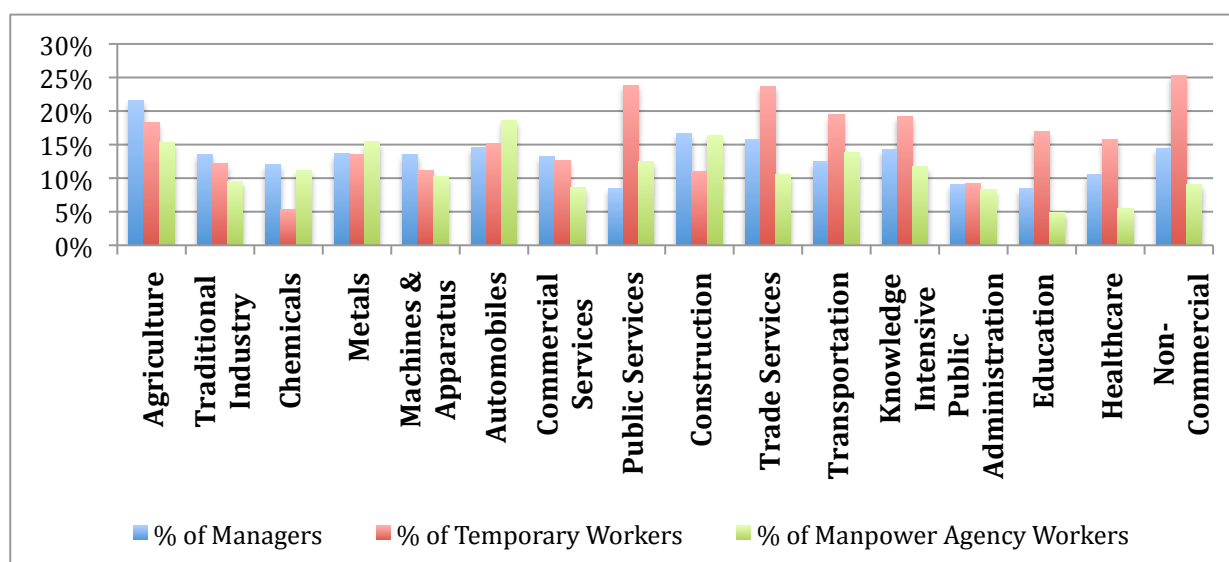
Figure 9. Average Management Ratio, Share of Temporary Workers and Manpower Agency Workers across Sectors

Agriculture industry is the one with the highest management ratio of 21.60%, much higher than the all firms' average of 13.19 %. Education, Public Services and Public Administration are three industry sectors with the lowest management intensity (below 10%). However, the correlation between sector variation in management intensity and shares of flexible workers employed is still unclear.

Other than the correlations between management intensity and each of the independent variable mentioned above, it is also important to take note the inter-correlations among the independent variables themselves. This is crucial to avoid multicollinearity problem, which may compromise the results of the subsequent regression analysis. A summarized version of the correlation table showing correlations between all the selected variables is presented in Appendix C.

3.3. Multiple Regression Analysis

The essence of regression analysis is to fit a model to the available data and use it to estimate values of the dependent variable (outcome) from one or more independent variables (predictor). Multiple regression analysis is a method employed to find linear combinations of several predictors (explanatory variables) that correlate maximally with the outcome variable. The general equation for multiple regression analysis can be defined as follow (Field, 2010):

$$Y_i = (b_0 + b_1X_{i1} + b_2X_{i2} + ... + b_nX_n) + \varepsilon_i$$

where Y is the dependent variable, b_1 is the coefficient of the first independent variable X_1, b_2 is the coefficient of the second independent variable X_2, b_n is the coefficient of the n_{th} independent variable X_n and ε_I is the error term (the difference between the estimated and the observed value of Y for the i_{th} unit of analysis.

In this research, multiple regression analysis method will be used to test the hypotheses listed in Chapter 2. The results of the analyses will be presented and interpreted in this section.

3.3.1. Regression Approach

Backward elimination is often recommended as regression method when the analysis is of exploratory nature. Since this study also includes several explorative independent variables (determinants from labour relations perspective), the recommendation is therefore applicable. This method begins by including all predictor variables in the model and then removes one least useful predictor at a time based on the set removal criteria. The removal criteria are based on the statistical contribution of each predictor (e.g. significance at the 5% level). Hence, the model is continuously re-estimated and the regression equation is constantly reassessed each time a predictor is deleted. This is done until all the remaining predictor variables make significant partial contributions in predicting the outcome (Agresti, 2007).

However, the 'Enter' method (used to generate the initial model estimation of backward elimination in SPSS regression) also offers additional insight that is not available in the final regression results obtained using backward elimination method i.e. the coefficients of the non-significant variables. In the enter method (also known as 'Forced Entry' method), all predictors are 'forced' into the model simultaneously (Field, 2010).

Forward selection is another regression method, which is the opposite of the backward elimination method. This method begins with none of the predictor variables and only consists of the constant b_0. One predictor is added at a time to the regression model, until it reaches a point where there is no remaining predictor that can be added to improve the ability of the regression model in predicting the outcome. The forward method is not used in this study to minimize the risk of missing an explanatory variable that may potentially contribute in predicting the outcome (Type II error or 'suppressor effect') (Field, 2010).

Based on the above considerations, backward elimination will be used as regression method in this study. However, both results generated by the 'Enter' and 'Backward' method will be presented for comparison. Both literature-based and explorative determinants will be included as explanatory variables in different regression models. However, it is important to note that not all the variables are going to be used in the final regression analysis. In general, variables that may potentially cause multicollinearity problems and/or strongly decrease numbers of valid observations will not be chosen. The number of valid N for each independent variable needs to be taken into account, as it is possible that the number of observations included in the regression analysis will be reduced substantially when more variables are added, because of missing cases. Sufficient numbers of observations are important for supporting the reliability of the results generated in the final analysis.

3.3.2. Preliminary Models

All the previously identified independent variables will be used in the pre-analysis models. The log-transformed version of 'firm size', 'firm growth' and firm age will be used as the independent variables, instead of the raw data. In addition to the highly skewed distribution of the raw data mentioned in section 3.2, the preliminary analysis also showed that the use of log-transformed variables substantially increase the R-square of the regression models (hence improving the models' explanatory power). Based on preliminary analyses, it was also decided that the square-transformed version of 'firm size' and 'firm age' variables will not be used for the reason of lower R-squares and the fact that non-linearity has been ruled out earlier (refer to Table 5 and 6 in section 3.2).

For the hypothesis regarding research and innovation as part of firm's corporate strategy, dummy variables on product innovation, process innovation and R&D activities are three direct measures of research and innovation in the OSA/SCP database that provide sufficient number of observations for multiple regression analysis. However, preliminary analysis revealed that these three variables are highly correlated with each other and also with other independent variables. Hence, the indirect measures on research and innovation (created based on the three dummy variables, which categorized the firms into non-, medium-, and strong- innovators) will be used in the subsequent regression analysis. Details on the construction of these indirect measures have been explained in section 3.2 of this report.

The explorative independent variables (determinants from labour relations perspective) will be added later to investigate whether they offer any additional insight in explaining firms' management intensity. Variables explaining flexible employment and working environment will be added sequentially to model two and three respectively.

MODEL ONE

The first model will only include all the literature-based variables: three organizational-context variables (log firm size, log firm growth, log firm age), three corporate strategy variables (restructuring activities, medium innovator, strong innovator) and two external environment variables (competitive market, economic sensitivity to the business cycle).

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	29.552	9.394***	29.313	9.877***
Log size	-7.74	-26.02***	-7.788	-27.725***
Log firm growth	-2.831	-1.882*	-2.574	-1.738*
Log firm age	-0.174	-0.383	n.s.	~
Restructuring activities	-0.177	-0.415	n.s.	~
Medium innovators#	0.287	0.67	n.s.	~
Strong innovators#	1.663	3.601***	1.526	3.837***
Competitive market	0.553	1.224	n.s.	~
Economic sensitivity	1.55	4.04***	1.694	4.597***
R-Square	0.267		0.266	
Number of observations	2199			

****significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant*
 # non-innovators are taken as a reference of firms' 'extent of research and innovation'

Table 10. Results of Regression Analyses for Model One

Log firm size is shown to have a very significant negative impact on management intensity (significant at 1% level). Strong innovators and economic sensitivity to business cycles have a strong positive effect on management intensity (both are significant at 1% level). Log firm growth is also shown to have a negative impact on management intensity at 10% significance level. In general, models generated from enter and backward method show similar results regarding the significance of the predictors, with slight variation in the coefficients.

MODEL TWO

Here, model one is further expanded by adding the flexible employment variables (share of temporary and manpower agency workers). In view of the fact that the impact of flexible employment on management intensity is the key hypothesis in this study, extensive investigation on the two flexible worker variables were conducted in the preliminary analysis. The main findings are:

- There is a substantially higher number of missing cases generated when both temporary workers and manpower agency workers are used as independent variables.

- To allow a maximum number of observations, multiple regression analysis is re-run by expanding model one with only one additional flexible employment variable included each time. The results indicate that share of temporary workers only have significant impact when Manpower Agency workers variable is removed (which probably has to do with multicollinearity).

- Further, several different versions of regression models are compared by running the analysis with different combinations of independent variables (i.e. inclusion/exclusion of certain variables). The results show that the coefficient of share of temporary variable is unstable across the versions and its significance may disappear when certain variables are included/excluded from the model.

- The inclusion of the temporary worker variable is also found to substantially decrease the R-square (explanatory power) of the regression models. This may serve as an indication of a multicollinearity problem between the temporary worker variable and other explanatory variables.

- There is also a concern that the temporary worker variable may be an imperfect measure of external flexibility. In the OSA/SCP database, firms were also asked about their main motivation of using temporary workers. More than half of the firms (58%) answered 'probationary period' as the main reason (i.e. the temporary workers may be hired permanently later, depending on their performance during the probations). The remaining 42% of the firms chose other reasons, which include uncertainty about future, project based (temporary funding/grants), layoffs, seasonal fluctuations or for flexibility within the company. Hence, it can be assumed that the temporary worker variable only partially measures external flexibility.

It is therefore decided to include only the Manpower Agency variable as a measure of flexible employment (external flexibility) in Model Two.

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	26.472	5.642***	22.481	29.828***
Log size	-6.783	-17.678***	-6.781	-17.785***
Log firm growth	-2.244	-1.009	n.s.	~
Log firm age	-0.22	-0.379	n.s.	~
Restructuring activities	-0.829	-1.617	-0.856	-1.699*
Medium innovators#	1.296	2.193**	1.306	2.215**
Strong innovators#	2.318	3.915***	2.37	4.023***
Competitive market	0.599	1.03	n.s.	~
Economic sensitivity	0.512	0.993	n.s.	~
Manpower Agency Workers	0.083	4.898***	0.087	5.158***
R-Square	0.268		0.265	
Number of observations	1129			

****significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant*
 # non-innovators are taken as a reference of firms' 'extent of research and innovation'

Table 11. Results of Regression Analyses for Model Two

Again, log firm size shows a very significant negative contribution (at 1% level) on management intensity. Medium and strong innovators have significant positive effects on management intensity (at 5% and 1% significance level respectively). Restructuring activities are shown to exert a negative influence on management intensity (significant at 10% level) in the backward elimination model. The share of Manpower Agency workers is found to have a positive effect on management intensity at 1% level. However, with the introduction of the Manpower Agency worker variable in this model, the significance of firm growth and economic sensitivity observed in model one disappear.

MODEL THREE
Model three is based on model two and further expanded by including explanatory variables associated with workplace environment (workload pressure in organization and average exposure time for new employees).

Similar to model two, log firm size, share of manpower agency workers and strong innovators have significant impact on management ratio at 1% level across all models (log firm size has negative effect, while the other two are positive). Medium innovators remain positively significant to management intensity at 5% level. The significance of restructuring activities variable to management intensity observed in model two disappears. The two workplace variables newly introduced in this model appear to be non-significant. Regression results generated using enter and backward method are similar, with slight differences in coefficients.

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	26.528	5.574***	22.632	29.308***
Log size	-6.9	-17.491***	-7.009	-18.431***
Log firm growth	-2.361	-1.043	n.s.	~
Log firm age	-0.322	-0.539	n.s.	~
Restructuring activities	-0.817	-1.558	n.s.	~
Medium innovators#	1.135	1.868*	1.177	1.957*
Strong innovators#	2.261	3.739***	2.231	3.746***
Competitive market	0.757	1.271	n.s.	~
Economic sensitivity	0.503	0.953	n.s.	~
Manpower Agency Workers	0.089	4.92***	0.093	5.176***
Workload pressure	0.207	0.373	n.s.	~
Ave. exposure time	0.637	1.33	n.s.	~
R-Square	0.272		0.266	
Number of observations	1098			

****significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant*
\# non-innovators are taken as a reference of firms' 'extent of research and innovation'

Table 12. Results of Regression Analyses for Model Three

SUMMARY

For ease of comparison, the coefficients on the first three regression models are reproduced below (only the results from backward elimination method are presented). The addition of explorative variables does not seem to improve the overall fitness or explanatory power of the model (the R-square remains more or less unchanged). Nevertheless, the signs and the significance levels of log firm size, strong innovators and manpower agency workers are robust across different specifications of the model, with only slight changes in the coefficients.

Variables	Coefficients model one	Coefficients model two	Coefficients model three
Log size	-7.788***	-6.781***	-7.009***
Log firm growth	-2.574*	n.s.	n.s.
Log firm age	n.s.	n.s.	n.s.
Restructuring activities	n.s.	-0.856*	n.s.
Medium innovators#	n.s.	1.306**	1.177*
Strong innovators#	1.526***	2.37***	2.231***
Competitive market	n.s.	n.s.	n.s.
Economic sensitivity	1.694***	n.s.	n.s.
Manpower Agency Workers		0.087***	0.093***
Workload pressure			n.s.
Ave. exposure time			n.s.
R-Square	0.266	0.265	0.266
Number of observations	2199	1129	1098

****significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant*
\# non-innovators are taken as a reference of firms' 'extent of research and innovation'

Table 13. Summary of Regression Models One, Two and Three

3.3.3. Final Models

In the preliminary models, explorative variables associated with workplace environment (workload pressure and average exposure time for new employees) seem to be insignificant. Hence, these two variables are removed from the final models. This simplification step allows higher numbers of observations to be included in the regression analysis, while including enough explanatory variables to make the model useful for theoretical purposes. This is important to improve the overall reliability and generalizability of the final results. Some of the literature-based variables are also shown to remain insignificant throughout the models e.g. firm age and competitive market. However, these variables will still be included in the final models, since the associated hypotheses are developed based on the results of existing literatures.

Based on these considerations, model two of the preliminary models is chosen to be the basis for the final models. Independent variables included in this model are: log firm size, log firm growth, log firm age, restructuring activities, dummy variables for medium and strong innovator firms (non-innovators are used as reference), competitive market, economic sensitivity and share of manpower agency workers (the only remaining explorative variables and the one associated with the key hypothesis of this study).

MODEL FOUR
Model four expands model two by including sector dummies in order to examine sectoral influence on management intensity. Agriculture sector is used as a reference. Hence the other 15 dummy sector variables are added as variables subsequently.

There are some changes in the significance of the predictors caused by adding sector dummies in this model. Firstly, the restructuring activities variable is no longer significant and medium innovators are significant only in the model generated by the 'Enter' method. The coefficients for log firm size, strong innovators and share of manpower agency workers are lower than those in model two, but the signs and significance levels remain the same. Most of the sector dummies appear to be negatively significant at various significance levels, which indicates that these sectors are more likely to have lower management ratios as compared to agriculture that is used as a reference. This is consistent with the preliminary descriptive analysis on average management ratio per sector as presented earlier in Table 9 (section 3.2).

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	30.488	6.033***	24.22	33.601***
Log size	-6.333	-15.797***	-6.637	-17.83***
Log firm growth	-2.139	-0.978	*n.s.*	~
Log firm age	-0.223	-0.382	*n.s.*	~
Restructuring activities	-0.658	-1.291	*n.s.*	~
Medium innovators#	1.094	1.861*	*n.s.*	~
Strong innovators#	2.329	3.909***	1.486	3.104**
Competitive market	-0.271	-0.408	*n.s.*	~
Economic sensitivity	-0.106	-0.205	*n.s.*	~
Manpower Agency Workers	0.066	3.865***	0.07	4.158***
Traditional industry sector^	-3.06	-1.321	*n.s.*	~
Chemicals sector^	-3.079	-1.167	*n.s.*	~
Metals sector^	-5.568	-2.243**	-3.248	-2.659**
Machines and apparatus sector^	-3.35	-1.369	*n.s.*	~
Automobiles sector^	-3.006	-0.989	*n.s.*	~
Commercial services sector^	-4.261	-1.704*	*n.s.*	~
Public Services sector^	-3.731	-1.299	*n.s.*	~
Construction sector^	-1.362	-0.601	*n.s.*	~
Trade services sector^	-1.99	-0.88	*n.s.*	~
Transportation sector^	-4.997	-2.141**	-2.715	-3.187***
Knowledge intensive services sector^	-2.135	-0.925	*n.s.*	~
Public administration sector^	-4.632	-1.919*	-1.934	-2.238**
Education sector^	-7.471	-3.117**	-5.07	-5.12***
Healthcare sector^	-7.617	-3.223***	-5.291	-5.888***
Non-commercial services sector^	-5.034	-2.162**	-2.562	-3.007**
R-Square	0.296		0.297	
Number of observations	1129			

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant
# non-innovators are taken as a reference of firms' 'extent of research and innovation'
^ agriculture is taken as sector reference

Table 14. Results of Regression Analyses for Model Four

MODEL FIVE AND MODEL SIX

Lastly, model five and model six serve as robustness test of model two and four, in which the only difference is the use of management ratio data from the 2009/2010 survey of the OSA/SCP database (introduction of time lag). The independent variables are still derived from the 2007/2008 data. As explained in section 1.7, it is expected that the number of valid observations will decrease by 40-50%. The regression results for model five and model six are documented in Appendix D.

Once data from two survey waves are combined, the signs and the significance levels of some independent variables change. Medium and strong innovators variables are no longer significant. Competitive market becomes positively and strongly significant in the models without sector dummies (the significance is lower or disappeared when sector dummies are added). Restructuring activities variable is negatively significant (at 10% level) when sector dummies are excluded. Less sectors make significant contributions to the management ratio, the coefficients of some sectors like construction and trade services sector even change from negative into positive. Relationships with the management ratio that still hold from the previous models are the strong negative relationship with log firm size and a positive significant relationship with the share of manpower workers variable. However, their coefficients are much lower than the ones in previous models.

Such inconsistencies can be attributed to the 'selection bias' commonly observed in panel data (pooling of observations on a number of cross-sectional units i.e. firms, households, etc., over several time periods) (Cincera, 2003). This is applicable for the case of OSA/SCP database. In this case, the selection bias is assumed to cause 'selective fall-off' of participants in the 2009/2010 survey (valid N goes down from 1129 in model two/four to 631 in model five/six, and the excluded firms are most likely not random). The Heckman method is normally used to correct the selection bias; however, this method is unfortunately not available in the SPSS software used for this study. Hence, model five and model six cannot be used as a robustness test and the subsequent discussions will rely more on the original model.

3.3.4. Models Summary and Interpretations

Observations and findings on various versions of the preliminary and final models presented earlier are summarized in this section. In general, the R-square is relatively low, however the coefficients are more important. On top of that, the number of valid observations included in the regression analysis is sufficiently large to support the results of the analyses. Comparison of the regression results generated by the 'Enter' and 'Backward' method suggests that the results are robust to a certain extent. Across the four different models, the signs and the significance level remain the same throughout. The variable coefficients are also stable with only slight variations. Coefficients of the independent variables included in model one to model four are presented again in Table 10 for ease of comparison (only the backward elimination models).

Variables	Coefficients model one	Coefficients model two	Coefficients model three	Coefficients model four
Log size	-7.788***	-6.781***	-7.009***	-6.637***
Log firm growth	-2.574*	n.s.	n.s.	n.s.
Log firm age	n.s.	n.s.	n.s.	n.s.
Restructuring activities	n.s.	-0.856*	n.s.	n.s.
Medium innovators#	n.s.	1.306**	1.177*	n.s.
Strong innovators#	1.526***	2.37***	2.231***	1.486**
Competitive market	n.s.	n.s.	n.s.	n.s.
Economic sensitivity	1.694***	n.s.	n.s.	n.s.
Manpower Agency Workers		0.087***	0.093***	0.07***
Workload pressure			n.s.	
Ave. exposure time			n.s.	
Traditional industry sector				n.s.
Chemicals sector				n.s.
Metals sector				-3.248**
Machines and apparatus sector				n.s.
Automobiles sector				n.s.
Commercial services sector				n.s.
Public Services sector				n.s.
Construction sector				n.s.
Trade services sector				n.s.
Transportation sector				-2.715***
Knowledge intensive services sector				n.s.
Public administration sector				-1.934**
Education sector				-5.07***
Healthcare sector				-5.291***
Non-commercial services sector				-2.562**
R-Square	0.266	0.265	0.266	0.297
Number of observations	2199	1129	1098	1129

Regression method: Backward elimination

**** significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant*

 # non-innovators are taken as a reference of firms' 'extent of research and innovation'

^ agriculture is taken as sector reference

Table 15. Summary of Regression Models One to Four

Below, all of the hypotheses previously developed in Chapter 2 are revisited and examined based on the results of the regression analysis.

- The firm size variable is shown to have highly significant impact on management intensity throughout all models. Hence, hypothesis 1 'Larger firms have <u>higher or lower</u> management intensity' is supported. In terms of direction of influence, the log firm size variable has a very strong negative effect on management ratio. This says that larger firms tend to have lower management ratios than small firms.

- In general, the firm growth variable shows insignificant contribution to management intensity (only significant at 10% level in model one). Looking at the results generated by the 'Enter' method for model two to four, the t-values are relatively low, but still close to 1 and the coefficients are consistent in term of their negative signs. The negative impact of firm growth is opposite of the prediction in hypothesis 2. Even though the results are too weak to derive any conclusion, the possibility of firm growth to influence management intensity cannot be excluded.

- Firm age has a insignificant effect on management intensity throughout the models. Looking further at the results generated by the 'Enter' method, the coefficients are consistently negative, yet due to the insignificant results, hypothesis 3 cannot be proven.

- The restructuring activities variable is shown to have a weak negative impact on management intensity in model two. Based on the results generated by the 'Enter' method, the coefficients are consistently negative. This contradicts the literature-based prediction of hypothesis 4. And since the t-values are above 1 in model two to four (only in model one, the t value is exceptionally low), the possibilities of restructuring activities influencing management intensity should not be excluded; yet the findings on this variable are too weak to arrive at any strong conclusion.

- The extent of research and innovation activities is shown to have a significant positive impact on management intensity. The strong innovator variable is significant across all models, while medium innovator variable is only significant in model two and three at lower significant levels. Hence, hypothesis 5 'Firms that are more research intensive and innovative have higher management intensity' is proven.

- The findings on the 'competitive market' variable seem spurious; mostly insignificant and the coefficients are inconsistent in sign (positive in the first three models and negative in model four). Hence, no conclusion can be derived on the effect of this variable on management ratio and hypothesis 6 therefore cannot be proven.

- The economic sensitivity (to business cycles) variable is shown to have a significant positive effect on management intensity only in model one. The significance of this variable is not observed in the other three models, and the coefficient signs are inconsistent (positive in model two and three, negative in model four). No definite conclusion can therefore be derived and hypothesis 7 cannot be proven.

- The manpower agency workers variable shows a significantly positive effect on management intensity at 1% significance level in all models. Hypothesis 8: 'Firms that employ more flexible workers have <u>higher</u> management intensity' is therefore proven. The coefficients of the manpower agency variable are also relatively stable across all models within the range of 0.07 to 0.093.

- Variables associated with the working environment in the organization: workload pressure and average exposure time for new employees are included in model three and appear to have no significant impact on management intensity. Therefore, hypotheses 9 and 10 cannot be proven in this study.

- Lastly, the findings presented in model four show that there is indeed substantial sectoral variation on management intensity. Taking agriculture as a reference, most other sectors are shown to have lower management ratios. This interpretation is consistent with the descriptive findings presented in Table 9 (average management ratio across sectors).

4. DISCUSSIONS AND CONCLUSIONS

Based on the multiple regression analysis, there are only three factors that are found to be highly significant in influencing management intensity: firm size, extent of research and innovation activities and share of flexible workers employed by the firm. However, as mentioned earlier, the possibility of firm growth and restructuring activities to influence management intensity should not be excluded. Even though these two variables are shown to be insignificant at 10% level in the multiple regression analysis, their t-values are above or close to 1. More interestingly, the coefficients of these two variables are opposite to the hypotheses. Besides the five firm-level factors mentioned above, significant sectoral variances on management intensity are also observed. The influence of these factors on management intensity will be discussed further in section 4.1 – 4.6 below.

4.1. Influence of Firm Size on Management Intensity

Hypothesis 1 of firm size is supported by the results of the analyses; firm size has a significant impact on the level of management intensity in the firm. The negative coefficients of the firm size variable in the regression models indicate that the firm size is inversely related to management intensity. Descriptive results on the average management intensity of firms in different size groups (see Table 5) further confirm the negative relationship between firm size and management intensity.
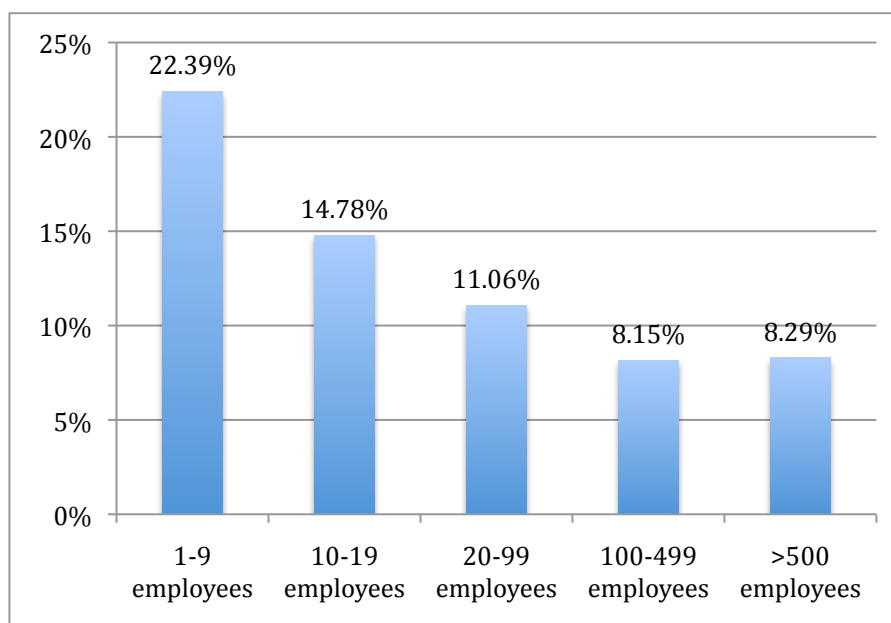
Figure 10. Average Management Intensity in Different Size Group

This finding is in line with Pondy (1969), Freeman (1973) and Baron et al (1999), but contradicts the earlier studies e.g. the classic paper by Graicunas (1933) and many other research conducted prior to 1960. The inverse relationship may be explained by the 'economies of scale' phenomenon commonly found in large firms:

- Managers simply perform the same coordination and monitoring function, yet transferring their services to a larger number of people.

- Large firms are more likely to adopt ICT in their HRM practices and other daily operations. This may reduce the control and coordination burden of managers and indirectly decrease the number of required managers.

4.2. Influence of Firm Growth on Management Intensity

The regression results suggested a weak negative relationship between firm growth and firm's level of management intensity. The direction of firm growth influence is opposite of the one predicted in hypothesis 2. This might be due to the fact that the hypothesis is derived from the previous studies built on the assumption that as firms grow in size, they would require more managers to respond to an increase in structural complexity (positive relationship between firm size and management intensity). Since this assumption has been proven to be invalid in this study (see earlier discussion in section 4.1), the hypothesis therefore no longer holds.

4.3. Influence of Firm Reorganization Activities on Management Intensity

The regression results suggested that firms that have undergone reorganization or restructuring activities during the past two years have lower management intensity than those who do not. This is opposite of what hypothesis 4 predicted. A study by DeWitt (1993) upon which hypothesis 4 is mainly based on argued that downsizing or other restructuring activities tend to increase the administrative/managerial burden, which may then lead to higher management intensity. However, in the same paper, it is also mentioned that restructurization may instead lower the administrative/management intensity if such action reduce the amount of administrative/managerial work in the firm. A closer look into the type of restructuring activities or reorganization strategy is therefore required. Restructurization that is intended to flatten out the firm hierarchy (often done by laying off managerial personnel), for example, may result in lower management intensity in the firm.

Another explanation can be offered by looking into the more precise timing of the restructuring activities. Even though management intensity is predicted to be higher shortly after restructurization due to the increased amount of administrative work and managerial burden, such activities may lower management intensity in the long run as results of the reduction in any redundancies that exist prior to the restructurization. Unfortunately, further insights into the impacts of the timing of (different types of) restructuring activities on management intensity cannot be explored in this study. The OSA/SCP database simply provides information on whether firms experienced any restructuring activities during the past two years of their operations without any further specifications on the exact timing. Hence, firms that had restructurization two years ago and those that only experienced it recently i.e. 1-3 months ago, are treated the same way, even though their respective level of management intensity may differ due to the time lag effect.

4.4. Influence of Research and Innovation Activities on Management Intensity

Firms that are more research intensive and innovative are shown to have higher management intensities. Strong innovators (defined as firms that conduct R&D activities, product innovation and process innovation) have 1.5-2 times higher management ratio than in non-innovating firms (those that do not engage in any research or innovation activities). Medium innovators have slightly higher management intensity than non-innovators, however the difference is not as evident as compared to strong innovators (only 1.2-1.3 times higher than non-innovating firms).

Several explanations can be offered to explain the positive relationship between level of management intensity and the extent of research & innovation in the firm. Firstly, the level of technical complexity in research intensive and innovative firms is higher than the non-innovating firms, which leads to coordination and management problems. Secondly, process innovation often involves automation or mechanization in the production process. And the more automated/ mechanized the production process is, the more important long-term or advanced planning would be. Thirdly, innovating firms tend to deal with a larger number of non-routine decisions in their daily operations than non-innovating firms. While routine decisions can be covered by specific predefined rules and regulations, non-routine or innovative decisions have to be referred to managerial personnel. To conclude, since managers are the one responsible for coordination, planning and non-routine decision-making, the higher the extent of research and innovation activities in the firm, the higher the management intensity will be.

4.5. Influence of the Use of Flexible Workers on Management Intensity

Firms with high external flexibility through the use of manpower agency workers are shown to have relatively higher management intensities. The relationship between management intensity and share of workers hired by manpower agency (and those hired under independent freelance contract) is small, yet highly significant. More specifically, a 1% increase in percentage of manpower agency workers employed by the firm would lead to 0.07-0.09% increase in management intensity, when all other independent variables are held constant. While the percentage figure may seem very small, however the 0.07-0.09% increase is likely to be significant when translated to money amounts (since labour overheads account for one of the largest expenses in most of the firms' operating budget). This money amount may become even higher, since there is evidence that extensive reliance on flexible workers will increase earning differentials between managers and employees in the firm even more (Davis-Blake & Uzzi, 1993). Hence, the cost reduction objective through the use of flexible workers might not be achieved at the end.

The percentage figure is expected to be even higher for workers hired under temporary contract, since unlike the manpower agency workers or the freelancer, firms are likely still have to exercise daily administrative control over the temporary workers. In the case of workers hired from manpower agency and those employed under freelance contract, the administrative control responsibility falls to the manpower agency or the freelancer himself. Unfortunately, the temporary worker variable available in the OSA/SCP database does not really represent the intended measure of external flexibility.

The above findings are in line with the country-level study by Gordon (1994) and Naastepad & Storm (2005), which suggest that 'low-trust' countries with high external flexibility have higher management intensity than the 'high-trust' countries. Therefore, hypothesis 8 on the positive relationship between share of flexible workers employed by the firm and management intensity is proven. Detailed explanations behind this finding have been described earlier in section 1.1 – 1.3 of this report. In summary, an implication of 'low road' practices is that, due to lack of trust and loyalty, there is a greater need for supervision and monitoring, leading to higher management intensity.

4.6. Sectoral Influence on Management Intensity

Regression results on model four show that there is substantial sectoral variation on management intensity. Taking agriculture as a reference (the one with the highest sector average of management intensity, see Table 9), all other sectors are

shown to have lower management intensities. This is consistent with the descriptive findings presented in Table 9 (average management ratio across sectors), which suggest that across all the sector divisions defined in this study, agriculture tends to have the highest management intensity. Sectors that are particularly shown to have significant difference on management intensity as compared to agriculture are metals, transportation, public administration, education, healthcare and non-commercial services

The sectoral variations can be explained by several firm-level factors such as firm size and level of technical complexity (or extent of research & innovation). Firms in agriculture sector tend to be small family-owned companies. This may explain the high level of management intensity observed. Based on the descriptive findings in Table 9, education, public services and public administration are three sectors with lowest management intensity (below 10%). Such low levels might be attributed to the fact that these three sectors have much lower levels of technical complexity than the others i.e. manufacturing industries. Educational institutions and public organizations are less likely to engage in product innovation or R&D activities.

4.7. Temporal Dynamics of Management Intensity

It is important to note that determinants of management intensity may be subjected to temporal and spatial boundaries. In this study, the spatial boundary is confined within a single country i.e. The Netherlands, such that the relevant cultural and regulatory aspects i.e. labour market regulations, etc. presumed to have certain influences on firm level of management intensity, are held more or less constant. The temporal dynamics of management intensity, however, are reflected in the literature reviews and some findings of this study. Taking firm size factor as an example, as discussed in section 2.2.1, while old literatures found positive relationship between firm size and management intensity, more recent literatures showed the opposite, which is also confirmed by this study. Economies of scale are proposed as the reason behind the negative relationship between firm size and management intensity, which include the use of ICT. Here, the temporal dynamism can be observed, since ICT is an example of new technology introduced only recently and not available during the time when the old literatures were published.

Besides technological development, leadership/management styles and perceived importance of labour relations have also changed dramatically during the past century. In the early 20th century when the industrialization was still booming, top-down bureaucratic approach with relatively high management intensity was perhaps seen as very effective. However, in view of today's knowledge economy, recruiting (and retaining) top talents, as well as stimulating

innovation becomes more important, which render the bureaucratic style obsolete. And since this study investigates determinants of management intensity based on factors derived from both 'classical' organizational science literatures and relatively 'modern' labour relations literature, the relevance of temporal dynamics in the subject of management intensity and its determinants becomes even more important. Some factors believed to have significant impact on management intensity based on traditional beliefs or intuition, may turn out to be insignificant in more recent studies i.e. as observed for firm age in this study. And as mentioned earlier, some other factors may remain significant, yet showed opposite direction of influence on management intensity from what predicted in the early literatures i.e. firm size and firm growth in this study.

The differences between 'Rhineland' and 'Anglo-Saxon' economic models, especially in terms of HRM practices and labour relation systems have been discussed in section 1.1-1.3 of this report. Classical literatures tend to distinguish countries like US and UK as 'Anglo-Saxon and most of the European countries as 'Rhineland' proponents, with each group employing totally opposite employment models. However, the recent trend showed that such clear-cut differences might no longer be observed. As an illustration, simultaneous use of strong employment protection and high shares of temporary workers are increasingly observed in many European countries (including the Netherlands), which are traditionally known for their rigid 'Rhineland' model. Such a trend is seen as the response to the raise of unemployment since 1970s. These two policy instruments are contradictory to each other, since employment protection aims to limit job destruction, while temporary employment tends to encourage it. Cahuc et al (2002) suggested that even though the possibility of hiring flexible workers (on temporary or fixed-duration contracts) was introduced in an attempt to stimulate job creation and reduce unemployment, the effect is however overcome by increase in labour turnover due to the relatively low firing costs. It was therefore implied that the use of diverging policy instruments are inefficient in terms of aggregate welfare and serve as poor mechanism to fight unemployment.

Nevertheless, besides the political support, this trend also gains approval from the majority of workers. Employees holding permanent jobs prefer the highest level of job protection and those unemployed appreciate the raising popularity of temporary jobs since it increases their job finding rate (Cahuc & Postel-Vinay, 2002). Despite the overwhelming support and encouragement for the use of flexible workers, firms need to be cautious in dealing with the temporary employment. As shown in this study, the intensity of use of flexible workers has a significant positive impact on management intensity. High levels of management intensity in the firm serve as an indication for the lack of trust and loyalty among the employees, which might be substantially damaging a firm's performance especially in the current knowledge-based economy.

4.8. Limitations and Further Research

By limiting the scope of research data to the first round of interview in the 2007-2008 OSA/SCP database, a large number of observations were obtained to support the reliability and generalizability of the results. However, this comes with a drawback on the limited selection of explanatory variables. Since the key hypothesis of this study is to investigate the relationship between external flexibility or 'low road' HRM practice i.e. the use of flexible workers and management intensity, it would be interesting to check whether the opposite relationship exists between management intensity and internal flexibility practices. The measures on internal flexibility or 'high road' HRM practices are only available in the subsequent interview rounds of the OSA/SCP database. A recommendation is therefore proposed to expand the analysis by including data from the second/third round of interviews or written questionnaires.

More on the OSA/SCP database, it would perhaps be useful to provide a more precise registration of flexible workers i.e. share of workers hired for manpower agency is separated from the independent freelancers and share of temporary workers are differentiated for those associated with external flexibility (e.g. to cut down costs or to cope with seasonal demands) or internal flexibility (e.g. for job probation purposes). This would provide richer insights on the impacts of (the intensity of) the use of different types of flexible workers on management intensity. Based on the findings of this study, as discussed in section 4.3 earlier, more in depth investigation on the influence of different types of restructuring strategies and the exact timing of such activities, to firm level of management intensity, also still need to be done.

Another limitation is the inability to expand the research data to another database. This thesis is mostly based on data provided in the OSA/SCP database. In this database, the unique identification of firms is provided by a variable called 'koppelnr', which is exclusive to OSA/SCP database. This is done to protect the privacy and confidentiality of the firms participating in the survey. And since OSA/SCP database is focused on labour relations, investigation on the impacts of other non-labour related factors on management intensity is limited to a certain extent. A different database should be used to provide better understanding of non-labour related determinants of management intensity.

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APPENDIX A: FIELDWORK OF SURVEY MEASUREMENTS IN 1989-2010

Year of Survey	Data Collection Method	Time Period of Fieldwork
1989	Oral questionnaire Written questionnaire Financial questionnaire	March 1989 – March 1990
1991	Oral questionnaire Written questionnaire	Mei – December 1991
1993	Oral questionnaire Written questionnaire	April – September 1993
1995	Oral questionnaire Written questionnaire Recall written questionnaire	April – September 1995
1997	Oral questionnaire Written questionnaire Recall written questionnaire	April – October 1997
1999	Oral questionnaire Written questionnaire Recall written questionnaire	April – December 1999
2001	Oral questionnaire Written questionnaire Recall written questionnaire	July 2001 – February 2002 July – December 2001 October 2001 – February 2002
2003/2004	First round telephone interview Written questionnaire Recall written questionnaire Second round telephone interview Third round telephone interview	April – July 2003 October – December 2003 November – December 2003 February – March 2004 April – June 2004
2005/2006	First round telephone interview Written questionnaire Recall written questionnaire Second round telephone interview Third round telephone interview	April – June 2005 May – June 2005 June – July 2005 October – December 2005 April – May 2006
2007/2008*	First round telephone interview Written questionnaire Recall written questionnaire Second round telephone interview Third round telephone interview	May – July 2007 July – August 2007 September – November 2007 November 2007 – January 2008 May – July 2008
2009/2010*	First round telephone interview Written questionnaire Recall written questionnaire Second round telephone interview Third round telephone interview	May – August 2009 June – August 2009 September – November 2009 October – November 2009 June – August 2010

Note: Focus of this study

Source: *Arbeidsvraagpanel 1989-2010 Verantwoording en Toelichiting.* Retrieved on 1 May 2012 from DANS (Data Archiving and Networked Services): https://easy.dans.knaw.nl/ui/home

APPENDIX B. INDUSTRY SECTOR CLASSIFICATION INDEX

Sector Division	SBI Code	Industry Title	N	%
Agriculture	1	Agriculture, hunting and services for agriculture and hunting	28	1 %
	2	Forestry and services to forestry	4	0.1 %
	14	Extraction of sand, gravel, clay, salt, etc.	1	0 %
Traditional Industry	15	Manufacturing of food products and beverages	1	0 %
	16	Processing of tobacco	44	1.5 %
	17	Manufacturing of textiles	6	0.2 %
	18	Manufacturing of clothing apparel, dressing and dyeing of fur	2	0.1 %
	19	Manufacturing of leather and leather goods (no clothing)	2	0.1 %
	20	Wood and Manufacturing of products of wood, cork, straw and plaiting materials (non furniture)	16	0.6 %
	21	Manufacturing of paper, cardboard and paperboard	12	0.4 %
	22	Publishing, printing and reproduction of recorded media	45	1.6 %
	26	Manufacturing of glass, ceramics, cement, lime and plaster products	20	0.7 %
	36	Manufacturing of furniture and other goods	64	2.2 %
Chemicals	23	Petroleum and coal processing industries, processing of fissionable and fertile materials	1	0 %
	24	Manufacturing of chemicals	27	0.9 %
	25	Manufacturing of rubber and plastic	17	0.6 %
Metals	27	Manufacturing of basic metals	14	0.5 %
	28	Manufacturing of fabricated metal products (except machinery and transport equipment)	57	2 %
Machines & Apparatus	29	Manufacturing of machinery and equipment	62	2.2 %
	30	Manufacturing of office machinery and computers	3	0.1 %
	31	Manufacturing of electrical machinery, equipment and supplies	10	0.3 %
	32	Manufacturing of radio, television and communication equipment and apparatus	5	0.2 %
	33	Manufacturing of medical equipment and instruments, orthopedic, precision and optical instruments	17	0.6 %
Automobiles	34	Manufacturing of motor vehicles, trailers and semitrailers	6	0.2 %
	35	Manufacturing of transport equipment (not cars, trailers and semitrailers)	18	0.6 %
Commercial Services	37	Preparation for recycling	3	0.1 %
	65	Financial institutions (except insurance and pension)	24	0.8 %
	66	Insurance and pension funds (no compulsory social security)	16	0.6 %

Source: Centraal Bureau voor de Statistiek

Sector Division	SBI Code	Industry Title	N	%
Commercial Services	67	Financial exchanges, stockbrockers, insurance, administrative offices for shares, securities, etc.	17	0.6 %
	70	Rental and commercial real estate	27	0.9 %
	71	Renting of transport equipment, machinery and equipment without operators and of household goods	4	0.1 %
Public Services	40	Production and distribution or and trade in electricity, gas and hot water	9	0.3 %
	64	Post and telecommunications	43	1.5 %
Construction	45	Construction	252	8.8 %
Trade Services	50	Trade and repair of cars and motorcycles, gasoline service stations	49	1.7 %
	51	Wholesale and commission trade (no cars and motorcycles)	233	8.1 %
	52	Retail trade and repair of household goods (no cars, motorcycles and motor fuels)	183	6.4 %
	55	Accommodation, meals and beverage delivery	67	2.3 %
Transportation	60	Land transport	117	4.1 %
	61	Water transport	7	0.2 %
	62	Air transport	5	0.2 %
	63	Services for transport	81	2.8 %
Knowledge Intensive Services	72	Computer and Information Technology	39	1.4 %
	73	Research and Development	15	0.5 %
	74	Other business services	217	7.6 %
	90	Environmental services	12	0.4 %
Public Administration	75	Public administration and compulsory social security	238	8.3 %
Education	80	Education	248	8.7 %
Healthcare	85	Health and welfare	254	8.9 %
Non-Commercial Services	91	Employers, employees and professional organizations, religious and political organizations, other voluntary organizations, etc.	41	1.4 %
	92	Culture, sport and recreation	122	4.3 %
	93	Other services	51	2 %

Source: Centraal Bureau voor de Statistiek

APPENDIX C. CORRELATION TABLE OF SELECTED VARIABLES

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Management Ratio	1	-0.494***	-0.025	-0.064**	-0.169**	-0.016	-0.056**	0.09**	0.07**	0.191**	-0.046*	-0.002
2	Log size		1	-0.01	0.088**	0.326**	-0.005	0.239**	-0.069**	0.037	-0.095**	0.08**	0.063**
3	Log firm growth			1	-0.124**	-0.097**	-0.01	0.042*	0.06**	0.003	-0.001	0.065**	0.002
4	Log firm age				1	-0.058**	-0.002	-0.021	-0.004	-0.036*	-0.094**	-0.03	0.064**
5	Restructurization					1	-0.001	0.181**	-0.083**	0.009	-0.031	0.086**	0.05**
6	Medium Innovator						1	-0.475**	-0.016	-0.015	-0.031	0.028	0.031
7	Strong Innovator							1	0.061**	0.088**	0.02	0.083**	0.042*
8	Competitive market								1	0.296**	0.089**	0.036	-0.078**
9	Economic sensitivity									1	0.113**	0.035	-0.079**
10	Manpower agency workers										1	0.054*	-0.025
11	Workload pressure											1	0.066**
12	Ave. exposure time												1
	Mean	13.19	1.61	1.97	1.36	0.31	0.34	0.31	0.76	0.63	10.71	0.74	0.42
	Standard Deviation	9.52	0.67	0.12	0.42	0.461	0.473	0.461	0.425	0.483	13.41	0.438	0.494
	Range	0-100	0-4.08	0-3.11	0-2.03	0-1	0-1	0-1	0-1	0-1	0-100	0-1	0-1
	Valid N	2828	2825	2443	2551	2861	2861	2861	2854	2861	1458	2856	2775

*** significant at 1% level; ** significant at 5% level; * significant at 10% level

APPENDIX D. RESULTS OF REGRESSION ANALYSES FOR MODEL FIVE AND MODEL SIX

Model Five (Combined 2007/2008 and 2009/2010 waves; sectors excluded)

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	31.304	5.342***	29.382	5.36***
Log size	-4.916	-10.944***	-4.921	-11.255***
Log firm growth	-5.921	-2.113**	-5.394	-1.977**
Log firm age	-0.583	-0.846	*n.s.*	~
Restructurization	-1.149	-1.928*	-1.071	-1.832*
Medium innovators#	0.055	0.08	*n.s.*	~
Strong innovators#	0.126	0.179	*n.s.*	~
Competitive market	2.324	3.519***	2.18	3.516***
Economic sensitivity	-0.318	-0.596	*n.s.*	~
Manpower Agency Workers	0.05	2.451**	0.05	2.476**
R-Square	0.226		0.225	
Number of observations	631			

Model Six (Combined 2007/2008 and 2009/2010 waves; sectors included)

Variables	Enter Method		Backward Method	
	Coef.	t	Coef.	t
Constant	29.664	4.953***	18.843	19.9***
Log size	-4.567	-9.643***	-4.662	-11.082***
Log firm growth	-4.577	-1.68*	*n.s.*	~
Log firm age	-0.907	-1.304	*n.s.*	~
Restructurization	-0.865	-1.468	*n.s.*	~
Medium innovators#	-0.487	-0.712	*n.s.*	~
Strong innovators#	0.056	0.081	*n.s.*	~
Competitive market	1.72	2.246**	1.579	2.6**
Economic sensitivity	-0.951	-1.582	*n.s.*	~
Manpower Agency Workers	0.027	1.339	*n.s.*	~
Traditional industry sector	0.414	0.176	*n.s.*	~
Chemicals sector	2.513	0.95	*n.s.*	~
Metals sector	-0.722	-0.29	*n.s.*	~
Machines and apparatus sector	0.605	0.248	*n.s.*	~
Automobiles sector	1.322	0.387	*n.s.*	~
Commercial services sector	0.042	0.016	*n.s.*	~
Public Services sector	-0.684	-0.208	*n.s.*	~
Construction sector	3.845	1.671*	4.064	4.54***
Trade services sector	1.935	0.848	1.758	2.134**
Transportation sector	-1.24	-0.522	*n.s.*	~
Knowledge intensive services sector	0.253	0.108	*n.s.*	~
Public administration sector	-0.079	-0.032	*n.s.*	~
Education sector	-3.539	-1.458	-3.316	-3.122**
Healthcare sector	-4.89	-2.058**	-4.989	-5.088***
Non-commercial services sector	-0.502	-0.211	*n.s.*	~
R-Square	0.305		0.287	
Number of observations	631			

*** significant at 1% level; ** significant at 5% level; * significant at 10% level; **n.s.** non significant
# non-innovators are taken as a reference of firms' 'extent of research and innovation'