Driving Sustainable Supply Chain Management in the Public Sector: The Importance of Public Procurement in the EU

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1. Introduction

The many challenges of sustainable developments such as environmental degradation, climate change, resource depletion and fair worker treatment are increasingly being addressed in academic and practitioner literature (e.g. Zhu and Sarkis, 2004; Rao and Holt, 2005; Vachon and Klassen, 2006; Brammer and Walker, 2011;Schaltegger et al., 2012a). While research in the private sector concerning green supply chain management (GSCM), as well as environment friendly and socially responsible procurement management and measurement has a long tradition (e.g. Zsidisin and Ellram, 2001;Srivastava, 2007; Linton et al., 2007; Seuring and Müller, 2008), the importance of social and environmental management and measurement within public procurement (PP) processes should not be neglected (Walker and Brammer, 2009).Public sectors internationally represent substantial demand, therefore public procurement has the potential to influence markets in terms of, for example, production and consumption trends in favor of environmentally friendly, socially responsible and innovative products and services on a large scale (Edler and Georghiou, 2007; Lember et al., 2011).

Sustainable public procurement (SPP), encompassing environmental and issues related with social responsibility, is gaining momentum throughout European member states. This is evidenced in a number of policy changes and working initiatives to drive sustainable change across EU countries. For instance, the majority of European Economic Area (EEA) countries have developed specific National Action Plans (NAPs) on SPP over the last decade(EC, 2003, 2012). The public sector is responsible for providing a vast range of products and services which have direct implications for sustainable and socially responsible issues. However, until recently, there have been very limited theoretical and empirical investigations in SPP in academic literature (Preuss, 2009; Walker and Brammer, 2009). Additionally, limited research (with a notable exception from Brammer and Walker, 2011) has investigated public body engagement with sustainable public procurement from a multi-country perspective as the vast majority of extant literature investigated sustainability management and performance issues from a single country perspective. Given the scale and importance of public procurement and the capacity to achieve sustainable and social goals across supply chains (SC)incorporating public and private organizations, it is important to gain in-depth knowledge on how effective policy initiatives

have been in driving supply chain sustainability management and measurement. In order to contribute to this area, we provide one of the first empirical and systematic investigations into the state of SPP across EU member states. The overarching research question this study seeks to address is how and to what extent public procurement can be a lever of reform of sustainability across governments, facilitating the uptake of environmental and socially responsible products and services? In order to answer this question, we deploy a survey method, collecting data from 281 procurement files from 2007-2009 relating to eight product categories and four EU member states. Structural equation modeling is used to determine the effectiveness of the policy consideration in PP to drive sustainable supply chain management (SSCM)and measuring across supply chains and, hence, improve SC performance in terms of green and socially responsible targets.

This empirical study seeks to make three distinct contributions to the emerging body of knowledge by examining the uptake of sustainable practices. First, it contributes by adding to existing, limited research on the use of public procurement as a lever of policy goals attainment. By determining how public sector authorities are able to implement environmental and social policies and targets by contracting with private sector companies through PP practices, it extends understanding of policy implementation beyond the public sector boundary. More specifically, we empirically investigate how sustainability and socially responsibility issues are reflected in, and transmitted though, the detailed processes of public procurement across EU member states. This is an emerging research area of interest, considering the importance of public-private relationships in delivering public sector infrastructure and services (Zheng et al., 2008; EU Com, 2012).In order to fill this gap, we use data collected from procurement files across four EU member states. Second, prior studies have considered environmental and socially responsible issues separately, thereby creating an artificial divide between two inter-related issues (Ashby et al., 2012; Miemczyk et al., 2012). This study offers an integrated conceptual and empirical treatment of both environmental and socially responsible issues which are vital factors for sustainable supply chain management for public and private organizations. Third, the study is one of the first comprehensive investigations into the uptake of sustainable and social policies and practices across EU member states and sectors. Prior studies have mainly explored the environmental part of sustainable public procurement in specific countries and

sectors, but not provided a cross-sectional and cross-country analysis (Prenen, 2008; Preuss, 2009). Additionally, we draw on the importance of investigating the tendering process as a crucial initial stage where environmental and socially responsible objectives are set out.

The remainder of the paper is structured as follows. The next section reviews the wider literature on sustainability and social responsibility in the private and public sector before considering public procurement as a policy lever and the policy drivers to realize sustainable and socially responsible public procurement across EU member states. Derived from this literature, we introduce our hypotheses and conceptual framework. Section 3 outlines the research methodology and section 4 presents the analysis and findings from the survey. Section 5 discusses the findings and in section 6 conclusions are drawn, distilling theoretical and practical contributions.

2. Conceptual background

2.1 Taking stock: Managing and measuring sustainability performance

Prior studies offer a myriad of different definitions and concepts when discussing sustainable developments in the private and public sector. These studies have used terms such as green procurement (Bolton, 2008), sustainable supply chain management (Seuring and Müller, 2008), green supply chain management (Walker et al., 2008), environmentally responsible public procurement (Li and Geiser, 2005), and sustainable procurement (Walker and Brammer, 2009). A relatively well-developed body of research has investigated aspects of sustainable supply chain management in private sector organizations (e.g. Sarkis, 2001; Zhu et al., 2005; Srivastava, 2007; Walker and Jones, 2012). Examples of such practices include reducing packaging and waste, assessing vendors on their environmental performance, developing more eco-friendly products and fair worker treatment, including paying fair wages and ensuring appropriate working conditions (Walker et al., 2008; Awaysheh and Klassen, 2010). Prior literature offers a number of different tools which can be deployed to management and measure sustainability across the supply chain. For instance, third party certifications are frequently used to drive SSCM, including, but not limited to, environmental such as ISO 14001 and social such as SEDEX (Boyd *et al.,* 2007). Certifications are vital to capture the level of SSCM and to establish which further

techniques and methods (e.g. joint initiative, supplier development) are need to drive SSCM. Prior studies of SSCM have, for instance, explored the importance of collaboration in realizing benefits of these practices (e.g. Simpson et al., 2007; Seuring and Müller, 2008), examined risks and risk management approaches (Carter and Rogers, 2008), the use of environmental management accounting to drive SSCM performance (Burritt and Schaltegger, 2012; Schaltegger et al., 2012b) and addressed the link between SSCM and firm performance (e.g. Zhu and Sarkis, 2004; Seuring et al., 2008; Björklund et al., 2012).

Sustainability performance, when considered across the supply chain, focuses on the performance of SC processes and systems including their measurement and management (Klassen and Vereecke, 2012).Prior studies have focused on SC performance to drive down cost and increase efficiency (Beamon, 1999; Gunasekaran et al., 2004). With regards to sustainability performance, a sub-set of studies have attempted to capture sustainability performance quantitatively (Burritt and Schaltegger, 2012; Schaltegger et al., 2012b). In addition, sustainable SC measurement is concerned with systems initiated by a company to capture and assess current SSC processes to then drive sustainable management activities (Boyd et al., 2007). Prior studies drew out a number of different issues with sustainability SC measurement such as what data to collect, when to collect it and proprietary reasons for collecting data across SC partners (Lehtinen and Ahola, 2010). While extant literature has explored these and related issues across a number of different industries such as paper production (Bloemhof-Ruwaard et al., 1996), furniture (Handfield et al., 1997), oil/gas (Matos and Hall, 2007) and automotive manufacturing (Thun and Mueller, 2010), empirical studies in the public sector are limited.

While the majority of prior studies have investigated environmental issues in procurement, the social responsibility aspects of sustainable procurement have been under-researched to date (Walker and Brammer, 2009). Apart from particular studies of environmental or social aspects, limited empirical and systematic research has investigated sustainable procurement practices in the public sector combining environmental and social concerns. So, therefore, this study is positioned to help fill this gap in extant literature.

2.2 The public sector: Driving sustainable public procurement across the EU

Public procurement represents a large volume of public spending each year and has been estimated to be around 19.4 per cent of the gross domestic product (GDP) across 27 European Union (EU) member states (EU Com, 2012). It is the process by which central, regional and local governments and public authorities, bodies and agencies, governed by public law and regulation, purchase and commission services, public works and associated goods and materials (Aschhoff and Sofka, 2009; Uyarra and Flanagan, 2010). The PP process has generally been intended as a rigid process narrowly aimed at non-discrimination, cost efficiency and the achievement of transparency goals (EU, 2004). However, given its' economic significance, PP has the potential to influence markets in terms of production and consumption trends (Thai, 2011; Aschhoff and Sofka, 2009). Attention has turned to ways in which it can be used as a tool for achieving a range of goals, including sustainability, promoting innovation and regional economic growth (Wilkinson et al., 2001; EU Com, 2012). Harland et al. (2007) provide a conceptual framework of seven stages of PP progressing through simply sourcing, to efficient or value for money approaches, through to supporting and then delivering broader government policy objectives (e.g. efficiency as one dimension of sustainability). The desire to integrate these broader policy objectives into PP is already widespread throughout Europe. For instance, the European Commission highlights the key role of public procurement in implementing the 'EU 2020' strategy, aiming to achieve smart and sustainable growth (EU Com, 2010). Public procurement is therefore best positioned to achieve the triple bottom line of economic, environmental, and social success (Elkington, 1997; De Giovanni, 2012). For example, Edler and Georghiou (2007) discuss public procurement as one of the key elements of a demand-oriented innovation policy and Barlow and Köberle-Gaiser (2008) draw out the importance of demand-driven innovation policy in stimulating innovation in healthcare infrastructure. These policies also encompass the inclusion of environmental and social aspects of PP.

In this study, we focus on sustainable public procurement, including managing and measuring sustainability, which can be viewed as part of the broader concept of SSCM, encompassing not only buying but a variety of issues along the supply chain, including social, environmental and economic issues (Walker, 2010). Table 1 compares and contrasts

key studies investigating SPP. We follow the definition by Preuss (2009) and Walker and Brammer (2011), referring to SPP as the act of integrating a concern for broader social and environmental impacts within procurement undertaken by government or public sector bodies. Based on the nomenclature of the EU (EU Com, 2011) we use in the term sustainable public procurement as an overarching concept covering green public procurement (GPP) and socially responsible public procurement (SRPP).

<Please insert 'Table 1' about here>

Prior literature on GPP and SRPP has focused on stimulating social and environmental benefits through exerting pressure on suppliers to reduce their own impacts (Walker and Brammer, 2011). Extant literature studies often adopted a sectoral perspective, investigating, for example, the construction, information technology and food sectors (e.g. Hall and Purchase, 2006; Remington et al., 2006). Similarly, the majority of prior GPP/SRPP studies focused on a particular country such as the UK (e.g. Walker and Brammer, 2009), USA (Li and Geiser, 2005; Swanson et al., 2005), South Africa (e.g. Bolton, 2008), Norway (e.g. Michelsen and de Boer (2009), or the Netherlands (e.g. Prenen, 2008). Limited prior research has investigated SPP across different sectors and countries. Additionally, a number of prior studies also explored SPP and its uptake in local governments (e.g. Thomson and Jackson, 2007). For instance, the study by Preuss (2009) investigates the uptake of GPP/SRPP initiatives and proposes a typology for the public sector. Similarly, another research theme within GPP/SRPP is the focus on developing tools to assist policy implementation (Swanson et al., 2005). So it does appear that more international studies of sustainable public procurement are required.

Incorporating environmental and social concerns into public procurement is a vital aim for governments around the world and will help to drive management and measurement of sustainability across SC partners. Successive EU procurement legislation (e.g. EU, 2004, 2009) has supported sustainable procurement by dismantling barriers to engagement with local business communities (Thomson and Jackson, 2007). In addition, the EU has provided leadership on environmentally friendly and socially responsible procurement, targeting issues such as energy consumption or CO_2 emission (e.g. EU, 2009).The wider EU and national policy environment regarding SPP influences variations in GPP/SRPP practices.

Hence, this section discusses key EU policy frameworks. The aim is not to offer an exhaustive list of policy documents, as this lies outside the scope of our study, but to set the scene with regards to green and socially responsible public procurement indicators (Table 2). Public procurement in the EU is guided by national policy frameworks, combined with overarching EU policy frameworks.

<Please insert 'Table 2' about here>

Prior studies have shown that firms taking environmental regulation more seriously are more likely to be involved in sustainable procurement practices (Min and Galle, 2001). This finding is supported by Carter and Dresner (2001) who argue that regulation should not be viewed as a barrier or requirement but instead as an opportunity to innovate and achieve competitive advantages. Porter and Van der Linde (1995) argue that firms and governments should move away from a static cost perspective when considering environmental practices. They state that properly designed environmental standards can trigger innovation, hence leading to cost reductions. Additionally, prior academic studies (e.g. Preuss, 2007) and EU and government policy documents (e.g. IDEA, 2003) have also emphasized the role of public-private relationships and collaboration in realizing GPP/SRPP. Therefore, additional research in SPP practices in the EU should contribute to understanding of policy makers of the role of public procurement in supporting and delivering broader government objectives (Harland et al., 2007).

From this understanding of previous research in SPP, the dearth of international empirical research in this area, and the accepted role of public procurement in delivering EU policy goals, we now form our initial conceptual framework and hypotheses for this study building on these three imperatives.

2.4Initial conceptual framework and hypotheses development

This study seeks to test two hypotheses relating to green and socially responsible public procurement. The public sector faces the constant challenge of effectively influencing supply markets through public expenditure in terms of environmental and social considerations (Lember et al., 2011). Through public tenders public authorities are trying to stimulate suppliers' offers and seek to select the most economically advantageous offer

with the desired requirements in terms of environmental and/or social considerations (Martin et al., 1999). Within the public tender procedure the integration of environmental and social considerations can occur at three stages: the call for tender, the reception of offers and contract award. For instance, if a purchasing authority decides to include environmental and social requirements for a needed product or service into its call for tenders, potential suppliers will most likely consider the desired product or service attributes in their offers in order to be awarded the contract. This inducement to potential suppliers to consider environmental and social aspects of their products/services represents the first step towards policy implementation, and the supply of sustainable products/services from the organization awarded with the contract represents the next, and may be viewed as its contribution.

From a theoretical perspective, this may be viewed as application of the inducement-contribution theory to public sector procurement (Simon et al., 1991).Therefore, the existence of an organization (or in our case a potential public buyer- private supplier relationship) is dependent on the compensation of contributions (fulfilled by members of the organization) through incentives in order to reduce inter-subjective injustice (March and Simon, 1958). In this regard, Bernard (1938, p. 57) highlights the "organizational equilibrium" which expresses the balance between contributions and incentives. From the supplier's perspective, the perceived incentive must at least equal the 'in exchange needful contribution'; at best the perceived incentive exceeds this contribution (March and Simon, 1958, p. 83). The level of inducement is measured through the subjective perceived value of the tender for the supplier, whereas the corresponding contribution is related to the requirements of the tender. The supplier's decision about the offer is made in favor of the expected benefit, if the opportunity costs (i.e. lost potential benefit through non-participation)exceed costs of bid participation. In this way public authorities are able to incentivize suppliers to consider environmental and social requirements within the production and supply process of their goods and services. Consequently, we propose the following hypothesis:

H1. Through public procurement, public sector authorities are able to engage suppliers in delivery of environmental and social goals.

The management of sustainability encompasses the equal emphasis on economic, social and environmental targets (De Giovanni, 2012). Through emphasizing to business markets that sustainable supply chain development is a strategic priority, the public sector can become a key driver behind sustainability (Elkington, 1994). For example, the European Commission postulates in its EU strategy 2011-14the "need to promote market reward for responsible business conduct, including through investment policy and public procurement" (EU Com, 2011a, p. 5). This claim complements the equivalent goal for green public procurement (EU Com, 2010 and 2012). Considering the development of GPP/SRPP in Europe, green public procurement was initiated in 2008 (EU Com, 2008) and socially responsible considerations within PP increased from the end of 2011 (EU Com, 2011b).Our second hypothesis therefore proposes:

> H2.Sustainable supply chain management in the public sector pursues and consequently achieves environmental and social considerations through public procurement in terms of equivalent policy goals.

The terms and methodology were designed to align with the required criteria in tenders, corresponding offers and contract award. In order to test our hypotheses and guide our research study, we developed an initial conceptual framework reflecting the documented stages of the PP process in order to consider green and socially responsible policy goals at each stage. The effectiveness of policies and practices on the awarded product or service shows the correlation between two latent variables of the conceptual framework; 'policy goals inclusion in the tender' is the latent *independent* variable and 'policy goals achievement through awarding' is the latent *dependent* variable. The variable 'policy goals inclusion in the offer' serves as a mediating variable as it is influenced by 'policy goals inclusion in the tender' and at the same time influences the target variable. Consequently, the latent independent variable influences the target variable in two ways, directly and indirectly via the mediating variable. By means of the conceptual framework we also test the direct effect of the inclusion of policy goals in tenders on the achievement of policy goals through contract award.

<Please insert 'Figure 1' about here>

3. Methods

3.1 Sample and data collection

In order to investigate GPP/SRPP practices across EU member states, we adopted the methodology which is most suitable for distribution across a wider geographical area and to a number of organizations (Boyer et al., 2002). The instrument for the data collection was the analysis of procurement files at selected contracting authorities in Europe such as the procurement agency of the Federal Ministry of the Interior in Germany. According to the directive 2004/18/EC, public authorities are obliged to document important decisions and records in procurement files meticulously (EU, 2004). A procurement file comprises all documents relevant to the pre-tendering, tendering, awarding and contract administration phases. Using procurement files it is possible to reconstruct the entire procurement and contract administration process. Consequently, a systematic collection from data through procurement files analysis (PFA) is able to produce a high internal validity of the data set which demonstrates the main advantage of this instrument. As survey respondents may embellish their answers, especially those to politically motivated questions, the analysis of procurement files provides an objective way to obtain information on public procurement. Since the analysis of procurement files necessitates the access to confidential documents and is also very time consuming our investigation was limited to selected procurement authorities' archives. In order to reduce the probability of selection bias we chose procurement agencies on different NUTS tiers (1-3). Moreover, we offer one of the first empirical examinations of procurement instances between public bodies and private suppliers.

Currently, there are no European statistics on public procurement volumes or the consideration of policy goals within public procurement; the procurement file analysis, therefore, may provide a first indication about the importance of sustainability issues within public procurement practice. However, it should be noted that procurement file analysis has a few limitations, particularly the volume and variety of information within the files and the complex procedure for collecting data. Moreover, the aggregation of information within the procurement files and therefore within the instrument for the analysis of the collected data is unavoidable. However, the high objectivity of the data from procurement file analysis was viewed as outweighing the disadvantages.

Given our overall objective to determine the extent to which policy objectives in PP are being implemented in practice, contracting authorities were chosen in Austria, Germany, the Netherlands and the UK, as they belong to the 'Green-7' countries (Bouwer et al., 2006). The 'Green-7' classification of the EU identifies countries that are front-runners in terms of sustainability. Consequently, these countries are most likely to represent good practice examples of the effectiveness of changing the procurement outcome by including policy goals in tenders. National procurement legislation in these countries demands that contracting authorities observe policy goals with regard to 'green public procurement' and 'socially responsible public procurement'.

In order to conduct the analysis, procurement files related to eight product categories (provided in Table 3) were randomly selected by each purchasing authority involved, based on the Common Procurement Vocabulary (CPV) codes, and within the enquiry period from 2007 to 2009.The period of enquiry directly coincides with important procurement legislation being issued on green and social policy goals in the EU. The data collection in each country was carried out personally by one researcher in each country. All analyzed files were available electronically so electronic copies of all relevant documents such as the call for tender, received bids and all correspondence are stored in every procurement file. Each researcher collecting data was provided with a standardized collection guideline and training in order to avoid bias within the data set.

Additionally, researchers were provided with a standardized data entry form with 63 variables along with detailed guidelines for the completion of the form. Input errors were prevented by providing respondents with a choice of predetermined answers. To reduce the probability of common method bias we used different scales and formats for the independent and the criterion measures (Podsakoff et al., 2003). A pre-test of the procurement file collection and of its' entry form and component questions (indicators) were conducted in January 2011. The pre-test assessed the operationalization of the indicators and allowed necessary rewording or elimination of items.

<Please insert 'Table 3' about here>

The total stratified sample consisted of 281 procurement files analyzed across four selected European member states. As mentioned above, at each contracting authority the corresponding procurement files were randomly selected after a pre-selection which identified suitable tender procedures. The data analysis period lasted from November 2010 to January 2011(Table 8).

Around half of the procurement files collected belonged to the office supplies and construction work product categories (Table 3). The next highest category was cleaning and washing services (18.9%). The other five product categories represented 2.5–8.9% of the total data collection. Canteen and catering services achieved a low frequency because the selected contracting authorities within this study carry out purchasing activities largely for other public entities, and services in this product category are mainly purchased directly by the consumer. The collected data was tested for common method bias by means of examining the unrotated factor solution (Podsakoff and Organ, 1986). We were able to determine three factors that almost equally accounted for the variance in the measures. Consequently, neither a single nor a general factor is likely to account for the majority of the covariance among the measures. Further, we analyzed the correlation matrix in order to identify potential bias that is connected to the method. According to this, the correlations are significantly below .90 which is able to indicate that our estimates are relatively unbiased.

3.2 Measuring GPP/SRPP

The core instrument used for data analysis was structural equation modelling (SEM), because the causality and the direction of effects within the public procurement process is already given by procurement legislation. SEM is a collection of statistical techniques that allow simultaneous establishing of relationships among variables that are complex and not directly observable, such as GPP or SRPP (Kline, 2010;Jöreskog and Sörbom, 1982). Further, SEM enables the determination of the strength of the impact of GPP and SRPP on the individual phases of the public procurement process. SEM methodology uses the Partial-Least-Squares (PLS) approach which represents an analysis of variance based on principal components analysis (Fornell and Cha, 1994). In general, the PLS approach has the

advantages that no assumption is needed with regards to the distribution of the sample (Chin and Newsted, 1999).

Statistically, SEM is based on the estimation of interdependencies between the latent variables of an explanatory model on the basis of variances and covariances between model indicators. In this way 'policy goals inclusion in the tender' can be differentiated into the two application areas discussed here, GPP and SRPP. To examine the effectiveness of each procurement policy separately, a distinction is drawn between GPP and SRPP policies. In our case, the indicators for GPP are the preservation of biodiversity, reduction of emissions into air and water, the reduction of consumption of energy, water and chemicals and reduction of waste generation (Bouwer et al., 2006; EU Com, 2008; Evans et al., 2010). The integration of SRPP requirements in tender documents, such as the promotion of employment opportunities, decent work, engagement of small and medium-sized enterprises, accessibility for all, as well as support for social inclusion, can result in more socially responsible products (Knopf et al., 2010). Moreover, SRPP requires compliance with ethical and fair trade issues as well as support for achieving wider voluntary adherence to CSR.

The elements of 'policy goals inclusion in the tender' for GPP and SRPP represent the relationship between the tender, offer and contract award and their operationalization. The scale and influence of the public sector impacts, via public procurement, market conditions and organizations operating within those markets; therefore, public procurement can change the framework and activities of markets. As procurement files consist of tender documents, incoming offers and contract awards (see Table 4), data on the dependent relationships between 'policy goals inclusion in the tender', 'policy goals inclusion in the offers' and 'policy goals achievement through the award (outcome)' can be distinguished.

<Please insert 'Table 4' about here>

4. Results

4.1 Analysis of measures

Analysis of measures used indicates that GPP in tender (GPPT), GPP in offer (GPPO) and GPP in award (GPPA) very well. Table5 shows strong indices for indicator reliability and

validity. The textual wording and allocation of the indicators can be deemed to be excellent, indicating that the items are suitable for representing the respective constructs. The construct reliability tests show that all three constructs are reliable and able to define the characteristics of their appropriate GPP indicators adequately. Furthermore, the correlation between each GPP construct (GPPT, GPPO and GPPA respectively) and its corresponding items is stronger than those between the other constructs. Consequently, GPPT, GPPO and GPPA are regarded as independent constructs.

<Please insert 'Table 5' about here>

Measuring SRPP, many factor loadings of the indicators are at a lower level than the loadings of GPP indicators (see Table 5). The indicators 'promotion of employment opportunities', 'promotion of decent work' and 'support for achieving wider voluntary adherence to CSR' are deemed to be acceptable and significant. However, the measurement model does not show reliable indices for construct validity. One possible reason is the limited use of social criteria by contracting authorities because of weak legislation for the inclusion of social aspects in public procurement. Further, the low factor loadings also reflect the lack of scientific literature with regard to SRPP. However, it can be stated that the goodness-of-fit criteria and appropriate threshold values presented in this study are considered as guiding values (Fornell and Larcker, 1981; Jöreskog and Sörbom, 1982). For that reason, minor breaches of individual criteria are regarded as acceptable. Slight deviations from individual criteria do not necessarily imply the modification or rejection of the model (Baumgartner and Homburg, 1996). In particular, the novelty of the subject matter 'social policy goals in public procurement' supports allowing wider acceptance ranges of evaluation criteria.

4.2 Hypothesis testing

The analysis supports the proposal that, through public procurement, public sector authorities are able to engage suppliers in delivery of environmental goals (in hypothesis 1). Figure 2 reflects underlying path coefficients and their significances. The high significance level attests that the causal relationships and the positive path coefficients correspond to the a priori hypothesized direction of the effects. The 'inclusion of GPP policies in the tender' directly influences the award to more environmentally sound products, but apart

from the significant effect (t = 2.53) the impact is only moderate (β=0.19). The effectiveness of 'GPP inclusion in the tender' on 'GPP inclusion in the offer' comes to a path coefficient of 0.6. This effect can be interpreted as a strong relationship with a probability error (p) lower or equal to 1% (t = 12.70).

<Please insert 'Figure 2' about here>

Taking into consideration direct causal relationships (GPPT→GPPA), and indirect relationships (GPPT→GPPO→GPPA), the total effect can be determined. The analysis of direct and indirect effects shows that the impact of 'inclusion of GPP policies in the tender' on changing the award represents an important magnitude of influence, in spite of its moderate direct effect (Table 5). The integration of GPP policies in the tender shows an indirect effect (0.32) which is stronger than the direct causal relationship (0.19). Another conclusion with regard to GPP is that the analyzed construct 'policy goals inclusion in the tender' is an important determinant of the construct 'policy goals achievement through award'.

'Policy goals achievement through award' shows a coefficient of determination (R^2) of 0.45 which is deemed to be above-average. This means that the explanatory power of the framework is considered to be sufficient. The coefficient of determination for 'policy goals inclusion in the offer' can be classified as moderate (0.36). Moreover, 'policy goals achievement in the award' is influenced by 45% by the procurement process which consists of the direct and indirect effect of 'policy goals inclusion in the tender'. This also means that other factors, such as the company philosophy or specific product requirements, have an impact on the award by 55%. The effect size of 0.05 for the endogenous construct 'policy achievement through award' indicates that this construct is moderately influenced by the other latent constructs. In regard to GPP our findings attest for the target construct a Q^2 of 0.27 which exceeds the critical level of zero. In conclusion, the model points to good predictive ability.

When analyzing the causal effects of SRPP, all relationships correspond to the postulated direction of the effects due to the positive path coefficients (Figure 3). Considering the direct effect of the framework, we can evidence that the target relationship among the

SRPP policy integration in the tender and SRPP goals achievement through the award is very strong with a path coefficient of 0.58 (t = 7.33) and shows very high significance. Furthermore, the independent construct SRPP in the tender represents the major determinant of the construct SRPP in award with a total effect of 0.86.

<Please insert 'Figure 3' about here>

Taking into account the coefficient of determination of the target construct SRPP in award (0.81) and the high total effect of the construct SRPP in tender, it can be stated that 81% of the common variance of the target construct is mainly defined by the influence of the tender (Figure 3). That means, in practical terms, that the purchasing authorities have an outstanding potential to influence their suppliers on the integration of social requirements into the production of their products and services.

The highly significant dependency between the 'inclusion of policy goals in the tender' and 'increasing policy goals inclusion in the offers' has a path coefficient of 0.77 (t = 18.81) which is also considered as very strong. Regarding the coefficient of the mediating variable with 0.59 the impact of the construct SRPP in tender is also classified as strong, even though 40% of the common variance is defined by factors not considered in the model. Finally, the effect size of the determined interdependencies of the SRPP in tender is 0.75 which indicates a strong and validated influence of the other latent construct. Like GPP, the SRPP overall structural model shows a good predictive quality as the Stone Geisser criterion evince a Q^2 of 0.12 and the data set can be well reconstructed by the determined model. Considering all the results of the assessment, the developed framework is well-suited for the description of the structure along the empirically obtained data set.

Our second research proposition postulates an equivalent emphasis and achievement of the actual consideration of environmental and social targets in public procurement. A multi-group analysis regarding the standardized path coefficients and standard errors revealed a highly significant difference ($p<0.01$) between GPP and SRPP for the relation 'policy goals inclusion in tender'→'policy goals achievement through the award' and the relation 'policy goals inclusion in tender'→'policy goals inclusion in offer' (Table 6). A difference of $p<0.05$ was disclosed for the relation 'policy goals inclusion in offer'→'policy

achievement through the award' and was deemed to be not significant. For instance, with regard to SRPP the direct effect of the variable SRPP in tender on the variable SRPP (0.57) in award is clearly and significantly higher than the one for GPP (0.19), but for the relation offer → award the identified difference between GPP and SRPP only equals a probability level of 0.1 (Tables 5 and 6). However, a statistically proven distinction between the consideration of environmental goals within public procurement and the achievement of social targets is evident. Consequently, the second hypothesis of our research framework is rejected through the analysis.

<Please insert 'Table 6' about here>

5. Discussion

Through one of the first systematic and empirical studies of green and socially responsible public procurement practices, we are able to address our two research hypotheses.

5.1 Engagement of suppliers in delivering environmental and social goals

This section discusses our first hypothesis asking whether public sector authorities can use public procurement to engage suppliers in the delivery of environmental and social goals in sustainable supply chain management. We identify a measurable and significant impact of public sector authorities engaging suppliers in sustainability through the use of public procurement. This finding confirms the importance of PP policies in stimulating the uptake of environmental and socially responsible procurement practices, reinforcing the findings of Walker and Brammer(2009). In addition, it shows that public procurement occupies a similar role towards GPP and SRPP uptake across European countries and emphasizes the importance of public, private and third sector organizations working together to achieve GPP and SRPP practices. Practically, this means that the inclusion of environmental and socially responsible policy goals in public tenders (GPPT and SRPPT) leads bidding suppliers to integrate the required criteria in their offers, although the strength of this effect differs between GPP and SRPP. However, suppliers are led to consider the desired environmental or social criteria within their production/supply processes and their final products or services supplied to the public sector, thereby enhancing the performance of sustainable supply chain management.

The consideration of policy goals with regards to green public procurement is explained through our research framework to a remarkable degree (50%). Consequently, the integration of policy goals in the procurement process clarifies up to 50% why suppliers consider GPP criteria in their production processes, products and services. The remaining variance may apply to companies which have progressed considerably with regards to GPP by themselves are already aware of existing environmental policies and their applications. These companies are already familiar with the use of environmental certificates and labels and, in fact, our findings indicate that the majority of companies may already have integrated environmental management systems such as ISO 14001(a global standard that motivates organizations across the world to adopt environmental practices (Heras-Saizarbitoria et al., 2001; Paulraj and de Jong, 2011).This phenomenon has been termed 'supplier readiness', emphasizing in the case of GPP that suppliers are increasingly preparing themselves for GPP requirements (Hartley and Jones, 1997). Our empirical observations can also be further underlined by taking a closer look at supplier readiness discussion in extant literature (e.g. Gelderman et al., 2006).

The vast majority of suppliers have integrated environmental aspects into tendering offers, implementing those certificates and labels in terms of the protection of the environment in their technical datasheets. Nevertheless, these findings further emphasize that a large number of companies have improved their sustainable performance and already responded to prior policy requirements, but also that governments need to provide concise legislation and regulation to realize environmental and socially responsibly procurement targets (Wilkinson et al., 2001). It is also vital to consider the supplier size and contract award size when considering the readiness of small- and medium-sized enterprises (SMEs) (e.g. Lee, 2008). Lee's (2008) study indicates the importance of improving environmental performance throughout the entire supply chain by including SMEs in the process.

In general, the findings illustrate that a number of green public procurement initiatives were implemented. For instance, technological progress for using alternative, renewable resources was achieved, allowing substantial savings by realizing biodiversity. These findings emphasize that suppliers are driven and motivated to adopt GPP practices by policy requirements, but also that suppliers themselves invest in GPP enhancing technology and practices. Confirming prior studies, cost consideration is a vital driver for

GPP uptake (Bouwer et al., 2006; EU Com, 2008), but our findings also show that GPP should not always be considered as a costly investment, but as a way of improving supplier and even whole supply chain performance and, hence, improving profits in the medium to long term.

In the case of SRPP, the coefficient of determination is80%, showing that only a share of the variance of 20% is not explained through our research framework. Thus, the integration of social policy goals in procurement processes determines 80% of the consideration of socially responsible criteria in the awarded product or service. A possible reason for this can be the fact that companies are less progressed and consequently less familiar with the integration of SRPP aspects in the production process or in products and services themselves. Knopf et al. (2010) confirm that many European companies have not yet fully integrated social concerns into their operations and core business strategy. Moreover, only 15 of 27 European member states have national policy frameworks to promote socially responsible public procurement (EU Com, 2011b). The extant literature on supplier readiness (e.g. Gelderman et al., 2006) indicates that vendors appear to be less progressed in delivering socially responsible than environment friendly operations. This is in line with a recent stream of literature, investigating the readiness of suppliers with regards to realizing green and/or socially responsible targets (for instance Koh et al., 2013).

5.2 Differences in GPP and SRPP uptake

In this section we discuss our second hypothesis examining the equivalence and current achievement of environmental and socially responsible goals through public procurement. Our findings show that when comparing the uptake of GPP and SRPP practices a clear distinction can be detected. This study provides evidence that the consideration of socially responsible goals in PP has a stronger influence on being awarded the contract than GPP practices. Currently ,public authorities can have greater effect on realizing socially responsible change through public procurement than environmentally sound goals. Again, the supplier readiness for the integration of social aspects in suppliers' operations is less progressed than in the case of environmental considerations. This finding is also in line with the status quo of the current scientific discussion which mostly is in favor of environmental issues instead of socially responsible aspects of public procurement.

Setting inducements in terms of considering environmental and social targets through public tenders will most likely impact the supply chain and change the behavior of suppliers who are dependent on the public sector for business (Simon et al., 1991).It is also evident that suppliers have, to date, made less progress on social responsibility in government contracts than on green issues, so insisting on implementation of their policies through public procurement is having a greater change effect (Knopf et al., 2010).Thus, our results indicate that the organizational equilibrium(Bernard, 1938) for SPP has not yet been fully met. Regarding procurement directives of the EU and corresponding informational initiatives, GPP is clearly more advanced. Most of the European member states already have action plans for GPP in place, forming the basis for a national GPP strategy. Following the idea of Gelderman et al. (2006), the supplier readiness for a more environment friendly production of goods and services is also likely to have a positive impact on the advancement of GPP within public agencies. In terms of SRPP, corresponding initiatives are gaining momentum as some EU member states (notably Austria, Belgium, Denmark, France and the UK) have already implemented elements of SRPP to a broader concept of SPP (Knopf et al, 2010), but the inclusion of environmental and social criteria in public procurement is still a voluntary option. Consequently, the majority of companies are still insufficiently familiar with social management systems like SA 8000.

Overall, our study provides broad confirmatory evidence for the importance of sustainable supply chain management in the public sector. The postulated consideration of policy goals is highly relevant for the stages of the PP process. The impact of GPP is different to SRPP criteria, but in both cases we were able to identify a strong influence on the awarding of more environment friendly or socially responsible products and services.

5.3 Managerial and policy implications

Our research has several managerial and policy implications. First, public procurement itself can be considered an instrument that uses incentives to change the structure and content of supply. Accordingly, public sector procurement managers need to balance the environmental, social and economic elements of sustainable procurement to set adequate inducements to the supply market. Policy makers need to consider developing guidance for

how to integrate environmental, social and economic impacts of sustainable procurement. A strategic approach to GPP and SRPP supports the achievement of social and environmental goals through public procurement and is additionally highly important to secure the competitiveness of enterprises. For instance, private sector companies can benefit in terms of better risk management, cost savings or innovativeness. Because the realization of GPP and SRPP targets requires the full engagement of all involved parties, enterprises need to get recognized inducements in order to contribute to policy targets to anticipate required environmental and social conditions better. Therefore, effective incentives through public procurement agencies can drive the development of new markets and create opportunities for growth.

Concerning SRPP, the public sector should make strongly use of social policy inclusion instruments through public procurement in not only adjusting procurement contracts but also the framework and activities of markets in a strategically focused way. The issuing of documents such as decrees, circulars or guidelines that are binding for public administrations is a first step. Even the adoption of legally binding instruments for public authorities (e.g. life-cycle costing or training for public buyers) provides effective inducements to private sector companies for the consideration of social criteria in their operations. Finally, it can be stated that GPP is already on the rise and policy as well as public sector authorities have to set the course in order to get SRPP to the same level of successful implementation.

Due to the fact, that available European statistics on public procurement represents only rough estimations; our novel approach of analyzing public procurement files is able to provide a first realistic indication about the actual importance given to sustainability within public procurement practice. The data and subsequent analysis on which this paper is based was published in a high profile EU Commission report (EU Com, 2012). The Commission drew on evidence collected in the evaluation and the insights obtained from stakeholder consultation, to prepare its 2012 legislation, debated at a landmark public procurement conference in Brussels on June 30th 2011.

5.4 Limitations and further research

This study has its limitations, some of which will serve as the stimulus for future work. Whilst we measured sustainable practices of public procurement involving buyer-supplier relationships, the collected data is based on procurement files which only reflect the buying perspective of those relationships. Consequently, only incoming offers and suppliers' attitudes within public tendering procedures can be used for the derivation of direct consequences that suppliers draw from public procurement incentives. Since we collected data from Green-7 countries which represent good practice examples for sustainability, non-Green-7 countries may be less progressed in terms of SPP. Additionally, the distribution of the sample is not equally spread over the four EU member states. Though, we could not identify possible bias within our data set, almost half of the files stem from German public procurement agencies. Further, the nature of public sector data from selected procurement agencies provides a snapshot of GPP/SRPP practices in the organizations studied. Future work that extends the analysis to incorporate a longitudinal analysis of changing GPP/SRPP practices, and which is not only based on data from selected procurement agencies in Europe, would add considerably to our understanding of sustainable public procurement practices.

Our study did not specifically look at small- and medium-sized enterprises and the uptake of GPP/SRPP practices. Extending our work to examine SMEs' sustainability practices would shed further light on GPP/SRPP involvement by these firms. Also, in order to make this research a 'triple bottom line' study, future studies might also include an economic measurement to investigate the link between GPP/SRPP, firm performance and subsequent impact on economy. Considering SRPP in Europe, it is likely that social criteria, such as compliance with human and labor rights, are already embraced by domestic companies as there are legal requirements for them to do so. For the purchase of imported material goods which are produced in non-European countries a different picture may evolve. It is possible that, in some other countries, social working standards do not reach the level of the EU countries examined within this study.

6. Conclusions and implications

This paper reviewed the literature on environmental and socially responsible public procurement and policy documents on green public procurement and socially responsible

public procurement to bring forward an initial conceptual framework. The study advances prior research by empirically investigating both GPP and SRPP practices across European member states and sectors. Our analysis provides evidence of progress within the selected European member states on the adoption of environmental and socially responsible public procurement practices. The assumption from March and Simon (1958) in terms of inducements and contributions also applies to the public sector, at least to a certain degree. Findings confirm that governments would be well advised to incorporate considerations of environmental and socially responsible policy goals within PP practices. However, our analysis does show that, in many instances, suppliers have already implemented particularly environmentally sound practices in their own operations.

More specifically, while suppliers are aware of GPP policies and partially adopted GPP practices, they are less aware of socially responsible PP practices. Therefore, there is still a huge knowledge gap comparing the application of GPP and SRPP practices. Our analysis disclosed that policy legislation in terms of SRPP has not yet led companies to integrate social criteria fully in their operations and core strategy. Even if the integration of social goals in public tender procedures needs to be more expanded, the effectiveness and consequently the inducements of the inclusion of socially responsible criteria on the procured products and services is higher than in the case of GPP. Apparently, public sector procurement managers are similarly inexperienced in integrating socially responsible targets in public tender procedures. Our findings show that the more indicators for green and socially responsible public procurement are integrated in the tender, the more sustainable procurement contracts are achieved. This means that purchasing authorities can enhance the effectiveness of inducements to suppliers when considering the full variety of environmental and social policy targets within their tenders.

References

Aschhoff, B. and Sofka, W. (2009), "Innovation on demand – can public procurement drive market success of innovations?", *Research Policy*, Vol. 38 No. 3, pp. 1235-47.

Ashby, A.; Leapt, M. and Hudson-Smith, M. (2012),"Making connections: a review of supply chain management and sustainability literature", *Supply Chain Management: An International Journal*, Vol. 17 No. 5, pp. 497 – 516

Awaysheh, A. and Klassen, R. D. (2010),"The impact of supply chain structure on the use of supplier
socially responsible practices", *International Journal of Operations & Production Management*, Vol. 30 No. 12, pp. 1246-1268.

Barlow, J. and Köberle-Gaiser, M. (2008), "The private finance initiative, project form and design innovation the UK's hospitals programme",*Research Policy*,Vol. 37 No. 8, pp. 1392-1402.

Baumgartner, H. and Homburg C. (1996), "Applications of structuralequation modeling in marketing and consumer research: are view", *International Journal of Research in Marketing, Vol.* 13 No. 2, pp. 139-161.

Beamon, B.M. (1999), "Measuring supply chain performance", *International Journal of Operations & Production Management*, Vol. 19 No. 3, pp.275 – 292.

Björklund, M., Martinsen, U., & Abrahamsson, M. 2012. "Performance Measurements in the Greening of Supply Chains", *Supply Chain Management: An International Journal*, Vol. 17 No. 1, pp.29-39

Bloemhof-Ruwaard, J.M.; van Wassenhove, L.N.; Gabel, H.L. and Weaver, P.M. (1996), "An environmental life cycle optimization model for the European pulp and paper industry", *Omega*, Vol. 20No.6 , pp. 615–629.

Bolton, P. (2008), "Protecting the environment through public procurement: the case of South Africa", *Natural Resources Forum*, Vol. 32, pp. 1–10.

Bouwer M.; Jonk M.; Berman T.; Bersani R.; Lusser H.; Nappa V.; Nissinen A.; Parikka K.;Szuppinger P. and Viganò C. (2006), "Green Public Procurement in Europe 2006 – Conclusions and Recommendations", Haarlem, the Netherlands: Virage Milieu & Management.

Boyd, D. E., Spekman, R. E., Kamauff, J. W. and Werhane, P. (2007), "Corporate social responsibility in global supply chains: a procedural justice perspective", *Long Range Planning,* Vol. 40 No. 3, pp. 341-356.

Boyer, K.K.; Olsen, J.R.; Calantone, R.J. and Jackson, E.C. (2002), "Print versus electronicsurveys: acomparison of two data collection methodologies",*Journal of OperationsManagement*, Vol. 20 No.4, pp. 357-373.

Brammer, S. and Walker, H. (2011),"Sustainable procurement in the public sector: an internationalcomparative study", *International Journal of Operations & Production Management*, Vol. 31 No. 4, pp. 452 – 476.

Burritt, R.,&Schaltegger, S. (2012). Measuring the (Un-)Sustainability of Industrial Biomass Production and Use.*Sustainability Accounting, Management and Policy Journal*, Vol.3 No. 2, pp. 109-133.

Carter, C. R. andDresner, M. (2001), "Purchasing's role in environmental management: cross-functional development of grounded theory",*Journal of Supply Chain Management*, Vol. 37 No. 3, pp. 12-26.

Carter, C.R. and Rogers, D.S. (2008), "A framework of sustainable supply chain management: moving toward new theory", *International Journal of Physical Distribution & LogisticsManagement*, Vol. 38 No. 5, pp. 360-87.

De Giovanni, P. (2012),"Do internal and external environmental management contribute to the triple bottom line?", *International Journal of Operations & Production Management*, Vol. 32 No. 3, pp. 265-290

Elkington, J. (1994), "Towards the sustainable corporation: win-win-win business strategies forSustainabledevelopment", *California Management Review*, Vol. 36 No.2, pp.90-100.

Elkington, J. (1997), Cannibals with forks: the triple bottom line of 21st century business, Oxford, UK: Capstone.

EU (2004), Directive 2004/18/EC of the European Parliament and of the Council,available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0018:en:NOT(Accessed 12 September 2012).

EU (2009), Directive 2009/33/EC of the European Parliament and of the Council, available at:http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:120:0005:0012:en:pdf(Accessed 15 September 2012).

EU Com (2003), Communication from the Commission to the Council and the European Parliament, Integrated Product Policy – Building on Environmental Life-Cycle Thinking, available at: http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2003:0302:Fin:EN:PDF(Accessed 12 October 2012).

EU Com (2005), Communication from the Commission to the Council and the European Parliament on the review of the Sustainable Development Strategy - A platform for action, available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52005DC0658:EN:NOT(Accessed 23 September 2012).

EU Com (2008), Public procurement for a better environment, available at: http://ec.europa.eu/environment/gpp/pdf/sec_2008_2126.pdf(Accessed 12 September 2012).

EU Com (2009), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions - Mainstreaming sustainable development into EU policies: 2009 Review of the European Union Strategy for Sustainable Development, available at:http://eur-

lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52009DC0400:EN:NOT(Accessed 10 September 2012).

EU Com (2010). Flagship Initiatives, available at:http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/flagship-initiatives/index_en.htm(Accessed 12 September 2012).

EU Com (2011a), *Buying Green! A Handbook on Green Public Procurement*, 2nded., Luxembourg: Publication Office of the European Union.

EU Com (2011b), *A renewed EU strategy 2011-14 for Corporate Social Responsibility*, available at: http://ec.europa.eu/enterprise/policies/sustainable-business/files/csr/new-csr/act_en.pdf(Accessed 12 September 2012).

EU Com (2012), Evaluation of Public Procurement Rules - Evaluation Report: Impact and Effectiveness of EU Public Procurement Legislation, available at: http://ec.europa.eu/internal_market/publicprocurement/modernising_rules/evaluation/index_en.htm(Accessed 12 September 2012).

Evans, L.; Nuttall, C.; Mouat, A. and Ewing D. (2010), Assessment and Comparison of National GPP/SPP Criteria and Underlying Schemes, available from: http://ec.europa.eu/environment/gpp/pdf/Criteria%20and%20Underlying%20Schemes.pdf(Accessed 12 September 2012).

Fornell, C. and Cha, J. (1994), "*Partial least squares*", In: Bagozzi, R.P. (Ed.), Advanced methods of marketing research, Wiley, CambridgeMA, pp. 52-78.

Fornell, C. and Larcker, D.F. (1981), "Evaluating Structural Models with Unobservable Variables and Measurement Error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Gelderman, C.J.; Ghijsen, P.W. and Brugman, M.J. (2006),), "Public procurement and EU tendering directives – explaining non-compliance", *International Journal of Public Sector Management*, Vol. 19 No. 7, pp. 702-714.

Georghiou, L. (2007), "Demanding innovation: lead markets, public procurement and innovation", Provocation 02: February 2007. NESTA.

Gunasekaran, A.; Patel, C. and McGaughey, R.E. (2004), "A framework for supply chain performance measurement", *International Journal of Production Economics*, Vol. 87 No. 3, pp. 333-347.

Hall, M. and Purchase, D. (2006), "Building or bodging?Attitudes to sustainability in UK publicsector housing construction development", *SustainableDevelopment*, Vol. 14 No. 3, pp. 205-218.

Handfield, R.B.; Walton, S.V.; Seegers, L.K. and Melnyk, S.A. (1997), "'Green' value chain practices in the furniture industry", *Journal of Operations Management*, Vol. 15 No. 3, pp. 293-315.

Harland, C.M., Telgen J., Knight L., Callender G. and Thai K.V. (2007), "Challenges facing public procurement", in Knigh L., Harland C.M., Telgen J., Thai K.V., Callender G. and McKen K., "*Public Procurement: International Cases and Commentary*", Routledge, Oxon

Hartley, J.L and Jones, G.E. (1997), "Process Oriented Supplier Development: Building the Capability for Change", *Journal of Supply Chain Management*, Vol. 33 No. 3, pp. 24-29.

Heras-Saizarbitoria, I.; Landín, G. A. and Molina-Azorín, J. F. (2011),"Do drivers matter forthe benefits of ISO 14001?",*International Journal of Operations & Production Management*, Vol. 31 No. 2, pp. 192-216.

HM Government (2005), The UK Government Sustainable Development Strategy, available at:http://archive.defra.gov.uk/sustainable/government/publications/uk-strategy(Accessed 22 October 2012).

IDEA (2003), *Sustainable procurement – making it happen*, available at:http://www.idea.gov.uk/idk/aio/69979(Accessed 21 September 2012).

Jöreskog, K.G. and Sörbon, D. (1982), "Recent Developments in Structural Equation Modelling", *Journal of Marketing Research*, Vol. 19 No. 4, pp. 404-416.

Klassen, R. D., &Vereecke, A. (2012), "Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance",*International Journal of Production Economics,* Vol. 140 No. 1, pp. 103-115.

Kline, R. B. (2011), "Principles and Practice of Structural Equation Modelling", 3rd. ed., London and New York: Wiley.

Knopf, J.; Kahlenborn, W.; Hajduk, T.; Weiss, D.; Feil, M.; Fiedler, R. and Klein, J. (2010), Corporate Social Responsibility National Public Policies in the European Union, available from: http://ec.europa.eu/social/main.jsp?langId=en&catId=331&newsId=1012&furtherNews=yes [Accessed 25 September 2012].

Koh, S. C. L., Genovese, A.,Acquaye, A.A., Barratt, P., Rana, N., Kuylenstierna, J. Gibbs, D. (2013), "Decarbonising product supply chains: design and development of an integrated evidence-based Decision Support System. The Supply Chain Environmental Analysis Tool (SCEnAT)", *International Journal of Production Research*, Vol. 51 No. 7 , pp. 2092-2109.

Lee, S.-Y. (2008), "Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives", *Supply Chain Management: An International Journal*, Vol. 13 No. 3, pp. 185-198.

Lehtinen, J. and Ahola, T. (2010), "Is performance measurement suitable for an extended enterprise?", I*nternational Journal of Operations & Production Management*, Vol. 30 No. 2, pp. 181-204.Lember, V., Kalvet, T. and Kattel, R. (2011), "Urban competitiveness and public procurement for innovation", *Urban Studies*,Vol. 48 No. 7, pp. 1373-1395

Li, L. andGeiser, K. (2005), "Environmentally responsible public procurement(ERPP) and its implications for integrated product policy (IPP)", *Journal of Cleaner Production*, Vol. 13 No. 7, pp. 705-715.

Linton, J. D.;Klassen, R. andJayaraman, V. (2007), "Sustainable supply chains: an introduction",*Journal of Operations Management*, Vol. 25 No. 6, pp. 1075-1082.

March, J. G. and Simon, H. A. (1958), "*Organizations*",Oxford, England: Wiley.

Martin, S.; Hartley, K. and Cox, A. (1999), "Public procurement directives in the European Union: A study of local authority purchasing", *Public Administration*, Vol. 77 No. 2, pp. 387-406.

Matos, S. and Hall, J. (2007), "Integrating sustainable development in the supply chain: The case of life cycle assessment in oil and gas and agricultural biotechnology", *Journal of Operations Management*, Vol. 25 No.6 , pp. 1083–1102.

Michelsen, O. and de Boer, L. (2009), "Green procurement in Norway; a survey of practices at the municipal and county level", *Journal of Environmental Management*, Vol. 91, pp. 160–167

Miemczyk, J.; Johnsen, T. E. and Macquet, M. (2012),"Sustainable purchasing and supply management: a structured literature review of definitions and measures at the dyad, chain and network levels", *Supply Chain Management: An International Journal*, Vol. 17 No. 5, pp. 478 – 496.

Min, H. and Galle, W.P. (2001), "Green purchasing practices of US firms", *International Journal ofOperations & Production Management*, Vol. 21 No. 9, pp. 1222-1238.

Paulraj, A. and de Jong, P. (2011),"The effect of ISO 14001 certification announcements on stock
performance", *International Journal of Operations & Production Management*, Vol. 31 No. 7, pp. 765-788.

Podsakoff, P.M. and Organ, D.W. (1986), "Self-reports in organizational research: problems and prospects",*Journal of Management*, Vol. 12 No. 4, pp. 531-544.

Podsakoff, P.M.; MacKenzie, S.B.; Lee. J.-Y. and Podsakoff, N.P. (2003), "Common method biases in behavioural research: a critical review of the literature and recommended remedies",*Journal of Applied Psychology*, Vol. 88 No. 5, pp. 879-903.

Porter, M. E. and Van der Linde, C.(1995), "Green and competitive", *Harvard Business Review*, Vol. 73 No. 5, pp. 120-134.

Prenen, E. C. L. (2008), "Green and sustainable public procurement in the Netherlands: An inconvenient truth",*3rd International Public Procurement Conference Proceedings*, 28-30 August 2008, pp. 549-570.

Preuss, L. (2007), "Buying into our future: sustainable initiatives in local government procurement", *Business Strategy and the Environment*, Vol. 16, pp. 354–365.

Preuss, L. (2009), "Addressing sustainable development through public procurement: the case oflocal government", *Supply Chain Management: An International Journal*, Vol. 14 No. 3, p. 213-223.

Rao, P. and Holt, D. (2005), "Do green supply chains lead to competitiveness and economic performance?",*International Journal of Operations & Production Management*, Vol. 25Nos. 9/10, pp. 898-916.

Remmington, M.; Smith, J.C. and Hawkins, R. (2006), "Corporate social responsibility and sustainable food procurement", *British Food Journal*, Vol. 108 Nos. 10/11, pp. 824-837.

Sarkis, J. (2001), "A strategic decision framework for green supply chain management", *Journal of Cleaner Production,* Vol.11 No. 4, pp. 397–409.

Sarkis, J. (2001),"Manufacturing's role in corporate environmental sustainability - Concerns

for the new millennium", *International Journal of Operations & Production Management*, Vol. 21 No. 5, pp. 666 -686.

Schaltegger, S., Windolph, S. E., &Herzig, C. (2012a), "Applying the Known: A longitudinal Analysis of the Knowledge and Application of Sustainability Management Tools in large German Companies", *Society and Economy*, Vol. 34 No. 4, pp. 549-579.

Schaltegger, S., Viere, T.,&Zvezdov, D. (2012b), „Tapping Environmental Accounting Potentials of Beer Brewing: Information Needs for Successful Cleaner Production",*Journal of Cleaner Production*, Vol. 29-30, pp. 1-10.

Seuring, S. and Müller, M. (2008), "From a literature review to a conceptualframework for sustainable supply chain management", *Journal ofCleaner Production*, Vol. 16 No. 15, pp. 1699-1710.

Seuring, S.;Sarkis, J.; Müller, M. andRao, P. (2008), "Sustainability and supply chain management - An introduction to the special issue",*Journal ofCleaner Production*, Vol. 16 No. 15, pp. 1545-1551.

Simpson, D.; Power, D. and Samson, D. (2007),"Greening the automotive supply chain: a relationship perspective", *International Journal of Operations & Production Management*, Vol. 27 No. 1; pp. 28-48.

Srivastava, S. K. (2007), "Green supply-chain management: A state-of-the-artliterature review", *International Journal of Management Reviews*, Vol. 9 No. 1, pp. 53-80.

Simon, H. A.; Thompson, V. A. and Smithburg, V. A. (1991), *Public Administration'*New Brunswick, New Jersey: Transaction Publishers.

Swanson, M.;Weissman, A.; Davis, G.;Socolof, M.L. and Davis, K. (2005), "Developing prioritiesfor greener state government purchasing: a California case study*", Journal of CleanerProduction*, Vol. 13 No. 7, pp. 669-677.

Thai, K.V. (2001), "Public procurement re-examined", *Journal of Public Procurement*, Vol. 1No. 1, pp. 9-50.

Thomson, J. and Jackson, T. (2007), "Sustainable procurement in practice: lessons from localgovernment", *Journal of Environmental Planning & Management*, Vol. 50 No. 3, pp. 421-444.

Thun, J.R.-H.and Mueller, A. (2010), "An empirical analysis of green supply chain management in the German automotive industry", *Business Strategy & the Environment*, Vol. 19 No. 2, pp. 119-32.

Uyarra, E. and Flanagan, K. (2010), "Understanding the innovation impacts of publicprocurement", *European Planning Studies*, Vol. 18 No. 1, pp. 123-143.

Vachon, S. and Klassen, R. (2006), "Extending green practices across the supply chain: the impactof upstream and downstream integration", *International Journal of Operations &Production Management*, Vol. 26 No. 7, pp. 795-821.

Walker, H. (2010), "*Successful business andprocurement:what lessons for sustainable public procurement can be drawnfrom successful businesses? Rapid Research and EvidenceReview*", December 2010, Sustainable Development Research Network.

Walker, H. and Brammer, S. (2009), "Sustainable procurement in the UK public sector", *Supply Chain Management: An International Journal*, Vol. 14 No. 2, pp. 127-38.

Walker, H. and Phillips, W. (2009), "Sustainable procurement: emerging issues", *International Journal of Procurement Management*, Vol. 2 No.1, pp. 41-61.

Walker, H. andPreuss, L. (2008), "Fostering sustainability through sourcing fromsmall businesses: public sector perspectives",*Journal of CleanerProduction*, Vol. 16 No. 15, pp. 1600-1609.

Walker, H.;diSisto, L.andMcBain, D. (2008), "Drivers and barriers ofenvironmental supply chain practices: lessons from the public andprivate sectors",*Journal of Purchasing and Supply Management*, Vol. 14 No. 1, pp. 69-85.

Walker, H., and Jones, N. 2012.Sustainable supply chain management across the UK private sector.*Supply Chain Management: An International Journal*, Vol. 17 No. 1, pp. 15-28.

Warner, K.E. and Ryall, C. (2001), "Greener purchasing activities within UK local authorities", *Eco-management and Auditing*, Vol. 8 No. 1, pp. 36-45.

Wilkinson, A.; Hill, M. and Gollan, P. (2001),"The sustainability debate", *International Journal of Operations & Production Management,* Vol. 21 No. 12, pp. 1492-1502.

Zheng, J., Roehrich, J.K. and Lewis, M.A. (2008), "The dynamics of contractual and relational governance: evidence from long-term public-private procurement arrangements", *Journal of Purchasing & Supply Management,* Vol. 14 No. 1, pp. 43-54.

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Journal of Operations Management*, Vol. 22 No. 3, pp. 265-289.

Zhu, Q., Sarkis, J. and Geng, Y. (2005), "Green supply chain management in China: pressures, practices and performance", *International Journal of Operations & ProductionManagement*, Vol. 25 No. 5, pp. 449-468.

Zsidisin, G. andEllram, L. (2001), "Activities related to purchasing and supply management involvement in supplier alliances",*International Journalof Physical Distribution and Logistics*, Vol. 31 No. 9, pp. 617-634.

Figures and Tables

Reference	Sustainable public procurement conceptualisation	Country	Sector/Level of analysis	Method and sample	Key findings
Warner and Ryall (2001)	Greener purchasing has a key role in reducing the negative environmental impacts of consumption by focusing on reducing procurement and selecting greener alternatives (p.36)	UK	Local government	Survey (180)	• Majority of green purchasing policies were only moderately successful, mainly due to the increased cost of greener products • Local authorities experience difficulties with implementation and maintenance of greener purchasing policies and national guidance would be beneficial.
Li and Geiser (2005)	Environmentally responsible public procurement (ERRP) is described as public authorities taking the responsibility, in their own purchasing practices, to identify the products and services that are environmentally benign and give preference in the purchasing of these identified products and services (p. 707)	USA	Government (computer purchasing at state level)	Interviews (governmental purchasing officials)	• Develops product-related environmental policy instruments such as eco- labelling, extended producer responsibility, and environmentally responsible public procurement across an integrated life-cycle • Environmentally responsible public procurement is a driving force in the integration of environmental product policy instruments
Swanson et al. (2005)	Green purchasing is concerned with, amongst others, the challenges to green purchasing is the number and variety of factors to consider when distinguishing or choosing environmentally preferable products (p.669)	USA	State Procurement Division	Secondary data analysis	• Develops a priority-ranking scheme and a ranked list of product categories based on technical and institutional criteria
Hall and Purchase (2006)	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (p.206)	UK	Public sector housing associations and housing association development managers	Survey (143) and interviews	• Sustainability is seen as a low priority and government initiatives have yet to make a significant impact • There has been criticism about the lack of progress made towards implementing government policies so far seen and the results in this paper suggest that this criticism is justified
Preuss (2007)	Sustainability procurement is vital to local government authorities who are responsible for the provision of a vast range of services, many of which have implications for sustainability at local level, such as economic regeneration or waste disposal (p.355)	UK	Local government	Case studies/interviews (16)	• Procurement by local authorities reveals a wide range of activities aimed at addressing the challenges of sustainable development, covering environmental and social as well as economic development aspects • However, these initiatives are still of a patchy nature, in terms of both differences between aspects of sustainability and variation

					between local authorities • Many sustainability initiatives also have cost implications for local government, which may clash with other priorities
Thomson and Jackson (2007)	Sustainable development requires environmental protection to become central to long-term economic development and laws to reduce unsustainable patterns of production and consumption (p. 422)	UK	Local government	Desk research and interviews (5 case studies)	• Green procurement has been encouraged through legislation, providing information and dismantling barriers, but momentum was lost following the Gershon review. Implementation of the new action plan would ensure green procurement becomes embedded within government procurement.
Bolton (2008)	Green procurement refers to the selection of products and services whose environmental impacts are not harmful or the least harmful to the environment and human health when measured against competing products and services (p. 1)	South Africa	n/a (theoretical paper)		• Government departments can use procurement as an environmental policy tool to contribute to sustainable development • It is argued that such use does not fall outside the current legislative framework governing procurement • Suggestions are made as to how environmental considerations could be incorporated throughout the procurement process
Walker et al. (2008)	Green supply chain management (GSCM) is understood as supply management activities that attempt to improve the environmental performance of purchased inputs, or of the suppliers that provide them. Projects might entail source reductions activities such as (1) recycling, reuse, input material purification, low-density packaging design; (2) environmental data gathering about vendors, products or processes; (3) waste elimination efforts such as biodegrading, non-toxic incineration (p.75)	UK	Cross-sectoral (healthcare, public procurement agency, environment agency, electronics, cosmetics; food retailer)	11 Interviews (7 case studies) – *includes public and private organisations*	• Explores the factors that drive or hinder organisations to implement GSCM initiatives • More drivers than barriers to environmental supply chain management are identified • Organisations seem to be more influenced by external rather than internal drivers
Preuss (2009)	Sustainable SCM is described as the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination ofkey interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains (p.215)	UK	Local authorities	Case studies/interviews (16)	• At an aggregate level, local government procurers have adopted a wide range of initiatives to address all three aspects of sustainability • These are condensed into a typology of sustainable supply chain management for the public sector
Michelsen and de Boer (2009)	Following Bouwer's et al. (2006)definition of Green Public Procurement describing it as 'theapproach by which Public Authorities integrate environmental	Norway	Municipalities and countries	Interviews and survey (448	• Confirms that there is a focus on green procurement in municipalities and counties in Norway, but the requirements from the Public Procurement Act are far from implemented

	criteria into all stages of their procurement process, thus encouraging the spreadof environmental technologies and the development of environmentally sound products, by seeking and choosing outcomes and solutions that have the least possible impact on the environment throughout their whole life cycle' (p.160)			respondents)	• There are large differences between the municipalities, among other things on focus, strategies, expertise and behaviour concerning green procurement • Findings show that green procurement is significantly more established in large municipalities than in small ones
Walker and Brammer (2009)	Sustainable procurement (SP) is procurement that is consistent with the principles of sustainable development, such as ensuring a strong, healthy and just society, living within environmental limits, and promoting good governance (p.128)	UK	Cross-sectoral (e.g. healthcare, local government, education)	Survey (106 respondents)	• There is significant variation across public sector agencies in the nature of sustainable procurement practice • Local authorities have a particularly strong emphasis on buying from local and small suppliers relative to other sectors, health looks generally lower in many categories, and education appears to have something of an emphasis on environmental aspects of sustainable procurement • Cost has been found to be the leading barrier to sustainable procurement, and top management support the leading facilitator
Walker and Phillips (2009)	Sustainable procurement (SP) is the pursuit of sustainable development objectives through the purchasing and supply process, and involves balancing environmental, social and economic objectives (p. 42)	UK	Cross-sectoral	Focus group (44 participants) - *includes public and private sector participants*	• Senior government commitment is needed to ensure practitioners are empowered to purchase responsibly • Having sustainable procurement measures included in annual reporting forms would give a clear message that public procurement is expected to deliver on this agenda • Regulation and legislation can promote sustainable supply practices • Political parties may consider cross-party agreement on the sustainability agenda to prevent short-termism
Brammer and Walker (2011)	SP has been defined by the UK SP Task Force as: [. . .] a process whereby organisations meet their needs for goods, services, works and utilitiesin a way that achieves value for money on a whole life basis in terms of generating benefits notonly to the organisation, but also to society and the economy, whilst minimising damage to theenvironment (DEFRA, 2006) (p. 454); SP embodies concern for social, environmental and economic aspects of procurement decisions.	World wide	Cross-sectoral	Survey (283 respondents)	• Shows that some SP practices are evident in public sector procurement practice • Extent and nature of SP practices varies significantly across regions • Highlights the main facilitators of, and barriers to, engagement with SP and investigate their importance for engagement with particular dimensions of SP

Table 1 Comparison of selected sustainable public procurement papers

EU and national policy document	Dimensions and indicators of GPP/SRPP	Key issues
EU Com (2003), 'Integrated Product Policy'	Suggestion to base eco-labels on ISO 14021:1999, 14024:1999, ISO Type III/TR 14025:2000	• Minimising environmental degradation through integrated product policies • Creation of an appropriate economic and legal framework; promotion of life-cycle thinking; transmission of product information to consumers
EU Com (2005), 'Review of the Sustainable Development Strategy'	Sustainability targets: • climate change and clean energy; public health; social exclusion, demography and migration; management of natural resources; sustainable transport; global poverty and development challenges	Identification of adequate measures for the follow-up and regulation of sustainability targets
HM Government (2005), 'The UK Government Sustainable Development Strategy'	Priorities for UK actions (based on the outcomes of the World Summiton SustainableDevelopment–Johannesburg 2002): • sustainable production and consumption; climate change and energy; natural resource protection and environmental enhancement; sustainable communities	Determination and description of UK Strategic Framework for Sustainable Development, consisting of UK Government Strategy, Welsh Assembly Action Plan, Scottish Executive Strategy and Northern Ireland Strategy, with the central aims: social progress which recognises the needs of everyone; effective protection of the environment; prudent use of natural resources; maintenance of high and stable levels of economic growth and employment
EU Com (2008), 'Public procurement for a Better Environment'	GPP criteria are referred to the Training Toolkit: • loss of biodiversity; emissions to air and water; energy and water consumption; chemical consumption; waste generation	Green Public Procurement is defined as: "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" (p.4).
EU Com (2009), '2009 Review of the European Union Strategy for Sustainable Development'	Advanced sustainability targets: • climate change and clean energy; sustainable transport; sustainable production and consumption; conservation and management of natural resources; public health; social inclusion, demography and migration; global poverty and sustainable development challenges; education and training; research and development; financing and economic instruments	Report on the achievement and future prospects of sustainability targets
EU Com (2011b), 'A renewed EU strategy 2011-14 for Corporate Social Responsibility'	Criteria for social responsibility cover: • human rights, labour andemployment practices (such as training, diversity, gender equality and employee health and well-being) • environmental issues (such as biodiversity, climate change, resource efficiency, life-cycle assessment and pollution prevention) • combating bribery and corruption.	Corporate Social Responsibility is defined as "the responsibility of enterprisesfor their impacts on society" (p. 6).

Table 2 Analysis of key EU and national policy documents in terms of GPP/SRPP indicators and dimensions (2003-2012)

Product categories	**Frequency**	**Percentage**
Office and computing machinery, equipment and supplies	73	26,0
Construction work	67	23,8
Cleaning and sanitation services & washing and dry-cleaning services	53	18,9
Clothing, footwear, luggage articles and accessories	25	8,9
Radio, television, communication, telecommunication and related equipment and apparatus	21	7,5
Machinery, equipment, appliances, apparatus and associated products	20	7,1
Electrical machinery, apparatus, equipment and consumables	15	5,3
Canteen and catering services	7	2,5
Total	**281**	**100,0**

Table 3 Overview of the investigated product categories

Manifest variables (policy goals)	**Indicators**
GPP	1 Ensuring biodiversity 2 Reducing emission to air/water 3 Reducing energy and water consumption 4 Reducing chemical consumption 5 Reducing waste generation
SRPP	1 Promoting employment opportunities 2 Promoting decent work 3 Supporting social inclusion and promoting social economy organization 4 Promoting SMEs 5 Promoting accessibility and design for all 6 Taking into account ethical and fair trade issues 7 Seeking to achieve wider voluntary adherence to CSR

Table 4 Measurement items for manifest variables

Construct	Indicator	Loadings	t-value	Cronbachs Alpha	Composite reliability	AVE	Discriminant validity
GPPA	gpp_a_1	0.68	13.79	0,87	0,91	0,67	ok
	gpp_a_2	0.9	61.96				
	gpp_a_3	0.82	26.93				
	gpp_a_4	0.82	32.89				
	gpp_a_5	0.84	37.88				
GPPO	gpp_o_1	0.71	14.97	0.85	0.89	0.63	ok
	gpp_o_2	0.88	57.05				
	gpp_o_3	0.75	18.33				
	gpp_o_4	0.81	31.76				
	gpp_o_5	0.8	29.76				
GPPT	gpp_t_1	0.5	5.96	0.79	0.85	0.55	ok
	gpp_t_2	0.89	61.85				
	gpp_t_3	0.64	12.99				
	gpp_t_4	0.82	30.28				
	gpp_t_5	0.78	25.09				
SRPPA	srpp_a_1	0.85	23.43	0.4	0.54	0.25	not met
	srpp_a_2	0.36	5.90				
	srpp_a_3	0.18	1.40				
	srpp_a_4	-0.19	2.00				
	srpp_a_5	0.18	1.51				
	srpp_a_6	0.21	1.65				
	srpp_a_7	0.89	36.20				
SRPPO	srpp_o_1	0.84	17.77	0.3	0.49	0.25	not met
	srpp_o_2	0.33	4.45				
	srpp_o_3	0.03	0.91				
	srpp_o_4	-0.20	2.04				
	srpp_o_5	0.24	1.76				
	srpp_o_6	0.10	0.98				
	srpp_o_7	0.90	41.18				
SRPPT	srpp_t_1	0.53	7.68	0.16	0.38	0.21	not met
	srpp_t_2	0.27	2.50				
	srpp_t_3	0.28	2.03				
	srpp_t_4	-0.44	4.59				
	srpp_t_5	0.13	1.08				
	srpp_t_6	0.17	1.32				
	srpp_t_7	0.90	21.75				

Table 5 Results of the measurement of items

Path	Direct effect	Indirect effect	Total effect
GPPT → GPPA	0.19		
GPPT → GPPO → GPPA		0.32	0.51
SRPPT → SRPPA	0.58		
SRPPT →SRPPO → SRPPA		0.28	0.86

Table 6 Path coefficients

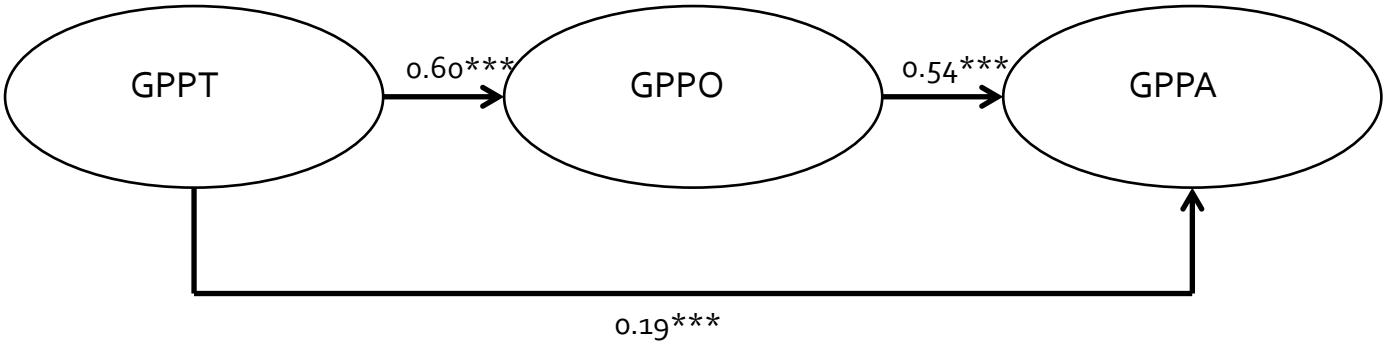
	GPP		SRPP		MGA	
Path	**Path co-efficient**	**Standard error**	**Path co-efficient**	**Standard error**	**t-value**	**p-value**
Tender→Award	0.19	0.08	0.58	0.08	3.52	0.00
Tender→Offer	0.60	0.05	0.78	0.04	2.84	0.00
Offer→Award	0.54	0.07	0.38	0.08	1.47	0.07

Table 7 Multi-group analysis

	Austria	Germany	Netherlands	UK	All countries
Number of contracting authorities	8	2	1	1	12
Number of procurement files	101	132	20	28	281
Percentage of sample	36	47	7	10	100
Involved contracting authorities	Land Burgenland Land Oberösterreich, Liegenschaftsverwaltung Land Steiermark, Straßenbauamt Land Steiermark, Zentrale Dienste Land Tirol, Gruppe Bau und Technik Land Tirol, Landeskanzleidirektion Land Tirol, Liegenschaftsverwaltung	Beschaffungsamt des Bundesministeriums des Innern, Landeshauptstadt München	Province Overijssel	Eastern Shires Purchasing Organisation	

Table 8 Overview of data collection

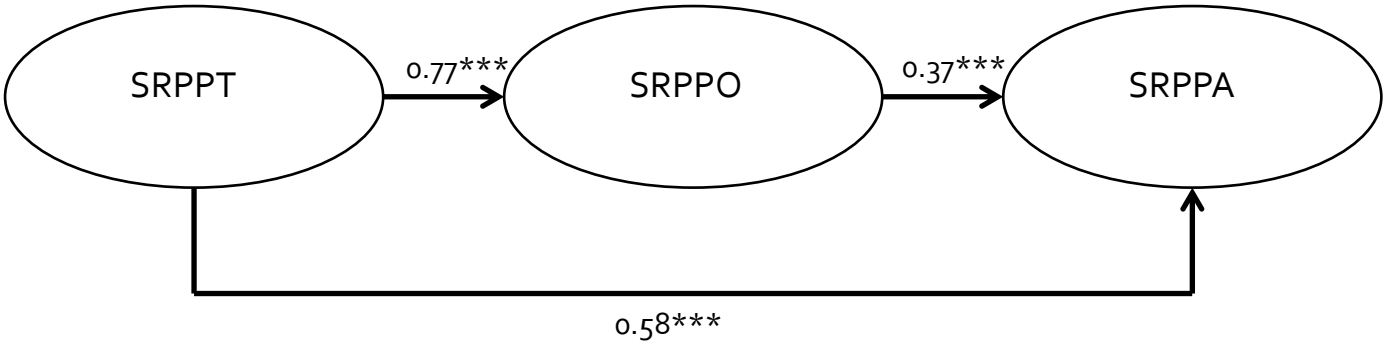
Figure 1 Initial conceptual framework



N = 281

Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.001

Figure 2 Effectiveness of devolving responsibility to companies in terms of environmental targets



N = 281

Significance levels: * p < 0.1, ** p < 0.05, *** p < 0.001

Figure 3 Effectiveness of devolving responsibility to companies in terms of social targets