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Table of contents

1. Introduction	6
2. Previous Research	7
3. Data and sample description.....	8
3.1. Green Public Procurement and green innovation	10
3.2. Country Representation	14
3.3. Employment and financial indicators.....	17
3.4. Descriptive statistics.....	18
3.5. Importance of the Contract Awards (CA).....	20
3.6. Company Size and greenness.....	23
3.6.1. Contract award winners’ size classes	25
3.6.2. Contract award winners’ greenness.....	26
4. Univariate Analysis	28
4.1. Is succeeding in a tender associated with a higher financial strength?.....	28
4.2. Is succeeding in a Green tender associated with a higher financial strength?	39
4.3. Is winning in a tender associated with a higher growth rate in financial strength indicators?	47
5. Conclusion	48
6. References.....	49



Index of tables

Table 1 - Number of observations for Contract Award (CA) firms and control firms	10
Table 2 - Green CA firms (firm-years).....	12
Table 3 - Green possible CA firms (firm-years)	13
Table 4 - Distribution of TED (treated) firms over countries in percent	16
Table 5 - Representation: the country's share of firms in the sample and in reality.....	17
Table 6 - Distribution of firms over years of observation	17
Table 7 – Treatment group: Balance sheet values in tsd. EUR.....	19
Table 8 - Control group: Balance sheet values in tsd. EUR	19
Table 9 - Growth of SME participation on TED	24
Table 10 - Univariate regression: Equity ratio and contract award	32
Table 11 - Univariate regression: long-term debt ratio and contract award.....	33
Table 12 - Univariate regression: short-term debt ratio and contract award	35
Table 13 - Univariate regression: Loan ratio and contract award.....	36
Table 14 - Univariate regression: Trade credit ratio and contract award.....	37
Table 15 - Univariate regression: Turnover ratio and contract award.....	39
Table 16 - Univariate regression: Equity ratio and greenness	40
Table 17 - Univariate regression: Long-term debt ratio and greenness	42
Table 18 - Univariate regression: short-term debt ratio and greenness	43
Table 19 - Univariate regression: Loan ratio and greenness.....	44
Table 20 - Univariate regression: Trade credit ratio and greenness.....	45
Table 21 - Univariate regression: Turnover and greenness	46

Index of figures

Figure 1 - Distribution of the number of firm-years over countries	14
Figure 2 - Distribution of the number of firms over countries.....	15
Figure 3 - Characteristics of Contract Award winners and control firms.....	18
Figure 4 - Contract award value over firm size	20
Figure 5 - Contract award value over loan amount	21
Figure 6 - Contract awards per year.....	22
Figure 7 - Contract awards per year per country.....	22
Figure 8 - Distribution of firm sizes (employees)	23
Figure 9 - Distribution over firm sizes (total assets)	24
Figure 10 - Contract award winners' size classes (employees)	25
Figure 11 - Contract award winners size class (total assets).....	26
Figure 12 - Contract award winners' distribution over the different categories of Greenness..	26
Figure 13 - Green contract award winners' distribution over the size classes	27
Figure 14 - Green possible contract award winners' distribution over the size classes	28
Figure 15 - Asset-related indicators of financial strenght.....	29
Figure 16 - Workforce-related indicators of financial strength	30
Figure 17 - Growth after winning a contract award.....	47



1. Introduction

From 2015 to 2017 numerous EU public authorities spend approximately 2 trillion Euros annually, around 14 % of GDP, on the purchase of services, works and supplies (European Commission 2019). Green Public Procurement is until now only a share of the total expenditure. However, it is to be expected that this share will grow in the future. According to the EU Commission green public procurement is "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" (COM 2008, p. 400 "Public procurement for a better environment"). By launching so-called green tenders and awarding offers for goods, services, and works that protect the environment better than conventional variants, public authorities' purchasing power is able to contribute to the Great Green Transition (Kemfert, Schäfer and Semmler 2020). Firms usually do need external funds to buy preliminary goods and services, to pay production wages and machinery leases, and to distribute their goods. In the European Union banks are the companies' dominant source for borrowing external funds. Funding from financial markets is way less important than bank lending. The funding structure of firms, of Small and Medium-Sized Enterprises in particular, is strikingly different in the EU than it is in the USA. However, both types of finance, bank lending and capital market financing, are needed for raising the huge amounts of investments required to facilitate the Great Green Transition (GGT). Accordingly, bank and market finance possess a key role in pathing the way toward a green economy.

Alongside with the huge opportunities embedded in the financing of the Great Green Transition huge uncertainties arise for financial institutions. To a large extent, the transition path is unknown. Progress in transferring the economy from a fossil fuel-intensive economy into a system that is based on renewable fossil free energy is highly dependent on innovative firms' power to invent, produce, sell, and use climate-protecting technologies, processes and products. Accordingly, financial institutions face substantial risks when they fund green processes and products. Previous research has already established that innovative companies face higher financial restrictions than firms which sell established and multiply proven technologies and products (Jensen, Schäfer & Stephan, 2019 and Schäfer, Stephan & Solórzano Mosquera 2017). The source for the often-observable financial restrictions is the huge risk revolving around the issue of whether the market success of innovative products and technologies is sustainable in a longer-term perspective. Therefore, banks and institutional investors funding climate-tech firms face depreciation risk at two ends. At the one end, if they follow a wait-and-see strategy and stick to their conventional investment policy, stranded legacy assets may threaten their existence when loans and other instruments to fund fossil fuel firms may turn into non-performing and, eventually, defaulted loans. At the other end, if the financial sector, including the prominently lending banks, immediately switches to funding only innovative companies from renewable energy and climate-tech branches, it faces the typical risk that first movers are exposed to when they step early into new and largely unknown economic activities.

Public procurement has a paramount role in easing this dilemma. The invitation to tender for new, little-tested goods and services commonly implies that the award winners gain substantial



additional demand in markets that have not yet been established. This effect is known as the demand-pull effect of public procurement. On the one hand, this demand provides companies with the necessary incentives to invest in product improvement and marketability, and on the other hand, it also is an instrument for de-risking the financial institutions' financial claims. From this perspective, it is Public Procurement (PP) that is one of the most important instruments for strengthening the financial sectors' willingness to fund the Great Green Transition. In other words, PP is an essential tool for easing the funding constraints of companies which pave the way into a green economy. This role may even become more important when rating agencies eventually start to implement climate risks in their rating models, and bank include climate risks in their internal risk models. Ratings and internal risk models' output determine regulatory capital requirements for banks, and via this channel, affect banks' lending decisions.

Against this background, we aim at a univariate assessment of how innovations in Renewable Energy Supply (RES) innovations and Green PP affects Small and Medium-sized Enterprises' (SMEs) financial strength and constraints. Accordingly, the demand from local governments for RES innovations to implement those innovations in their community is also one of the keys for additional funding from banks and other financial institutions. The univariate analysis provides first insights into how the firms' financial strength is associated with PP in general and GPP in particular.

2. Previous Research

The issue of funding RES innovations is of growing interest both for businesses and policy makers, since RES innovations pave the way to a low carbon economy. Currently, little is known about how SMEs finance the purchase of new clean energy and technologies necessary to make production processes and distribution channels climate-friendly, and what restrictions SMEs face in financing RES innovations. In general, the funding possibilities of RES innovators, be they on the forefront in applying innovative RES technologies or in creating new climate-tech solutions, are constrained. Environmental innovation projects are long-term commitments often associated with immature and intricate technology (Olmos, Ruester and Liong 2012). The long payback period reinforces the perceived risk of such investments (Ghisetti, Mancinell., Mazzanti and Zoli 2017b). In addition, innovative firms own often fairly large amounts of intangible assets that are impossible to be pledged as collateral (Brown, Martinsson and Petersen, Cosci et al., 2016, Hall, Moncada-Paternò-Castello, Montresor and Vezzani 2016).

Opaqueness and information asymmetry between borrowers and investors are particularly large for SMEs. Those obstacles are more pervasive for environmental innovation projects (Cecere, Corrocher, Gossart and Ozman 2014). Accordingly, immaturity of some RES markets, a greater perceived risk of the investment in environmental innovations (Aghion et al., 2009, Ghisetti et al., 2017a), fierce competition from fossil-fuel-affine incumbents and an insufficient recognizing of climate risks in rating models including the banks' own internal models work in favor of funding constraints and induce financial institutions often to shy away from supplying the required funds (Hottenrott and Peters, 2012, Schäfer Stephan and Mosquera 2017).



The pecking order theory claims that internal financial strength is of utmost importance for firms (Myers and Majluf 1984). Therefore, the financial strength of RES innovating firm is key for the break-through of RES technologies and for accelerating the development to a low carbon economy.

Investment into technologies to achieve a low carbon economy produce positive externalities in both innovation and diffusion stages. This causes market failure and underinvestment as the private returns from those investment are lower than the social returns (Rennings 2000, Kemp and Oltra 2011, De Marchi 2012). The discrepancy between private and social returns justifies policy intervention. Public procurement is considered to be a key policy instrument to incentivize private actors to broaden the application of existing RES technologies but also to develop innovative RES products and solutions. Hottenrott and Peters (2012) argue that the access to external finance depends on the creditworthiness of firms. Gaining a contract award in a publicly procured tender may contribute to strengthen the creditworthiness of RES innovators.

Cheng, Appolloni, D'Amato and Zhu (2018) see the main benefits of GPP in its ability to be a demand pull factor and “market trigger” meaning that GPP is able to enlarge the market for environmentally friendly goods and services. However, the authors also point out that there is no sufficient coverage in the academic literature on the impact of GPP. Zipperer (2019) provides evidence on the relationship between GPP and firms’ innovation activities. Her findings confirm the demand-pull effect of GPP for general product innovations but not specifically for environmental innovations. Czarnitzki, Hünermund and Moshgbar (2018) find a robust and significant effect of innovation-directed public procurement on turnover from new products and services. However, the effect seems to be restricted to innovations of a more incremental nature instead of market novelties. Cecere, Corrocher, Gossart and Ozman (2018) propose that access to public funds and fiscal incentives contribute to improve the firms’ ability to introduce eco-innovations as firms consider public funding to be complementary to other external finance. Public Procurement is no direct public funding but an instrument to allocate and distribute public funds in return for societal benefits. Accordingly, the question arises of whether winning in a GPP influences the succeeding firms’ financial strength and access to external funding. The existing literature revolving around PP in general and GPP provides no conclusive answer yet. We address this research gap in the following sections. For this purpose, we make use of a dataset that combines SMEs’ financial data and public procurement data.

3. Data and sample description

The Tender Electronically database (TED) and the AMADEUS firm database are the two sources on which we base our univariate assessment on. TED is the public procurement database of the European Union. The data is based on Contract Award Notices (CAN). The ultimate focus of the work in Working Package 3 is to shed new light on the question of how RES innovations and Green Public Procurement affect the SMEs' financial strength and constraints in the 10 EU countries under consideration. Therefore, all information obtained from the CAN needs to be broken down to the firm-level. For example, we calibrate the Contract Award (CA) value and the number of



awards per year for each firm. The observation period of firms with CAs ranges from 2015 to 2018.

Participating firms that failed to receive a CA would be the ideal candidates for the control group of CA firms. However, in the TED database no information on those firms is included. Thus, we need to apply an alternative strategy to establish a suitable control group. We make use of AMADEUS, a database of European SMEs that has been compiled by BvD. AMADEUS contains financial data from the companies' balance sheet and income statements. We select companies with yearly financial and employment data in the period 2010–2019, and we work with unconsolidated accounts. Amadeus reports financial data in domestic currencies. To obtain the Euro (EUR) values we apply the official ECB exchange rates. We retain only those AMADEUS SMEs that are in the same industries as the CA firms from the TED database. All financial variables are winsorized to control for outliers.

In the first step of building the sample of treated and control firms, we merge the CA firms from TED with financial and employment data from AMADEUS. The merging assigns key information to each CA firm for the years before the success, in the success year and after the success year. In the second step, we apply a matching technique to select and add the control firms. Those firms did not receive a CA but were in the year before the CA similar in key indicators to the succeeding firms and, therefore, qualify as suitable control firms.

The entire sample of treated CA firms and non-treated control firms consists of 12271 firm-years in total. 6319 firm-years belong to Contract Award (CA) firms from the TED dataset, and 5952 firm-years are observed in the group of control firms taken from the AMADEUS database. We make use of those firms as they resemble the CA firms in some predefined key indicators at time $t-1$ with t being the year in which the firm receives the CA. The resemblance one year before the CA year is crucial. It supports identifying the causal effect of the CA on the successful firms' financial strength. In total, between 2015 and 2018 we observe 1016 firms that have gained a CA in either one of the 10 countries. The number of firms varies significantly across the 10 countries under consideration, Belgium (BE), Denmark (DK), Germany (DE), Great Britain (GB), Italy (IT), Norway (NO), Portugal (PT), Slovakia (SK), Spain (ES) and Sweden (SE). For example, as Figure 1 below shows the final sample contains 225 CA firms from Great Britain but only 35 CA firms in Denmark.



FIRM-YEARS	FREQUENCY	PERCENT	CUMULATIVE PERCENT
noTED	5952	48.50	48.50
TED	6319	51.50	100.00
Total	12271	100.00	.

Table 1 - Number of observations for Contract Award (CA) firms and control firms

The industries linked to the firms in the sample cover a broad spectrum. Firms in the industries "Specialized construction activities", "Wholesale trade, except of motor vehicles and motorcycles" and "Electricity trading" show the highest frequency. The most relevant sector for the Renewable Energies Supply (RES) is the energy sector. Specifically, "Energy supply", "Electricity generation", "Electricity transmission", "Electricity trading" and "Heating and cooling supply" are of particular interest.

3.1. Green Public Procurement and green innovation

The Common Procurement Vocabulary (CPV) allows to identify tenders from the area of Green Public Procurement (GPP) with more accuracy than the industry codes. The Table below shows the CPVs of GPP tenders. We label the respective successful suppliers of goods, services and works as green companies. The sample contains 1237 observations for green companies. The green CA firms are most frequently active in the areas "Electricity, heating, solar and nuclear energy", "Electric vehicles", "Wood fuels" and "Heat pumps". The least number of firms-years are observed in the areas of "Solar collectors for heat production" and "Wind farms".¹

¹ Note that the identification of Green, Green possible and Brown tenders from the Common Procurement Vocabulary (CPV) is based on the TED raw data.



CPV: GREEN	FREQUENCY	PERCENT	CUMULATIVE PERCENT
Fuel wood	9	0.73	0.73
Wood waste	19	1.54	2.26
Wood fuels	107	8.65	10.91
Biodiesel	10	0.81	11.72
Electricity, heating, solar and nuclear energy	263	21.26	32.98
Solar energy	57	4.61	37.59
Solar panels	46	3.72	41.31
Solar collectors for heat production	5	0.40	41.71
Solar photovoltaic modules	48	3.88	45.59
Solar installation	42	3.40	48.99
Wind energy generators	36	2.91	51.90
Wind turbines	10	0.81	52.71
Wind farm	5	0.40	53.11
Semiconductors	10	0.81	53.92
Electric vehicles	255	20.61	74.54
Electric buses	35	2.83	77.36
Heat pumps	96	7.76	85.13
Hydro-electric plant construction work	77	6.22	91.35
Thermal power plant construction	30	2.43	93.78
Wind-power installation works	26	2.10	95.88



Roof-covering work	51	4.12	100.00
Total	1237	100.00	

Table 2 - Green CA firms (firm-years)

In addition, we identify tenders that may belong to the area of GPP but the contrary may also be true. We label those suppliers as green possible firms. The sample contains 4711 firm-year observations of green possible companies. Those firms are most frequently active in the areas "Petroleum products, fuel, electricity and other sources of energy", "Electricity", "Energy and related services" and "Electricity distribution and control apparatus". The lowest number of firm years is observed in the area of "Parts of electric motors, generators and transformers".

The missing ability to uniquely infer from the CPV codes of whether green possible tenders belong definitely to the GPP segment is non-satisfactory. Clearly labelling such tenders either as compatible with the EU Green Deal and, thus, GPP goods, services and works or as incompatible would avoid any ambiguity and support incentivizing green innovation. Many governments intend to increase their issuances of "green sovereign bonds". Of course, money in itself is not green, and so are the proceeds from those issuances not in itself green. Those bonds can only be advertised as green if the proceeds from the issuance are used to finance investments in green projects or purchases of green goods and services. Therefore, an easier identification of those tenders that qualify for public promotion and, thus, can be financed by issuing sovereign green bonds would most likely support the development of a strong and highly liquid market for sovereign green bonds (Wulandari, Schäfer, Stephan and Sun 2019). In addition, easy identification facilitates better auditing and supports preventing "greenwashing".

CPV: GREEN POSSIBLE	FREQUENCY	PERCENT	CUMULATIVE PERCENT
Petroleum products, fuel, electricity and other sources of energy	1069	22.69	22.69
Electricity	1687	35.81	58.50
District heating	278	5.90	64.40
Hydrogen	20	0.42	64.83
Electric motors, generators and transformers	113	2.40	67.23
Electric motors	39	0.83	68.05



Steam-turbine generator and related apparatus	11	0.23	68.29
Parts of electric motors, generators and transformers	20	0.42	68.71
Parts for electrical motors and generators	20	0.42	69.14
Electricity distribution and control apparatus	346	7.34	76.48
Electricity supplies	56	1.19	77.67
Hydraulic or pneumatic power engines and motors	19	0.40	78.07
Hydraulic power packs	10	0.21	78.28
Waste incinerators	59	1.25	79.54
Repair and maintenance services of electric motors	43	0.91	80.45
Other sources of energy supplies and distribution	33	0.70	81.15
Energy and related services	888	18.85	100.00
Total	4711	100.00	.

Table 3 - Green possible CA firms (firm-years)



Finally, for reasons of completeness, we identify the tenders that with certainty do not deserve the label green. We name the respective CA firms as brown firms. The brown firms are most frequently active in the areas "Refuse incineration services", "District-heating mains construction work" and "District-heating plant construction work".

3.2. Country Representation

Figure 1 displays the distribution of firm-years over countries. Our complete period of observation ranges from 2010 to 2018. In an ideal setting the number of observations (firm-years in total) would equal the number of firms times the observation periods' number of years.

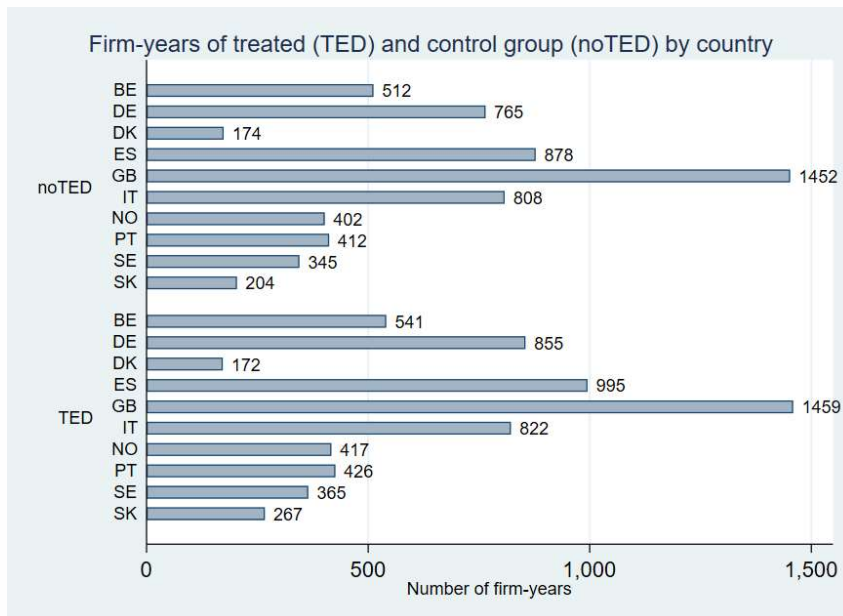


Figure 1 - Distribution of the number of firm-years over countries

However, the complete range of years is often not observed. Thus, the panel is unbalanced and the shares in firm-numbers and firm-years deviate from each other for the total of all 10 countries but also for single countries. Figure 2 displays the distribution of firms over countries. Great Britain, Germany, Spain and Italy are the countries with the most frequent CA firms (TED) and control firms (noTED) in the sample.



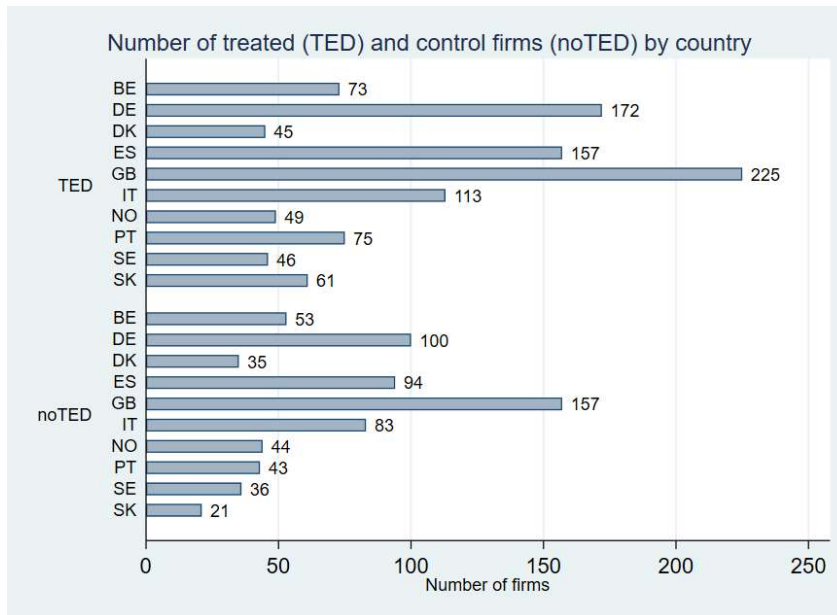


Figure 2 - Distribution of the number of firms over countries

Table 4 below reports the firm distribution over the selected countries in percentage points. More than two third of CA firms in the sample are located in those four countries.

COUNTRY	FREQUENCY	PERCENT	CUMULATIVE PERCENT
Belgium	73	7.19	7.19
Germany	172	16.93	24.11
Denmark	45	4.43	28.54
Spain	157	15.45	44.00
Great Britain	225	22.15	66.14
Italy	113	11.12	77.26
Norway	49	4.82	82.09
Portugal	75	7.38	89.47
Sweden	46	4.53	94.00



Slovakia	61	6.00	100.00
Total	1016	100.00	.

Table 4 - Distribution of TED (treated) firms over countries in percent

To put the countries' representation in the estimation sample into perspective we compare it with the real firm distribution over the 10 countries and with the TED raw data. The number of firms in the TED raw data is higher since all firms for which no control match in the AMADEUS data set exists are dropped to obtain the estimation sample. Eurostat delivers the data for the entire real population of firms in the 10 countries under consideration. The Table below reports the calibrated shares of each country in the estimation sample (Column (2)), the true number of firms in the 10 countries (see Column (3) and the TED raw data (Column (4)). Comparing the sample proportions in Column (2) and (3) reveals that the representation in the estimation sample deviates from the countries' real shares in the population of firms. Some countries are well represented but other have a rather low representation compared with the Eurostat data. Smaller countries are over- and larger countries are underrepresented. The only exception from this rule is Great Britain (GB). GB has a considerable larger firm share in the estimation sample than its real share suggests. When we compare the estimation sample's shares in Column (2) with the country share in the TED raw data in Column (4), we observe an even larger deviation from the real proportions than in the estimation sample. In particular, the larger countries' shares indicate a considerable underrepresentation of large countries among CA winners.

COUNTRY (1)	COUNTRY'S TED FIRMS' SAMPLE SHARE (2)	COUNTRY'S SHARE IN ALL FIRMS - EUROSTAT (3)	COUNTRY'S SHARE IN THE RAW TED DATA (4)
Belgium	7.19	4.19	4.37
Germany	16.93	18.89	10.31
Denmark	4.43	1.45	2.70
Spain	15.45	19.86	9.41
Great Britain	22.15	14.89	13.48
Italy	11.12	25.60	6.77
Norway	4.82	1.89	2.94
Portugal	7.38	5.53	4.49



Sweden	4.53	4.84	2.76
Slovakia	6.00	2.87	3.65

Table 5 - Representation: the country's share of firms in the sample and in reality

In 2014 the European Union implemented a Public Procurement policy reform. The reform aimed at enhancing SME participation. The key feature was that large contracts could be broken up into smaller lots. Those smaller lots should enable SMEs to submit a tender for a lot instead of the total contract value. The CA data in the estimation sample cover the post SME reform period. Accordingly, it ranges from 2015-2019. The CA firms are fairly even distributed over this period as the Table below shows. The highest frequency of CA incidences is observed in the year 2017 but the differences in the percentage points across years are rather small.

YEAR	FREQUENCY	PERCENT	CUMULATIVE PERCENT
2015	216	21.26	21.26
2016	241	23.72	44.98
2017	284	27.95	72.93
2018	275	27.07	100.00
Total	1016	100.00	.

Table 6 - Distribution of firms over years of observation

3.3. Employment and financial indicators

We make use of appropriate characteristics to describe the firms. The measures of financial strength that we calibrate and use in the later univariate analysis are based on those characteristics. Specifically, we use size, as measured by number of employees or by total assets, and selected balance sheet items such as shareholder funds, long-term debt, current liabilities in form of loans and trade credits (trade payables), operating revenue, total turnover (sales) and the export turnover. The Figure below reveals that, on average, firms with a CA (=TED firms) are larger, and have higher values in most balance sheet items. Only the sales from exports are on average lower for TED than for the control firms. CA winners may be more locally oriented suppliers than the control firms. However, because of the export variable's many missing values



in the sample, we cannot exclude the explanation that the lower average export value reported for TED firms is the result of a lower reporting propensity.

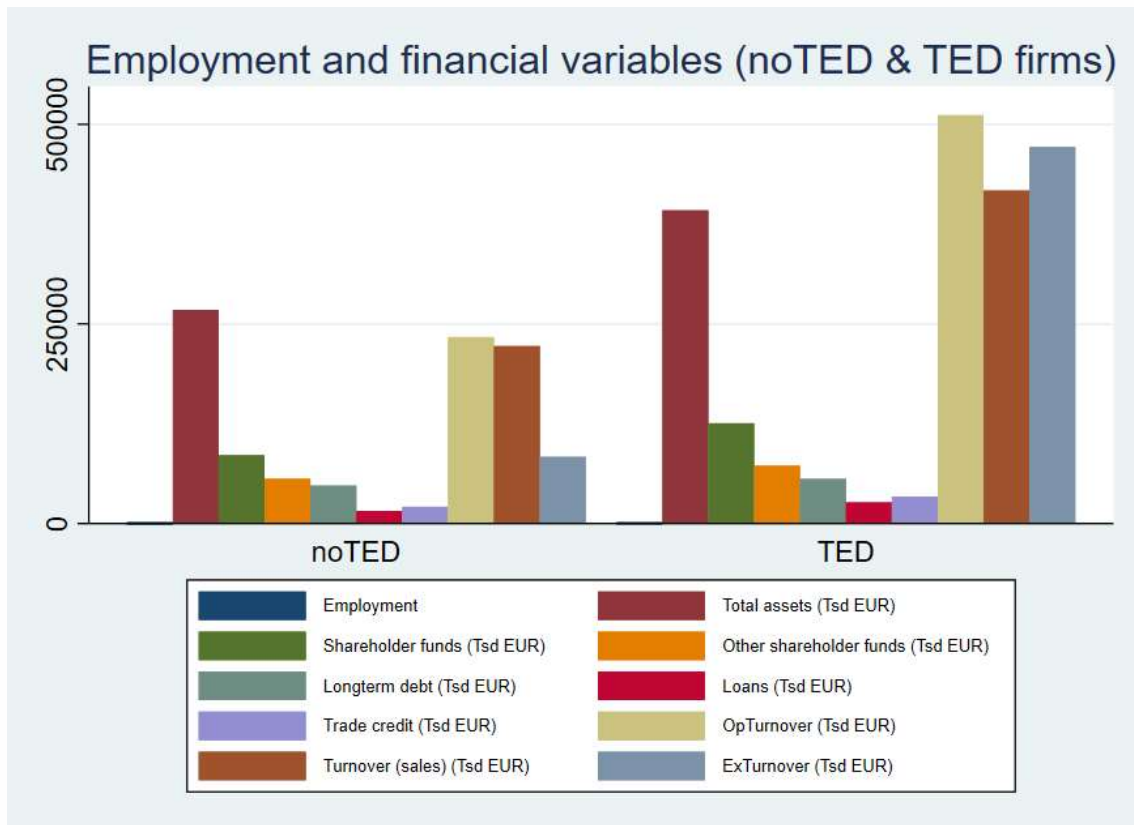


Figure 3 - Characteristics of Contract Award winners and control firms

3.4. Descriptive statistics

Our main interest is the comparison of the financial strength or weakness of firms with a CA on the one hand and firms with no CA on the other hand. The descriptive statistics of the treatment (TED) and control group (noTED) in the two Tables below give a grasp of how the two groups deviate from each other.

VAR. (TED)	OBS.	MEAN	Q1	MEDIAN	Q3	MIN	MAX	STD
EMPL	6307	392429	4167	27835	135187	54	9716824	1398120
TOAS	6307	125635	933	6573	37944	-9961	3498057	490869

SHFD	5624	508	19	76	292	1	8336	1336
OSFD	6309	72451	438	3904	25593	-31998	1927269	272523
LTDB	5501	55933	0	155	6403	0	2054352	261074
LOAN	6157	26392	0	191	3352	0	834628	118603
CRED	6203	33578	366	2346	13964	0	595705	99908
OPRE	5586	511435	8864	47321	204053	45	9869333	1591075
TURN	4539	416992	6938	43113	173619	0	8694618	1321794
EXPT	340	471721	322	3846	17482	0	10924793	2056630

Table 7 – Treatment group: Balance sheet values in tsd. EUR

VAR. (NOTED)	OBS.	MEAN	Q1	MEDIAN	Q3	MIN	MAX	STD
EMPL	5946	267508	3467	20002	93925	54	9716824	1015432
TOAS	5949	85534	800	5155	27571	-9961	3498057	358152
SHFD	5246	408	17	66	248	1	8336	1062
OSFD	5947	56188	372	3139	18945	-31998	1927269	216502
LTDB	5202	47517	0	120	3363	0	2054352	240019
LOAN	5808	15609	0	73	2300	0	834628	78083
CRED	5815	20976	173	1517	8558	0	595705	67357
OPRE	5104	233565	6020	29653	138812	45	9869333	780313
TURN	4088	222332	4006	23770	119345	0	8694618	773424
EXPT	416	83447	1339	7770	28915	0	2379450	258450

Table 8 - Control group: Balance sheet values in tsd. EUR



3.5. Importance of the Contract Awards (CA)

In this section we aim at assessing how important the CA value is for the firm. For this purpose, we construct two ratios using the CA values per year in the numerator. If a firm has more than one CA in one year we aggregate the amount of the CAs to one CA value per firm and year. The first ratio relates the CA value to the firm's size: aggregate CA value per year over (lagged) total assets. The second ratio relates the yearly aggregated CA value to the lagged loan amount. We hypothesize that the influence of the CA value on the firm's financial strength is growing with an increasing ratio.

The Figures below show the distributions of both ratios. The yearly CA value over (lagged) total assets displays a strong right skewness. The vast majority of firms obtains CAs values per year that are smaller than their own balance sheet amount. Ratios beyond the value of one do occur but rarely. The ratio of the CA value per year over (lagged) loans is also power distributed. The vast majority of the loan-related ratios are located in the range below the value two. Again, very large ratios exist but are rare.

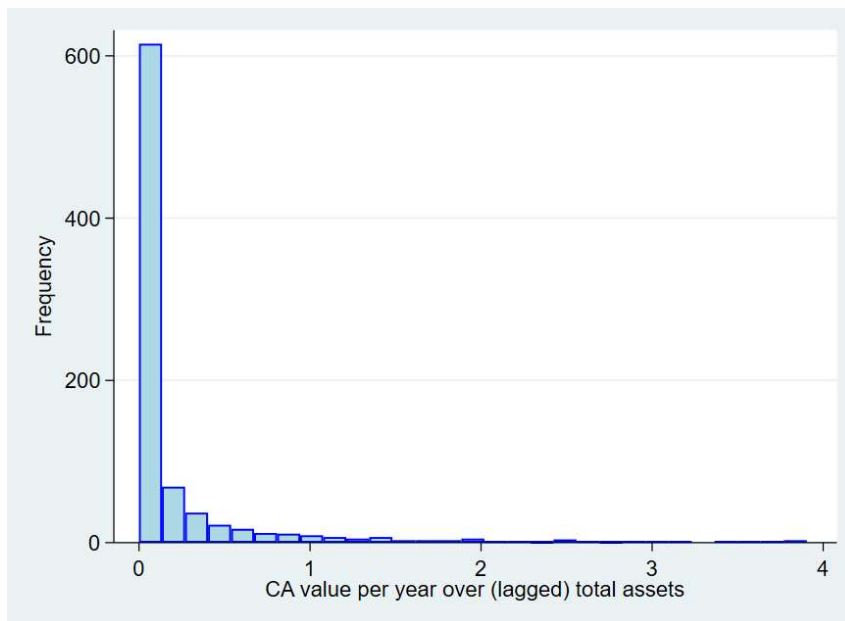


Figure 4 - Contract award value over firm size



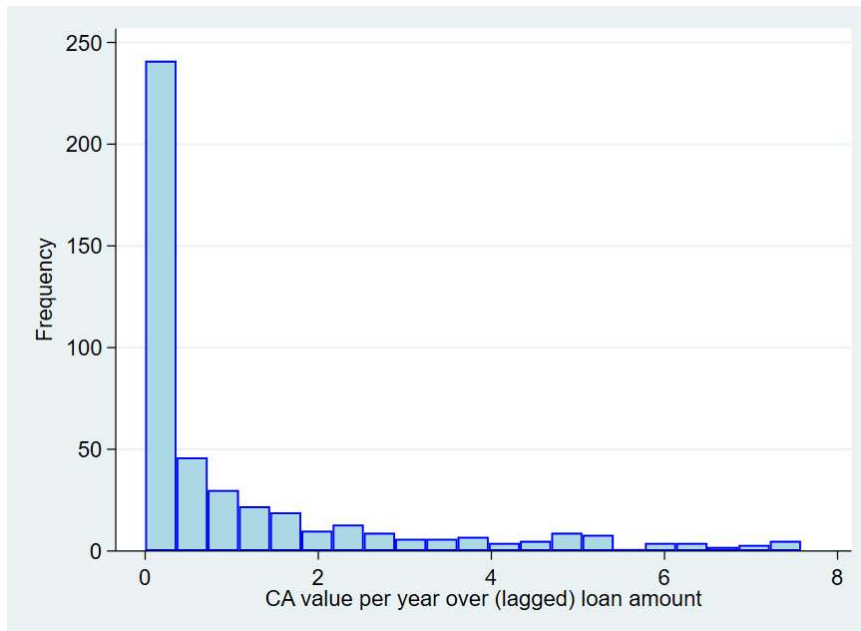


Figure 5 - Contract award value over loan amount

Another important indicator for the assessment of the firm's financial strength is the capability of succeeding in a tender. The number of awards per firm during the complete CA observation period captures the firm's performance in tendering. The following histograms reveals that most firms have achieved less than 20 CA during the observation period. However, some firms have been very successful in collecting CA. The pattern of the number of successes per firm over the CA observation period seems to be rather similar across countries. However, the frequency of CA successes differs considerably across countries.



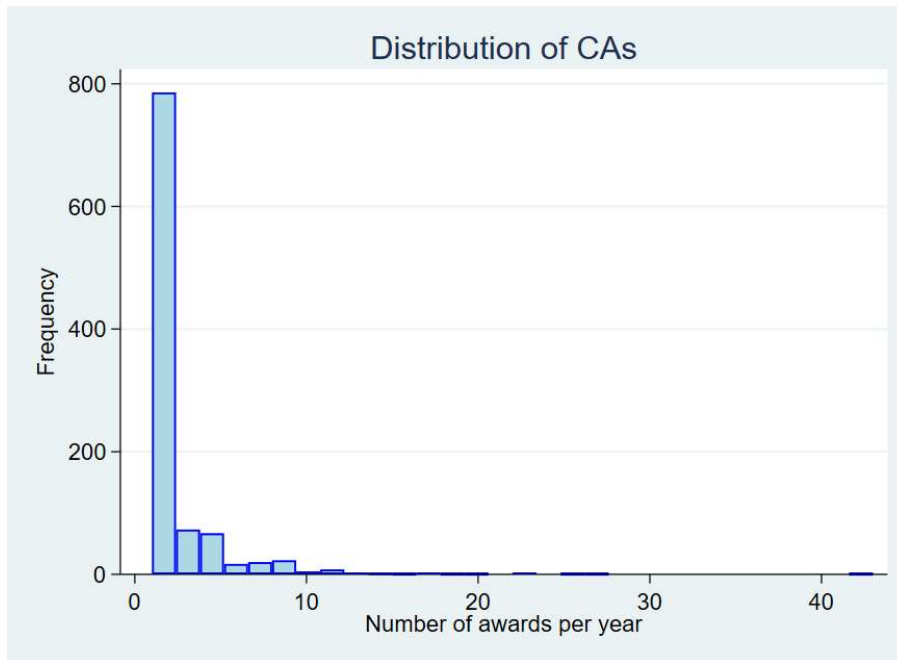


Figure 6 - Contract awards per year

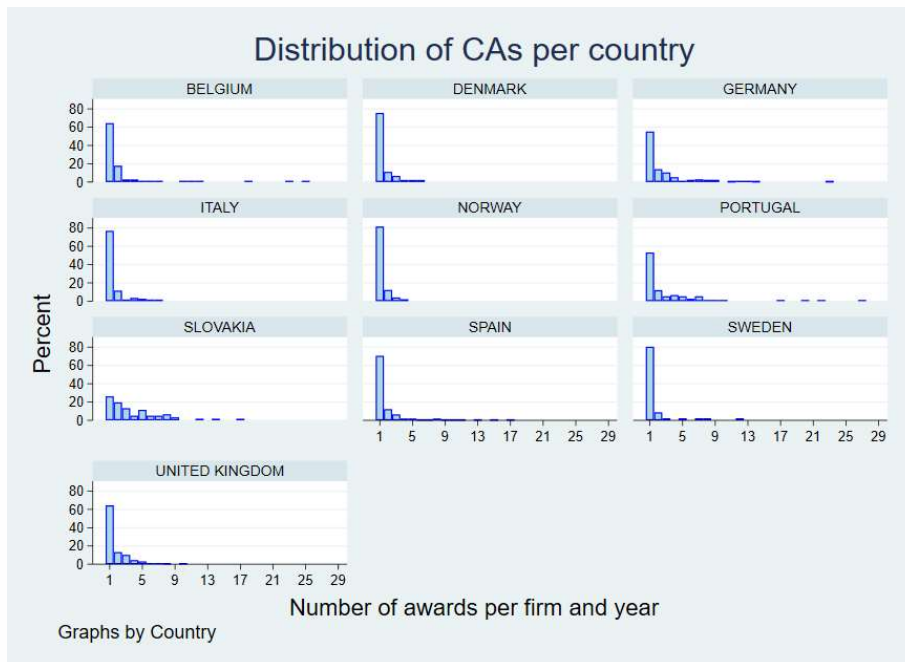


Figure 7 - Contract awards per year per country



3.6. Company Size and greenness

The Public Procurement policy reform of 2014 to encourage participation of SMEs emphasizes the high importance of SMEs for the EU economy. SMEs are also at the center of interest in our analysis of GPP. The estimation sample contains both large firms and SMEs as the following diagrams illustrate. The size distribution in terms of employment in the sample shows the usual shape following a power law. The overwhelming majority of firms is rather small. The frequency decreases with growing rate when we move on the x-axis to larger workforces. A similar pattern appears when the firm size is measured in total assets.

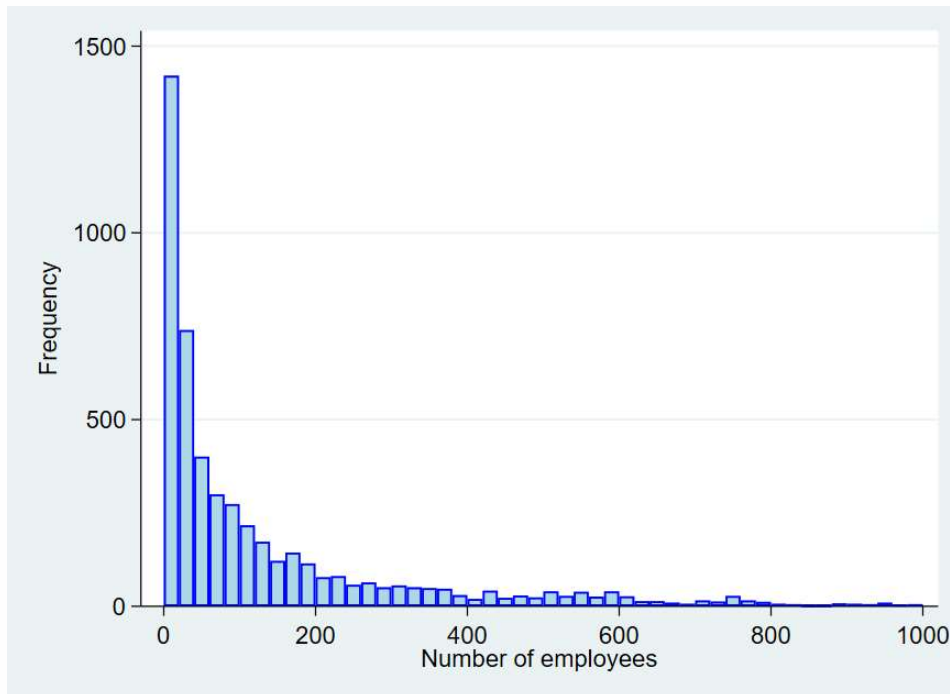


Figure 8 - Distribution of firm sizes (employees)



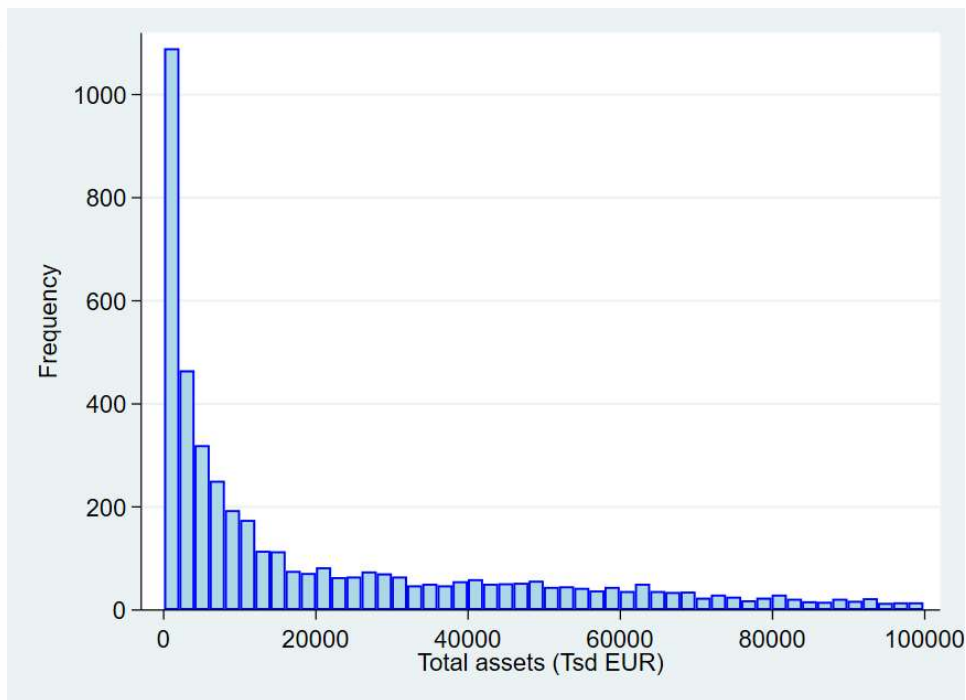


Figure 9 - Distribution over firm sizes (total assets)

The Table below shows the growth rate of SME participation obtained from the sample. It suggests a considerable success of the PP reform in favor of SMEs. The participation of SMEs increased substantially over the years after the reform. The growth rate achieved 34 percent between 2016 and 2017. However, this positive trend was broken in 2018 when the number of participating SMEs decreased for the first time since the reform. The growth rate for 2019 is not available because of a lack of data. Accordingly, it remains to be seen how the participation of SMEs in the TED develops in the upcoming years.

CA-SMES/- GROWTH IN %	SME (EMPL)	GROWTH (EMPL) IN %	SME SMES (TOAS)	GROWTH (TOAS) IN %
2015	145	.	86	.
2016	161	11	114	33
2017	215	34	148	30
2018	184	-14	139	-6

Table 9 - Growth of SME participation on TED

3.6.1. Contract award winners' size classes

To obtain the size class of a particular firm we use both employment (EMPL) and total assets (TOAS). The firm is micro if EMPL<10 employees, small if EMPL<50 employees, medium-sized if EMPL<250 employees and large if EMPL higher or equal 250 employees. Micro firms have total assets of two million euro (MEUR) or less, small firms are between 2 and 10 MEUR, medium-sized have total assets between 10 and 43 MEUR and larger firms' total assets are above 43 MEUR.

The graph below illustrates the distribution of employee-related size classes over countries. Very small, small enterprises and medium-sized companies (SMEs) are the most frequent in almost all countries. Very small and small enterprises clearly dominate in Belgium, Italy, Portugal and Sweden.

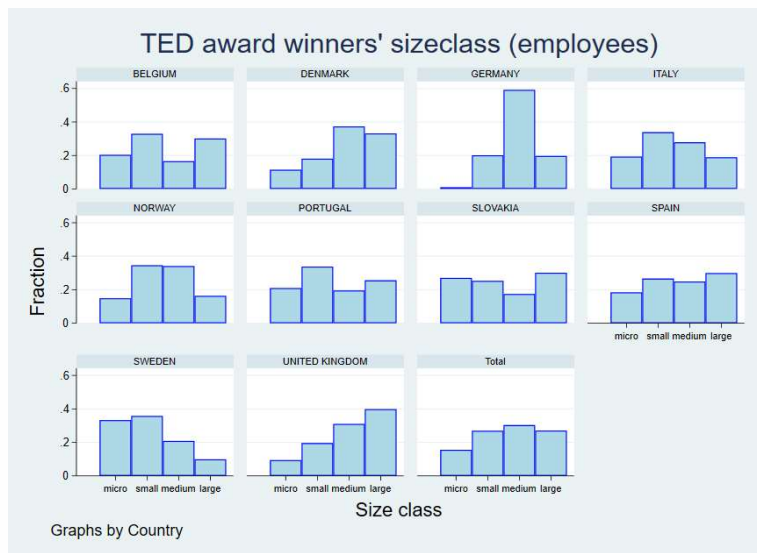


Figure 10 - Contract award winners' size classes (employees)

The distribution of size classes in the countries changes if total assets are the size measure. In particular, large firms are observed more frequently relative to the other sizes. Very small and small enterprises clearly dominate in Belgium, Italy, Norway, Portugal, Slovakia and Sweden.



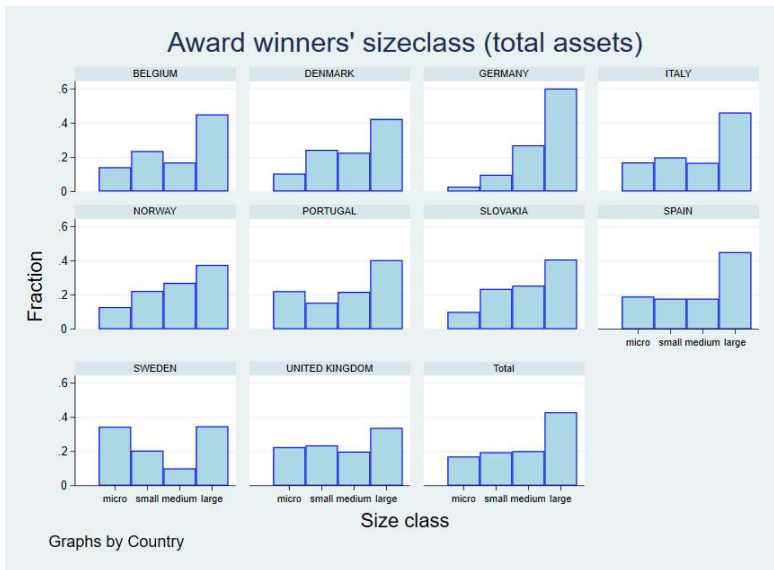


Figure 11 - Contract award winners size class (total assets)

3.6.2. Contract award winners' greenness

The distribution of CA winners' over the different categories of “Greenness” differs between countries. The most frequent category in almost all countries is “Green possible”. In many countries “Green” is more prominent among CA winners but tenders with the label “Brown” still play a considerable role in the PP.



Figure 12 - Contract award winners' distribution over the different categories of Greenness



The two Figures below combine the degree of "Greenness" and firm size measured in terms of employees. Slovakia's green firms are entirely micro SMEs. In contrast, in the other 9 countries all size classes are represented.



Figure 13 - Green contract award winners' distribution over the size classes

The sizes of CA winners in the category of "Green possible" tenders are distributed over all four classes in all countries. Overall, the distribution across size classes is less uniform than in the category "Green".





Figure 14 - Green possible contract award winners' distribution over the size classes

4. Univariate Analysis

The following sections pursue the univariate analysis of CA firms vis-a-vis control firms. We structure the exploration of financial strength along a few guiding questions. In a first step, we construct key financial ratios that are appropriate to indicate financial strength. We consider two types of ratios, (1) balance sheet ratios such as the equity ratio, the long-term debt ratio, the short-term debt ratio, the loan ratio, the trade credit ratio and the turnover ratio which indicate financial strength as a percentage of total assets, and (2) ratios that are based on the same balance sheet items but the denominator is the size of the firm's workforce. The treatment group has succeeded in gaining a contract award (CA) at least once in the considered period. Commonly, the financial strength of large firms differs systematically from the strength of small firms. Therefore, we split the overall sample into subsamples of SMEs and large firms and examine those subsamples separately. We follow the EU classification and define SMEs as firms with a workforce smaller or equal 250 employees while the firms with a workforce beyond 250 employees are classified as large companies (noSME).

4.1. Is succeeding in a tender associated with a higher financial strength?

We start with the first guiding question of whether succeeding in a tender is associated with a higher financial strength. The following graphs compare the means of the asset- and employee-

based ratios indicating financial strength or weakness separately for SMEs and large firms. This approach allows us to obtain not only a first idea of how success in a tender is linked to the firm's financial strength, but also of how this link is influenced by firm size. The dark blue color represents the CA firms (=TED firms) while light blue stands for the control group (noTED companies).



Figure 15 - Asset-related indicators of financial strength

The graphical exercise reveals that the CA firms have on average a lower equity ratio, a higher short-term debt ratio, a higher trade credit ratio and a higher turnover ratio. For the remaining asset-based ratios the graph suggests a dependence of the link on firm size. The second graphical exercise illustrates that CA winners (TED) achieve on average a higher productivity (turnover (MEUR)/employee) and a higher long-term debt per employee than the control firms. The remaining workforce-related financial strength indicators are differently linked to succeeding in a tender for SMEs and large firms.

The univariate linear regressions below provide further clarification on the direction and significance of the link between having received a CA (TED) and the key balance sheet and employee-related indicators. In addition to the regression results for the subsamples of SMEs and large firms, we report the coefficients for the complete sample (All).



Figure 16 - Workforce-related indicators of financial strength

We fit a univariate linear regression of the key balance sheet ratios and financial strength ratios based on the number of employees on a dummy variable taking on the value of one for all firm-years if the firm is a Contract Award Winner (TED) and zero otherwise. In addition, we regress selected financial strength variables on a dummy variable representing the value of the CA. Specifically, we construct a variable that takes on the value of 1 if the CA value is higher than the median CA value, and another dummy variable taking on the value one if the CA value of the firm in that particular year is higher than the amount defining the 25th percentile of the distribution



of the CA values for that particular year. These additional regressions provide first insights as to whether the size of the contract influences the firms' financial strength.

The first three regression results below indicate how the firm's equity ratio is associated with the success in the tender, and also what role the value of the CA plays in this relationship. The fourth Table below reports how the firm's equity per employee is associated with the CA success in comparison to the control firms. SME CA winners show significantly lower equity ratios than the control group. This result is confirmed when the equity ratio is regressed on the dummy variable indicating different sizes of the CA. If the contract size is large enough, even non-SMEs obtain a negative coefficient. This result may propose that the CA award works like a substitute for the equity ratio. However, it remains to be seen whether the significantly negative coefficient is robust to including more control variables into the estimation model.

The employee-based equity ratio is significantly positively associated with winning a CA if the firm is large but not in case of SMEs. For SMEs the negative relationship is robust even to changes in how the equity ratio is calculated. This is another hint that the CA could serve as a substitute for equity, for example in negotiations with lenders such as banks. Obviously, in all regressions, the difference between treatment and control group in the SME group drives the negative significance of the CA success in the overall sample.

EQUITY RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	-0.04***	-0.01	-0.03***
CONSTANT	0.37***	0.34***	0.36***
N	8035	4216	12251

EQUITY RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	-0.062***	-0.050**	-0.058***
CONSTANT	0.352***	0.335***	0.346***
N	8035	4216	12251



EQUITY RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE 25TH PERCENTILE	-0.035**	-0.017	-0.028***
CONSTANT	0.353***	0.334***	0.346***
N	8035	4216	12251

EQUITY (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	-0.78*	0.23***	-0.54*
CONSTANT	1.78***	0.25***	1.40***
N	8022	2822	10844

The stars indicate the following significance levels in all univariate regression tables below: * p<0.05; ** p<0.01; *** p<0.001

Table 10 - Univariate regression: Equity ratio and contract award

No significant difference in the long-term debt ratio of SMEs exists between CA winners and control group. However, when the CA amount is higher than the median value, the CA SMEs show a significantly lower long-term debt than the control group of SMEs.

LONG-TERM DEBT RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.00	-0.02***	-0.01*
CONSTANT	0.11***	0.12***	0.11***
N	6915	3771	10686



LONG-TERM DEBT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	-0.028*	-0.017	-0.023*
CONSTANT	0.111***	0.109***	0.111***
N	6915	3771	10686

LONG-TERM DEBT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE 25TH PERCENTILE	-0.008	-0.009	-0.008
CONSTANT	0.111***	0.109***	0.110***
N	6915	3771	10686

LONG-TERM DEBT (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.20**	0.38**	0.25***
CONSTANT	0.27***	0.16	0.24***
N	6924	2689	9613

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 11 - Univariate regression: long-term debt ratio and contract award

Large CA firms possess a significantly lower long-term debt ratio than their counterparts. The size of the CA does not play a significant role in this association. CA firms, be they small or large, show overall a higher long-term debt per employee than the control group.

CA winners show a significantly higher short-term debt ratio vis-a-vis the control firms in both size categories and in the total sample. A firm that has received a large contract shows a significantly higher short-term debt ratio than the control group with a lower contract award or



no CA at all. However, this uniform result for the ratio is not robust to switching to the employee-based ratio. Only large CA firm show a positive link in the short-term debt per employee vis-a-vis the control group.

SHORT-TERM DEBT RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.02***	0.04***	0.03***
CONSTANT	0.24***	0.18***	0.22***
N	7835	4070	11905

SHORT-TERM DEBT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	0.083***	0.061***	0.071***
CONSTANT	0.249***	0.201***	0.233***
N	7835	4070	11905

SHORT-TERM DEBT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE 25TH PERCENTILE	0.039***	0.045***	0.043***
CONSTANT	0.249***	0.201***	0.232***
N	7835	4070	11905

SHORT-TERM DEBT (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.02	0.11***	0.03
CONSTANT	0.64***	0.11***	0.51***

N	7837	2776	10613
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The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 12 - Univariate regression: short-term debt ratio and contract award

Disentangling the joint effect embedded in the short-term debt ratio into a loan and a separate trade credit effect provides a clearer picture about the drivers of the joint effect. Only large CA winners show significant and positive coefficients in both types of ratios when winning a CA as such is the regressor. The picture changes if the size of the CA is considered. A firm that has achieved a CA of a size above the value that defines the 25th percentile possesses a significantly higher loan ratio than firms which do not fall in the two considered high award categories. These results support again the notion that lenders may recognize a contract award as a positive signal. However, in case of SMEs, the benefit of a positive signal seems to emerge only when the size of the award is substantial.

LOAN RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.00	0.02***	0.00
CONSTANT	0.08***	0.07***	0.08***
N	7877	4071	11948

LOAN RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	0.040***	0.058***	0.047***
CONSTANT	0.079***	0.075***	0.078***
N	7877	4071	11948

LOAN RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
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CA VALUE ABOVE 25TH PERCENTILE	0.014*	0.037***	0.021***
CONSTANT	0.079***	0.075***	0.078***
N	7877	4071	11948

LOANS (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.00	0.06***	0.01
CONSTANT	0.27***	0.05***	0.21***
N	7879	2776	10655

The stars indicate the following significance levels in all univariate regression tables below: * p<0.05; ** p<0.01; *** p<0.001

Table 13 - Univariate regression: Loan ratio and contract award

The coefficient on the trade credit ratio suggests that CA winners have more trade credits in their balance sheets than the control group. This link is highly significant and appears in both size categories. When the size of the CA is accounted for, we obtain this result only for SMEs while the significance for large firms disappears. Again, achieving a large CA may turn out beneficial especially for SMEs in the sense that suppliers accept granting higher trade credits. Large firms with high CA sizes do not have a significantly higher trade credits/total assets ratio than firms with a low CA size or firms that are members of the control group and therefore have no CA. When the trade credit/employees ratio is explored, it turns out that the effect of being successful in a tender disappears for SMEs.

TRADE CREDIT RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.03***	0.02***	0.02***
CONSTANT	0.16***	0.12***	0.14***



N	7881	4120	12001
TRADE CREDIT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	0.049***	0.007	0.029***
CONSTANT	0.170***	0.127***	0.155***
N	7881	4120	12001
TRADE CREDIT RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE 25TH PERCENTILE	0.028***	0.010	0.024***
CONSTANT	0.170***	0.126***	0.155***
N	7881	4120	12001
TRADE CREDIT (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	-0.01	0.05***	0.00
CONSTANT	0.40***	0.06***	0.31***
N	7883	2817	10700

The stars indicate the following significance levels in all univariate regression tables below: * p<0.05; ** p<0.01; *** p<0.001

Table 14 - Univariate regression: Trade credit ratio and contract award

The relationship between the turnover ratio and procurement success is straightforward. Winning a CA is associated with a higher turnover ratio for both SMEs and large firms no matter whether the turnover over total assets or the turnover per employee is considered. Firms that



are winners of a CA perform significantly better in terms of productivity than the control firms, independently of size.

TURNOVER RATIO REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	0.64*	0.35***	0.55**
CONSTANT	1.50***	1.30***	1.44***
N	6026	2591	8617

TURNOVER RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE MEDIAN	0.588	0.876***	0.668
CONSTANT	1.811***	1.446***	1.703***
N	6026	2591	8617

TURNOVER RATIO REGRESSED ON HIGH CA AMOUNT	SME	noSME	ALL
CA VALUE ABOVE 25TH PERCENTILE	0.247	0.611***	0.357
CONSTANT	1.811***	1.440***	1.699***
N	6026	2591	8617

TURNOVER (MEUR)/EMPLOYEES REGRESSED ON CA WINNER	SME	noSME	ALL
CONTRACT AWARD WINNER (TED)	1.14*	1.10***	1.08**
CONSTANT	3.16***	0.67***	2.59***
N	6030	1902	7932



The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 15 - Univariate regression: Turnover ratio and contract award

4.2. Is succeeding in a Green tender associated with a higher financial strength?

The second guiding question focusses on whether succeeding in a green tender is associated with a higher financial strength. For this purpose, we fit a univariate linear regression of the key balance sheet and employee-related ratios on the categorical variable "priority". The priority variable indicates the "greenness" of the tender. It takes on the value of one if the firm succeeded in a "Green" tender (CA of priority one), the value of 2 if the firm won a "Green possible" CA (CA of priority two) and the value of 3 if the firm won a "Brown" CA (CA of priority three). The value of zero is reserved for the control firms and is also the base category.

Note that all firm-years of a CA winner are assigned the priority category's value of the firm's first CA. In other words, all observations of a firm with two or more CAs of which at least one is in the "Green" category is allocated to this category. This setting implies that the firm-years of different types of CA winners are compared with all firm-years of the control group of noTED firms.

The Table below indicates how the firms' equity ratio is associated with the different types of CA success in comparison to the base category of zero which represents the control firms. The regression's outcome proposes that successful SMEs in all categories tend to have a lower equity ratio than the comparable noTED SMEs. In case of large firms, the negative link between the equity ratio and the CA success exists only for CAs in the "Green" category. Obviously, the difference between treatment and control group in the SME group drives the negative significance of the CA success in the overall sample. However, the uniformly negative link between equity ratio and success in the tender disappears for the employee-based ratio. Large firms with CAs in the "Green possible" category show even a positive and significant coefficient.



EQUITY RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	-0.09***	-0.03*	-0.07***
GREEN POSSIBLE	-0.02**	-0.01	-0.01**
BROWN	-0.11***	-0.03	-0.09***
CONSTANT	0.37***	0.34***	0.36***
N	8035	4216	12251

EQUITY/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	-0.09***	-0.03*	-0.07***
GREEN POSSIBLE	-0.02**	-0.01	-0.01**
BROWN	-0.11***	-0.03	-0.09***
Constant	1.78***	0.25***	1.40***
N	8022	2822	10844

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 16 - Univariate regression: Equity ratio and greenness



Whether the CA is "Green", "Green possible" or "Brown" has no significant impact on the long-term debt ratio relative to the control group if the firm is an SME. Large CA winners in the "Green possible" category appear to have a significantly lower long-term debt ratio than the control group. The results are different for the employee-based long-term debt ratios. SME in the "Green" and large CA winners in the "Green possible" category obtain a significantly positive coefficient implying a higher long-term debt/employees ratio for those firm types vis-a-vis the control group.

LONG-TERM DEBT RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.00	-0.01	0.00
GREEN POSSIBLE	0.00	-0.03***	-0.01**
BROWN	0.01	-0.01	0.01
CONSTANT	0.11***	0.12***	0.11***
N	6915	3771	10686

LONG-TERM DEBT/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.47***	-0.06	0.32**
GREEN POSSIBLE	0.15	0.54***	0.26***



BROWN	-0.01	-0.14	-0.02
Constant	0.27***	0.16	0.24***
N	6924	2689	9613

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 17 - Univariate regression: Long-term debt ratio and greenness

The CA winners in the "Green" and "Green possible" show overall a significantly higher short-term debt ratio than the control group while no significant difference relative to the control group appears for the "Brown" category. The significance disappears vastly for the employee-related short-term debt ratio.

SHORT-TERM DEBT RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.04***	0.06***	0.04***
GREEN POSSIBLE	0.02***	0.04***	0.03***
BROWN	0.01	0.02	0.02
CONSTANT	0.24***	0.18***	0.22***
N	7835	4070	11905

SHORT-TERM DEBT/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			

noTED	(BASE)	(BASE)	(BASE)
GREEN	0.20	0.01	0.14
GREEN POSSIBLE	0.03	0.15***	0.05
BROWN	-0.49	-0.06	-0.37
Constant	0.64***	0.11***	0.51***
N	7837	2776	10613

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 18 - Univariate regression: short-term debt ratio and greenness

The loan ratio of "Green" CA winners is statistically non-different from the control group's ratio in all size classes. In contrast, "Green possible" large firms show a significantly higher loan ratio than the control group. Interestingly, SMEs in the "Brown" category possess a significantly lower loan ratio than the control SMEs. This latter result drives the negative coefficient for the overall sample. In case of the employee-related ratios, a significantly positive coefficient appears for the "Green" SME firm and the "Green possible" large firms compared to the control firms.

LOAN RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.01	0.00	0.00
GREEN POSSIBLE	0.00	0.02***	0.01**
BROWN	-0.03***	-0.02	-0.03***
CONSTANT	0.08***	0.07***	0.08***
N	7877	4071	11948



LOAN/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.25*	-0.02	0.17*
GREEN POSSIBLE	-0.04	0.09***	-0.01
BROWN	-0.22	-0.04	-0.17
Constant	0.27***	0.05***	0.21***
N	7879	2776	10655

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 19 - Univariate regression: Loan ratio and greenness

The coefficient on the trade credit ratio suggests that CA winners of all priority categories have more trade credit in their balance sheets than the control group. This link is highly significant in all size categories. Interestingly, most significances disappear when the employee-related coefficients are considered.

TRADE CREDIT RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.03***	0.06***	0.04***
GREEN POSSIBLE	0.02***	0.01*	0.02***



BROWN	0.04***	0.05**	0.04***
CONSTANT	0.16***	0.12***	0.14***
N	7881	4120	12001

TRADE CREDIT/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	-0.07	0.03*	-0.05
GREEN POSSIBLE	0.04	0.06***	0.04
BROWN	-0.29	-0.02	-0.22
Constant	0.40***	0.06***	0.31***
N	7883	2817	10700

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 20 - Univariate regression: Trade credit ratio and greenness

Winning a CA affects significantly positive only the turnover ratio of the large "Green" firms. In the "Green possible" category the turnover ratio of both firm types benefits from winning a CA. Interestingly, a significant effect of the CA on the turnover ratio of "Brown firms" is only observable if the firm is large. Winning in a "Brown" tender is associated with a smaller employee-related turnover ratio vis-a-vis the control group in the group of SMEs and the complete sample.



TURNOVER RATIO REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	ALL
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	0.16	0.38***	0.22
GREEN POSSIBLE	0.90**	0.33***	0.71**
BROWN	-0.08	0.40*	0.05
CONSTANT	1.50***	1.30***	1.44***
N	6026	2591	8617

TURNOVER/EMPLOYEES REGRESSED ON THE GREENNESS OF THE FIRM'S CA	SME	noSME	All
PRIORITY, FIRST CA			
noTED	(BASE)	(BASE)	(BASE)
GREEN	-0.59	0.50*	-0.36
GREEN POSSIBLE	2.23***	1.43***	1.95***
BROWN	-2.63*	-0.42	-2.12*
Constant	3.16***	0.67***	2.59***
N	6030	1902	7932

The stars indicate the following significance levels in all univariate regression tables below: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 21 - Univariate regression: Turnover and greenness



4.3. Is winning in a tender associated with a higher growth rate in financial strength indicators?

This section focuses on the question of whether winning in a tender is associated with a higher growth rate of the financial strength indicator. We calibrate average growth rates for both firm types SMEs and large firms. The analysis is restricted to graphs because of a rather short period in which we can observe the growth. The intention is to achieve a first assessment about the effect of winning a CA on the development of the financial strength indicators in the coming years. The graphs illustrate the average growth rate in the time span after the treatment for both the treated firms (TED) and the control firms (noTED). The growth of the ratios is winsorized at the 5 percent level to account for outliers.

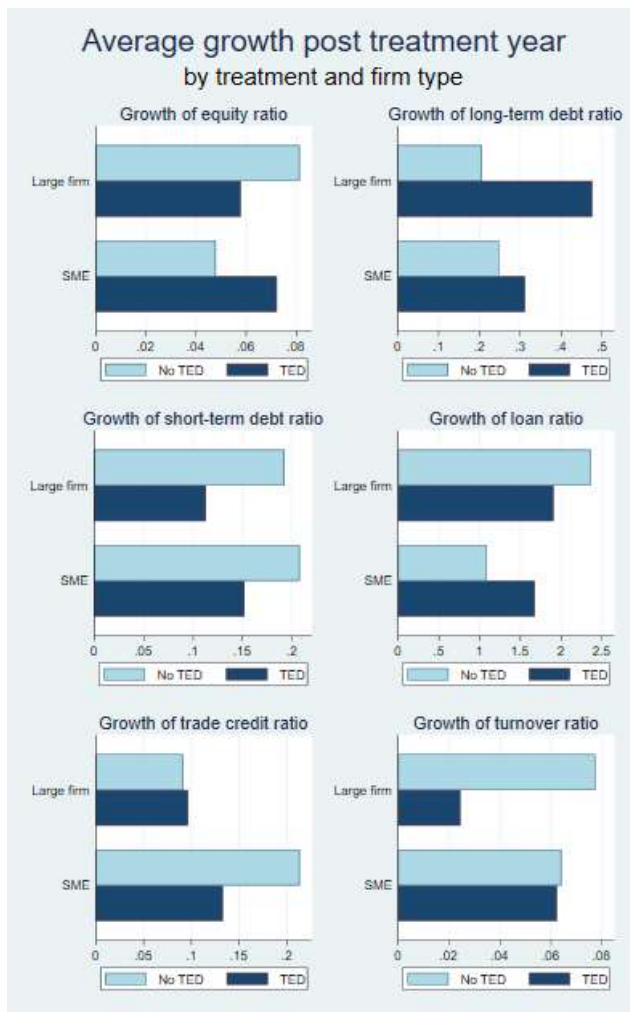


Figure 17 - Growth after winning a contract award



By and large, the graphs propose that SMEs benefit more from winning a CA than large firms. The growth of the equity ratio is in treated SMEs higher than the respective growth in the control SMEs. In contrast, large, treated firms experience a lower growth of the equity ratio than the control group. The growth of the long-term debt ratio is for both firm types higher when they are treated than when they are non-treated. The growth of the loan ratio is higher for the treated SMEs than for the SMEs of the control group. Again, this result proposes that the treated SME borrowers may have some advantage over the non-treated control group in loan negotiations.

5. Conclusion

The goal of D 3.5 is the “Initial assessment of the RES innovations and GPPs on SMEs financial constraints”. Accordingly, the study tackles the question of whether the financial strength of CA winning companies and of CA winning SMEs is associated with the demand for RES from local governments and municipalities.

The base for the analysis is a combined dataset of the Tender Electronically database (TED) 2015-2019 and the AMADEUS firm database covering the 10 European countries of interest. The dataset consists of TED (treated) firms and matched control firms which did not receive a CA but are similar to the treated firms. According to the The Common Procurement Vocabulary (CPV) the majority of observed contracts are either in the **Green** segment or in the **Green possible** segment.

The univariate analysis is applied separately to SMEs and large firms. It revolves around three guiding questions,

- Is succeeding in a tender associated with a higher financial strength?
- Is succeeding in a **Green** tender associated with a higher financial strength?
- Is winning in a tender associated with a higher growth rate in financial strength indicators?

Our main finding is that SME CA winners, including those which have succeeded in a Green tender, show a significantly lower equity ratio than the respective control firms. This results is fairly robust across different specifications. If the awarded contract size is large enough, even large CA firms obtain a negative sign. These results propose that the CA award works like a substitute for a high equity ratio. In addition, we found a significantly higher short-term debt ratio for CA firms, in particular for firms in the **Green** and in the **Green possible** segment, supporting again the notion that lenders may recognize a TED contract award as a positive signal. Accordingly, borrowers with a CA may have some advantage over the non-treated control group in loan negotiations, and also when they negotiate over trade credits with their suppliers. For SMEs, this proposition is to some extent also supported by the observation that the average growth of the equity ratio is in treated SMEs higher than the respective average growth in the control SMEs.



Firms, that are winners of a CA perform significantly better in terms of productivity than the control firms, independently of firm size. The positive effect of a **Green** CA on the turnover ratio is limited to the large firms. In contrast, a CA in the **Green possible** segment affects both SMEs' and large firms' turnover ratios positively.

In sum, the univariate analysis provides some indication that a CA may be a substitute for a high equity ratio and, thus, may work in favor of a better access to debt financing. This effect of easing the winners debt constraints may even be more pronounced if the CA belongs to the **Green** and **Green possible** segment. In addition, we obtain some indication that a CA pulls the turnover ratio.

The univariate analysis supports an indicative yet incomplete understanding of whether winning a TED-CA enables firms to overcome financial constraints. Thus, at this stage, we can report first evidence that a TED-CA may be associated with improving the winners' financial access. However, for gaining a causal and robust evidence multivariate analyses are required. The complementary Deliverable 3.3 presents such multivariate estimations and, thus, allows to conduct a causal assessment of a possible pull effect arising from public procurement.

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