Stjepan Srhoj, Bruno Škrinjarić, Sonja Radas and Janette Walde

Closing the Finance Gap by Nudging: Impact Assessment of Public Grants for Women Entrepreneurs

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Closing the Finance Gap by Nudging: Impact Assessment of Public Grants for Women Entrepreneurs

Abstract:
Several recent papers draw attention to a lack of rigorous research on public policies supporting women entrepreneurs' competitiveness. This paper evaluates the effect of small business development gender-specific matching grants using a quasi-experimental approach. The grants have a positive effect on firm survival, as well as positive effects on obtaining bank loans, turnover, value added, employment, and total factor productivity. Heterogeneous treatment effects show that the grants increase the chance of young women entrepreneurs' firm survival and are even more effective for firms owned by mature women. Cost-benefit analysis estimates an increase in value added, which outweighs scheme-induced costs by 80% in the short-run and 170% in the long run.

Keywords: women entrepreneurship, public grants, policy evaluation, gender financing gap, behavioral additionality, nudging
JEL classification: B54, J16, H81, L26, L38, H43

Smanjenje razlike u financiranju kroz poticaj: Evaluacija učinaka bespovratnih sredstava za žene poduzetnice

Sažetak:
Nekoliko recentnih istraživanja skreće pozornost na nedostatak analiza utjecaja javnih politika koje potiču konkurentnost poduzeća u vlasništvu žena. Ovo istraživanje procjenjuje učinak javnog financiranja u obliku manjih bespovratnih potpora namijenjenih isključivo ženama poduzetnicama. Rezultati ukazuju na pozitivan utjecaj bespovratnih potpora na preživljavanje poduzeća, kao i pozitivne učinke na dobivanje bankovnih kredita te povećanje poslovnih prihoda, dodane vrijednosti, zaposlenosti i ukupne faktorske produktivnosti. Heterogeni učinci ukazuju na veću vjerojatnost preživljavanja poduzeća u vlasništvu mlađih žena, dok učinci na poduzeća u vlasništvu starijih žena poduzetnica ukazuju na ekonomski značajnije pozitivne efekte. Analiza troškova i koristi u kratkom roku procjenjuje 80% više stvorene dodane vrijednosti od troškova uzrokovanih potporom, dok se u dugom roku procjenjuje 170% više stvorene dodane vrijednosti od troškova uzrokovanih potporom.

Ključne riječi: žensko poduzetništvo, javne potpore, evaluacija politika, razlike između financiranja spolova; bihevioralna dodanost; poticaj
JEL klasifikacija: B54, J16, H81, L26, L38, H43

1 Introduction

Women make up about half of the world's population, but less than 30% of all businesses in Sweden or in the USA are women-owned, with percentages even lower in specialized, wealthy sectors such as technology (Ahl and Nelson, 2015). Nevertheless, women entrepreneurs are perceived as untapped potential for economic growth (Kauffman Foundation, 2011). Various studies in the entrepreneurship literature demonstrate the existence of gender differences in the way entrepreneurs approach and run their businesses (Foss et al., 2018; Henry et al., 2017; Jennings and Brush, 2013). Compared to men, women entrepreneurs are more sensitive to social, family-related and other non-financial concerns that significantly influence their business choices (Ahl and Nelson, 2015; Henry et al., 2017; Shahriar, 2018). Women tend to choose self-employment for the flexibility of working time, the workplace, or both (Allen and Curington, 2014). Thus, women entrepreneurs are overrepresented as owners of home-based part-time ventures (McAdam, 2012; Carter et al., 2015).

As opposed to their male counterparts, women entrepreneurs find it more difficult to acquire the necessary human, social and financial capital in order to establish and run their business (Henry et al., 2017). Women are less likely to be educated in science, technology, engineering or mathematics (STEM), which predestines them to work in low-technology sectors (Lerner et al., 1997; Marlow, 1997; Carter, 2000). Since entrepreneurs tend to set up their businesses in the same sector they had worked before, women entrepreneurs are more strongly represented in low-technology sectors, often characterized by relatively low growth. Not surprisingly, given this operating profile, women are also more likely to depend on informal sources of funding such as savings, credit and family support (Anyadike-Danes et al., 2015; Roberts, 2015; Lim and Suh, 2019).

Women are also less likely to hold executive positions prior to starting their own business, which deprives them of important leadership experience. Thus, compared to their male counterparts, they are less likely to belong to influential business networks that provide access to contacts, resources and relevant information. This lack of social capital (Neumeyer et al., 2018) also has additional negative consequences for accessing financial capital. Foss et al. (2018) show that not belonging to networks is a significant gender-related impediment for securing external financing.

Adequate financing is necessary for the survival, long-term growth and sustainability of small and medium-sized enterprises (SMEs), but women entrepreneurs face greater obstacles in securing financial capital than do male entrepreneurs (Marlow and Patton, 2005; Alsos et al., 2006; Orser et al., 2006; Verheul et al., 2012; Speelman et al., 2013; Roberts 2015; Cowling et al., 2019). Although obtaining capital involves both a supply side (lender) and a demand side (entrepreneur), most literature has focused on the former

inefficiencies (Wilson, 2009), while we focus on the latter and show how policy may be able to partly influence demand. It has been demonstrated that women show greater risk aversion to taking out a loan (Barber and Odean, 2001; Beckmann and Menkhoff, 2008; Hastings et al., 2013, Block et al., 2015), which is reflected in their lower demand for business finance (Croson and Gneezy, 2009; Huang and Kisgen, 2013). Interestingly, Cowling et al. (2019) argue that in the context of economic recession, prototypical forms of femininity actually become advantageous as banks seek to hedge risks by favoring lenders that are more conservative. Thus, we end up with the paradox that the risk aversion of women entrepreneurs prevents them from seeking financing, although it is precisely their risk aversion that may increase the chance of obtaining external financing. It would hence be beneficial to nudge women entrepreneurs to increase their demand for funding, for example by helping them to alleviate some of the excessive risk aversion.

In order to close the finance gap between men and women entrepreneurs, many governments have put in place gender-specific policies intending to help women-owned businesses (GEM, 2018). The policy dimension of women's entrepreneurship research has been neglected, as noted by Foss et al. (2018) in their systematic review of women's entrepreneurship policy. Examination of gender and entrepreneurship literature shows that only 4% of articles address public policy (Link and Strong, 2016). Consequently, very little is known about the impact of policies designed to support women entrepreneurs. Specifically, this pertains to overall policy effectiveness (Pandey and Amezcua, 2018), as well as to the impact on access to financial capital and/or the causal channels at work (Cho and Honorati, 2013; De Mel et al., 2014; Brush et al., 2018; Leitch et al., 2018).

This paper contributes to the literature concerned with supporting women entrepreneurship with policy measures. Using a quasi-experimental approach, we evaluate the impact of public grants with the aim to foster firms' development by affecting women entrepreneurs' demand for funding. We choose a policy instrument that provides very small amounts of money to the beneficiaries and argue that, despite the fact that these grants are too small to produce any direct effect on capital or labor, an observable impact can be accomplished by inducing a change in the beneficiary's behavior by nudging with the grant subsidized activities. The analyzed grant scheme is designed to give women entrepreneurs a nudge to more accurately evaluate their firm's situation and the risk involved in obtaining external financing. This more correct assessment of their firm situation may alleviate excessive risk aversion and encourage women entrepreneurs to seek appropriate funding. Thus, the policy achieves impact by changing behavior. This induced behavior additionality (Clarysse et al., 2009) should then have a measurable impact on the demand for funding and, consequently, on the firm's performance. To our knowledge, we are the first ones to investigate the impact on firms' competitiveness by nudging women entrepreneurs with small public grants towards more competition.

Specifically, we evaluate the grant scheme provided by the Ministry of Entrepreneurship and Crafts of the Republic of Croatia in the recession period from 2008 to 2012. Croatian figures for 2010 state that 37% of businesses were women-owned, but only 16% of women entrepreneurs were beneficiaries of public subsidies (European Commission, 2014; MINPO, 2014). The analyzed grants were given exclusively to women entrepreneurs and the focus was on micro and small enterprises. The financial level of support was too small (on average about 12,154 HRK[1] or 1,639 EUR) to directly increase the capital or labor force of the firms. The grants supported activities such as preparing necessary documents for an investment, like a business plan, or getting childcare. More available time (resulting from not having to engage in childcare) or more expertise (thanks to the ability to purchase consulting services) enabled women entrepreneurs to better evaluate the economic situation of their firm and to plan necessary steps for firm development. This nudge may shift women entrepreneurs' willingness to enter into the competition for funding, for example by applying for bank loans. Implementation of entrepreneurial measures, e.g., getting a bank loan, can lead to a significant increase in a firm's output performance. Women entrepreneurs may also consider profits or other financing possibilities besides bank loans. This nudging process and the behavioral additionality as its result might be particularly relevant during the recession as the chance to obtain a bank loan might have been greater for women entrepreneurs (Cowling et al., 2019).

In order to empirically investigate the grant scheme we use a matching difference-in-differences estimation approach. We employ a rich dataset including financial and structural data on the universe of Croatian firms, data on the women entrepreneurship grants, demographic data on the entrepreneurs, and data on the employment history of entrepreneurs. The availability of the relevant covariates and the possibility for the matching approach to access all firms in Croatia should allow identification of the grant effects. Hence, based on the findings in the literature and from the causal channels of recent empirical and experimental studies, we hypothesize positive policy effects on firm survival, firm output, capital, employment, intermediate inputs, labor productivity, and total factor productivity (TFP). In addition, we examine whether grants have an indirect effect on capital through bank loans and whether women entrepreneurs' life experience implies heterogeneous grant impact effects.

The remainder of the paper is organized as follows: Section 2 presents the theoretical framework and Section 3 describes the institutional setting. Section 4 presents data and methodology followed by the results in Section 5. The last Section 6 provides the discussion and conclusions.

[1] 1 EUR ~ 7.41 Croatian kuna (HRK).

2 Theoretical Framework

For our theoretical framework, we use results from the empirical and experimental literature. The advantage of experiments conducted in the laboratory or in the field for the purpose of identifying causal effects is recognized in many substance sciences, especially recently also in the scientific literature in the entrepreneurship area (Williams et al., 2019). The causal findings of the relevant experimental studies as well as the economic theory of business decisions under uncertainty provide us with the theoretical framework for analyzing the effects of small public grants on the performance of women entrepreneurs in a quasi-experimental study.

Empirical evidence shows that women tend to be less competitive than men (Gneezy et al., 2003; Gneezy and Rustichini, 2004; Niederle and Vesterlund, 2007; Gupta et al., 2013; Niederle, 2015; Saccardo et al., 2017; Born et al., 2018). Experimental studies attempt to identify suitable framework conditions, under which women increase their willingness to compete. Gupta et al. (2013) show that women, when able to choose whom to compete with (men or women), tend to choose other women and then act more competitively in the experimental game. The authors explain this finding with an increased feeling of women's confidence. Recently, in an experimental study, Born et al. (2018) confirm that women in male-majority teams are less confident in their relative performance. They suggest that more targeted policies are needed to reduce this gap in competitiveness, such as affirmative action (Niederle et al., 2010), quotas or preferential treatment (Balafoutas and Sutter, 2010). The grants investigated in this research are in line with these results and are therefore awarded exclusively to women entrepreneurs.

Behavioural economic theories of decision-making suggest that women's competitiveness can be nudged towards more willingness to enter into competition. This is done by making a choice architectural change that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. The analyzed policy intends to change women entrepreneurs' behaviour to actively engaging in competitive choices. One possible nudging approach is priming, referring to the temporal individual enabling of desired response behavior by making personal characteristics salient (Cohn et al., 2010; Cohn et al., 2014), activating particular feelings (Galinsky et al., 2003), and putting individuals in intended mind-sets (Gollwitzer et al., 1990). Applied in different contexts and on subject groups with a variety of socio-economic backgrounds, priming has been shown to successfully change how people think and behave (Frederiks et al., 2019; Rigtering et al., 2019). Balafoutas et al. (2018) show that priming with high power can significantly increase competition-entry decisions made by women. They argue that "when a feeling of power is activated, this might create in women a feeling of being in control to achieve one's goals and hence could close the gender gap in the willingness to compete" (p. 2). The analyzed grants are designed especially for women entrepreneurs in

order to increase the likelihood of a high participation rate. The grant was provided for activities to evaluate firms' development possibilities, with or without external expertise. After being more convinced of their firm's potential, women may be more willing to enter into competition. Investments, previously perceived as too risky, may subsequently be again in the choice set and even pursued further. The policy instrument analysed for the promotion of women entrepreneurs is thus designed in such a way that it leads to more competitive behaviour on the part of women and thus stimulates business growth.

Economic theory states that under uncertainty the optimal output for a risk-averse firm is characterized by marginal costs ($C'(x)$) being less than expected marginal revenue or price ($E[p]$) under full competition, i.e. $C'(x) \leq E[p]$, where x is output and $C(x)$ the variable cost function (Sandmo, 1971; Pope and Just, 1977; Blair 1984; Fooladi, 1985). Experiments demonstrate that women are more risk-averse than men and thus "gender" may impede investments profitable for the firm. Providing additional expertise or having more time available increases the relevant information set for the women entrepreneur, with which the expected value of the marginal revenue may increase. Thus, less risk-averse expectations encourage investments, and increases in the input and output performance of firms can be the result. The effect of a capital increase can be different depending on the firm's production function. If the women-owned firm is capital-constrained and has previously substituted labor for capital, it will reduce workers once it can buy capital to replace them. On the other hand, if capital and labor are complements, more capital will go along with hiring more labor.

In addition, we investigate heterogeneous effects with regard to young and mature women entrepreneurs. Prior studies show that the founder's previous professional experience has a significant influence on the performance of her firm (Colombo and Grilli, 2005), as individuals with higher industry-specific skills are better able to exploit business opportunities (Ganotakis, 2012). If this is the case, the grants should be more effective for mature women entrepreneurs as they are already aware of business opportunities.

In general, grants can affect firm output both directly and indirectly. Grants can directly ensure the inflow of needed capital that can boost firm output. They can also reduce information asymmetry, thus reducing the cost of capital and consequently increasing output via the certification effect (Martí and Quas, 2018; Hottenrott et al., 2018). In our case, the analyzed grant amounts are too small to produce any direct effects. The amount of the grant is also too small to have any effect via certification, and the grants are not provided for a concrete investment proposal, for which the bank is supposed to provide additional credit and, by awarding the grant, would receive the signal that it is worth actually granting the loan for this purpose. Therefore, any impact on company performance has to be achieved by nudging and thus by means of behavioral additionality.

3 Institutional Setting

The Republic of Croatia adopted the *Strategy for Development of Women Entrepreneurship* for the 2009–2013 and the 2014–2020 period, together with their Action Plans (MINPO, 2014). The aim of the grant strategy was to reduce the finance gap between women and men entrepreneurs. Table 1 gives evidence for the finance gap by providing the average amount of bank loans acquired by men versus women entrepreneurs. The Ministry of Entrepreneurship and Crafts of the Republic of Croatia (hereinafter: Ministry) was in charge of the vast majority of grant schemes in the Republic of Croatia[2]. The grant schemes under the umbrella of this Ministry encompassed various competitiveness grant schemes (e.g. Srhoj et al., 2018). Women entrepreneurs did not make satisfactory use of the Ministry's public funding programs. In Croatia in 2010, 37% of all female entrepreneurs were women (European Commission, 2014), but only 19% benefited from public subsidies, although additional points were awarded to female entrepreneurs in the selection process (MINPO, 2014). In order to increase the allocation of grants to women, the Ministry launched several grant programs in the 2008–2012 period targeting exclusively women entrepreneurs of micro and small firms (details are given in Table A1 and Table A2 in the Appendix).

However, the effectiveness of these public funds has not yet been rigorously evaluated (MINPO, 2014). Critics argue that the government policies in Croatia were rather ineffective in spurring firm competitiveness (Bartlett, 2016; Srhoj et al., 2018). Bartlett (2016) concludes that policy measures did not have the desired impact on the competitiveness of Croatia's economy. He takes the Global Entrepreneurship Monitor's total early-stage entrepreneurial activity (TEA) index for women and men entrepreneurs to demonstrate considerable gender differences. The differences in the TEA index were rather large and persistent for the 2006–2014 period in Croatia (Bartlett, 2016), showing stagnation in the development of women entrepreneurship.

For the investigated women entrepreneurship grants potential recipients had to be registered in Croatia, had to have a surplus recorded in the previous year of business and at least one full-time employee, and had to have no unpaid debts towards the state or employees. The programs were matching grants, i.e. the grant co-financed 75% of the project value (VAT excluded), and firms had to finance the remaining 25% (and VAT) from private funds. Common activities that were co-funded by the grant included: (1) development of business plan and consulting services, (2) entrepreneurial training, (3) purchase of equipment, tools, and inventory, (4) preparing documentation for bank loans, and (5) babysitting and kindergarten costs. After the public call, firms submitted

[2] The policy basis for these grant schemes can be found in the policy documents entitled Operational Plan of Incentives for Small and Medium Entrepreneurship (OPPMSP, 2008; 2009; 2010; 2011) and Entrepreneurial Impulse: Plan of Incentives for Entrepreneurship and Craftsmanship (MINPO, 2012; 2013).

applications describing their planned activities along with their financial statements for the previous year. Evaluation was undertaken by the Ministry's expert team, taking into consideration the conditions elaborated above and the quality of the applicants. Table A2 in the Appendix shows that women entrepreneurship grant schemes encompassed 1,284 grants over the 2008–2012 period, with a total amount of 15,605,987 HRK (about 2,104,089 EUR) and on average 12,154 HRK (about 1,639 EUR) being awarded.

Table 1 **Differences in Amount of Bank Loans between Men- and Women-Owned Firms**

Industries (NACE 1-digit)	Only men-owned firms			Only women-owned firms		
	N	Mean	S. D.	*N*	Mean	S. D.
Agriculture, forestry, fishing	16,565	1,330,449	5,691,460	2,633	954,181	3,707,362
Mining, quarrying	1,552	1,868,451	6,021,357	174	1,164,530	2,502,710
Manufacturing	76,108	855,724	5,451,814	14,090	464,829	5,597,953
Energy	2,321	3,552,665	24,636,720	275	1,355,619	9,884,572
Water, sewage, waste	1,966	2,024,480	9,002,067	356	1,461,604	4,409,589
Construction	80,010	2,332,674	53,477,844	10,049	953,948	6,367,973
Wholesale, retail, motor vehicles	168,028	795,035	9,537,078	48,421	362,794	2,319,809
Transport, storage	26,605	654,171	3,666,366	4,173	439,733	2,669,539
Accommodation, food	31,865	1,564,572	23,992,582	8,727	376,811	1,935,207
ICT	27,627	262,318	2,143,660	5,016	80,784	421,540
Finance, insurance	3,961	9,815,577	95,349,906	1,051	153,148	1,400,915
Real estate	14,614	4,570,686	26,275,716	4,425	615,516	7,030,754
Professional, scientific work	75,336	815,551	18,401,673	35,458	97,966	877,045
Administration	17,849	764,794	15,350,344	6,022	223,986	1,380,926
Education	3,621	136,960	834,913	3,705	77,021	237,262
Health, social work	3,892	418,914	1,802,891	3,252	225,530	1,081,743
Arts, entertainment, recreation	5,115	1,084,389	8,595,110	1,256	859,086	13,543,615
Other services activities	10,156	160,461	1,756,170	9,764	255,803	7,466,470
TOTAL	**567,191**	**1,211,396**	**24,636,601**	**158,847**	**347,138**	**3,797,945**

Notes: Data on the universe of Croatian firms, for which gender ownership structure data are available for the time period 2008 to 2011; N denotes number of firms, S.D. standard deviation.

4 Data and Methodology

4.1 Data

Five datasets were merged: financial and structural data on the population of Croatian enterprises for the 2005–2016 period, obtained from the Croatian Financial Agency (hereinafter: FINA); data on women entrepreneurship grants in the 2008–2012 period, obtained from the Ministry; data on demographic information on entrepreneurs, obtained from the court register of incorporated companies (hereinafter: Companies Register) and from the Ministry of Public Administration's birth registry (hereinafter: Birth Registry); and data on the employment history of entrepreneurs, obtained from the Croatian Pension Insurance Institute (hereinafter: HZMO).

The FINA dataset includes balance sheet and profit and loss statement data covering 300 variables for the universe of Croatian incorporated firms, as well as firm characteristics such as region, size, industry sector, firm ID, year of the report. On the other hand, the Ministry dataset includes the name of the grant recipient, the amount of grant given and the year the grant was received. The Companies Register contains identifiers for entrepreneurs, together with their characteristics such as age, gender, and their position within the firm. The HZMO dataset contains individual identifiers, firm identifiers, and the duration of their pension insurance within the firm. HZMO data are also connected to the Croatian Employment Office, which enabled us to obtain a person's total period of unemployment prior to receiving the grant. Finally, the Birth Registry dataset contains the identifiers for children associated with each person.

After merging the FINA and Ministry datasets, data are available on 196,300 firms, 1,274 of which obtained the analyzed grants. We remove all medium and large firms, foreign-owned firms, and state-owned firms, as these were not eligible as recipients for the analyzed grants. For the same reasons, we remove all firms that reported a negative operating surplus, unpaid debts towards the state or employees, and firms with a male ownership structure in the year prior to treatment. We exclude firms having either no employees or zero turnover[3]. At this point, our sample is reduced to 59,299 firms. Firms receiving grants in the year of incorporation are dropped, as we have no previous financial records for these firms. Finally, we exclude all grant recipients in 2012 as these grants targeted a very small number of firms that were awarded heftier grant amounts than in previous grant schemes (Table A2 in the Appendix) and matching grants in 2012 had a 100% support as opposed to 75% support in the 2008–2011 period (Table A1 in the Appendix). Our analysis thus focuses on the 2008–2011 period only[4]. As identification strategy, we exclude firms also receiving other grants in the 2008–2012 period. We end up with 484 grant-awarded firms (treated firms) and 6,380 potential control firms (considering the time dimension, we have 20,392 observations).

4.2 Method

The methodical approach identifies the causal effect by comparing outcomes between a treatment group and a control group (Rosenbaum and Rubin, 1983). Treatment is usually modelled as a binary variable D, taking the value 1 for the treated firms and 0 for the control (non-treated, counterfactual) firms. The greatest challenge is to find a control firm

[3] These observations are mostly crafts. In line with existing papers (e.g. Vitezić, Srhoj and Perić, 2018), we discard crafts as no financial data are available for these organizations. Crafts report their income on the basis of the Income Tax Law (OG 177/2004), while limited liability firms must keep accounting records at a detailed level according to the Accounting Act, Croatian and International Financial Reporting Standards, and International Accounting Standards.

[4] We also performed the analysis with 2012 data, and our results remained robust. These results are available on request.

that is as similar as possible for each treated firm as firms may systematically differ in both observable and unobservable characteristics (Heckman et al., 1998). To mitigate this problem, Rubin (1977) introduced the conditional independence assumption (CIA), stating that potential outcomes are independent of treatment assignment (i.e. that exposure to treatment can be considered random), given a set of observable covariates X, which are not affected by the treatment, i.e. $Y(D{=}0)$, $Y(D{=}1) \perp D|X$, where $Y(D)$ denotes the potential outcome.

Empirically, this allows each treated firm to be matched with one (or several) control firms that are as similar as possible in their pre-treatment characteristics. We estimate this similarity of treated and control firm using a propensity score. This propensity score is defined as the conditional probability of receiving treatment given pre-treatment characteristics and is estimated using a standard probit model. We restrict the propensity scores to the common support area, thus considering only firms in the intersection of the range of the propensity scores for treated and control firms. Finally, the control firm for each treated firm is selected using the nearest neighbor method (for the baseline scenario) without replacement. Once the control firms are matched to the treated firms, the average treatment effect on the treated firms (ATT) is estimated via $ATT = \frac{1}{N^T}\sum_{i \in T}\left(y_i^T - y_i^C\right)$, where N^T is the number of treated firms and y_i^T (y_i^C) the observed outcome of the treated (control) firm i.

To check the robustness of our ATT findings, we conduct a placebo test and perform matching with various matching algorithms. For the placebo test we discard the treated group, make the control group from our main specification a *placebo-treated* group and repeat our main specification matching procedure. If the effects are due to the grants, the placebo treatment should have no effect on firm performance. Additionally, we perform this procedure 10,000 times to empirically obtain the distribution of the ATT estimates. In this way, we do not have to rely on the calculated standard errors (Abadie and Imbens, 2008) or on the normality distribution of the ATT estimates. Moreover, we conduct a sensitivity analysis regarding the matching approach. We estimate nearest neighbor matching with two, three and four control firms per treated firm; nearest neighbor matching with two, three and four control firms per treated firm but with a caliper set at 10% of the standard deviation of the estimated propensity score; radius matching with the same caliper; kernel matching and local linear regressions using the Epanechnikov kernel.

In order to investigate the grants' mediation effect exerted on capital growth by bank loans growth, a causal mediation analysis is conducted (Imai et al., 2010). The causal mediation effect for each firm i is defined as

$$\delta_i(D) \equiv E\left[Y_i(D=1, M_i(D=1)) - Y_i(D, M_i(D=0))\right]$$

where D gives the treatment status, Y is the potential outcome variable and M is the mediator. The average causal mediation effect (ACME) is the expected difference in the potential outcome when the mediator takes the value that would occur under the treatment condition as opposed to the control condition, while the treatment status itself is held constant. For estimation, we compute two linear models with capital growth on the left-hand side. On the right-hand side are D, control variables, and the mediation variable (in our case bank loans growth). In this way, the direct effect (ADE) of the treatment as well as the indirect effect (ACME) are estimated.

In causal mediation analysis, an assumption additional to CIA is necessary, in particular the sequential ignorability assumption. This assumption implies that the mediator is ignorable given the observed treatment and pre-treatment confounders. The ignorability of the mediator implies that among those firms that share the same treatment status and pre-treatment characteristics, the mediator can be regarded as if it were randomized. This assumption cannot be directly tested. However, sensitivity analysis (Imai et al., 2010) is conducted to investigate how robust the results are. The correlation of the residuals (ρ) of the linear models is varied from -1 up to 1, ACME estimated and checked for the ρ value ACME that changes its sign. In our case large values of ρ imply that the conclusion is plausible given even fairly large departures from the ignorability of the mediator.

4.3 Variables Used in the Analysis

Our dataset includes a rich set of covariates (Table 2). All relevant variables for the public call schemes as well as covariates considered as important in the literature are used to calculate the propensity score.

As covariates, we select relevant firm characteristics that impact not only the selection into treatment, but the outcome as well. Some are obvious, such as firm age and size (measured in number of employees and real turnover); other covariates are proxies for firm characteristics, like average wage. Firms that pay higher average wages, have on average larger capital and cash reserves and thus are more likely to be financially stronger. Entrepreneurs of such firms may either be not interested in applying for the grants, or if they do apply, they may "make more out of it" than do weaker firms. The same holds for firms that have some knowledge-related capabilities indicated by ownership of fixed intangible assets, because these may facilitate more sophisticated production processes, which lead to higher outputs. We also include variables for financial constraints of firms, such as real values of short-term liabilities towards employees, short-term liabilities towards the state, liabilities towards banks and debt ratio, because firms with higher financial

constraints are found to be more vulnerable (Musso and Schiavo, 2008; Stucki, 2013). This vulnerability can induce firms to seek public aid and is also likely to shape how well the firm uses the grant. Debt ratio is included in quadratic form, as firms with more debt might be more motivated to apply for a grant, while those with too large a debt ratio may be rejected. The set of covariates also contains measures of productivity, such as real value added per employee and total factor productivity. These covariates are also assumed to affect firm performance. Firms that are exporters tend to be more productive (Costa et al., 2017) and to have specific entrepreneurial skills and human capital (Brambilla et al., 2012) that can affect both receiving a grant and the potential outcomes. Therefore, we use export-to-turnover ratio and import-to-turnover ratio.

Table 2 **Covariates Used for Matching**

Variable	**Description**
Treatment variable	
grant	1 if the firm received any grant scheme funding, 0 otherwise
Firm characteristics	
age	Age of the firm
age_sq	Squared age of the firm
ownership	Ownership of the firm: 1 – State, 2 – Private, 3 – Mixed
tech_intensity	Sectors of economy based on technological intensity[a]: 1 – Agriculture and mining, 2 – High-tech manufacturing, 3 – Mid high-tech manufacturing, 4 – Mid low-tech manufacturing, 5 – Low-tech manufacturing, 6 – Energy, 7 – Construction, 8 – Knowledge-intensive high-tech services, 9 – Knowledge-intensive other services, 10 – Less knowledge-intensive services
nuts2_region	NUTS2[b] region of the firm classified as: 1 – Continental Croatia, 2 – Adriatic Croatia
firm_size	Size of the firm: 1 – Micro (1–9 employees), 2 – Small (10–49 employees)
trade_orientation	Trade orientation of the firm: 1 – Exporter only, 2 – Importer only, 3 – Exporter and importer, 4 – Domestic market only
team_size	Number of people listed for each firm in the Companies Register: 1 – One, 2 – Two, 3 – Three or more
gender_combination	Gender combinations connected to each firm in the Companies Register: 2 – Only women, 3 – Men and women
Firm performance characteristics[c]	
labor	ln(1 + number of employees)
average_wage	ln(1 + real average personnel costs)
capital	ln(1 + real tangible fixed assets)
fixed_intangible_assets_d	dummy for positive fixed intangible assets
cash_reserves	ln(1 + real cash and cash equivalents)
debt_ratio	Debt ratio (real fixed + current liabilities / real total assets)
debt_ratio_sq	Squared debt ratio
liabilities_banks	ln(1 + real total liabilities towards banks)
turnover	ln(1 + real turnover)
intermediate_costs	ln(1 + real intermediate (material + energy) costs)
export-turnover	Export-to-turnover ratio
import-turnover	Import-to-turnover ratio
rva	ln(1 + real value added)
tfp[d]	ln(Total factor productivity)
Entrepreneur (owner) characteristics	
mean_age	Mean age of firm owner(s)
mean_age _sq	Squared mean age of firm owner(s)
kids	Number of children
work_experience	ln(total work experience) (years)

unemployment	ln(unemployment) (years)
previous_experience	Dummy for previous work experience in current NACE2 sector
employers	Number of different employers
Year	
year	Dummy for each year in our sample

Notes: [a] More specific definitions of these technology sectors are available on request. [b] According to https://ec.europa.eu/eurostat/web/nuts/background. [c] All monetary variables were deflated using year- and sector-(NACE 2-digit) specific Eurostat deflators with base in 2010. Value added was deflated using value added deflator. Intermediate inputs (raw materials and energy) were deflated using intermediate input deflator. All other monetary variables were deflated using output deflators. [d] Total factor productivity was estimated using Wooldridge (2009) methodology based on the production function approach using value added as output, labor and capital as inputs, and intermediate inputs to control for unobservables. As technologies used in the production process differ across different industries, TFP was estimated separately for each NACE 2-digit industry.

We also include characteristics of the women entrepreneur, such as age and employment history, as this relates to aspects of human capital, which affects firm performance and survival (Colombo and Grilli, 2005). Square of age is also included as the grant-awarding agency may view entrepreneurs with too little experience as being too risky for a grant and a saturation effect in this relationship may also be present. We include the number of children as a limiting factor for the working hours, but also because childcare was one of the subsidized activities. As is common in the relevant literature, we also control for year, ownership, region, sector, size, trade and composition with respect to gender of top management team.

Outputs are categorized in six groups (Table 3): firm survival, output growth, labor inputs growth, capital inputs growth, intermediate inputs growth, and productivity growth.

Table 3 **Outcome Variables Used in the Analysis**

Variable		**Description**
Firm survival		
Active on the market	$survive_{t+q}$	Dummy if firm is still on the market in year $t + q$, $q \in \{1, ..., 5\}$
Output growth		
In sales (turnover)	growth $turnover_{t-1,t+q}$	Real turnover growth from $t - 1$ to $t + q$, $q \in \{1, ..., 5\}$ $\ln(sales_{t+q}) - \ln(sales_{t-1})$
In value added	growth $value\ added_{t-1,t+q}$	Real value added growth from $t - 1$ to $t + q$, $q \in \{1, ..., 5\}$ $\ln(value\ added_{t+q}) - \ln(value\ added_{t-1})$
Labor inputs growth		
In employees	growth $employees_{t-1,t+q}$	Number of employees growth from $t - 1$ to $t + q$, $q \in \{1, ..., 5\}$ $\ln(employees_{t+q}) - \ln(employees_{t-1})$
Capital inputs growth		
In capital	growth $capital_{t-1,t+q}$	Real capital growth from $t - 1$ to $t + q$, $q \in \{1, ..., 5\}$ $\ln(capital_{t+q}) - \ln(capital_{t-1})$
In bank loans	growth $liabilities\ banks_{t-1,t+q}$	Real total liabilities towards banks growth from $t - 1$ to $t + q$, $q \in \{1, ..., 5\}$ $\ln(liabilities_{t+q}) - \ln(liabilities_{t-1})$

Intermediate inputs growth		
ln intermediate input costs	growth intermediate costs$_{t-1,t+q}$	Real intermediate inputs growth from $t-1$ to $t+q$, $q \in \{1, ..., 5\}$ ln (intermediate costs$_{t+q}$) – ln (intermediate costs$_{t-1}$)
Productivity growth		
ln total factor productivity	growth TFP$_{t-1,t+q}$	Real total factor productivity growth from $t-1$ to $t+q$, $q \in \{1, ..., 5\}$ ln (TFP$_{t+q}$) – ln (TFP$_{t-1}$)
ln labor productivity (value added)	growth labor productivity$_{t-1,t+q}$	Real labor productivity (value added) growth from $t-1$ to $t+q$, $q \in \{1, ..., 5\}$ ln (labor productivity$_{t+q}$) – ln (labor productivity$_{t-1}$)

5 Results

5.1 Descriptive Statistics and Matching

Treated firms are less frequently found in less knowledge-intensive service sectors (33%) and more frequently in low-technology manufacturing sectors (9%) than are the control firms before matching and on average have acquired larger bank loans. Treated firms more frequently have positive intangible assets (32%), domestic-only trade status (11%), but are less frequently just exporting firms (Table A3).

Treated firms are more frequently composed of several entrepreneurs. In particular, 31% of treated firms have three or more entrepreneurs as compared to 11% of the potential control firms. At the same time, the treated firms are less frequently single-owned (35%) as compared to all other women-owned firms (58%). A total of 59% of treated and 72% of control firms are owned by women only, while the remaining firms in both subsamples have a gender combination in ownership structure. Interestingly, although women entrepreneurs receiving and those not receiving grants do not significantly differ in the total number of years of work experience, the former are more likely to have several times changed their job prior to starting their own firm. They are also more likely to capitalize on their experience by starting their firms in the same NACE 2-digit industry in which they previously worked. Finally, on average there is no difference in the number of children per woman entrepreneur between treated and control firms.

We used a probit model with a dummy variable indicating whether or not the firm i received the grant in time t, $t \in \{2008, ..., 2011\}$, and with all firm performance variables, firm characteristics and entrepreneur characteristics as independent variables (Table A3). To avoid the problem of simultaneity, the covariates enter the calculations with a lag of one period. Estimation results are provided in Table A4. We do not interpret the specific findings obtained with the probit model. The purpose of the probit model is to forecast the propensity score and not to interpret the coefficient estimates or their statistical significance. The quality of the matched sample is our main objective here.

The propensity score is then used to find the control group composed of the nearest neighbors to the treated firms. Table A3 shows no significant differences in means of all covariates after matching and considerable decreases in standardized bias. The observed empirical densities of the covariates and the propensity score can be accepted as sufficiently equal for treated and control firms. The necessary balancing property is thus achieved.

5.2 Average Treatment Effect on the Treated

Women entrepreneurship grants yield a positive effect on firm survival as compared to control firms five years after treatment (Table 4).

Table 4 **Treatment Effects of Women Entrepreneurship Grants on Firm Performance**

Outcome variables	**ATT (S. e.)**				
	t + 1	*t + 2*	*t + 3*	*t + 4*	*t + 5*
Firm survival					
Active on the market	-0.008 (0.009)	-0.008 (0.011)	0.010 (0.015)	0.017 (0.017)	0.025* (0.018)
Output growth					
In sales (turnover)	0.077** (0.046)	0.097* (0.063)	0.085* (0.064)	0.058 (0.070)	-0.049 (0.071)
In value added	0.088** (0.044)	0.087* (0.058)	0.100* (0.063)	0.066 (0.070)	-0.011 (0.068)
Labor inputs growth					
In employees	0.047** (0.022)	0.051** (0.026)	0.029 (0.031)	-0.008 (0.034)	-0.009 (0.037)
Capital inputs growth					
In capital	0.431*** (0.166)	0.293* (0.198)	0.329* (0.221)	0.199 (0.228)	-0.161 (0.233)
In bank loans	0.674** (0.357)	0.832** (0.398)	0.673* (0.424)	0.769** (0.451)	0.441 (0.449)
Intermediate inputs growth					
In intermediate input costs	0.079* (0.054)	0.095* (0.070)	0.113* (0.077)	0.120* (0.080)	0.034 (0.082)
Productivity growth					
In total factor productivity	0.039 (0.059)	0.066 (0.059)	0.097* (0.062)	0.057 (0.060)	-0.006 (0.056)
In labor productivity (value added)	0.045 (0.058)	0.056 (0.055)	0.098** (0.059)	0.070 (0.057)	-0.002 (0.053)

*Notes: *p < 0.1; ** p < 0.05; *** p < 0.01, one-sided p values. Standard errors (S.e.) are based on Abadie and Imbens (2008).*

Grants induce a positive output additionality in sales and value added in the short run (t+1, t+2, and t+3 years after receiving the grant). However, at period t+4 and t+5 these effects vanish. The treatment has a positive significant effect on employment at time period t+1 and t+2, suggesting a positive effect on labor input additionality in the short run only.

With regard to capital inputs, grants induce positive capital input additionality in the short run, too. Treated firms have higher growth rates in bank loans up to four years after undergoing treatment. Intermediate inputs show positive growth effects in years t+1 to t+4. With regard to productivity, grants yield additionality in labor productivity and TFP only in year t+3.

The placebo test with and without the normality assumption demonstrates the robustness of our findings. All ATT estimates for the placebo-treated firms are not statistically significantly different from zero (Table A5). Figure A1 in the Appendix shows the empirical distribution of the estimated ATTs for 10,000 replications of the placebo test computed for each statistically significant ATT in Table 4. The red line marks the estimated ATT reported in Table 4, while green dashed lines represent the top and bottom 10% of the distribution. All estimated ATTs are in the far-right tail of their distribution, supporting the conclusion that there remains only a small probability that they occur by chance. These findings confirm that our ATTs (in Table 4) are attributable to the grants. Table A6 in the Appendix shows the results of the alternative matching approaches; all findings confirm the robustness of the main results.

Table 5 shows the indirect effect of grants on capital growth through bank loans. The average causal mediation effect (ACME) is the part of the ATT that is transmitted through bank loans growth, while the average direct effect (ADE) is the direct effect of treatment on capital growth. We find a strong grant indirect effect. This implies that the grant induced a positive effect on bank loans, which accounted for capital growth. When the ADE is statistically insignificant, this implies that the treated group does not statistically significantly differ in capital growth from the control group in the absence of the mediator. This points out the importance of grant indirect effects that are achieved via bank loans as a source for external financing. We find that the indirect effect of grants is significant in t+1, but in size it is smaller than the direct effect. This gives evidence that women entrepreneurs on average do not use bank loans only to finance firm investments.

Table 5 **Mediation Results of Treatment Through Bank Loans Growth on Capital Growth**

Effect	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
ACME	0.056**	0.084**	0.092**	0.123**	0.086*
ADE	0.372**	0.187	0.276*	0.052	-0.277
Total effect	0.428***	0.271*	0.368**	0.175	-0.191

*Notes: Standard errors are obtained via bootstrapping (10,000 simulations). The following lagged controls (t-1) are included: age, age squared, debt ratio, debt ratio squared, log capital, log profits, trade status dummies, firm size, and sector dummies. *p < 0.1; ** p < 0.05; *** p < 0.01, one-sided p values. The coefficients for the controls are omitted for the sake of brevity and are available on request.*

The sensitivity analysis indicates that the sign of the ACME would be maintained unless the sensitivity parameter ρ is greater than 0.18 (t+1), 0.2 (t+2), 0.21 (t+3), 0.26 (t+4) and 0.25 (t+5). Hence, the findings are of limited robustness to possible unobserved confounders.

Finally, we consider heterogeneous effects due to age and its associated characteristics of female entrepreneurs. Therefore, we split the sample into women below and above 40 years of age and re-estimate the ATT (Table 6). We find that the grant effects are indeed different for these two groups. The differences are particularly striking for growth in capital inputs (particularly in bank loans), where young women entrepreneurs exhibit stronger effects. Consequently, we investigate the differences between the two groups more closely. Younger women entrepreneurs, as compared to mature women, own on average younger (7.9 years versus 12.2 years) and smaller firms (5.3 employees versus 6.3 employees). They are thus more likely to have shorter and weaker credit histories than mature women entrepreneurs. In addition, younger women entrepreneurs own less capital – the average tangible fixed assets (proxy for capital) are significantly smaller for young women (112,645 EUR) versus mature women entrepreneurs (159,675 EUR). The same holds for liabilities to banks (61,853 EUR versus 79,375 EUR). Hence, any nudging towards competitiveness and investment is expected to increase capital and consequently output.

Although the grants are seen to have stronger effects on the survival of young women's firms, all other effects (output growth, intermediate inputs growth, labor input and long-term productivity) are much more pronounced for mature women entrepreneurs. This can be explained by the fact that these women have worked longer in the same industry; 60% of them have continued working in the same sector, which is a statistically significantly higher proportion than for the young women entrepreneurs (χ^2=8.587, p=0.003). They might have been able to build larger industry-specific human capital, superior business networks and business skills (Ganotakis, 2012). Against this background of the women entrepreneurs, the nudging effect is most successful. For the sake of completeness, we investigate whether there is a difference between the two groups of women entrepreneurs regarding the number of children. In both groups more than 50% of the women entrepreneurs have no children (75th percentile is 1 child), and the proportion of women having children does not statistically differ between young (40%) and mature women entrepreneurs (45%, χ^2=1.8914, p=0.169).

Table 6 **Treatment Effects for Women below or 40 Years of Age and above 40 Years of Age**

Outcome variables	ATT (S. e.)									
	Women below or 40 years of age (n_T = 169 [a])					Women age > 40 (n_T = 315 [a])				
	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Firm survival										
Active on the market	0.006	0.012	0.030	0.041*	0.047*	-0.006	-0.003	0.013	0.013	0.022
Output growth										
ln sales (turnover)	-0.003	0.014	0.010	0.008	-0.128	0.081**	0.076*	0.108**	0.170**	0.110*
ln value added	-0.020	-0.060	-0.057	-0.031	-0.145	0.095**	0.105**	0.107**	0.162**	0.162**
Labor inputs growth										
ln employees	0.051	0.045	0.019	0.003	-0.050	0.051**	0.075***	0.053*	0.064*	0.043
Capital inputs growth										
ln capital	0.605**	0.525*	0.518*	0.598*	0.187	0.288*	0.272	0.167	-0.015	-0.046
ln bank loans	1.777***	2.317***	1.387**	1.687**	1.148*	0.497	0.723*	0.981**	0.964**	0.610
Intermediate inputs growth										
ln intermediate input costs	0.040	-0.001	-0.012	0.072	-0.014	0.114**	0.132**	0.142**	0.194**	0.149**
Productivity growth										
ln total factor productivity	-0.089	-0.079	0.027	-0.060	-0.151*	0.056*	0.037	0.055	0.100*	0.131**
ln labor productivity (value added)	-0.094	-0.106	0.005	-0.034	-0.095	0.044	0.029	0.053	0.092*	0.119**

*Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, one-sided p values. Standard errors (s. e.) are based on Abadie and Imbens (2008). Balancing property after matching is satisfied; for the sake of brevity we do not report the results, but they are available on request. [a] n_T denotes the number of treated firms.*

5.3 Cost-Benefit Analysis

The estimated treatment effects for women below or equal to and above 40 years of age (Table 6) enable us to make a cost-benefit analysis with common "*back-of-the-envelope*" calculation (Czarnitzki and Lopes-Bento, 2013). On the cost side, the amount of public funds provided for women entrepreneurs' business development projects was 0.2 million EUR and 0.4 million EUR for young and mature women entrepreneurs, respectively (2008–2011 period, Table A2(b)). The grant scheme had a positive effect on obtaining bank loans in the value of 3,008 EUR and 4,910 EUR for younger and mature women, respectively, per firm at $t+2$, as indicated in Table 7. This value multiplied by the number of total public grants awarded (169 and 315 for younger and mature women, respectively) gives a 0.5 million EUR and a 1.5 million EUR higher value of financing due to the grant scheme for younger and mature women, respectively. In sum, the grant scheme costs (0.2 million EUR and 0.4 million EUR) and the bank loans (0.5 million EUR and 1.5 million EUR) for the women entrepreneurship project amount to 0.7 million EUR and 1.9 million EUR for the younger and mature women, respectively.

On the yearly benefits side, the overall grants and bank loans lead to an increase in value added per firm at time $t+2$ of 14,532 EUR for mature women, which amounts to total (multiplied by 315 grants awarded to mature women) estimated benefits of 4.6 million EUR, and outweighs the public costs and higher bank loans by 2.4 times two years after the grants were distributed[5]. The benefits that are 2.4 times higher than costs are similar to the three times higher value added created by an export promotion policy in Denmark (Munch and Schaur, 2018). Since no additional value added was created among young women entrepreneurs, the benefits from mature women entrepreneurs can also be compared to the costs of both young and mature women entrepreneurs. A comparison of the 4.6 million EUR additional value added created by firms owned by mature women entrepreneurs and the 2.6 million EUR additional project costs shows that value added outweighs costs by 1.8 times. In the long run, at $t+5$, again no additionality is found for firms owned by young women entrepreneurs, and stronger positive effects on firms owned by mature women entrepreneurs are seen. The 22,452 EUR additional value added created per firm owned by mature women entrepreneurs (multiplied by 315 grants) leads to additional 7.1 million EUR value added and outweighs the additional project costs for young and mature women entrepreneurs (2.6 million EUR) by 2.7 times in the long run.

[5] We do not report this analysis for the subsample of women younger than 40 years of age, as for them we do not find a significant effect on the value added growth figures.

Table 7 **Quantification of Treatment Effects for the Women Entrepreneurship Grant Scheme by Women's Age**					
Outcome variables	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Women below or 40 years of age (n_T = 169 [a])					
Real turnover	-[b]	-	-	-	-
Real value added	-	-	-	-	-
Number of employees	-	-	-	-	-
Real capital	6,622	5,745	5,674	6,545	-
Real total liabilities towards banks	2,307	3,008	1,801	2,190	1,490
Real intermediate inputs	-	-	-	-	-
Women above 40 years of age (n_T = 315 [a])					
Real turnover	12,564	11,791	16,772	26,349	17,053
Real value added	13,170	14,532	14,811	22,490	22,452
Number of employees	0.256	0.377	0.267	0.318	-
Real capital	5,784	-	-	-	-
Real total liabilities towards banks	-	4,910	6,657	6,545	-
Real intermediate inputs	7,011	8,113	8,733	11,987	9,165

Notes: We estimate the effects for the sample of treated firms in our analysis. All monetary variables are expressed in EUR. 1 EUR ~ 7.42 Croatian Kuna (HRK). [a] n_T denotes the number of treated firms. [b] We report only significant effects.

6 Discussion and Conclusion

Not only is the absolute number of female entrepreneurs still low, but there is also a considerable financing gap in the average amount of bank loans granted to male- and female-owned firms. Policy-makers are aware of this fact and of the economic potential that can evolve from supporting female entrepreneurs. Many governments have started to tackle this issue with public policies (GEM, 2018). While these initiatives are seen as positive, several scholars have called for further research on the effectiveness of these policies (Foss et al., 2018; Pandey and Amezcua, 2018). The aim of this paper is to provide evidence on the effectiveness of a public business development grant scheme as a possible instrument for promoting women entrepreneurs and reducing this financing gap.

From empirical and experimental studies we know that women entrepreneurs differ from their male counterparts in several aspects of their entrepreneurial orientation (Goktan and Gupta, 2015). Many experimental studies provide indications as to how a women-specific funding scheme should be designed. However, these proposals have not yet been implemented and tested for their suitability for use in supporting women entrepreneurs. When women have the opportunity to choose with whom they want to compete, they choose other women over men, and the more competitive a female co-participant is expected to be the more competitive they become themselves (Gupta et al., 2013). Therefore, grants awarded exclusively to women entrepreneurs are advantageous if the aim is to increase grant applications and women's competitiveness.

We analyze the impact of a public support scheme aimed exclusively at women entrepreneurs. Specific to our case is the fact that the grant amount itself is too small to be invested directly in capital or labor as a means of increasing business performance. Rather, the grant serves as an incentive, as a so-called nudge, for female entrepreneurs to reassess the economic situation of their firm or possible investment opportunities. Activities such as the development of business plans, entrepreneurial training and obtaining childcare are supported. This allows women entrepreneurs either to spend more time in the company or to use external expertise to obtain information. When female entrepreneurs have been able to gather more information (and thus reduce their risk aversion), investments are more likely to be made. These investments can be observed in firm input and output performance measures. The main objective of this paper is to investigate whether the nudge provided by the design of the grant scheme was successful, i.e. behavioral additionality was stimulated and increases in firm performance were achieved.

The results show the grant scheme had a positive impact on firm survival. Positive effects on firm survival over the long run are in line with the findings of De Mel et al. (2013). However, in our case the positive effect on firm survival is driven by the impact that young women entrepreneurs have on firms.

For the entire sample, we find increased output additionality, but the effects do not persist on average beyond the third year after receiving a grant. Empirical research on long-term output additionality produced by subsidies is lacking, but the literature suggests that long-term effects may depend on the type of subsidy and characteristics of the entrepreneur. Goerke and Albers (2016) consider several types of subsidies and find long-term effects only for R&D instruments. De Mel et al. (2012) find long-term effects of small grants, too. These grants led to relatively large increases in business profits for male owners of microenterprises, but to no change in business profits for female business owners. They conclude “Capital alone thus does not appear to be enough to grow subsistence-level female-owned firms. Ongoing work is exploring the extent to which complementary interventions such as business training can help, or whether the other duties such as household production and child care constrain the extent to which women wish to grow their firms” (p. 965). The average age of the women entrepreneurs in the study by De Mel et al. (2012) is just around our cut-off point for investigation of heterogeneous effects (40 years). The long-term effect on firm output measures, however, is evident in our case for mature women entrepreneurs only. This can be explained by the higher industry-specific human capital of mature women entrepreneurs that allows them to better exploit business opportunities. We find statistical evidence for output additionality with respect to sales, value added and intermediate inputs growth. For younger women entrepreneurs, who have less capital, the behavioral additionality results in capital investments that do not pay off in the short term as compared to the control firms without grants, but that slightly increases the chance of firm survival.

The consideration of age and its associated characteristics of women entrepreneurs is decisive for impact assessment, as the heterogeneity of the effects is pronounced. A limitation of this study is that the sample size permitted us to split our sample only into young and mature women entrepreneurs. Further splits may be necessary to more appropriately capture the gradient in the acquired human or financial capital. We must leave that for future research. In addition, in our exploration of the effect that social environment exerts on female entrepreneurs we are limited by the available data. Neither having a child or not nor the number of children is responsible for the difference in the effect between young and mature women entrepreneurs. However, we were not able to obtain data on more personal details of the applicants such as their family income, or partner's employment status and income. Therefore, we cannot rule out differences in such variables between the investigated groups.

Nevertheless, we have a universe of women-owned firms and women entrepreneur data, on which we implemented various estimation approaches in order to be confident about the robustness of the results. The fact that the grants were awarded during the recession could have been particularly conducive to the impact effects achieved. Therefore, whether the conclusions also apply in times of economic growth remains to be further analyzed.

We conduct a cost-benefit analysis of the grant scheme with standard "back-of-the-envelope" calculation in the short and long term. In the short term, the yearly benefits outweigh the grant costs (defined by public money plus additional bank loans) by 2.4 times for mature women entrepreneurs' and by 1.8 times for both young and mature women entrepreneurs' grant costs. The positive effects on mature women entrepreneurs increase in the long run and benefits outweigh the young and mature women entrepreneur grant costs by 2.7 times.

To sum up, this study (1) provides robust evidence for the positive impact of small business development grants aimed exclusively at women entrepreneurs, (2) shows that such a grant scheme designed to nudge women entrepreneurs is particularly effective for mature women entrepreneurs, and (3) shows that the benefits of such a grant scheme clearly outweigh the costs.

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Appendix

Table A1 **Women Entrepreneurship Grant Scheme(s) Description**			
Grant scheme name	Subsidized activities	Minimum conditions	Min. and max. amounts
Women entrepreneurship 2008; 2009; 2010; 2011; 2012	Co-financing the business plan development, consulting services, documentation for bank loans, entrepreneurial training (apart from study costs), business registration costs, purchasing equipment, tools, inventory, and protective equipment, babysitting costs, kindergarten costs, child educator costs or extended school stay costs for the period of one year.	Firms in bankruptcy or liquidation procedure and those with unpaid debts towards the state or employees are not eligible. Surplus in previous year (turnover higher than costs). Headquarters in the Republic of Croatia. At least 1 full-time employee (including the owner). If the firm received the grant before – a statement of funds spent as planned in the previous year.	The support intensity is up to 75% of project costs (VAT excluded). Min. amount was set at 673 EUR from 2009 onwards (there was no min. amount in 2008) and max. amount at 10,768 EUR. In 2012 min. amount was set at 6,732 EUR and max. amount at 20,190 EUR with 100% support intensity (VAT excluded).

Note: All monetary variables are expressed in EUR. 1 EUR ~ 7.42 Croatian kuna (HRK).
Source: Authors based on OPPMSP (2008; 2009; 2010; 2011) and MINPO (2012; 2013).

Table A2 **Women Entrepreneurship Grant Scheme(s) Descriptive Statistics**

(a) Overall

Year	All grants					Final sample				
	Grants	Amount	Mean (S. d.)	Min.	Max.	Grants	Amount	Mean (S. d.)	Min.	Max.
2008	526	571,539	1,087 (776)	296	5,385	217	230,764	1,063 (704)	296	5,385
2009	98	226,254	2,309 (1,476)	673	6,058	23	52,504	2,283 (1,311)	673	6,058
2010	305	416,953	1,367 (1,245)	673	10,770	117	164,445	1,405 (1,359)	673	10,770
2011	331	438,232	1,324 (1,076)	673	6,731	127	150,645	1,186 (794)	673	6,731
2012	24	448,553	18,691 (2,986)	9,932	20,194	11	202,648	18,424 (3,917)	9,932	20,194
Total	1,284	2,100,876	-	-	-	495	800,989	-	-	-

(b) By Women Age (Final sample only)

Year	Women age below or equal to 40					Women age above 40				
	Grants	Amount	Mean (S. d.)	Min.	Max.	Grants	Amount	Mean (S. d.)	Min.	Max.
2008	89	93,315	1,048 (622)	296	4,043	128	137,682	1,076 (759)	377	5,391
2009	8	19,272	2,409 (1,165)	674	4,043	15	33,288	2,219 (1,419)	674	5,526
2010	35	39,825	1,138 (745)	674	4,043	82	124,798	1,522 (1,540)	674	10,782
2011	37	43,935	1,187 (940)	674	5,391	90	106,873	1,187 (733)	674	4,717
2012	4	71,765	17,941 (4,549)	11,119	20,216	7	131,102	18,729 (3,875)	9,943	20,216
Total	173	268,113	-	-	-	322	533,743	-	-	-

Note: All monetary variables are expressed in EUR. 1 EUR ~ 7.42 Croatian kuna (HRK).
Source: Authors based on OPPMSP (2008; 2009; 2010; 2011) and MINPO (2012; 2013).

Table A3 **Balance of Covariates Used in Analysis (Common Support Applies After Matching)**

Variable	Before matching			After matching			
	Control	Treated	St. bias (%)	Control	Treated	St. bias (%)	% of reduction in standardized bias
	Mean (S. d.)	Mean (S. d.)		Mean (S. d.)	Mean (S. d.)		
	(*n* * *T* = 18,734)	(*n* = 484)		(*n* = 484)	(*n* = 484)		
Firm characteristics							
Age of firm	10.05 (5.85)	9.52 (6.10)**	-8.9	9.45 (6.08)	9.52 (6.10)	1.3	85.2
Age of firm (squared)	135.36 (115.30)	127.87 (116.06)	-6.5	126.11 (119.33)	127.87 (116.06)	1.5	76.5
Ownership[a]							
State	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]
Private	0.99 (0.07)	0.99 (0.05)	4.6	0.99 (0.08)	0.99 (0.05)	7.1	-53.9[c]
Other	0.01 (0.07)	0.01 (0.05)	-4.6	0.01 (0.08)	0.01 (0.05)	-7.1	-53.9[c]
Industry sectors[a]							
Agriculture, forestry, fishing, mining	0.01 (0.12)	0.01 (0.06)*	-10.5	0.01 (0.05)	0.01 (0.06)	2.2	79.3
High-tech manufacturing	0.01 (0.08)	0.01 (0.10)	4.9	0.01 (0.12)	0.01 (0.10)	-4.6	6.2
Mid high-tech manufacturing	0.01 (0.11)	0.01 (0.11)	0.2	0.01 (0.08)	0.01 (0.11)	5.6	-2,638.9[c]
Mid low-tech manufacturing	0.03 (0.18)	0.03 (0.18)	-0.2	0.03 (0.17)	0.03 (0.18)	1.2	-579.8[c]
Low-tech manufacturing	0.05 (0.22)	0.09 (0.28)***	13.7	0.07 (0.26)	0.09 (0.28)	5.7	58.3
Energy	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]
Construction	0.05 (0.22)	0.04 (0.20)	-5.5	0.04 (0.20)	0.04 (0.20)	-1.0	82.4
High-tech KIS[d]	0.02 (0.15)	0.02 (0.16)	1.5	0.02 (0.16)	0.02 (0.16)	0.0	100.0
Other KIS	0.30 (0.46)	0.45 (0.50)***	31.6	0.45 (0.50)	0.45 (0.50)	1.3	95.9
LKIS[d]	0.50 (0.50)	0.33 (0.47)***	-35.2	0.36 (0.48)	0.33 (0.47)	-5.1	85.5
Regions[a]							
Continental	0.65 (0.48)	0.72 (0.45)***	14.0	0.71 (0.46)	0.72 (0.45)	2.2	84.0
Adriatic	0.35 (0.48)	0.28 (0.45)***	-14.0	0.29 (0.46)	0.28 (0.45)	-2.2	84.0
Firm size[a]							
Micro	0.82 (0.39)	0.80 (0.40)	-5.3	0.80 (0.40)	0.80 (0.40)	-0.5	90.1
Small	0.18 (0.39)	0.20 (0.40)	5.3	0.20 (0.40)	0.20 (0.40)	0.5	90.1
International exposure[a]							
Exporter only	0.74 (0.44)	0.69 (0.46)**	-9.8	0.70 (0.46)	0.69 (0.46)	-0.5	95.3
Importer only	0.08 (0.26)	0.08 (0.27)	1.1	0.08 (0.27)	0.08 (0.27)	-0.8	31.9
Exporter and importer	0.11 (0.32)	0.12 (0.33)	2.2	0.13 (0.33)	0.12 (0.33)	-1.9	12.0
Domestic market only	0.07 (0.26)	0.11 (0.31)***	11.9	0.10 (0.30)	0.11 (0.31)	3.6	69.6
Team members[a]							
One team member	0.58 (0.49)	0.35 (0.48)***	-47.0	0.34 (0.47)	0.35 (0.48)	3.0	93.7
Two team members	0.31 (0.46)	0.33 (0.47)	5.4	0.32 (0.47)	0.33 (0.47)	2.2	59.1

Three or more team members	0.11 (0.31)	0.31 (0.46)***	51.1	0.34 (0.47)	0.31 (0.46)	-6.3	87.8
Gender ownership combination[a]							
Women only	0.72 (0.45)	0.59 (0.49)***	-26.4	0.59 (0.49)	0.59 (0.49)	1.3	95.0
Men and women	0.28 (0.45)	0.41 (0.49)***	26.4	0.41 (0.49)	0.41 (0.49)	-1.3	95.0
Firm performance characteristics							
ln(number of employees)	1.62 (0.77)	1.71 (0.73)**	11.8	1.69 (0.82)	1.71 (0.73)	1.7	86.0
ln(real average wage)	10.66 (0.65)	10.61 (0.75)	-7.0	10.66 (0.77)	10.61 (0.75)	-7.2	-3.2[c]
ln(real capital)	10.96 (3.75)	11.12 (3.47)	4.4	11.02 (4.04)	11.12 (3.47)	2.8	35.5
Fixed intangible assets dummy	0.23 (0.42)	0.32 (0.47)***	20.5	0.33 (0.47)	0.32 (0.47)	-3.7	81.8
ln(real cash reserves)	10.15 (2.68)	10.39 (2.26)*	9.5	10.4 (2.53)	10.39 (2.26)	-0.3	97.3
Debt ratio	0.61 (0.30)	0.59 (0.25)	-7.1	0.59 (0.26)	0.59 (0.25)	0.3	95.3
Debt ratio (squared)	0.46 (0.38)	0.41 (0.30)***	-14.4	0.41 (0.3)	0.41 (0.30)	-1.2	91.7
ln(real liabilities towards banks)	5.95 (6.28)	7.14 (6.24)***	19.0	7.40 (6.27)	7.14 (6.24)	-4.1	78.2
ln(real turnover)	13.85 (1.53)	13.88 (1.47)	1.9	13.89 (1.68)	13.88 (1.47)	-0.8	57.3
ln(real intermediate costs)	13.13 (1.91)	13.01 (1.93)	-6.6	13.05 (2.03)	13.01 (1.93)	-2.3	65.2
Export-to-turnover ratio	0.05 (0.18)	0.05 (0.18)	0.2	0.05 (0.18)	0.05 (0.18)	-2.2	-908.5[c]
Import-to-turnover ratio	0.06 (0.17)	0.05 (0.15)	-2.4	0.05 (0.14)	0.05 (0.15)	1.1	54.2
ln(real value added)	13.78 (1.54)	13.82 (1.47)	2.2	13.85 (1.66)	13.82 (1.47)	-2.1	4.4
ln(total factor productivity)	11.94 (1.29)	11.80 (1.20)**	-11.2	11.83 (1.31)	11.80 (1.20)	-1.9	83.2
Entrepreneur (owner) characteristics							
Entrepreneur age	44.85 (7.90)	42.93 (7.37)***	-25.1	43.10 (7.35)	42.93 (7.37)	-2.2	91.1
Entrepreneur age (squared)	2,074.05 (702.86)	1,897.61 (629.44)***	-26.4	1,911.93 (628.17)	1,897.61 (629.44)	-2.1	91.9
Number of children	0.70 (0.99)	0.73 (0.95)	3.5	0.71 (1.07)	0.73 (0.95)	2.1	38.4
Total work experience (years)	1.78 (0.98)	1.84 (0.91)	7.1	1.89 (0.88)	1.84 (0.91)	-4.5	35.8
Total unemployment (years)	0.18 (0.44)	0.19 (0.43)	1.7	0.18 (0.44)	0.19 (0.43)	2.1	-22.7[c]
Previous employment in the same sector dummy	0.53 (0.5)	0.57 (0.50)*	8.2	0.55 (0.50)	0.57 (0.50)	3.7	54.2
Number of different employers	1.41 (1.26)	1.55 (1.45)**	10.3	1.54 (1.21)	1.55 (1.45)	0.9	91.1
Year							
2008	0.24 (0.43)	0.45 (0.50)***	44.3	0.45 (0.50)	0.45 (0.50)	-0.4	99.0
2009	0.22 (0.41)	0.05 (0.21)***	-52.1	0.04 (0.20)	0.05 (0.21)	1.9	96.4
2010	0.26 (0.44)	0.24 (0.43)	-5.2	0.25 (0.43)	0.24 (0.43)	-1.4	72.8
2011	0.27 (0.45)	0.26 (0.44)	-2.6	0.26 (0.44)	0.26 (0.44)	0.5	81.9

*Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. [a] Difference in categorical variables was tested using the χ^2 test. [b] Not at all or after cleaning not in the sample. [c] Denotes the cases where the standardized bias increases; however, in all these cases the initial difference in means between treated and non-treated units is insignificant. Percentage reduction in standardized bias is computed as* $\left(1-\frac{|st.\ bias\ after\ matching|}{|st.\ bias\ before\ matching|}\right)\times 100$. *[d] KIS and LKIS denote knowledge-intensive services and less knowledge-intensive services.*

Table A4 **Results of the Probit Model**		
Variable[a]	**Estimated coefficients**	**Standard error**
Age of firm	-0.033**	(0.015)
Age of firm (squared)	0.002**	(0.001)
ln(number of employees)	-0.024	(0.066)
ln(real average wage)	-0.200***	(0.043)
ln(real capital)	-0.011	(0.008)
Fixed intangible assets dummy	0.165***	(0.048)
ln(real cash reserves)	0.010	(0.010)
Debt ratio	1.655***	(0.326)
Debt ratio (squared)	-1.467***	(0.262)
ln(real liabilities towards banks)	0.010**	(0.004)
ln(real turnover)	0.130	(0.080)
ln(real intermediate costs)	-0.089***	(0.032)
Export-to-turnover ratio	-0.066	(0.136)
Import-to-turnover ratio	-0.133	(0.164)
ln(real value added)	0.155*	(0.090)
ln(total factor productivity)	-0.155***	(0.056)
Entrepreneur age	0.016	(0.025)
Entrepreneur age (squared)	-0.000	(0.000)
Number of children	0.028	(0.021)
Previous employment in the same sector dummy	0.038	(0.049)
ln(total work experience (years))	0.080***	(0.029)
ln(total unemployment (years))	0.002	(0.052)
Number of different employers	-0.007	(0.020)
N	20,392[b]	
McFadden pseudo R^2	0.144	

*Notes: * p < 0.1; ** p < 0.05; *** p < 0.01, two-sided p values, mean variance inflation factor (VIF) is 10.86 (as mentioned in the text, we do not interpret the significance of the coefficients, we simply use the estimated probability score). [a] In this model we also control for effects of years, ownership, region, sector, size, trade exposure, gender, and team. However, for the sake of brevity and presentation purposes, these results are available on request. [b] There is a difference between the number of observations in Table A4 (20,392) and the number of observations in Table A3 (18,734 + 484 = 19,218), because we remove some observations after probit estimations, as they do not have common support.*

Table A5 **Results of Placebo Test for the Baseline Model**

Outcome variables	ATT (S. e.)				
	$t+1$	$t+2$	$t+3$	$t+4$	$t+5$
Firm survival					
Active on the market	0.004 (0.008)	0.012 (0.011)	-0.002 (0.015)	0.002 (0.018)	0.014 (0.020)
Output growth					
ln sales (turnover)	-0.029 (0.049)	-0.067 (0.064)	-0.019 (0.071)	0.001 (0.078)	0.039 (0.075)
ln value added	-0.052 (0.048)	-0.080 (0.071)	-0.038 (0.073)	-0.033 (0.077)	0.003 (0.070)
Labor inputs growth					
ln employees	0.010 (0.023)	0.007 (0.028)	0.026 (0.034)	0.076 (0.066)	0.080 (0.059)
Capital inputs growth					
ln capital	0.057 (0.162)	0.095 (0.185)	0.010 (0.206)	0.181 (0.226)	0.515 (0.432)
ln bank loans	0.047 (0.351)	-0.148 (0.399)	-0.553 (0.499)	-0.664 (0.543)	-0.473 (0.446)
Intermediate inputs growth					
ln intermediate input costs	-0.067 (0.065)	-0.107 (0.099)	-0.127 (0.107)	-0.112 (0.090)	-0.035 (0.090)
Productivity growth					
ln TFP	-0.048 (0.057)	-0.075 (0.066)	-0.055 (0.073)	-0.071 (0.074)	-0.051 (0.064)
ln labor productivity (value added)	-0.055 (0.056)	-0.079 (0.063)	-0.073 (0.070)	-0.079 (0.070)	-0.049 (0.062)

*Notes: $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, one-sided p values. Standard errors (s. e.) are based on Abadie and Imbens (2008). Balancing property after matching is satisfied. We do not report this for brevity, but the results are available on request.*

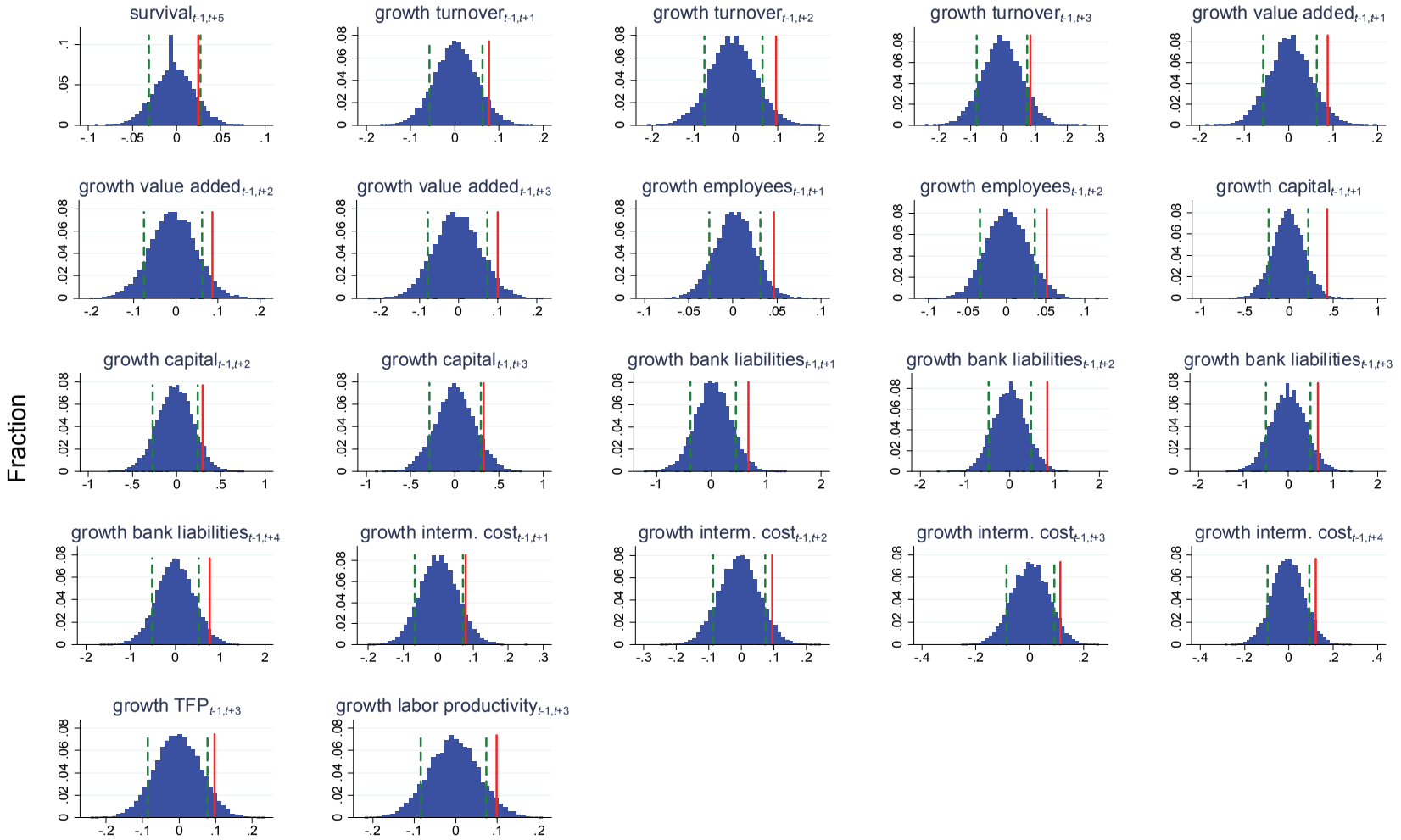
Table A6 **Result Comparison between Baseline Model and Other Matching Algorithms**

Variables	NN (1) Baseline	NN (2)	NN (3)	NN (4)	NN (2) Caliper	NN (3) Caliper	NN (4) Caliper	Radius Caliper	Kernel Epan.	LLR Epan.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm survival										
ln $t+1$	-0.008	-0.004	-0.005	-0.005	-0.004	-0.005	-0.005	-0.005	-0.003	-0.005
ln $t+2$	-0.008	-0.001	-0.001	0.002	-0.001	-0.001	0.002	0.004	0.010	0.006
ln $t+3$	0.010	0.010	0.011	0.010	0.010	0.011	0.010	0.012	0.019**	0.013
ln $t+4$	0.017	0.018	0.021*	0.021*	0.018	0.022*	0.021*	0.021**	0.031***	0.023*
ln $t+5$	0.025*	0.033**	0.034**	0.035**	0.033**	0.034**	0.035**	0.035***	0.046***	0.037**
Output growth										
ln sales at $t+1$	0.077**	0.047	0.072**	0.075**	0.039	0.064**	0.069**	0.062**	0.093***	0.075*
ln sales at $t+2$	0.097*	0.074*	0.087**	0.096**	0.064	0.077**	0.087**	0.061*	0.085**	0.073
ln sales at $t+3$	0.085*	0.080*	0.127***	0.114***	0.069*	0.115***	0.104***	0.098***	0.127***	0.111*
ln sales at $t+4$	0.058	0.057	0.087**	0.077*	0.044	0.075*	0.065*	0.087**	0.111***	0.102*
ln sales at $t+5$	-0.049	-0.019	0.004	0.007	-0.031	-0.009	-0.004	0.026	0.049	0.042
ln value added at $t+1$	0.088**	0.056*	0.074**	0.07**	0.047	0.065**	0.062**	0.059**	0.086***	0.072*
ln value added at $t+2$	0.087*	0.063*	0.085**	0.087**	0.053	0.074**	0.078**	0.055*	0.077**	0.067
ln value added at $t+3$	0.100*	0.096**	0.130***	0.118***	0.084*	0.118***	0.108***	0.086**	0.111***	0.097*
ln value added at $t+4$	0.066	0.068	0.082*	0.064	0.057	0.071*	0.054	0.080**	0.102***	0.092
ln value added at $t+5$	-0.011	0.008	0.023	0.023	-0.005	0.010	0.012	0.049	0.070*	0.065
Labor inputs growth										
ln employees at $t+1$	0.047**	0.053***	0.055***	0.056***	0.052***	0.054***	0.056***	0.051***	0.056***	0.051**
ln employees at $t+2$	0.051**	0.061***	0.068***	0.073***	0.058***	0.064***	0.071***	0.066***	0.072***	0.069***
ln employees at $t+3$	0.029	0.043*	0.054**	0.052**	0.040*	0.051**	0.050**	0.051***	0.058***	0.055**
ln employees at $t+4$	-0.008	0.031	0.026	0.022	0.027	0.022	0.019	0.026	0.033*	0.033
ln employees at $t+5$	-0.009	0.017	0.016	0.013	0.011	0.011	0.008	0.019	0.030	0.033
Capital inputs growth										
ln capital at $t+1$	0.431***	0.381***	0.402***	0.404***	0.368***	0.393***	0.400***	0.388***	0.444***	0.409***
ln capital at $t+2$	0.293*	0.258*	0.245*	0.251*	0.240*	0.229*	0.241*	0.261**	0.329**	0.282*
ln capital at $t+3$	0.329*	0.235	0.245*	0.204	0.221	0.224	0.187	0.235*	0.309**	0.265
ln capital at $t+4$	0.199	0.163	0.214	0.156	0.152	0.199	0.145	0.238*	0.324**	0.281

ln capital at $t+5$	-0.161	-0.021	0.084	0.080	-0.013	0.100	0.102	0.233*	0.300**	0.252
ln bank loans at $t+1$	0.674**	0.743**	0.752***	0.711***	0.777***	0.787***	0.745***	0.889***	0.664***	0.821**
ln bank loans at $t+2$	0.832**	0.807**	0.788***	0.734**	0.845***	0.827***	0.773***	0.941***	0.748***	0.904**
ln bank loans at $t+3$	0.673*	0.570*	0.615**	0.551*	0.578*	0.623**	0.557*	0.635**	0.422*	0.603*
ln bank loans at $t+4$	0.769**	0.539*	0.585*	0.606*	0.525*	0.538*	0.567*	0.479*	0.300	0.484
ln bank loans at $t+5$	0.441	0.262	0.264	0.308	0.315	0.286	0.323	0.307	0.081	0.257
Intermediate inputs growth										
ln intermediate input costs at $t+1$	0.079*	0.016	0.058	0.072*	-0.009	0.034	0.047	0.038	0.097***	0.077*
ln intermediate input costs at $t+2$	0.095*	0.024	0.067	0.076*	0.005	0.045	0.053	0.025	0.083**	0.062
ln intermediate input costs at $t+3$	0.113*	0.033	0.100*	0.104**	0.010	0.073*	0.076*	0.047	0.107**	0.083
ln intermediate input costs at $t+4$	0.120*	0.044	0.100*	0.088*	0.013	0.069	0.057	0.067*	0.130***	0.108
ln intermediate input costs at $t+5$	0.034	0.009	0.044	0.038	-0.008	0.021	0.012	0.027	0.081*	0.066
Productivity growth										
ln TFP at $t+1$	0.039	0.030	0.032	0.017	0.022	0.025	0.010	0.008	0.027	0.017
ln TFP at $t+2$	0.066	0.037	0.045	0.058*	0.029	0.038	0.050	0.030	0.043	0.037
ln TFP at $t+3$	0.097*	0.077*	0.097**	0.086**	0.068*	0.088**	0.078**	0.062**	0.082***	0.068
ln TFP at $t+4$	0.057	0.022	0.059	0.066*	0.014	0.053	0.060*	0.078**	0.086***	0.079
ln TFP at $t+5$	-0.006	-0.018	0.012	0.022	-0.027	0.003	0.014	0.037	0.046	0.038
ln labor productivity (va) at $t+1$	0.045	0.032	0.034	0.018	0.024	0.027	0.011	0.006	0.027	0.016
ln labor productivity (va) at $t+2$	0.056	0.026	0.032	0.044	0.019	0.024	0.037	0.010	0.026	0.018
ln labor productivity (va) at $t+3$	0.098**	0.074*	0.090**	0.075**	0.066*	0.082**	0.067**	0.048*	0.072**	0.056
ln labor productivity (va) at $t+4$	0.070	0.034	0.072*	0.078**	0.027	0.065*	0.072*	0.085***	0.097***	0.088*
ln labor productivity (va) at $t+5$	-0.002	-0.009	0.026	0.038	-0.017	0.019	0.032	0.043	0.056*	0.046

Notes: Column 1 presents our baseline results. Columns 2 to 4 use nearest neighbor matching with 2, 3, and 4 control firms for each treated firm. Columns 5, 6, and 7 perform nearest neighbor matching using 2, 3, and 4 control firms for each treated firm within a caliper defined as 10% of the standard deviation of the estimated propensity score. Column 8 performs radius matching within the same caliper. Columns 9 and 10 use kernel matching and local linear regression matching using the Epanechnikov kernel and bandwidth of 0.06.
*$p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, one-sided p values. Standard errors are based on Abadie and Imbens (2008), but are omitted to conserve space. They are available on request.*

Figure A1 **Empirical ATT Distribution of Placebo Test with 10,000 Replications**



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