Overdraft Facility Policy and Firm Performance

An Empirical Analysis in Eastern European Union Industrial Firms

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Abstract

This article evaluates the effect of the overdraft facility (or line of credit) policy by comparing a large sample of overdraft facilitated firms and matched non-overdraft facilitated firms from Eastern Europe at the sector level. The sample firms are compared with respect to rates of different performance indicators including: technical efficiency (a Data Envelopment Analysis approach is applied to estimate the technical efficiency level

for individual sectors), production workers trained, expenditures on research and development, and export activity. In order to avoid the selectivity problem, propensity score matching methodologies are adopted. The results suggest that a certain level of overdraft facility provided to firms would be needed to stimulate investment in research and development, which will eventually result in increased growth in productivity.

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**Overdraft Facility Policy and Firm Performance:
An Empirical Analysis in Eastern European Union Industrial firms¹**

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Overdraft Facility Policy, Propensity Score Matching, Technical Efficiency, Data Envelopment Analysis (DEA), Bootstrapping.

JEL Classifications

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1 Introduction

The overdraft facility² policy from private financial institutions provides financial support to increase firms' accessibility to private financing sources. However, according the IMF (2005) the overdraft facility policy has often been criticized for its negative effects by impairing the development of an innovative private financial sector and for making firm highly dependent on government support policy measures. Even though there have been some qualitative remarks on the effectiveness of the policy, an evaluation of the overdraft facility policy has not been conducted systematically in terms of methodology and data, especially in Eastern European Union Industrial firms. This study aims to fill the gap in the existing literatures.

In this work, we evaluate the effect of the overdraft facility policy in terms of human capital (production workers trained), technological capital (expenditures of R&D), competitiveness (sales export level) and the firm's technical efficiency in the Eastern European Union Industrial firms, by comparing overdraft facilitated firms and non- overdraft facilitated firms. The amount of funds allocated to the overdraft facility policy is huge and the number of targeted firms is large. Therefore, we need to investigate its effectiveness and to provide background information for further evolution of the policy.

This work utilizes an original dataset that covers manufacturing firms in 11 Eastern European countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovak Republic, and Slovenia). Moreover, we analyze the effectiveness of the overdraft facility in four industrial sectors (Beverages, Food, Garments, and Metals and machinery).

Methodologically, reliable policy evaluation should solve the 'selectivity' problem. According to Muthen and Jöreskog (1983), selectivity problems can occur whenever one tries to estimate population parameters from a nonrandom sample. The sample may be nonrandom because only firms with certain characteristics are selected into the sample (sample selection), or because firms participate voluntarily in the sample (self-selection). Selective samples can also occur because firms fall out of the sample for various reasons, despite an initial random sample (attrition). According to Jaffe (2002), if we cannot control the selectivity problem, we might over- or under-estimate the true effects of the policy.

In order to deal with the selectivity issue, we adopt propensity score matching estimators, which have recently been applied to firm-level studies (Yasar and Rejesus 2005; Loof and Heshmati 2005; Oh et al. 2009). Propensity score matching was chosen because: (i) it reduces (although does not eliminate) selection biases, (ii) it reduces the limitation from matching on many observable variables for finite data, and (iii) it is best suited to the structure of the available data. For example, because baseline data was not collected at the outset of the program and detailed secondary source data were not available to construct an appropriate baseline, evaluation techniques such as difference-in-difference, which would have removed non-observable biases between the treatment and control groups, could not be utilized. The difference-in-difference compares the difference between the treatment and control groups before (first difference) and

² An overdraft facility is defined as a flexible account that allows firms to draw upon in the event their account balance becomes negative.

after the program (second difference)³. See Ravallion (2009) for a discussion of commonly used evaluation techniques⁴.

This study is organized as follows. The following section introduces the economic environment of the Eastern European Union Industrial firms and the existing overdraft facility policy schemes. Section 3 briefly explains the methodologies of Data Envelopment Analysis (DEA) Frontiers (with Bootstrap procedure) and propensity score matching. Section 4 describes the data and it presents the key descriptive statistics. The empirical results are discussed in Sect. 5. The final section summarizes and concludes this study.

2 Background

2.1 The Eastern European Union Companies

The EU enlargement to 27 countries in 2004 and 2007 constitutes a historical benchmark in the forming of the European space. In contrast to previous enlargements, the entering of Eastern European countries has peculiar characteristics due to the large number of nations entering the EU and due to the heterogeneity in its parameters and levels of development (Hay, 2003: 13).

Although the Eastern European countries have the common trait of their recent history linked to the Soviet Union and the fall of the Berlin Wall, their entry into the European club required the compliance of three conditions: democratic institutions, a market economy capable of insertion in a competitive world and the capacity to take on the Union's goals. These conditions were an important impulse to leave that common trait behind and, to a certain extent, have allowed differentiating the strengths and weaknesses of each country.

On the other hand, one must emphasize that this important enlargement in terms of numbers did not maintain a proportional relation with its economic relevance. Comparing the UE15 (2004) and taking into account data of that year, the contribution in population of the Eastern European nations is of about 100 million inhabitants, which translated into a 28% increase in the EU population whereas in added terms, the increase in GDP was of nearly 7%, emphasizing Poland's contribution of 42.7% of that value (Alcalá, 2004: 144).

In terms of rent per capita, the set of the countries of Eastern Europe was placed in 2004 in 4,380 Euros (current exchange rates) and 9,100 (PPP) Euros, respectively, which supposed 20% and 40% of the per capita income in the Europe of the fifteen. By countries the issue was somewhat different: in the case of Rumania the number in PPP was of 24% whereas in Hungary the per capita income was almost a 70% of the EU15. All this put into evidence the retard of these countries, but mainly the effort (with a very high degree of heterogeneity) needed to obtain the much desired real convergence of the EU27.

Another trait to consider is the characteristic of its productive structure: in the countries of the enlargement, more than 20% of the population was occupied in the agricultural sector whereas in the EU15 that percentile was of 4.8%. Among the countries one can highlight are Romania (40%), Bulgaria (28%) and Poland (26%). As far as foreign trade is concerned, the entailment of the 12 countries with the EU15 (exports and imports) approximately reached 60% of its trade balance whereas for the EU15 that value remains below 2.5% (Alcalá, 2004).

³ Randomization, was not possible either since the treatment group was not randomly selected.

⁴ Ravallion, M. (1999: "The Mystery of the Vanishing Benefits: Ms. Speedy Analyst's Introduction to Evaluation". Policy Research Working Paper 2153, World Bank, Development Economics Research Group, Washington, D.C.

In any case, the enlargement is a reality and as all integration processes, it involves benefits and costs to bear in mind. Among the benefits one can mention: the inclusion of new rules in the operation of the society and the economy that allow greater opportunities for initiatives and creativity, as well as the suppression of tariff barriers and the exploitation of scale economies that allow a suitable resource allocation.

But also the risks related to the appearance of structural deficits are present as a result of the commercial deficit, budgetary deficit of both national governments and the European Union, and deficit in the social cohesion process of the EU27 as a result of a greater number of population and regions with incomes far below the average.

At the micro level, one of the most worrisome problems—and perhaps the one that is of greater interest for our study—is the way in which the productive companies of these countries will respond (the majority of them are of recent creation and are modestly consolidated in terms of management background).

In this sense, it is interesting to analyze the behavior of companies from the point of their technical efficiency, as well as of their contribution to the value chain, which will allow shedding light on some conclusions on policy priorities, not only among the countries but among the productive sectors⁵.

The primary aim of this article is to examine the technical efficiency and its determinants in companies from the countries included in the enlargement of the EU and to know the main conditioning factors of the growth of productivity⁶.

In this context, a variety of features distinguish the business environment in sectors from those typically observed in the OECD. We will begin by mentioning the most remarkable and generally acknowledged among them, as identified by Tybout (1992):

- a) Market size (e.g. population and GDP). Although some economies are quite large, most are not. Hence, with the exception of countries such as Poland or Romania, the size of the domestic market for manufactured products is relatively limited. This means that the strategy of companies must be oriented towards the external sector and thus, must necessarily bear in mind the macroeconomic aspects that are translated through channels such as direct foreign investment, exchange rates and immigration.
- b) Access to manufactured inputs (e.g. merchandise imports and exports). The set of choices of domestically produced intermediate inputs and capital equipment is also often limited.
- c) Human capital (e.g. school enrollment, primary). Low rates of secondary education (less than 90%) and an insufficiency of technicians and scientists in countries like Hungary or Lithuania also affect the mix of goods manufactured and the factor proportions used to produce them.

⁵ A study on the experience of the start of the internal European market in 1993 (that had as one of its main objectives the increase in company efficiency) shows that during the 1987-1996 period, there has not been an increase in efficiency in the productive sectors of the Union. This paper argues that a possible cause of this stagnation is the possibility that the efficiency has a cyclic character and, therefore, the recession suffered in the beginning of the 90's could explain this situation (Esteban, Gallizo and Hernández, 2002).

⁶ In this research paper, the data of Malta and Cyprus have not been taken into consideration since they are considered as Mediterranean countries. On the contrary, data from Moldova (not in the EU) with the sole objective of homogenizing the sample of the block of countries considered as Eastern European.

- d) Infrastructure (e.g. road density). Roads, ports, airports, communication facilities, power, and safe water access also tend to be relatively limited in all countries, although they especially affect countries like Bulgaria or Moldova.
- e) Financial markets (e.g. domestic credit to private sector). Credit markets are also relatively thin in countries like Romania or Moldova.
- f) Volatility (e.g. inflation, consumer prices). Macroeconomic and relative price volatility is typically more extreme in countries like Romania or Moldova than in other economies like the Czech Republic or Lithuania⁷.
- g) Governance (e.g. procedures to enforce a contract). Red tape is also relatively high in countries like Poland or Romania, for this reason the protection of contract enforcement can be problematic⁸.

The information on the economic characteristics of the countries analyzed was taken from different World Bank publications. A synthesis is shown in Table 1.

⁷ “All developing regions do worse than the industrialized countries”, Hausmann and Gavin (1996).

⁸ “Anti-trust policy is also often weak, as are environmental standards” Brunetti (1997).

Table 1 Socio-Economic and Development Indicators by country (2005 year).

Country/ industry	Total population ¹	GDP per capita, PPP ²	Industry, value added ³	Merchandise exports ⁴	Merchandise imports ⁴	School enrollment, primary ⁵	Road density ⁶	Domestic credit private sector ⁷	Inflation, consumer prices ⁸	Procedures to enforce a contract ¹
Bulgaria	7781000	8737.161	4022807808	9932382032	14453494993	94.98052791	40.48639206	36.31128868	6.346133143	34
Czech Republic	10206923	19094.62	22018136064	68986459239	69967456060	..	165.3908879	32.61472877	2.833643175	22
Estonia	1348999	15107.31	1911966336	5932476581	8335935795	93.90955231	134.0858693	40.01893348	3.048071707	25
Hungary	10107095	16306.48	15011529728	55566718661	60538321226	89.09593776	..	45.82225836	6.780023712	21
Latvia	2312791	11885.7	2287386624	4009170454	7095505106	..	111.6262642	50.77709798	6.191878487	24
Lithuania	3435585	12967.48	4650113536	9301566446	12386991757	88.62493488	126.5650925	28.80164646	1.195219124	24
Moldova	3925170	2012.422	290329920	986255000	1773742000	92.37393608	38.73745056	21.23095682	12.5283047	37
Poland	38182200	13091.86	53077282816	75046614430	89696102001	97.51612288	..	28.14845	3.576547231	41
Romania	21684884	8977.659	15057262592	23553215092	32690617860	90.9535242	86.44217391	15.6740974	11.87686787	43
Slovak Republic	5382449	14989.53	8776060928	27744734233	29861579419	..	89.3970894	30.54339454	7.548500882	27
Slovenia	1997000	22132.83	7092050944	16361365166	17758527740	95.54712377	190.9126156	48.77266733	3.589026796	25

¹ Number.

² Constant 2005 international \$.

³ Constant 2000 US\$.

⁴ Current US\$.

⁵ % net.

⁶ Km of road per 100 sq. km of land area.

⁷ % of GDP.

⁸ Annual %.

Source: DDP Quick Query database of WDI & GDF, World Bank.

As already mentioned in the introduction, the socio-economic and development indicators for the analyzed countries reflect economies that have gone from a planned system to a mixed system, which has culminated with its incorporation into the European Union (EU). These magnitudes show the necessity of convergence with respect to the set of countries that make up the present EU, both from the nominal and the real points of view:

- 1) Firstly, in aspects related to infrastructure endowment (highway density), bureaucracy (number of procedures to sign a contract), education (incorporation of the population to primary education), with respect to the rest of the countries that form the EU.
- 2) In second place, in aspects related to the efficiency of its productive structure, in order to promote economic growth and development magnitudes (growth of the per capita gross domestic product). This second aspect is precisely the object of analysis of this paper, although the interaction between both factors is an aspect that is widely discussed in the literature on economic growth and development. In fact, another line of work with the countries of the East is related to the analysis of the convergence among these countries and the rest of the European Union (Esteban, Gallizo and Hernández, 2002).

2.2 The Overdraft Facility Policy

According Lerner (2002), firms, especially young and high-tech firms, face great difficulties in accessing the loan market due to asymmetric information which arises from the lack of public information on standardized financial statements and further growth potential. In this context Stiglitz and Weiss (1981) showed that in equilibrium a loan market might be characterized by credit rationing. In a perfect economic system, if prices do their duty, credit rationing should not exist. However, there exists residual imperfect information even after the evaluation of loan applications. Due to imperfect information and followed adverse selection and moral hazard, market failure occurs in the firms loan market and banks are more likely to demand collateral in loan contracts (Cowling 1998), and it is often difficult for firms to borrow funds, even at higher interest rates⁹.

There exist some recently published studies aimed at analyzing and evaluating overdraft facility policy schemes in various countries. In the case of the UK, Cowling and Mitchell (1997), the overdraft facility policy scheme has successfully addressed a real capital constraint for the majority of firms which applied to the scheme¹⁰.

In the case of Malaysia, Boocock and Shariff (2005) evaluated the overdraft facility policy scheme in terms of finance additionality, i.e. an increase in accessibility to loans, and economic additionality, i.e. utilizing the funds to benefit their own firms and to generate positive spillovers. These authors concluded that Malaysian overdraft facility policy schemes in general failed to satisfy financial additionality, though it showed some positive outcomes in relation to economic additionality.

Kang (2005) and IMF (2005) shared the views that the nonselective financial support of firms was one of the key sources of the sluggish firm restructuring process after the financial crisis.

⁹ Adverse selection reflects a situation in which lenders do not have sufficient information to ascertain the risk level of a loan applicant. With moral hazard, borrowers react to increases in interest rates by switching to yet riskier projects.

¹⁰ In addition, the paper also showed that firms which received loans to finance their working capital had a higher default rate compared to the firms which invested in buildings.

They argued that a too generous and non-selective guarantee provision worsened the firm market environment in two ways: the first was the effect of crowding out the private financial sector. The second and long-term negative effect was to make firms become more dependent on public support¹¹.

In the case of Korea, Lee (2006) criticized that firms with low creditability will gradually receive the overdraft facility by excessive supply. It will eventually increase the credit default ratio and hence financial difficulties for government in the end.

Using a data from a cross-section of Bulgarian firms Gatti and Love (2008) estimate the impact of access to credit, as proxied by indicators of whether firms have access to a credit line or overdraft facility, on productivity. To overcome potential omitted variable bias of Ordinary Least Squares (OLS) estimates. These authors find credit to be positively and strongly associated with TFP.

Augier, Dosis and Gasiorsek (2010) focus on the role of the business environment in understanding differences in the performance of Moroccan firms. The evidence on the relationship between credit and productivity is strongly indicative of credit resources misallocation in Morocco.

Kasseah (2011) studies the link between firm performance and firm characteristics of small and medium-sized enterprises (SMEs) in Mauritius. This author observes that the growth of SMEs in Mauritius depends mainly on access to finance and firm size. Access to finance is captured through access to overdraft facilities, line of credit and self reported measures of access to finance.

Butler and Cornaggia (2011) study the relation between access to finance and productivity. These authors exploit an exogenous shift in demand for a product to expose how producers adapt their productivity in the presence of varying levels of access to finance. These authors find that production increases the most over the sample period in areas with relatively strong access to finance.

Using a panel of Chinese manufacturing firms over the period 2001-2007, Chen and Guariglia (2011) find that, especially for illiquid firms, productivity is strongly constrained by the availability of internal finance. Furthermore, these authors find higher sensitivities of productivity to cash flow for private exporters, but lower sensitivities for foreign exporters.

Finally, Clarke, Cullb and Kisunkoc (2012) study how country and firm characteristics affected firms' financial constraints and their likelihood of survival during the early phase of the recent global financial crisis in Eastern Europe and Central Asia (ECA). These authors find that financial constraints during the crisis were less severe in countries with well-established foreign banks, and that changes in the severity of financial constraints were more pronounced for large firms than others during the crisis. Controlling for other relevant characteristics, firms were more likely to survive the crisis if they had access to external credit.

¹¹ The survival of uncompetitive firms with the help of government support might result in a decrease in market share and the profits of competitive firms. Thus, uncompetitive firms might replace competitive ones with overdraft facility policy.

3 Methodology

Not much quantitative research has been conducted referring to the effectiveness of the overdraft facility policy, mainly due to the unavailability of consistent data and an appropriate methodological framework.

Although there is no consensus among researchers regarding the way to establish the process to evaluate the influence of environmental variables on service efficiency levels, in this paper we have attempted to detect the repercussion of certain exogenous factors on the said efficiency levels by using a two-stage process made up of the following steps:

- 1) Obtaining the Charnes, Cooper and Rhodes (CCR) efficiency index. In order to calculate efficiency, the behavior of each unit observed is optimized, thus determining the efficient production frontier by means of linear segments based on the Decision Making Units (DMUs) that operate with the best practices. This corresponds to the set of units considered efficient in Pareto's terms. Therefore, the only requirement established is that each DMU should belong to the frontier envelopment (Cooper et al. 2001: 3).
- 2) Using re-sampling methods and bootstrapping techniques. Though there is currently information available on statistical inference with a reasonable level of certainty, as a result of advancement in the development of bootstrap techniques (Simar and Wilson 2000), we have opted for the traditional application of determinist mathematical models, and as a complement to them, we have used the re-sampling methods and bootstrapping techniques, in accordance with the contribution by Simar and Wilson (1998)¹². The rationale behind bootstrapping is to simulate a true sampling distribution by mimicking the data-generating process, and the results throughout this paper were obtained from 2,000 bootstrap iterations.
- 3) Assessment of overdraft facility policy impact using Propensity Score Matching (PSM). The PSM was selected as the most suitable methodology to conduct the overdraft facility policy impact evaluation. The objective of the matching is to construct treatment and control groups that are as similar as possible, so that the control group would resemble what would have happened to the beneficiaries in the absence of overdraft facility policy (Rosenbaum and Rubin, 1983). The PSM estimation strategy requires multiple steps: (i) estimation of the propensity score, in terms of probability to have overdraft facility given observable variables, (ii) the review of overlap and common support conditions (i.e. which firms are matched) and (iii) assessing matching quality.

3.1 Data Envelopment Analysis (DEA) Frontiers and Bootstrap Procedure

According to Leibenstein (1966), a company can be categorized as technically efficient if it is able to produce maximum output given available resources. It has been acknowledged in the literature that a gap normally exists between a firm's actual and potential levels of economic performance¹³. Efficiency will be defined herein as the activity which produces maximum

¹² Simar and Wilson noted that the DEA efficiency estimates are biased and serially correlated, which invalidates conventional inferences from the two-stage approaches. In this context, the authors proposed a procedure, based on a double bootstrap, that enables consistent inference within models explaining efficiency scores simultaneously producing standard errors and confidence intervals for these efficiency scores.

¹³ To better illustrate the relation existent between added growth of the productivity and the evidence at the company and sector levels, see Foster, Haltiwagner and Krizan (1998).

production given a certain set of resources, or in other words, the action which consumes the least possible volume of resources in order to achieve a certain volume of production.

According Farrell's contribution (1957), this paper focuses on technical efficiency, which measures total production volume produced with allocated productive resources. In this context, Data envelopment analysis (DEA) will be used to estimate the above components¹⁴. The essence of this technique lies in the definition of an efficient frontier as a point of reference for evaluating the variations observed in the performance of different production units (countries in this case)¹⁵. The DEA method does not create assumptions about functional forms, being a non-parametric performance evaluation approach; however, it does allow different inputs and outputs to be incorporated, something that is essential to the aims of the present study and the principal justification for its employment.

One of the major advantages of dea is that it can be used to work with multiple inputs and outputs that have different units, while it does not create a need to consider full employment of production factors or require explicit functional forms. As for the drawbacks, the method is sensitive to measurement errors (the reference points are highly productive) and does not permit easy application of statistical tests, and relative rather than absolute inefficiencies are identified. To minimise these limitations we use Bootstrap Techniques to analyze the sensitivity of efficiency scores relative to the sampling variations of the estimated frontier.

The original DEA estimator proposed by Charnes, Cooper and Rhodes (1978), referred to as the CCR formulation, allows the efficiency of any Decision Making Unit (DMU) to be measured from the maximization of a ratio of weighted outputs with respect to weighted inputs, subject to the restriction that similar ratios for the rest of the DMUs are less than or equal to the unit. More precisely, the linear calculation program would be:

$$\min \theta_0$$

Subject to:

$$\begin{aligned} \sum_{j=1}^n y_{rj} \lambda_j &\geq y_{ro}; \quad r = 1, \dots, s \\ \theta_0 x_{io} - \sum_{j=1}^n x_{ij} \lambda_j &\geq 0; \quad i = 1, \dots, m \\ \lambda_j &\geq 0 \end{aligned}$$

¹⁴ Coelli, T. J., Rao, P., O'Donnell, C. J., and Battese, G. E. (2005) give a detailed presentation of this technique and an excellent review of the concepts of productivity and efficiency.

¹⁵ In other words, the starting assumption when applying this technique in the case before us is that all the countries in the sample ought to be able to function at an optimal level of efficiency, determined by the efficient countries included therein. In the specialist literature, these efficient countries are called "peer countries" and are the ones that determine the efficiency frontier, so that the distance to the efficient frontier represents the measure of efficiency or the lack thereof.

This program calculates a virtual unit as a linear combination, where λ_j represents all the weighted units evaluated, and obtains an identical or greater number of outputs with a smaller number of inputs than the unit being evaluated. If it is not possible to find a virtual unit that obtains the same outputs with a smaller number of inputs, the unit is efficient and is situated on the frontier. θ represents the factor that weighs all the inputs, and takes values between 0 and 1. Efficient DMUs will have $\theta = 1$, which means that it is not possible to reduce the number of inputs used to produce an identical level of outputs.

The measurement of technical efficiency calculated by the Banker, Charnes and Cooper (1984) formulation makes it possible to find out whether there is proper use of resources in relation with the production of goods or services of the DMU analyzed. As for scale efficiency, it is equal to the quotient of BCC efficiency and CCR efficiency, and provides a measurement of the distance from the analyzed DMU to a virtual DMU that operates with the most productive scale size (MPSS). For this purpose, these authors propose the existence of a single difference between the envelopment of the BCC and the CCR formulations: the inclusion of the restriction of convexity

(relating to the DMU k): $\sum_{j=1}^n \lambda_{jk} = 1$.

Finally, the procedure applied in this study follows Simar and Wilson (2007). It consists of the following steps: (a) standard DEA efficiency point estimates are calculated, (b) Truncated maximum likelihood estimation is used to regress the efficiency scores against a set of explanatory variables, (c) these estimates are then integrated into a bootstrap procedure that is similar to the smoothed bootstrap procedure of Simar and Wilson (2000). This bootstrap procedure allows correcting for bias, and (d) the bias corrected scores produced by the preceding bootstrap are used in a parametric bootstrap on the truncated maximum likelihood, thus creating standard errors for the parameters of the regression. Confidence intervals are then constructed for the regression parameters as well as for the efficiency scores.

3.2 Propensity Score Matching (PSM)

Since Rubin (1974), the effect of a program is defined as a created value added by participating in a program. In this regard, the effect of a program can be defined as ‘what would have happened to those who, in fact, did receive treatment, if they had not received treatment?’. Hence, mere comparison between supported firm groups and non-supported firm groups cannot identify the exact additional effect of the support program, since their characteristics before participation in the supporting program were different already, which is also generally referred as the selection bias. The concept of effect of a program defined by the additional value added should, thus, be based on the appropriate construction of a counterfactual.

Modern evaluation methods are focused on estimating this counterfactual (Blundell and Costa Dias, 2000). Given the counterfactual problems, the most appropriate measure of the effectiveness of government support might be a comparison of the performances of two firms with the same characteristics, assuming that one received support and the other did not. However, it is hard to find appropriate comparison groups, which can represent the non-supported firms in evaluating the program.

In this study we apply the PSM methodology, which allows us to construct a comparison group by matching twin firms based on the propensity score in the population of unsupported firm

groups. With this approach, we expect to solve the selection bias problem and to compare the factual and the counterfactual to estimate the sole outcome from the program.

PSM methodology was first introduced by Rosenbaum and Rubin (1983). The concept of PSM requires fulfillment of the conditional independence assumption (CIA). It means that conditioned on the observable characteristics (X variables) of possible participants, the decision for participation in the program should be independent of the outcome measures. CIA in this respect can be written as following:

$$(Y_0, Y_1) \perp T | X \quad [1]$$

where $\perp$ denotes independence, Y_1 means the outcome of the supported firm and Y_0 denotes the outcome of the unsupported firm. T is an indicator variable denoting participation in the program. Another required assumption is that the probability to participate in the program for program group and comparison group should lie in the same domain, which is called the common support assumption.

If these assumptions are satisfied and when there exist a sufficient number of observable variables related to the characteristics of participants in a program, it is theoretically possible to obtain an unbiased estimation of the effect of a program. Propensity score indicates a conditional probability of applicants to participate in a program when observable characteristics of applicants are given. In other words,

$$\text{Propensity score} = P(X) = \Pr(T = 1 | X) \quad [2]$$

Rosenbaum and Rubin (1983) proved that under CIA and the common support assumption, with propensity score defined as [2], all biases due to observable variables can be removed by conditioning solely on the propensity score:

$$(Y_0, Y_1) \perp T | P(X) \quad [3]$$

Based on [3], for a population of units denoted by i , we can define the policy effect, which is defined as the difference between real and counterfactual outcomes, as the average effect of treatment on the treated (ATT) as follows:

$$\begin{aligned} ATT &= E\{Y_{1i} - Y_{0i} | T_i = 1\} = E\{E(Y_{1i} - Y_{0i} | T_i = 1, P(X_i))\}^{\text{CIA}} = \\ &E_{P(X_i)}\{E(Y_{1i} | T_i = 1, P(X_i)) - E(Y_{0i} - Y_{0i} | T_i = 0, P(X_i)) | T_i\} \quad [4] \end{aligned}$$

where the outer expectation is taken over the distribution of $P(X_i)$ in the population of supported firms, $T_i = 1$. ATT is the difference in average outcomes of the supported and unsupported firms, where the unsupported firm group is formed matching units based on the propensity score.

However, estimation of the propensity score only, is not enough to estimate the ATT of interest using Eq. [4]. This is because the probability of observing two units with exactly the same value

of the propensity score is in principle zero, since $P(X)$ is a continuous variable. Various methods have been proposed in the literature to overcome this problem, and three of the most widely used are nearest neighbor matching, radius matching, and kernel matching.

Based on the literatures on the selection and implementation of matching estimators, we decided to analyze the effect of credit guarantee with kernel matching which showed good precision when the unsupported-to-supported ratio is high (Frolich 2004) and can avoid the criticism expressed by Abadie and Imbens (2006), which pointed out the problem of nonsmoothness in calculating standard errors with bootstrapping for the case of nearest neighbor matching or radius matching.

4 Data and Variables

4.1 The Data

The statistical source used for this analysis is the World Bank's Enterprise Surveys (ES). The ES collect data from key manufacturing and service sectors in every region of the world. The Surveys use standardized survey instruments and a uniform sampling methodology to minimize measurement error and to yield data that are comparable across the world's economies.

To generate internationally comparable data, the questions in the Core questionnaire are asked in all countries and for all industries where the survey is implemented. In addition to this Core instrument, the Manufacturing Module and Services Module questions are asked to establishments in the manufacturing and services sectors, respectively.

The Core instrument is comprised of eleven sections: the first eight sections contain qualitative questions, asking for the manager's opinion on the business environment and for his motivation for business decisions¹⁶. The last three sections of the questionnaire deal with facts and figures specific to the transactions businesses make in order to operate¹⁷. The Manufacturing Module contains questions about capacity (use of production capacity and hours of operation).

The sampling methodology of the World Bank's Enterprise Survey generates sample sizes appropriate for achieving two main objectives: (1) a sample representative of the whole economy that substantiates assertions about the whole economy, not only about the manufacturing sector. In addition to selected manufacturing industries, the overall sample should include services industries and other relevant sectors of the economy, and (2) a sample that is large enough in size for selected industries to conduct statistically robust analyses with levels of precision at a minimum 7.5% for 90% confidence intervals about¹⁸: (a) estimates of population proportions (percentages), at the industry level, and (b) estimates of the average mean of log of sales at the industry level.

¹⁶ These sections deals with the characteristics of the business and the investment climate in which it operates including: Control Information, General information (ownership, start-up), Infrastructure and Services (power, water, transport, and communication technologies), Sales and Supplies (imports, exports, supply and demand conditions), Degree of Competition (price and supply changes, competitors), Land (land ownership, land access issues), Crime (extent and losses due to crime), Business-Government Relations (quality of public services, consistency of policy, regulatory compliance costs), and Investment Climate Constraints (evaluation of general obstacles).

¹⁷ More specifically, these sections contain questions on production costs, investment flows, balance sheet information and workforce statistics. These sections include: Finance (sources of finance, terms of finance, financial services), Labor (worker skills training, skill availability, employment, education levels of workers) and Productivity (Numbers and figures needed to estimate productivity).

¹⁸ A 7.5% precision of an estimate in a 90% confidence interval means that we can guarantee that the population parameter is within the 7.5% range of the observed sample parameter, except in 10% of the cases.

Table 2 Statistical distribution: firms according to country and sector (year 2005).

Country/industry	Beverages	Food	Garments	Metals and machinery
Bulgaria	10	2	5	9
Czech Republic	7	3	3	29
Estonia	4	1	5	8
Hungary	7	28	41	153
Latvia	2		4	5
Lithuania	4		3	8
Moldova	40	4	14	20
Poland	15	46	97	178
Romania	56	36	75	86
Slovak Republic		1	1	12
Slovenia	1	1	2	23
Total	146	122	250	531

Source: Authors' calculation from the Investment Climate Survey Databank, World Bank.

The previous table 2 comprises the sectors analyzed in this research paper respectively and includes secondary activity (industry) sectors.

4.2 Variable Selection

In order to estimate technical efficiency with DEA, there exists considerable disagreement in empirical literature on the definition of outputs (in the context of multiple-outputs firms) of an industrial institution. Nevertheless, according to Coelli et al. (2005), a commonly-used classification of inputs involves five categories: capital (K), labour (L), energy (E), material inputs (M), and purchase services (S). The use of data according to these categories in productivity measurement is sometimes referred to as KLEMS approach¹⁹.

To ensure the validity of the DEA model specification, an isotonicity test (according to Golany and Roll, 1989) was conducted. This isotonicity test involves the calculation of all inter-correlations between inputs and outputs for identifying whether increasing amounts of inputs lead to greater outputs. Finally, according to Golany and Roll (1989), the number of DMUs should be at least twice of the total number of input and output factors considered when applying the DEA model. In this study the number of DMUs was 146 (for Beverages sector), 531 (for Metals and Machinery sector), 250 (Garments sector) and 122 (for Food sector), at least ten times of the selected four factors. According to these facts, in this study, the proposed DEA model has good construct validity.

On the other hand, Smith (2000) argues that, in order to obtain correct and robust estimates of program effects using PSM, one need to use a broad set of observed firm characteristics in the estimation of the propensity score. The propensity score is in general estimated using probit or logistic regression, from a set of possibly abundant observable variables which are supposed to

¹⁹ In our sample, Capital (K) and Purchased Services (S) are not available.

affect both the probability that the firm enters the program and the future outcome of the firm, based on economic theory and previous empirical findings (Caliendo 2006).

In this research, we utilized the age of the firm and dummies variables for the existence of R&D expenditures, export activities and production workers trained. Others dummies variables are the size of the firm (large, medium and small), the country income level (high/ upper-middle), and the existence of domestic owners. The industrial sector was divided into four categories based on the World Bank's Enterprise Surveys (ES). As the survey does not contain information related to the performance or productivity of firms, we calculated the technical efficiency of each firm using one output (sales) and five inputs (capital stock , labor cost, materials, energy cost and others costs).

We evaluated the effect of overdraft facility policy by observing various aspects of a firm's performance. The outcome variables considered are: technical efficiency, R&D expenditures, export activities and production workers trained. The definition of variables including firm characteristics and outcomes are explained in Table 3.

Table 3 The definition of variables including firm characteristics and outcomes.

Variables		Definition
Production Function (output and inputs)	Sales	Used as the measure of output for the production function estimation. For all countries, sales figures in local currency are converted into USD using PPP conversion factor to the official exchange rate ratio
	Capital Stock	Book value of all fixed assets ¹ . For all countries, capital stock figures in local currency are converted into USD using PPP conversion factor to the official exchange rate ratio.
	Labor cost	Total expenditures on personnel ² . For all countries, labor cost figures in local currency are converted into USD using PPP conversion factor to the official exchange rate ratio.
	Materials	Total costs of intermediate and raw materials used in production (excluding electricity, fuel, and water). For all countries, materials figures in local currency are converted into USD using PPP conversion factor to the official exchange rate ratio.
	Energy Cost	Total annual costs of electricity, fuel, and water.
	Other Costs	Total annual costs of communications services, transport for goods (not including fuel), and rental of land/buildings, equipment, furniture, etc.
Outcomes	Technical efficiency	CCR efficiency index (Bias-Corrected) by Industry (year 2005).
	Dummy exporter	Dummy variable that takes value 1 when firm is exporter and 0 when firm is non-exporter
	Dummy production workers trained	Dummy variable that takes value 1 if the firm has permanent full-time productions workers who have been trained (by the firm)
	Dummy Expenditures of R&D	Dummy variable that takes value 1 if the firm carried out internal R+D during 2006 (performed within this establishment).
Treatment and control	Dummy Overdraft facility	Dummy variable that take value 1 if the firm has an overdraft facility

Matching	Age	Difference between the year that the firm started operations and current year.
	Dummy Large firm	Dummy variable that takes value 1 if the firm has >99 permanent workers
	Dummy Medim firm	Dummy variable that takes value 1 if the firm has 20-99 permanent workers
	Dummy small firm	Dummy variable that takes value 1 if the firm has <20 permanent workers
	Dummy high/ upper-middle income country	Dummy variable that takes value 1 if the country has high/ upper-middle income according with World Bank (2005)
	Dummy domestic owners	Dummy variable that takes value 1 if the firm has private domestic owners and 0 if the firma has Foreign owners

¹Total annual expenditure for purchases of: machinery and equipment (including vehicles), and land and buildings.

²Including wages, salaries, bonuses and social payments.

Source: Adapted from based in OECD (2001) Economic Studies No. 33, 2001/II, and from World Bank (2007).

Most of the variables listed above are related to the firm's risk and growth potentials. The size (sales and employment) of a firm is often taken to be a good proxy for the firm's risk (Cowling and Westhead 1996). The amount of fixed capital can be related to the availability of collateral, which can act as a sorting device to decide which firms are to receive loans (Bester 1985). R&D and technical efficiency of firms are related to the future growth potentials as well as current profitability. The country income level (high/ upper-middle), and the existence of domestic owners are also used to control the firm's risk, value, and growth potential in general.

The production workers trained will represent improvement in skill or the quality of employees. Variables indicating R&D and exporter status are introduced to observe if overdraft facility is used to enhance future productivity and expanded production facility. The level of technical efficiency might be an ultimate goal of such a government support policy.

5 Estimation Results

5.1 Estimation of Technical Efficiency

To evaluate the efficiency of manufacturing companies, five inputs²⁰ (labor cost, materials and energy cost) and one output (sales) have been incorporated into the model. A synthesis of production function variables and the descriptive statistics for the indicators considered for the sample is presented in table 4.

²⁰ Coelli, et al. (2005), a commonly-used classification of inputs involve five categories: capital (K), labor (L), energy (E), material inputs (M), and purchased services (S). The use of data according to these categories in productivity measurement is sometimes referred to as KLEMS approach. In this study, Capital (K) and Purchased Services (S) are not available.

Table 4 Means Difference for Supported and Non-supported Groups

Industry	Beverages					Food					Garments					Metals and machinery				
Firms	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference
Variable	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test
Age	41	25.12	94	16.03	-1.8097**	28	18.54	88	15.14	-0.9826	55	16.33	188	14.95	-0.5961	133	19.84	382	17.99	-1.0110
Variable	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test
Dummy Large firm	13	31.71	21	22.34	-1.1501	5	17.86	15	17.05	-0.0982	20	36.36	29	15.43	-3.4739***	43	32.33	74	19.32	-3.1099***
Dummy Medim firm	15	36.59	32	34.04	-0.2832	8	28.57	36	40.91	1.1687	11	20.00	59	31.38	1.6420*	40	30.08	118	30.81	0.1580
Dummy small firm	13	31.71	41	43.62	1.2974*	15	53.57	37	42.05	-1.0642	24	43.64	100	53.19	1.2457	50	37.59	191	49.87	2.4541***
Dummy high/ upper-middle income country	10	24.39	28	29.79	0.6374	20	71.43	55	62.50	-0.8561	30	54.55	120	63.83	1.2449	101	75.94	304	79.37	0.8292
Dummy domestic owners	5	12.20	21	22.34	1.3741*	10	35.71	23	26.14	-0.9740	16	29.09	76	40.43	1.5254*	25	18.80	112	29.24	2.3583***
Note:																				
* significant at 10%; **significant at 5%; and *** significant at 1%.																				
Dummy variables take on the value of 1 if the firm has the stated characteristic and 0 otherwise.																				
Source: Authors' calculations																				

The results of the analysis of efficiency with monetary inputs are shown in Table 5. These results reveal the sensitivity of the efficiency measures with respect to sampling variation. The bias-corrected efficiency (BC) reveals that differences in measurement efficiency are of a different magnitude than when the original efficiency scores (N) are considered. For all of the manufacturing sectors, the efficiency declines slightly.

Table 5 Descriptive statistics of the output and inputs used by sector and country (year 2005).

Variables/industry	Beverages	Food	Garments	Metals and machinery
Mean				
Sales (Y)	2476.644	895.9026	592.492	1030.763
Materials Cost (X ₁)	1282.234	453.563	242.7717	497.1371
Energy Cost (X ₂)	136.3903	50.45932	35.12418	53.18183
Personal Cost (X ₃)	209.1959	80.92757	151.6997	149.9907
Median				
Sales (Y)	196.418	262.3651	118.1627	82.81187
Materials Cost (X ₁)	85.13541	116.6796	46.78612	37.21292
Energy Cost (X ₂)	9.772637	12.94952	6.90287	5.241257
Personal Cost (X ₃)	22.49096	23.00957	27.17094	14.67552
Standard deviation				
Sales (Y)	9214.583	1604.977	1536.927	3170.787
Materials Cost (X ₁)	5205.379	856.9301	664.3403	1578.464
Energy Cost (X ₂)	595.0032	87.42706	104.0559	154.6308
Personal Cost (X ₃)	641.1238	154.4191	427.9902	445.9945
Maximum				
Sales (Y)	88827.03	8673.232	13709.87	30116.26
Materials Cost (X ₁)	52686.09	5364.427	5982.488	15777.23
Energy Cost (X ₂)	6747.266	587.511	875.7089	1700.407
Personal Cost (X ₃)	5275.788	773.6096	3373.633	4774.785
Minimum				
Sales (Y)	2.154254	0.509635	0.2548175	0.3011479
Materials Cost (X ₁)	0.4787231	0.2162088	0.1235479	0.1389914
Energy Cost (X ₂)	0.2393615	0.0386087	0.0154435	0.0154435
Personal Cost (X ₃)	0.4015306	0.1081044	0.0540522	0.0540522

Source: Authors' calculation from the Investment Climate Survey Databank, World Bank

Having found that there exists wide variation in technical efficiency among the sample firms it is important and useful to understand the impact of the overdraft facility policy.

5.2 Propensity Score Matching Estimation.

To better construct the match, table 6 below shows tests for mean differences between supported and non-supported groups for the impact and other key variables. Identification of the matching technique to create the propensity score requires that the impact variables are independent of the treatment conditional on the propensity score. Few statistically significant differences between participants and non-participants were observed, with the exception of the large and younger firms being more prevalent among those receiving overdraft facilities.

Table 6 Descriptive statistics of the CCR efficiency index (Normal and Bias-Corrected) by Industry and country (year 2005).

Country/industry	Beverages		Food		Garments		Metals and machinery	
	Normal	Bias Corrected	Normal	Bias Corrected	Normal	Bias Corrected	Normal	Bias Corrected
Bulgaria	0.781	0.658	0.977	0.866	0.811	0.682	0.780	0.718
Czech Republic	0.611	0.554	0.536	0.504	0.554	0.518	0.687	0.656
Estonia	0.547	0.492	0.503	0.430	0.609	0.566	0.777	0.722
Hungary	0.752	0.653	0.763	0.681	0.719	0.628	0.700	0.656
Latvia	0.784	0.627			0.790	0.627	0.769	0.693
Lithuania	0.751	0.645			0.606	0.564	0.870	0.801
Moldova	0.665	0.598	0.525	0.485	0.560	0.521	0.664	0.637
Poland	0.624	0.571	0.678	0.617	0.663	0.620	0.726	0.685
Romania	0.708	0.636	0.759	0.682	0.706	0.629	0.733	0.682
Slovak Republic			0.647	0.608	0.552	0.519	0.768	0.726
Slovenia	0.702	0.616	0.673	0.621	0.927	0.781	0.912	0.814
Mean	0.693	0.605	0.673	0.611	0.682	0.605	0.762	0.708

Source: DDP Quick Query database of WDI & GDF, World Bank.

5.2.1 Estimation of the propensity score

The propensity score calculated to reflect the probability of a firm receiving overdraft facility, predicts that firms that are younger are more likely to receive benefits. The score, presented in Table 7, is predicted based upon a logit model controlling for factors such as age, age squared, and dummy variables (size firm, country income level, and domestic owners). Each additional year of existence (age) lowers the likelihood of receiving overdraft facilities. Country income level and owners characteristics do not seem to influence the likelihood of receiving overdraft facilities.

Table 7 Logistic Regression to Estimate Propensity Score for overdraft facility policy.

Dependent Variable		Dummy for HTAP Subsidy, =1 if treated by the program															
Industry	Beverages				Food				Garments				Metals and machinery				
Independent variables	Coefficient	Standard error	Z	P>z	Coefficient	Standard error	Z	P>z	Coefficient	Standard error	Z	P>z	Coefficient	Standard error	Z	P>z	
Age	-0.01245	0.024976	-0.5	0.618	0.12828**	0.062587	2.05	0.04	-0.01708	0.026247	-0.65	0.515	-0.00263	0.01533	-0.17	0.864	
Age squared	0.000164	0.000178	0.92	0.359	-0.00135	0.000882	-1.53	0.126	0.000147	0.000269	0.54	0.586	1.79E-05	0.000155	0.12	0.908	
Dummy Large firm	0.447817	0.557797	0.8	0.422					1.305646***	0.45932	2.84	0.004	0.522057*	0.279631	1.87	0.062	
Dummy Medium firm	0.327875	0.45841	0.72	0.474	-0.43002	0.679557	-0.63	0.527									
Dummy small firm					0.194275	0.659108	0.29	0.768	0.326923	0.41772	0.78	0.434	-0.1526	0.254381	-0.6	0.549	
Dummy high/upper-middle income country	-0.42417	0.469876	-0.9	0.367	0.046765	0.562043	0.08	0.934	-0.05657	0.366503	-0.15	0.877	-0.08481	0.248774	-0.34	0.733	
Dummy domestic owners	-0.44578	0.565572	-0.79	0.431	0.182613	0.579717	0.32	0.753	-0.28575	0.371397	-0.77	0.442	-0.34143	0.279259	-1.22	0.221	
Constant	-0.82554*	0.427795	-1.93	0.054	-2.64108***	0.875654	-3.02	0.003	-1.38919***	0.439206	-3.16	0.002	-0.93797***	0.315	-2.98	0.003	
Number of obs.		135				116				243				515			
LR chi2		6.55				9.29				12.20				12.07			
Prob > chi2		0.2128				0.1577				0.0576				0.0604			
Log likelihood		0.0351				0.0725				0.0469				0.0205			
Pseudo R2		-79.974592				-59.461831				-123.85812				-288.14436			
Note:																	
* significant at 10%; **significant at 5%; and *** significant at 1%.																	
Dummy variables take on the value of 1 if the firm has the stated characteristic and 0 otherwise.																	

Note:

* significant at 10%; **significant at 5%; and *** significant at 1%.

Dummy variables take on the value of 1 if the firm has the stated characteristic and 0 otherwise.

Source: Authors estimation

5.2.2 Review of overlap and common support conditions

The distribution of the propensity score for the treatment and control groups is presented in Figure 1 to assess whether there are any differences in each group's probability to receive overdraft facility. The distribution for the control group firms is more right skewed, i.e. conditioned towards those firms that are more likely to receive treatment. Observations with a propensity score below 0.10 were dropped, as they had a very low likelihood of being treated. The regions of common support show the observations with propensity scores that were matched are those where the treatment and control groups had similar propensity score values.

Figure 1 Distribution of Propensity Scores by sector

In order to compute ATT accurately, one should match the supported and unsupported firms precisely on the basis of the propensity score²¹.

Table 8 shows the results of the Average Treatment Effect on the Treated (ATT) for key outcomes. That is, it shows the difference between the average outcomes for the firms with overdraft facility policy and the average outcomes of those same firms had they not had overdraft facility policy.

²¹ In practice, it is never possible to match the scores precisely and therefore in this study, three alternative matching methods of nearest neighbor matching, radius, and kernel matching methods were used and compared. The radius matching estimator was conducted with different radius. However, since the results from these four estimators were robust and essentially gave the same implications, here we only presented the results based on kernel matching methods. It should be noted that all the analyses were based on the implementation of common support, so that the distribution of supported and unsupported firms were located in the same domain. However, only a few observations were discarded, and given the large samples, the number of excluded observations is relatively small. Standard errors for support effects for all cases were calculated by the bootstrapping method.

Table 8 Average Impact for Firms Receiving overdraft facility.

Industry	Beverages					Food					Garments					Metals and machinery				
Impact Variable	Obs	ATT	SE	z	P>z	Obs.	ATT	SE	z	P>z	Obs.	ATT	SE	z	P>z	Obs.	ATT	SE	z	P>z
Technical efficiency	134					107					243					515				
		-0.02649	0.025574	-1.04	0.3		0.03408	0.034031	1	0.317		-0.0262	0.018725	-1.4	0.162		-0.00291	0.0122	-0.24	0.811
Dummy exporter	134					107					243					515				
		-0.10264**	0.051905	-1.98	0.048		0.087419	0.066266	1.32	0.187		-0.03621	0.067501	-0.54	0.592		0.033311	0.047338	0.7	0.482
Dummy production workers trained	129					103					236					496				
		-0.02158	0.099918	-0.22	0.829		0.01824	0.127035	0.14	0.886		-0.03743	0.072809	-0.51	0.607		0.047712	0.04969	0.96	0.337
Dummy Expenditures of R&D	103					86					207					449				
		0.018612	0.089425	0.21	0.835		-0.07904	0.08403	-0.94	0.347		-0.02203	0.063987	-0.34	0.731		0.119596***	0.0475	2.52	0.012

Note: * significant at 10%; **significant at 5%; and *** significant at 1%.

Dummy variables take on the value of 1 if the firm has the stated characteristic and 0 otherwise.

Impact variables: Technical efficiency variable is continuous, Exporter, Production workers trained and Expenditures of R&D and are not.

Matching variables: Age, Age squared, dummy variables for size (Large, Medium and Small), dummy variable for high/ upper-middle income country and dummy variable for domestic owners.

Weighting matrix: inverse variante

Number of matches (m) = 4

Number of matches, robust std. err. (h) = 4

Source: Authors' estimates

The results indicate that the sole statistically significant impact attributable to overdraft facility policy is that these firms have a higher incidence of doing R&D activities. The sign of the coefficients representing the impact of overdraft facility on expenditures of R&D activities are positive but only statistically significant in Metals and machinery sector.

5.2.3 Assessing matching quality

The quality of the propensity score match is conditional on the validity of the conditional independence assumption. That is, the treatment and control groups should be as similar as possible and have no significant differences in terms of observables and unobservable characteristics. Table 9 shows that following the match observable statistically significant differences between the treatment and control group exist.

However, to identify a causal relationship, matching requires that the treatment and control groups be similar in unmeasured characteristics. It is uncertain how likely this assumption is because treated firms had the initiative to apply to overdraft facility while the control did not, and there may be other unobserved differences between the treatment and the control group (e.g., the degree of entrepreneurship and quality of management teams).

Table 9 Means Difference for Supported and Non-supported Groups after Matching

Industry	Beverages					Food					Garments					Metals and machinery				
	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference	Supported		Non- Supported		Difference
Variable	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test	Obs.	Mean	Obs.	Mean	T-Test
Age	40	21.25	94	16.03	-1.1901	27	19	80	13.59	-2.4066***	55	16.33	188	1.02	-0.5961	133	19.84	382	17.99	-1.0110
Variable	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test	Obs.	%	Obs.	%	T-Test
Dummy Large firm	12	30.00	21	22.34	-0.9378	5	18.52	14	17.50	-0.1186	20	36.36	29	15.43	-3.4739***	43	32.33	74	19.37	-3.0944***
Dummy Medim firm	15	37.50	32	34.04	-0.3811	7	25.93	30	37.50	1.0892	11	20.00	59	31.38	1.6420*	40	30.08	118	30.89	0.1752
Dummy small firm	13	32.50	41	43.62	1.1981	15	55.56	36	45.00	-0.9446	24	43.64	100	53.19	1.2457	50	37.59	190	49.74	2.4271***
Dummy high/upper-middle income country	9	22.50	28	29.79	0.8593	20	74.07	51	63.75	-0.9769	30	54.55	120	63.83	1.2449	101	75.94	303	79.32	0.8153
Dummy domestic owners	5	12.50	21	22.34	1.3168*	10	37.04	22	27.50	-0.9309	16	29.09	76	40.43	1.5254*	25	18.80	111	29.06	2.3193**

Note:

* significant at 10%; **significant at 5%; and *** significant at 1%.

Dummy variables take on the value of 1 if the firm has the stated characteristic and 0 otherwise.

Source: Authors' calculations

6 Summary and Discussion of Results

This research evaluates the impact of overdraft facility policy, for recipient firms by controlling the selection bias with the up-to-date propensity score matching technique. The results are based on an investigation of the differences in the performance indicators from 2005, for the firms receiving overdraft facility policy.

In 2005, growth in the eight new European Union (EU) member States from Central and Eastern European (EU-8) economies had become more broadly based, driven by robust consumption and investment expenditure and strengthening external demand. On the other hand, most Southern and Eastern European economies had preserved a strong growth momentum in 2005. Finally, macroeconomic policy in most of these countries had remained restrictive.^{22 23}

For all of these factors, 2005 have been chosen to establish performance baseline and establish the impact of overdraft facility policy. In this context, the empirical analysis in Eastern European Union industrial firms showed that the overdraft facility policy would be needed to stimulate investment in R&D, which will eventually result in growth in productivity. We could not find sufficient evidence that the overdraft facility has affected positively technical efficiency, production workers trained, and sales export activity.

Since this research was based on relatively short period of time not accompanied with significant changes in overdraft facility schemes, the comparative analyses regarding the changes on the parameters were not possible. The designing of these parameters to reach the optimal level could remain as an interesting further research topic.

On the other hand, comparing with today situation, we have conducted our empirical analysis in a very different economic scenario. In this context, a longitudinal study with new data could provide a greater richness to the results, capturing the effects that persist over time. Extensions of future research could be aimed at addressing the limitations discussed.

²² The OECD (2001b) provides a framework allowing policy-makers to identify strong and weak points in their country's business environment by comparing their performance and business environment to that of other OECD countries. The OECD report concludes that four micro-drivers (human capital, information and communications technology, innovation and entrepreneurship) are key drivers of productivity and economic growth performance in knowledge-based economies

²³ The most notable micro-policies highlighted in the OECD report are: (1) increasing access to venture capital corresponds to the driver, "fostering firm creation and entrepreneurship", (2) Enhancing public-private partnerships for innovation relates to the driver "harnessing the potential of innovation and technology diffusion", (3) Promoting Information and Communications Technology (ICT) diffusion to business is the driver "seizing the benefits of ICT", and (4) Developing highly-skilled workers for future industry needs corresponds to the driver "enhancing human capital and realizing its potential"

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