Does Export Promotion Work in Denmark? Evidence from a Matching Approach *

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Abstract

Does the pooling of knowledge in export networks help firms to be more successful exporters? Do firms who become member in an export association exhibit higher export sales, ship more products or serve a greater number of markets in the future? Using Danish firm-level data from 1995 - 2006, we assess whether the major Danish export association fosters trade along these dimensions. Using an approach which combines matching techniques with difference-in-difference estimation, we find a positive causal effect of membership on export sales after entry into the association. Moreover, our estimates provide evidence for an immediate increase in the number of exported products. According to our estimates, there is no positive effect on the number of export destinations served.

Keywords: Export Promotion, Firm-level analysis

JEL-Codes: F16, F22

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1 Motivation

How can firms overcome barriers to trade? This question has raised the interest of managers, policy makers and economists all over the globe. As barriers to trade are diverse, so is the answer to this question. Firms need to collect information on potential export destinations in order to be successful in selling their product abroad. They need to know, which of their products they can sell abroad. They need to learn to grasp chances, in order to successfully expand their international sales.

The recent economic literature has established the importance of knowledge flows beyond the borders of the firm. A particularly important role for international transactions has been ascribed to international networks, and they have been extensively studied in both theoretical and empirical work (see for example Rauch 1999, Rauch 2001, Rauch and Trindade 2002). Similarly, firms may benefit from the knowledge embedded in surrounding firms, such that regional export spillovers have been found to matter (Koenig et al. 2010) for a firm's export performance. On top of these networks that arise naturally, also deliberately set up networks exist, which regard it at their mission to promote their members' exports. Some studies have assessed empirically, whether export promotion indeed exhibits a positive effect on trade (see for example Lederman et al. 2004, Volpe Martincus and Carballo 2008, Volpe Martincus and Carballo 2010a, Volpe Martincus 2010b and Volpe Martincus et al. 2010c). Moreover, a couple of studies assess how financial support affects exports (Bernard and Jensen 2004, Görg et al. 2008, Girma et al. 2009)

This paper considers the causal effect of export promotion on firm-level export sales, the coverage of foreign markets, and the number of unique traded products. It complements the existing literature in terms of geographical coverage: To our best knowledge, previous studies have considered how export promotion agencies affect firm-level trade in developing countries (Lederman et al. 2004, Volpe Martincus and Carballo 2008, 2010a, 2010b, 2010c, Volpe Martincus et al. 2010, Volpe Martincus et al. 2011). The role of export promotion agencies can be conjectured to be very different in a country with high exposure to trade like Denmark. Is there still something to be learned for exporting firms in Denmark from joining an export association?

We find that for a sample of Danish manufacturing firms, firms benefit from becoming a member in the major Danish export association. The membership is associated with an increase in export sales, which amounts to 87% in the third year after entry and reduces to 47% in the subsequent year. In addition to the increase in export sales, which is economically significant, we find that membership increases the number of exported products. Our estimates suggest no effect of membership on the number of countries served.

The remainder of this paper is structured as follows. Section 2 provides an overview over the related literature, Section 3 presents the data, Section 4 introduces the econometric methodology, Section 5 describes and discusses our empirical results. Section 6 concludes.

2 Literature Review

International business and economics literature has devoted considerable attention towards the exploration how export promotion agencies and their activities affect firm export performance. These studies cover a wide methodological range: Business-studies tend to rely on self-assessment of firms participating in export promotion programmes, whereas economic studies tend to rely on objective performance measures. Plant-, firm- and country-level data is considered, mostly in a panel dimension. Some firm-level studies use firm-level exports which is product- and destination-specific (for example Volpe Martincus and Carballo 2008). The regional coverage of firm-level data studies is limited to South America, China, Ireland, Spain and the United States of America. Overall, there is evidence for a positive effect of export promotion, whereby the size of the effect and whether it occurs along the extensive or intensive margin of international trade varies across studies.

Alvarez and Crespi (2000) use Chilean plant level data to assess the treatment effect of three governmental export promoting activities managed by the National Agency for Export Promotion: exporter committees, presence in international trade fairs and the utilization of a business information system. They find that participation in exporter committees foster exports more than participation in trade fairs or the utilization of a business information system. More recently, Volpe Martincus and Carballo (2010a) employ an efficient semi-parametric quantile

treatment effect strategy in order to assess how export promotion affects exports across the firm distribution in Chile. They find that main beneficiaries from Chilean export promotion are firms with a low export volume or firms located at the extreme tails of the distributions of number goods and number of markets, which corresponds to the finding of Wilkinson and Brouthers (2006). Görg et al. (2008) couple a non-parametric matching with a difference-in-difference estimation in order to assess whether government support boosts exports at the plant level for a panel of Irish plants. They find that grants which are large enough can help firms to compete better abroad and sell more. They find no evidence for an effect of grants on export starting. Similarly, Girma et al. (2009) use an unbalanced Chinese firm-level panel which covers the years 1999-2005. They employ an IV Tobit estimation strategy and find evidence for a positive impact of production subsidies on firm exports along the intensive margin. According to their results, the intensity of the effect varies with firm characteristics: It is strongest for firms which make profits, are located in the interior of the country or belong to capital-intensive industries. Their finding is in contrast to Volpe Martincus and Carballo (2008). Using Peruvian firm-level data for the years 2001 to 2005, they find that the activities of the main Peruvian export association causes an increase in the number of exported products and markets served, but not in export sales. More recently, Volpe Martincus and Carballo (2010c) use data on Uruguayan firms between 2000 and 2007 to explore how support by Uruguay's export agency affects the product and destination margins of exporting firms and find that export assistance helps firms to enter a new geographic market in particular in Latin America or the Caribbean, or to introduce a new differentiated product. Anyways, it does not prove to significantly affect the probability to enter a new OECD market or to generally export a new product. Recently, Volpe Martincus and Carballo (2010b) use Colombian firm-level data to assess the effectiveness of different services of export promotion agencies, and find that bundling services is most effective.

At a more aggregate level, Gil et al. (2008) establish a positive effect of governmental export promotion on the regional level in Spain. Looking from a slightly different angle, Rose (2007) analyzes a cross-section of countries using a gravity model and finds that each additional consulate abroad raises bilateral exports by 6 to 10 percent. But, Lederman et al. (2010) argue

that export promotion agencies differ fundamentally from foreign missions and assess their impact on national exports based on survey data of 173 countries. They establish a robust positive effect of export promotion expenditure on exports with substantial decreasing returns to scale. Volpe Martincus et al. (2010) use Latin American sector-level data to assess how export promotion affect the extensive margin of goods on the country level. Both exporter country's embassies and consulates in the importing country as well as specialized public export promotion agencies are considered. According to their results, export promotion of both types never exhibits a negative effect on the goods extensive margin. Secondly, specialized export promotion exhibits a positive effect in more sectors than the mere presence of embassies, and the effect is larger on average. Third, the distinction between differentiated goods, reference-priced goods and homogeneous goods reveals that the effect of specialized trade promotion (diplomatic representation) increases (decreases) in the degree of differentiation.

In a nutshell, the related literature establishes an important role to the promotion of exports for export success in particular along the extensive margin for developing countries. However, the effects of export promotion for developed countries is less clear: Bernard and Jensen (2004) find no effect of governmental grants on export success. In light of this disparity, it will be interesting to broaden the country portfolio to a small open economy, Denmark, using data which is described in the next section.

3 Data and Descriptive Analysis

Membership data has been kindly provided by the Danish Export Association[1] (henceforth, DEA). DEA is a private non-profit association, which seeks to promote trade between Danish and foreign firms. It is the largest export promotion agency in Denmark, and has been founded in 1965 on initiative of three private firms. Nowadays, DEA is an umbrella organization which covers twelve industry networks, namely Airport, Cruise and Ferry, Fishing Equipment, Hospitality, Marine, Marine China, Mining and Quarry, Offshore Energy, Postal and Logistic, Rail-

[1] www.dk-export.dk

Table 1: Entry and Membership in the Danish Export Association

Year	Members	Net Entry	Permanent Entry	Total Number of Firms
1995	32			3146
1996	32	0	1	3155
1997	34	4	0	2974
1998	40	6	3	2999
1999	43	3	2	2952
2000	43	0	2	2761
2001	50	7	5	2714
2002	53	3	2	2714
2003	56	3	3	2705
2004	72	16	16	2608
2005	81	9	10	2452
2006	94	13	12	2450
Total	630	64	54	33.630

This Table depicts the membership and entry pattern into the DEA over the sample period. Net entry is the differences between entry and exit at time t. Permanent entry is the number of firms who enter DEA and remain in the organization throughout the sample period.

way, Energy and Energy China. According to its mission statement, DEA encourages the exchange of information and close cooperation between members and promotes joint initiatives to foster export sales of its members. Its activities cover the creation of networks between Danish exporters of all sizes, the organization and execution of exhibitions, symposia, workshops and meetings with potential clients and partners. Moreover, DEA arranges meetings where its members can share their knowledge.

From the raw data on firm membership, we can retrieve the year of entry in the export association and the exit year (if applicable). Firms can enter industry networks separately, and may be member of several networks simultaneously. We do not take into account heterogeneity of subnetworks. This is due to the fact that we do not always observe entry and exit year, and some networks are too small when merged with the firm-level information. In order to measure membership as precise as possible, we consider the earliest year of entry as the year where the membership starts and take the latest observed exit year as the end of membership. Moreover, due to the bookkeeping system at DEA, there is a considerable number of firms who are registered as former members, but for whom it is unclear, when membership ended. We

discard all firms of our sample who have at some point been member in the Export Association if there is uncertainty with respect to the time span. This is important in order to avoid to capture member firms in the control group. Moreover, we exclude firms which have become DEA member in 1995 in order to be able to match on pre-sample information.

This DEA data set is merged to firm-level data of Statistics Denmark. We can identify around 100 manufacturing firms who have been or become member in DEA in our sample period. Our unbalanced panel covers the years from 1995 - 2006. More specifically, we consider a sample of manufacturing firms. This is important, because it enables us to deflate with an industry specific price index. In order to be able to use the information on DEA membership in a meaningful way, firms for which we know that they have been DEA members at some point in time, but do not know the time period, are excluded. Similarly, we consider only those exporters who stay members of the association over the sample period. With these restrictions, 54 entries of firms into DEA occur during the sample period, which lead to permanent membership. The total number of member observations over the sample period amounts to 630. As the vast majority of DEA members are exporting or even two-way traders, all subsequent results are conditional on the firm being an exporter. We do not include any firm which has been a member in DEA prior to 1995, in order to ensure comparability.

These constraints lead to membership and entry dynamics as depicted in Table 1. Over time, the number of manufacturing members increases to 94 observed in 2006. Most of entry takes place in 2004, 2005, and 2006. This increase presumably reflects a change in the DEA's organizational structure: In 2004, the director of the organization has changed, and since then, DEA staff itself has grown considerably. The total number of exporting firms in our sample decreases over time from 3146 firms to 2450 firms in 2006, reflecting a general evolution in the Danish firm landscape.

Table 2 provides summary statistics on the overall sample as well as on the member and non-member subsample. It conveys a clear message: Member firms have higher export sales than non-members, serve considerably more markets and ship more products than non-member firms. Not only do they seem to exhibit a better export performance. They also outperform non-member firms in the number of employees, the average hourly wage paid as well as in

Table 2: Summary Statistics

	Mean	Median	SD	Min	Max	N
			All firms			
			Export Performance			
Total Export Sales (ln)	14.684	15.122	2.870	0	23.737	33630
Number of Products	3.633	2	4.246	1	45	33630
Number of Export Markets	9.936	4	13.286	1	125	33630
			Firm Characteristics			
Employees (ln)	3.283	3.219	1.381	0	9.451	33630
Average Hourly Wage (ln)	5.100	5.100	0.238	2.708	7.722	33630
Total Sales (ln)	17.032	16.939	1.548	8.694	240.722	33630
			DEA members			
			Export Performance			
Total Export Sales (ln)	17.157	17.755	2.529	8.889	21.542	200
Number of Products	9.685	6	9.528	1	45	200
Number of Export Markets	26	22	21.091	1	90	200
			Firm Characteristics			
Employees (ln)	4.466	4.151	1.669	1.099	9.036	200
Average Hourly Wage (ln)	5.294	5.293	0.144	4.762	5.841	200
Total Sales (ln)	18.504	18.385	1.701	14.902	22.559	200
			Non-members			
			Export Performance			
Total Export Sales (ln)	14.669	15.017	2.866	0	23.737	33430
Number of Products	3.597	2	4.168	1	42	33430
Number of Export Markets	9.840	4	13.167	1	125	33430
			Firm Characteristics			
Employees (ln)	3.276	3.219	1.376	0	9.451	33430
Average Hourly Wage (ln)	5.095	5.100	0.238	2.708	7.722	33430
Total Sales (ln)	17.024	16.932	1.543	8.694	24.072	33430

This Table depicts summary statistics for the estimation sample and two subsamples for DEA members and non-members pooled over time.

total sales.

But is this performance difference driven by self-selection of the high performance firms into the DEA? Or does the DEA cause the superior export performance of its members? In order to

disentangle the causal effect of DEA membership on export performance, we are employing a matching approach paired with difference-in-difference estimation, which is presented in the next section.

4 Empirical Strategy

Matching techniques have become an important tool of empirical trade studies in the recent years. Their use extends from testing the learning-by-importing hypothesis (Wagner 2002), export market exit and firm dynamics (Girma et al. 2003), the wage premium of foreign ownership (Girma and Görg 2007), the Euro effect on trade (Chintrakarn 2008), or the effect of foreign acquisition on wages and productivity (Bandick 2011).

This exposition is based on Girma and Görg (2007). We aim at assessing how membership in the Danish Export Association affects trade outcomes. Now define $M_{it} \in \{0,1\}$ be an indicator of whether firm i becomes a DEA member at time t. The outcome variables which we consider are export sales, the number of exported products and the number of export destinations. For expositional simplicity, we consider export sales as an example and denote export sales after DEA entry by z^1_{it+s}, $s \geq 0$. Export sales without entry into DEA at time $t+s$ are denoted by z^0_{it+s}. The difference between these two outcomes $z^1_{it+s} - z^0_{it+s}$ is the causal effect of DEA membership on sales abroad. However, this quantity is not observed: whenever z^1_{it+s} is observable, z^0_{it+s} is not - and vice versa.

We define our treatment as entry into the Danish export association, and assess whether association is successful in promoting their members by fostering these outcomes. As it might take some time for the membership effect to manifest itself, we estimate the membership effect for four different periods after entry into the association. We exclude all firms from our analysis, which - upon entry within our sample period - exit the DEA within the sample period. Thus, we measure the effect of entry into DEA for firms who stay as compared to firms who never become member of the export promotion agency.

As suggested in the microeconometric literature (Heckman et al. 1997, Dehejia and Wahba

2002) and as implemented in Girma and Görg (2007), we define the average effect of DEA membership on members as

$$E\{z^1_{t+s} - z^0_{t+s} | M_{it} = 1\} = E\{z^1_{t+s} | M_{it} = 1\} - E\{z^0_{t+s} | M_{it} = 1\}. \quad (1)$$

In order to identify the so-called treatment effect on the treated, we need to construct a counterfactual measure for the export sales of a DEA member had it not become a member, which is the last term in equation 1. One potential approximation candidate is $E\{z^0_{t+s} | M_{it} = 0\}$, i.e., the average export sales of those firms who have not joined the trade network. But this choice is prone to be problematic, as there may be contemporaneous factors which are correlated with both, the treatment status, M_{it}, and the outcome. Thus, we need to select our control group more wisely. One approach to define this control group, are matching techniques. Ideally, we would like to compare identical firms, which differ only in membership status. Practically, we compare firms that are highly similar based on a set of measurable characteristics apart from their membership status.

Our matching strategy is based on propensity score matching as suggested by Rosenbaum and Rubin (1983). This means that we match firms on the basis of the probability of being treated, which is assessed by estimation of the following Probit model:

$$P\left(M_{it} = 1\right) = F\left(X_{it-1}\right) \quad (2)$$

where X_{it} captures a set of observable firm characteristics, which explain both, firm export sales and membership status in DEA. Our variable selection criterion is that the explanatory variables are (individually) statistically significant at the 10% significance level. This leads us to the choice of two different sets of conditioning variables: First, we include the lagged number of employees, the lagged average hourly wage, lagged sales and a linear time trend. Secondly, we only include the lagged export sales similar to Volpe and Carballo (2008) and a linear time trend. Thirdly, we include lagged export sales, the lagged number of destinations, the lagged number of products, and all covariates from the first specification. For future reference, we denote these three specifications by PSP 1, PSP 2 and PSP 3.

Note that we perform matching based on firm characteristics before treatment. From this model, we can predict the probability of entering the Danish Export Association for all firms. Denote the group of member firms by T, and their probability of receiving treatment by p_i. Similarly, denote the group of firms who do not become network members by C, and their probability of receiving treatment by p_j. Then, the estimator for the causal effect of membership in general form is given by

$$\mu = \sum_{i \in T} \left(z_i - \sum_{j \in C} g(p_i, p_j) z_i \right), \tag{3}$$

where $g(\cdot)$ is a weighting function. The microeconometric literature has suggested different weighting functions, for example nearest neighbor matching and kernel matching. We employ Kernel matching with a Epanechnikov Kernel with a 0.003 bandwidth as well as Nearest Neighbor Matching with one neighbour.

In order to apply matching methods to panel data, Girma et al. (2003) suggest to perform matching on repeated cross-sections. Also, we consider this as preferable in our setting. However, as we observe only few firms who enter DEA every year (compare Table 1), this is not applicable in our case. As a compromise, we split the sample in two periods covering the years from 1996 to 2002 and 2003 to 2006 and account for time variation in the sub-period by including a time trend in the specification used to estimate the propensity score.

Following Girma and Görg (2007), we exploit the panel structure of the data and combine matching with a difference-in-differences estimation strategy. This approach has the advantage that it accounts for unobserved time-invariant firm heterogeneity and thus improves estimation quality and reliability considerably. This has been pointed out by Blundell and Costas Dias (2000) as well as by Smith and Todd (2005a). According to Heckman et al. (1997), this estimator is then given by

$$\delta = \sum_{i \in T} \left(\Delta z_i - \sum_{j \in C} g(p_i, p_j) \Delta z_i \right), \tag{4}$$

where Δz is the difference of export sales, number of export products or export markets before

and after treatment, i.e., entry into the DEA. An alternative approach, which is based on a direct weighting scheme, has been suggested by Abadie (2005), but will not be pursued further in this paper.

5 Empirical Results

5.1 Matching Quality

For a successful matching procedure, the treated and the control group should be a similar as possible in terms of matching covariates after matching. We use two different tests, which have been suggested in Caliendo and Kopeinig (2008), to assess matching quality. The first test is regression based and uses the propensity scores estimated from equation 2 and it has initially been suggested by Smith and Todd (2005b). Consider the average hourly wage as an example of our matching covariates and denote it by w. Denote the estimated propensity scores by $\widehat{P}(X)$, where X is a matrix of variables included in the model. Then, define M as a dummy which assumes value one if a firm is DEA member and zero otherwise. Then, the following regression is estimated by OLS:

$$w = \beta_0 + \sum_{k=1}^{4} \beta_k \widehat{P}(X)^k + \sum_{k=1}^{4} \eta_k M\widehat{P}(X)^k + \epsilon, \tag{5}$$

where β_k and η_k are parameters and ϵ is an error term. We test whether η_k are jointly significant. If we fail to reject the Null hypothesis, this provides evidence for a fulfilled balancing condition, as additional powers of the propensity score do not provide additional information (Smith and Todd 2005b). This test regression is run for each covariate which is used for matching.

As a second test, we compare the standardized bias before and after matching. Again using the average hourly wage w as an example, the standardized bias is defined as

$$SB(w) = 100 \frac{\frac{1}{N}\sum_{i\in A}\left(w_i - \sum_{j\in C} g(p_i, p_j) w_j\right)}{\sqrt{\frac{1}{2}\left(Var_{i\in A}(w) + Var_{j\in C}(w)\right)}}, \tag{6}$$

Table 3: Balancing F-Test

	$p\left(\eta_1 = ...\eta_k = 0\right)$
PSP 1	
Employees $(t-1)$	0.079
Average Wage $(t-1)$	0.543
Sales $(t-1)$	0.061
Year	0.281
PSP 2	
Export Sales $(t-1)$	0.467
Year	0.737
PSP 3	
Export Sales $(t-1)$	0.447
Destinations $(t-1)$	0.004
Products $(t-1)$	0.000
Employees $(t-1)$	0.128
Average Wage $(t-1)$	0.004
Sales $(t-1)$	0.423
Year	0.001

This Table summarizes balancing results for the F-test from the test regression given by equation 5.

i.e., it measures the difference in means between members and matched non-members, normalized by equally weighted subgroup variances, $Var_{i\in A}$ and $Var_{j\in C}$. As denoted by Girma and Görg (2007) with reference to Rosenbaum and Rubin (1985), a standardized bias of 20 can be regarded as large.

Moreover, we consider three different specifications of the propensity score as described in equation 2 and two different matching algorithms to satisfy ourselves with respect to the robustness of our results.

Table 3 summarizes the results of the F-test for joint significance of $\eta_1, ...\eta_k$ in regression 5. For propensity score specification 1, henceforth PSP 1, we fail to reject the null for all covariates apart from sales and employees on a 10% significance level, i.e., balancing properties cannot be regarded as fully satisfactory in this specification. In the second specification, abbreviated as PSP 2, we fail to reject the Null of joint insignificance on the ten percent significance level.

In the third specification, PSP 3, we fail to reject the Null of joint insignificance for all variables apart from the number of destinations, the number of products, the average hourly wage and the linear time trend. To conclude, this test indicates superiority of PSP 2 as compared to PSP 1 and PSP3. Notably, the inclusion of lagged export sales in the PSP 1 model turns estimates on employees, average wages and sales insignificant in the Probit model as given in equation 2. Thus, even if PSP 2 is based on lagged export sales only, these are presumably the most important measurable determinant of participation in the Danish Export Association. Moreover, lagged export sales determine export sales today. Thus, lagged export sales are highly correlated with both, entry into the DEA and our outcomes.

Table 4 presents the balancing tests for Kernel and Nearest Neighbor Matching (henceforth, KM and NN). Across propensity score specifications and time horizons, we find that Nearest Neighbor Matching leads to a more substantial reduction in the standardized bias (henceforth, SB, see equation 6). As in the previous test, PSP 2 performs relatively well and exhibits an SB below 20 for $s = 1$ and $s = 2$ in the case of NN matching. For Kernel matching, SB is larger, but still acceptable. For the two remaining time horizons, the performance of PSP 2 in terms of SB worsens, but still remains in a tolerable range relative to the other two propensity score models.

In all cases equality of means cannot be rejected on the basis of a t-test which strengthens confidence in success of the matching procedure. Reconciling all test results, PSP 2 paired with NN is our preferred specification. We present matching estimates for all strategies in the next section.

Table 4: Summary of Further Balancing Tests

	Nearest Neighbor Matching						Kernel-Matching					
	Mean		*SB*		*t*-test		Mean		*SB*		*t*-test	
	Treated	Control	%	%-Red.	*t*-Stat.	*t*	Treated	Control	%	%-Red.n	*t*-Stat.	*t*
						s=1						
						PSP 1						
Employees ($t-1$)	4.415	4.302	8.000	87.600	0.330	0.740	4.415	4.129	20.300	68.600	0.840	0.404
Average Wage ($t-1$)	5.215	5.223	-4.6	93.800	-0.21	0.831	5.215	5.174	22.7	69.700	0.990	0.323
Sales ($t-1$)	18.238	18.001	15.900	76.300	0.620	0.538	18.238	17.927	20.800	68.900	0.860	0.395
Year	2002.700	2002.600	3.1	96.500	0.16	0.875	2002.700	2001.900	29.8	65.900	1.290	0.201
						PSP 2						
Export Sales ($t-1$)	16.977	17.265	-11.8	82.900	-0.59	0.554	16.977	16.560	17.1	75.300	0.74	0.459
Year	2002.700	2002.300	12.400	85.800	0.600	0.549	2002.700	29.600	29.600	66.200	1.260	0.212
						PSP 3						
Export Sales ($t-1$)	16.977	16.873	4.300	93.800	0.190	0.853	16.977	16.686	11.900	82.700	0.510	0.611
Destinations ($t-1$)	24.500	25.556	-6.2	91.900	-0.20	0.843	24.500	21.583	17.1	77.500	0.61	0.543
Products ($t-1$)	8.278	7.833	6.400	89.800	-0.23	0.817	8.278	6.593	24.100	61.500	0.90	0.371
Employees ($t-1$)	4.146	4.111	21.500	66.600	0.84	0.404	4.146	4.179	16.700	74.000	0.77	0.446
Average Wage ($t-1$)	5.215	5.243	-15.4	79.500	-0.69	0.495	5.215	5.182	17.8	76.300	0.77	0.446
Sales ($t-1$)	18.238	17.954	19.100	71.600	0.72	0.474	18.238	17.987	16.800	75.000	0.67	0.502
Year	2002.700	2002.600	1.000	98.800	0.05	0.959	2002.700	2002.000	25.600	25.600	1.111	0.271
						s=2						
						PSP 1						
Employees ($t-1$)	4.449	4.454	-0.400	99.400	-0.010	0.989	4.449	4.099	23.500	61.200	0.850	0.398
Average Wage ($t-1$)	5.206	5.165	22.300	69.600	1.040	0.302	5.206	5.150	30.300	58.700	1.150	0.257

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Table 4: Summary of Further Balancing Tests

	Nearest Neighbor Matching						Kernel-Matching					
	Mean		*SB*		*t*-test		Mean		*SB*		*t*-test	
	Treated	Control	%	%-Red.	*t*-Stat.	*t*	Treated	Control	%	%-Red.n	*t*-Stat.	*t*
Sales ($t-1$)	18.275	18.129	9.400	85.500	0.330	0.740	18.275	17.862	26.500	59.200	0.950	0.346
Year	2001.900	2002.000	-2.800	96.500	-0.120	0.905	2001.900	2001.000	35.200	56.700	1.320	0.193
					PSP 2							
Export Sales ($t-1$)	16.992	17.084	-3.700	94.400	-0.160	0.870	16.992	16.435	22.500	66.200	0.840	0.407
Year	2001.900	2001.800	4.300	94.700	0.180	0.858	2001.900	2000.900	38.300	52.900	1.410	0.164
					PSP 3							
Export Sales ($t-1$)	16.992	17.121	-5.200	92.200	-0.210	0.836	16.992	16.636	14.300	78.400	0.530	0.598
Destinations ($t-1$)	25.071	28.286	-18.100	75.900	-0.490	0.624	25.071	21.677	19.100	74.600	0.590	0.558
Products ($t-1$)	9.036	7.929	14.800	78.600	0.500	0.622	9.036	6.445	34.500	49.800	1.150	0.256
Employees ($t-1$)	4.449	4.068	25.600	57.800	0.960	0.340	4.449	4.202	16.600	72.600	0.580	0.564
Average Wage ($t-1$)	5.206	5.218	-6.900	90.600	-0.250	0.804	5.206	5.162	23.500	67.900	0.880	0.383
Sales ($t-1$)	18.275	18.096	11.500	82.300	0.430	0.668	18.275	17.977	19.100	70.600	0.670	0.509
Year	2001.900	2002.500	-22.800	72.000	-0.960	0.341	2001.900	2001.100	30.400	62.600	1.140	0.259
					s=3							
					PSP 1							
Employees ($t-1$)	4.560	4.068	30.900	49.600	0.890	0.378	4.560	3.758	50.500	17.700	1.410	0.168
Average Wage ($t-1$)	5.124	5.133	-5.200	86.000	-0.170	0.867	5.124	5.086	21.900	41.200	0.610	0.545
Sales ($t-1$)	18.188	17.745	26.900	51.000	0.770	0.448	18.188	17.471	43.500	20.500	1.220	0.234
Year	2000.000	2001.000	-47.800	-66.000	-1.520	0.139	2000.000	1999.800	11.700	59.300	0.320	0.748
					PSP 2							

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Table 4: Summary of Further Balancing Tests

	Nearest Neighbor Matching						Kernel-Matching					
	Mean		*SB*		*t*-test		Mean		*SB*		*t*-test	
	Treated	Control	%	%-Red.	*t*-Stat.	*t*	Treated	Control	%	%-Red.n	*t*-Stat.	*t*
Export Sales ($t-1$)	16.783	16.243	21.500	61.300	0.690	0.494	16.783	15.465	52.600	5.400	1.510	0.142
Year	2000.000	2000.600	-29.900	-3.700	-1.060	0.298	2000.000	1999.400	27.200	5.400	0.770	0.449
						PSP 3						
Export Sales ($t-1$)	16.783	16.584	7.900	85.800	0.210	0.831	16.783	15.909	34.800	37.300	0.950	0.352
Destinations ($t-1$)	22.313	20.438	10.000	82.100	0.220	0.829	22.313	16.164	32.700	41.400	0.800	0.432
Products ($t-1$)	9.125	7.938	14.400	77.800	0.350	0.730	9.125	4.875	51.400	20.400	1.360	0.185
Employees ($t-1$)	4.560	4.231	20.700	66.300	0.530	0.597	4.560	3.871	43.400	29.300	1.150	0.261
Average Wage ($t-1$)	5.124	5.107	9.500	74.600	0.310	0.762	5.124	5.089	19.900	46.700	0.550	0.585
Sales ($t-1$)	18.188	18.007	11.000	80.000	0.280	0.781	18.188	17.594	36.000	34.300	0.950	0.351
Year	2000.000	2001.200	-56.800	-97.400	-1.820	0.079	2000.000	1999.800	11.400	60.300	0.320	0.753
						s=4						
						PSP 1						
Employees ($t-1$)	4.606	4.421	11.400	81.400	0.330	0.746	4.606	3.867	45.700	25.400	1.220	0.233
Average Wage ($t-1$)	5.117	5.132	-8.600	78.900	-0.260	0.800	5.117	5.077	22.800	44.000	0.610	0.547
Sales ($t-1$)	18.225	18.125	5.900	89.300	0.170	0.863	18.225	17.567	39.300	28.800	1.040	0.305
Year	1999.800	2000.200	-21.400	53.600	-0.630	0.534	1999.800	1999.300	28.000	39.300	0.750	0.462
PSP 2												
						PSP 2						
Export Sales ($t-1$)	16.794	16.160	25.000	53.800	0.780	0.443	16.794	15.548	49.100	9.100	1.350	0.187
Year	1999.800	2000.500	-39.200	14.900	-1.270	0.215	1999.800	1999.000	42.900	6.900	1.160	0.256
						PSP 3						

Continued on next page

Table 4: Summary of Further Balancing Tests

	Nearest Neighbor Matching						Kernel-Matching					
	Mean		*SB*		*t*-test		Mean		*SB*		*t*-test	
	Treated	Control	%	%-Red.	*t*-Stat.	*t*	Treated	Control	%	%-Red.n	*t*-Stat.	*t*
Export Sales ($t-1$)	16.794	16.980	-7.300	86.400	-0.200	0.841	16.794	15.947	33.400	38.200	0.870	0.391
Destinations ($t-1$)	22.533	16.867	29.500	47.000	0.680	0.504	22.533	17.021	28.700	48.500	0.650	0.520
Products ($t-1$)	9.200	6.133	36.200	44.400	0.860	0.396	9.200	5.184	47.400	27.200	1.170	0.253
Employees ($t-1$)	4.606	4.262	21.300	65.300	0.530	0.600	4.606	3.931	41.800	31.800	1.060	0.299
Average Wage ($t-1$)	5.117	5.235	-68.100	-66.500	-0.970	0.341	5.117	5.070	26.900	34.300	0.730	0.470
Sales ($t-1$)	18.225	18.238	-0.800	98.600	-0.020	0.984	18.225	17.630	35.500	35.700	0.900	0.377
Year	1999.800	2000.700	-46.300	-0.600	-1.530	0.138	1999.800	1999.200	32.200	30.100	0.870	0.394

This Table summarizes balancing tests for all time horizons $s = 1, ..., 4$ and all propensity score specifications PSP 1, PSP 2 and PSP 3.

5.2 The Effect of DEA Membership on Exports

As previously discussed, this section presents estimates of the causal effect of DEA membership on export performance measured in terms of export sales, number of export products and number of destination countries. These estimates are presented in Table 5 together with p-values for the test of that DEA membership exerts no or a negative effect on export sales, the number of export destinations or the number of exported products. These p-values are based on analytical standard errors according to Abadie and Imbens (2006), as Abadie and Imbens (2008) prove that the bootstrap fails to provide correct standard errors for matching estimators. Recall that treatment is defined as firm entry into the DEA conditional on subsequent membership in the organization. This implies that we omit firms which have left the association after entry. With this in mind, our estimates should be interpreted as an upper bound of trade creation effects. Please note that our estimations for different time horizons are based on distinct samples, which has been done to be able to use as many treated observations as possible in each estimation.

Table 5 summarizes our estimation results. The subsequent discussion starts from our preferred specification, PSP 2 with NN matching, and subsequently relates to PSP 2 with KM. Export sales are measured in natural logs, such that δ multiplied by 100 measures the percentage change in export sales which is caused by entry into the DEA. According to our preferred propensity score specification, PSP 2, we find that DEA membership exhibits a positive effect on export sales three and four years after entry. It takes a while until a new member can benefit from the export knowledge pooled in the DEA. In the first two years after entry, membership does not exhibit an effect which is greater than zero. However, point estimates reflect a gradual increase over time, and the effect turns to be significantly positive in the third year. Then, the effect is substantial and amounts to export sales which are 47% higher for a member three years after entry and 82% higher four years after entry. The gradual increase in the effect over time is also reflected in the size of the two point estimates for the two years after entry. The general picture carries over to the KM estimates, where the point estimates increase over time for all propensity score specifications. However, we never reject the Null hypothesis that point esti-

mates are less or equal to zero. A similar picture emerges from the KM estimates which rely on a different specification of the propensity score model. But considering the PSP 1 specification with NN matching, we confirm our previous finding that DEA membership turns beneficial two years after entry: DEA membership increases export sales by around 85%. In this specification, the effect turns insignificant but remains positive in the following year.

The number of destination countries is not affected by DEA membership. This results from all specifications of the propensity score for both NN and Kernel matching. Still, the estimated effects increase in the time after entry up to $s = 3$ for all propensity score specifications but for PSP 3 and both matching methods.

Contrastingly, we find evidence for an increase in export products due to DEA membership: NN matching with PSP 2 indicates no effect on the number of export products, but moving to Kernel matching, we find that the number of exported products increases by 0.625 one year after entry, and to 0.905 two years after entry. Estimates obtained from PSP 1 are very similar in size and evolution after entry. For all three propensity score specifications, we find a positive and significant effect of DEA membership on the number of traded products when we employ Kernel matching. This is confirmed by NN matching estimates with PSP 1 and PSP 3. Yet, in these cases participation in the network manifests itself by a stronger increase in the number of traded products: Point estimates for PSP 1 amount to 1.25 (1.42) and 1.50 (2.42) in the first and second year after entry. For PSP 3, we find a significantly positive effect also for the third period after entry

All in all, our estimates indicate that DEA membership matters for export success. Its important role in export promotion stems from increasing the number of exported products, and boosting export sales rather than broadening the range of export destinations. However, the benefits of entry do not manifest immediately for export sales, but fade in over a period of two years after entry. This reflects that at the beginning of the membership, the firm cannot immediately access all knowledge pooled in the association, but needs to invest further in getting to know other members and to interact with them. Moreover, activities which are set up to foster export sales like participation in trade fairs or assemblies take place all over the year. Thus, it is not surprising that the gain from membership arises in the long run. Then, firms experi-

ence a strong boost in their export sales, amounting to 48% after the third, and 82% after the fourth year. Our estimates suggest that firms immediately benefit from an increased number of exported products after entry into the DEA.

Similar to earlier related work, we find that export promotion helps to foster exports. But our results differ in important ways: Volpe and Martincus (2008) find that export promotion fosters exports almost exclusively along the extensive destination and product margins, rather than the intensive margin of exports. On the contrary, Görg et al. (2008) find that sufficiently large investment grants, which indirectly might support exports, lead to an increase in export sales, but play no role on the extensive margin of trade. This suggests that export promotion plays a different role in developing and developed countries: As Volpe and Martincus (2008) argue, national reputation effects may render it even more difficult to enter new product or geographical markets. The opposite is probably true for Danish firms: In the journal of the DEA, Dansk Eksport (2005), the administrative director of a big member company says that even for his company, it is an advantage to be jointly participate at trade fairs and to be visible as one part of a large national stand. Thus, the reputational and potentially informational barriers to overcome might be considerably lower in the case of a developed small open economy like Denmark. But, on the contrary, for Danish manufacturing firms it may be much more important to be in a common network with its suppliers which potentially translates into lower variable cost.

6 Conclusion

This paper addresses the question whether and how export promotion works in a developed small open economy. In order to explore the role of different channels through which exports may be fostered, we use firm-level information on exported products and export destination on top of export sales. We employ a difference-in-difference estimation technique to estimate the causal effect of membership in the export association on firm-level trade.

From our analysis, we can conclude that the Danish Export Association is certainly a pool of high-performance firms both in terms of export sales, the number of export destinations and

the number of export products. But more importantly, this is not due to cherry-picking: indeed, we find that DEA membership causes an increase in export sales and encourages the shipment of more products. The increase in export sales manifests itself two years after entry, whereas the increase in exported products occurs already in the first year after the beginning of the membership.

Our results corroborate an interesting finding of earlier work: For developed countries, export promotion indeed seems to be more important for the intensive margin of firm-level trade rather than the extensive margin, whereas for developing countries the reverse is true. This suggests that benefits from the pooling of knowledge differ substantially by the level of economic development and overall trade exposure in the country.

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Table 5: Difference-in-Difference Matching Estimates

Nearest Neighbor Matching

	PSP 1		PSP 2		PSP 3	
s	$\widehat{\delta}$	$p(\delta \leq 0)$	$\widehat{\delta}$	$p(\delta \leq 0)$	$\widehat{\delta}$	$p(\delta \leq 0)$
			Export Sales			
1	-0.079	0.637	0.184	0.125	0.067	0.349
2	0.134	0.350	0.190	0.254	-0.133	0.680
3	0.852	0.072	0.476	0.103	0.385	0.155
4	0.477	0.146	0.818	0.053	0.145	0.372
			Destination Markets			
1	0.167	0.440	0.917	0.216	0.861	0.218
2	0.714	0.334	0.286	0.413	-1.500	0.838
3	1.750	0.178	1.875	0.183	1.625	0.356
4	2.200	0.160	1.400	0.249	-2.400	0.866
			Number of Products			
1	1.250	0.072	0.167	0.397	1.417	0.020
2	1.500	0.034	-0.714	0.817	2.429	0.028
3	0.813	0.210	-0.188	0.575	1.563	0.109
4	0.733	0.248	0.867	0.207	0.067	0.477

Epanechnikov Kernel Matching

	PSP 1		PSP 2		PSP 3	
s	$\widehat{\delta}$	$p(\delta \leq 0)$	$\widehat{\delta}$	$p(\delta \leq 0)$	$\widehat{\delta}$	$p(\delta \leq 0)$
			Export Sales			
1	0.001	0.496	0.016	0.416	0.011	0.445
2	0.087	0.367	0.109	0.335	0.108	0.337
3	0.115	0.340	0.136	0.313	0.141	0.306
4	0.172	0.335	0.194	0.314	0.197	0.312
			Destination Markets			
1	0.489	0.263	0.526	0.247	0.515	0.252
2	0.468	0.313	0.522	0.293	0.498	0.302
3	0.709	0.335	0.639	0.351	0.726	0.332
4	0.570	0.364	0.483	0.384	0.372	0.410
			Number of Products			
1	0.650	0.101	0.654	0.103	0.647	0.102
2	0.915	0.044	0.905	0.046	0.944	0.040
3	0.265	0.373	0.224	0.392	0.308	0.353
4	0.168	0.420	0.145	0.431	0.316	0.352

This Table summarizes the matching estimates for the effect of DEA membership on export sales, number of export destinations and number of products shipped by time after entry into the Danish Export Association s. Samples differ across horizons, in increasing time after entry, the number of treated firms amounts to 36, 28, 16 and 15. Nearest neighbor matching is done for one neighbor. The bandwidth for the Epanechnikov kernel is set to 0.003.