Firm Specific Trade Policy: Evidence on Effectiveness and Mechanisms*

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Abstract

Most countries engage in a variety of firm-specific trade policies. In this paper we examine the effectiveness and the mechanisms behind a firm-specific trade policy, export promotion. We use detailed data from the Danish Trade Council to solve measurement problems, and we exploit randomness in the targeting of the policy across firms to solve selection problems. We first find that the firm-specific trade policy boost exports of firms along the intensive margin. Next, we show that this is due to increasing sales, while marginal costs, export prices and quality remain roughly constant. This suggests that firms use the firm-specific trade policy to increase demand for their products on foreign markets consistent with a trade expansion theory such as Arkolakis (2010).

Keywords: Firm-specific trade policy, Firm-level export data, adjustment mechanisms

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1 Introduction

Recent literature examines adjustments in prices, quality and markups to understand firm's responses to tariff liberalizations and success in export markets (De Loecker et al. 2016; Fan, Li, and Yeaple 2015; Khandelwal, Schott, and Wei 2013; Fitzgerald, Haller, and Yedid-Levi 2016; Rodrigue and Tang 2019). Beyond tariffs, several common and widespread trade policies including trade facilitation, export promotion, trade subsidies, export credits etc. are difficult to observe, are specific to firms, and depend on firm's self selection to achieve their desired goals. Due to measurement and identification challenges, existing empirical literature provides limited evidence on their effectiveness and whether these policies meet their objectives. In addition, we do not have evidence on how to interpret these policies with respect to standard trade models, WTO rules, and other agreements regulating international commerce.

We solve several data and identification challenges to fill this gap in the literature. Firm's selection to use these trade policy instruments may be related to expected success on export markets, or, an attempt to revitalize failing markets. To solve these identification problems we examine Denmark's export promotion policy. We develop an exogenous instrument based on the Danish Trade Council's strategy to distribute destination specific export promotion services across firms. We apply detailed export data to determine effects of export promotion on sales and prices at the destination-product level. Standard margins of adjustment such as markups, marginal costs, product quality and input quality are not directly observable, but we apply recent developments in structural techniques to measure these outcomes. We then examine adjustment mechanisms by estimating the effects of export promotion on firm-level production, markups, marginal costs, product quality, and inputs.

Our empirical strategy provides the first instrumental variable estimates to examine effectiveness of promotion services. We provide evidence and institutional background to show that the Trade Council's own selection of firms is random conditional on firm, product and destination characteristics. Our first stage shows that the Trade Council's approach of firms with information regarding export promotion services has a positive effect on take-up, suggesting that to reach their full potential, trade policies relying on self-selection must overcome information asymmetries.

In the second stage, conditional on high dimensional fixed effects, accounting for self-selection raises the effectiveness of export promotion. Therefore, self-selection downward biases OLS and other estimation techniques. A simple explanation is that low performing firms seek out the trade council for help with export markets. A more nuanced explanation is that firms that self-select to seek out services have good export managements, therefore additional services have limited ability to improve performance.

Exploiting destination and product level variation allows us to provide evidence regarding effects of export promotion on export prices. This evidence does not exist in the literature as most work grapples with more aggregate firm, industry, or country level information. We discuss how price effects combined with evidence on supply side effects of export promotion are useful to distinguish several mechanisms that have recently been studied to examine the effects of trade liberalizations. We find that firms use export promotion to increase sales on foreign markets avoiding significant price adjustments (Fitzgerald, Haller, and Yedid-Levi 2016). At the firm-product level, we provide evidence that export promotion significantly increases production and is associated with a weak and negative effect on marginal costs. We do not find evidence for quality or markup adjustments. In sum, these results are most consistent with trade expansion theory according to Arkolakis (2010). Firms use export promotion to increase demand for their products on foreign markets. They satisfy this additional demand along relatively constant marginal cost curves. Evidence and theory on demand side mechanisms are traditionally limited in the trade literature. Our evidence shows that they are important to understand trade policy such as export promotion.

We make several additional contributions to the literature. In a recent paper Munch and Schaur (2018) examine the effect of export promotion on firm level performance beyond export measures. They apply matching estimators to examine the effect of promotion on firm level performance measures including employment, total sales, and value added and they provide a cost-benefit calculation of export promotion. By contrast, we focus on the mechanisms behind export promotion and examine effects of export promotion on prices and product level mechanism consistent with trade theory and the complimentary literature that examines firms' response to tariff liberalization. Also, we apply an instrumental variable technique rather than relying on observables to solve the identification problem. Furthermore, throughout they assume that export promotion does not

affect the firm's sales in other markets or the sales of competing firms. Using product level data, we directly examine spillover effects according to theories of multi-product firms.

Multi-product firm theories all have tradeoffs between the number of products, the destinations and the intensive margin. We examine how export promotion affects these tradeoffs applying recent approaches to determine marginal costs etc for multi-product firms.

2 Data

In this section we outline our data sources and data construction. Overall, we collect data on export promotion services from The Trade Council under the Ministry of Foreign Affairs of Denmark and merge these data with several administrative registers from Statistics Denmark. Our sample consists of the universe of exporting Danish manufacturing firms with registered employees for the years 2002-2015.

2.1 Export Promotion

The Trade Council organizes all governmental export-promotion activities in Denmark, and offers tailored export-promotion services to Danish firms. Firms are charged for these services, but prices are heavily subsidized. In practice, these services are provided by the Danish embassies and consulates abroad, and export-promotion services are then naturally destination-specific.

Crucial for our identification strategy, the Trade Council actively approaches firms and offer them export-promotion services. This outreach is conducted by the individual embassies and consulates, and The Trade Council has no overall strategy for which firms to approach nor is there any coordination across embassies and consulates. Instead, each embassy and consulate approach firms based on information about industry-specific conditions in the local destination market. This suggests that, once these conditions are controlled for, firms are approached randomly.

We collect data on export-promotion services from The Trade Council which allows us to observe, for any given destination and year for the years 2002-2015, a) whether a given firm purchased promotion-services, and b) whether a given

firm was approached by The Trade Council and offered export-promotion services. This allows us to distinguish between two groups of treated firms, "self-selected" and "approached", and two groups of un-treated firms, "approached" and "un-approached". As The Trade Council does not offer export-promotion services to all destinations, in the following analysis we focus exclusively on destinations in which we observe at least one purchase of services throughout our sample years.

2.2 Sample

The data on export-promotion services are merged to several administrative registers from Statistics Denmark.

We extract firm-level characteristics from the Firm Statistics Register and Firm Accounts Statistics, covering the universe of private sector Danish firms. We limit our sample to manufacturing firms (defined as two-digit NACE code 10-34) with registered employees active in (any of) the years 2002-2015. This leaves 22,147 unique firms.

As the aim of this paper is to examine the effect of export-promotion services along the intensive export margin, we consider only exporting firm-year observations, further limiting the number of firms to 8,815, but maintaining the lion's share of total sales and employment. Lastly, as noted above, we consider only firms exporting to a destination in which export promotion was observed. As this restriction maintains all Denmark's major export destinations, only few firms are dropped, and the final sample consists of 8,385 firms. Of the total population of Danish manufacturing firms with employees, our sample maintains app. 85 pct. of employment, 91 pct. of sales, and 91 pct. of export sales (see Table 1).

2.3 Export Sales and Prices

As we are interested in examining the effect of export promotion-services on variables that are inherently product-specific, the natural unit of observation is a firm-destination-product-year quadruplet. Trade flows are recorded according to the eight-digit Combined Nomenclature, and for each flow we observe its value and quantity, the unit of the latter being dependent of product. Unit values are defined as value divided by quantity, and we refer to these as "prices" throughout the remainder of the paper.

2.4 Marginal Cost and Productivity

In order to examine the effect of export-promotion services on supply-side variables, the estimation sample must necessarily differ from the one outlined above. Firstly, the natural unit of observation is now the firm-product-year level. Secondly, this analysis requires production data rather than export data. To meet these requirements we introduce the Danish PRODCOM dataset containing all manufacturing firms with at least ten employees and the products they produce. For each firm-product-year observation, we observe the quantity produced and the corresponding sales value. After cross-validating with the Firm Statistics Register and Firm Accounts Statistics, but not requiring firms to be exporting, this dataset contains 2,475 unique firms.

The supply side variables that are not readily observed, e.g. marginal costs and productivity, are estimated. We apply the estimation procedures proposed by De Loecker and Warzynski (2012) and extended by De Loecker et al. (2016) to obtain firm-product-year specific marginal cost estimates. The main insight is that marginal costs are identified from the firm's short-run cost-minimization problem, such that the demand side can be left unspecified. Econometrically, the procedure mainly relies on estimation of production functions, which is a well-studied topic in empirical research. The procedure also produces firm-year specific productivity estimates.

2.5 Summary Statistics

Table 2 contains brief summary statistics for the main sample at the firm-year level. The sample is split into four mutually exclusive groups: UU (un-treated, un-approached), UA (un-treated, approached), TU (treated, un-approached), and TA (treated, approached). In terms of all measures, average and median firm size within each group is increasing in the order: UU, UA, TU, TA.

Table 3 compares destinations in terms of number of exporting and treated firms. The average destination-year is served by app. 500 Danish exporters of which around 1.2 pct. had purchased export promotion-services to that particular destination in the given year. Table 3 shows, unsurprisingly, that the export destinations differ vastly in terms of both export at treatment density.

3 Empirical Strategy

In this section we first explain how we identify the effect of export promotion on export values and prices. Then, we explain how we obtain measures for firm-product level performance measures using structural techniques to identify the effect of export promotion on marginal costs and markups.

3.1 Empirical Models and Predictions

Let $TCS_{fdt} = 1$ if firm f received trade council services to promote exports to destination d in year t, in year $t-1$, or, both (Broocks and Van Biesebroeck 2017). Let $Exports_{fpdt}$ and $Price_{fpdt}$ be the firm's f.o.b. export value and price of product p realized in destination d in year t. To examine effectiveness of export promotion to increase exports our baseline empirical model relates export values to export promotion

$$ln(Exports_{fpdt}) = \beta_0 + \beta_1 TCS_{fdt} + FixedEffects + u_{fpdt} \tag{1}$$

The parameter of interest is β_1. Based on the existing literature we expect that export promotion raises export values.

To examine the effect of export promotion on prices we relate unit values to export promotion

$$ln(Price_{fpdt}) = \beta_0 + \gamma_1 TCS_{fdt} + FixedEffects + u_{fpdt} \tag{2}$$

Our parameters of interest, γ_1, β_1, capture the effect of export promotion on export values and prices. Given the log-separability of unit values and export values, the total effect γ_1 decomposes into the price effect and quantity effect. Therefore, $\gamma_1 - \beta_1$ equals the residual quantity effect associated with export promotion to determine export values.

Based on the literature the effect of export promotion on prices is ambiguous. If export promotion increases firms exports, then firms potentially engage in innovation, upgrade technology to lower marginal cost and reduce export prices (Bustos 2011; Lileeva and Trefler 2010). Therefore, if export promotion increases exports, then based on this mechanism we expect $\gamma_1 < 0$. On the other hand, if export promotion is a strategy to grow the destination market, then, if exporters accumulate demand via export promotion strategies, they upgrade their product quality and charge higher prices (Rodrigue and Tang 2019). Consequently,

in this case we expect $\gamma_1 > 0$. Finally, export promotion may be considered a strategy to increase foreign demand through advertising, marketing efforts and matching with new buyers without affecting marginal costs of supplying the foreign market. In that case export promotion is akin to a marketing stratgy that expands demand on the foreign market without affecting prices (Arkolakis 2010; Fitzgerald, Haller, and Yedid-Levi 2016), $\gamma_1 = 0$.

3.2 Identification

Variation in the promotion indicator is due to firms purchasing services from the trade council, but many firms that purchase services only purchase them for specific destinations. Therefore, we observe variation in the promotion indicator across firms and destinations. Our parameters of interest, $\gamma \times 100$, translates this variation in the promotion indicator into percentage changes in export values and prices. In estimating the these treatment effects we tackle several identification challenges.

Firms may self-select to purchase trade promotion services based on unobservable information that is also systematically related to export performance. For example, Holmes and Stevens (2012) shows that firms with high scale invest to reduce distance and border costs. Consequently, highly productive firms, or firms highly productive in certain products, may be more likely to engage in actions to reduce trade costs. In addition, we expect that firms are more likely to invest in destinations that have sufficient scale to recover the investment. Across several specifications we work with firm-year, firm-product-year, firm-destination, and firm-product-destination fixed effects to account for this unobserved heterogeneity. In addition to accounting for unobserved firms characteristics, these fixed effects also accommodate variation in the difficulty to enter certain destination markets even at the product level.

Conditional on firm-product-destination fixed effects, variation in the promotion indicator across destinations provides a proper control group to identity promotion effects by comparing changes in export flows to treated destination with changes in export flows to non-treated destination. Conditioning on firm-year effects focuses identification on comparing trade flow to multiple destinations within the same firm. Conditioning on firm-product-year effect focuses identification on comparing treated trade flows of the same product within firms across

multiple destinations. In terms of identifying export promotion effects, this is the most rigorous and cleanest approach to date in the literature.

To account for growth potential, or decline, across export markets and products we examine effects of including destination-year fixed effects and product-year fixed effects. In all of our specifications we include at least a product year fixed effect to account for unit differences in prices. For example, some products may be more appropriately measured in piece counts while other may be measured in gallons. As long as the conversion of these units to weight is stable, product fixed effects account for this heterogeneity.

If despite our rigorous fixed effect approach selection of firms into export promotion is still endogenous due to time varying information we can't control with fixed effects, then only randomization will break the endogeneity. It is unclear which way the bias would go. Firm's may have information about future success that leads them to approach the council to deepen their export experience. If they are right, then trade council services are associated with greater export performance generating positive bias. On the other hand, firms concerned about their future success may be more likely to approach the council to save their export markets. If they are right, then promotion services are correlated with future failure on export markets leading to a negative bias. Unfortunately we do not have the ability to randomly select firms for export promotion, but the trade council data provides us with a similar experiment.

The trade council approaches firms to advertise its services. For each firm-destination-year observation in our data we observe if the firm approach the trade council, or, if the trade council first approached the firm. In our data, about x percent of firms-destination year observations were initiated by the trade council. Of these firms, about y percent took up export promotion services. Let $z_{fpdy} = 1$ if the trade council approached a firm for promotion services and zero otherwise. Then, z_{fpdy} is a valid instrument if it predicts the treatment indicator and and is exogenous conditional on fixed effects.

The trade council approaches firms based on industry, firm, and destination specific information. For example, they see whether products are selling well in certain destinations and approach firms that produce such products. They may observe basic firm characteristics to predict who may be interested in services. Conditional on that, it is just calling firms up to promote their services. In our empirical model we account for a much wider range of unobserved firm, product

and destination characteristics. To our knowledge, the trade council does not have more information then we do to predict success in export markets. Therefore, conditional on our fixed effects, the trade councils attempt to approach firms for services is as good as random. Then, as long as z_{fpdy} predicts the promotion indicator, the trade council approaching firms for services is a valid instrument to break any remaining endogeneity.

To examine the validity of our identification assumptions we examine both, the treatment and the instrument for pre-trends. As a straight forward placebo test we predate treatment to the year before the actual treatment and estimate our baseline regressions. Next we also predate our instruments and estimate the baseline using two stage least squares. In both cases we expect that treatment does not affect export sales. Next we examine if the instrument is directly associate with export sales before treatment. We predate z_{fpdy} by one period and examine if the trade councils approach of firms was associated with export performance in the previous period. Finally we follow (Autor 2003) and include leads and lags of the treatment indicator to our model. This allows us to examine potential dynamic effects of export promotion and rule out pre-trends.

3.3 Product Level Heterogeneity

International trade is dominated by multiproduct firms that optimize across their product mix (Bernard, Redding, and Schott 2010; Eckel and Neary 2010; Eckel, Iacovone, et al. 2015). If firms sell multiple products within each destination, then specifying the treatment indicator at firm-destination-year level potentially ignores two sources of heterogeneity.

First, if promotion is destination-product specific, then a firm may ask for services as part of the learning process to successfully establish a low performing product in the export market (Timoshenko 2015). In that sense export promotion can be considered a subsidy to maintain export markets and avoid early exit (Arkolakis, Papageorgiou, and Timoshenko 2018). In that case, for multiproduct firms the treatment indicator is miss-measured in that it assigns treatment to all of a firms products in a given destination even though the firm only purchased services for a particularly low performing product. Alternatively, export promotion may be an investment strategy to lower trade costs for products that have sufficient scale to recover fixed costs from these investments (Holmes and

Stevens 2012). In this case, firms demand export promotion services for their high performing products, but the promotion indicator considers all of the firm's products within the destination treated.[1]

Second, even if promotion is at the destination level, then it may not be equally effective across all products. For example, a firm may receive intelligence on import permits and customs valuation, but not all products the firm sells may be equally subject to the same regulations (Bowen and Crowley 2016).

We follow two approaches to examine product level heterogeneity based on export performance. First we apply weighted regressions.[2] We weigh each firm-product-destination-year observation by last period's export value share the firm achieved for the product among all products it sold in the destination. To be precise, let w_{fpdt} be the weight and Ω_{fdt} be the set of products firm f sells in d in year t. The weights are then computed as $w_{fpdt} = \frac{Exports_{fpdt-1}}{\sum_{p \in \Omega_{fdt-1}} Exports_{fpdt-1}}$. For multi product firms, these weights give more importance to observations characterized by greater export performance. If multiproduct firms use export promotion to support high performing products, then our weights emphasize firm's core products within destinations. In that case, we expect that weighted estimates increase in magnitude. The reason is that assuming erroneously that all products are treated introduces an intent to treat effect that is mitigated by the regression weights.

Next, we distinguish core products by export performance and within the firm as a whole to examine if export promotion is a mechanism firms use to more actively promote their core competence on foreign markets. We define three measures of core competence. First, with each destination, we consider the core product as that product with the larges export sales over the whole sample period. Second, we define the core product as the product with the larges export sales over the sample period within the firm. Third, we define the core product as that product with the greatest export and domestic sales within the firm. We then estimate our baseline empirical models on the sample of core products to examine firm's use and effectiveness of export promotion across core and non-core products.

[1] While the actual fixed costs of export promotion are subsidized and likely to small to justify such a mechanism, the more substantial cost may be in implementing and executing and export strategy based on the received information. Both are required for export promotion to be effective.

[2] Interaction terms of export promotion with export performance measures would raise endogeneity concerns as they would include information about the dependent variable as regressors. Even if this information is lagged it raises concerns because we estimate with fixed effects.

3.4 Substitution

Rotemberg (2018) examines the effects of subsidies for small firms on sales. He shows that subsidies determine firm-level sales via two effects, a direct effect and a competition effect. In this set-up, if individual firms' treatment does not affect the destination market as a whole, the standard monopolistic competition assumption, then the direct effect captures export promotions ability to reduce trade distortions and increase exports. However, if only few firms compete on the destination market, or, treated firms are large compared to other firms, then export promotion reduces the average price in the market, making the market more competitive. In that case, not only do treated firms gain sales due to mitigated trade distortions, non-treated competing firms lose sales because market prices drop compared to their own prices.

This creates a challenge for identification and effectiveness of export promotion. From an identification point of view this results in a violation of he stable-unit-treatment-value assumption (Rubin 2005). This is especially concern when identifying variation emphasize with destination product difference in sales and treatment such as with destination-product fixed effects. We examine these indirect effects in several ways.

If the direct effect is the main coefficient of interest, then a simple solution is to include destination-product-year fixed effects. If sufficient variation remains to identify the model, then these fixed effects account for average prices in the destination market. This solution is straight forward, but not satisfying if the concern is whether export promotion raises exports as a whole. For example, the fixed effect specification does not tell us whether the direct effects come at the cost of reducing export sales of competing non-treated Danish firms. To examine this we develop two alternative strategies.

First, we expect that competition effects are relevant in markets where treated firms control a large share of the market. To examine this, we distinguish effects of treatment by market size, number of treated firms relative to total number of exporters, and firm size. Second, we directly examine if treatment of some firms reduced sales of non-treated firms in the same destination market.

Multiproduct firms dominate international trade. (Bernard, Redding, and Schott 2010). Eckel and Neary (2010) show in theory that firms optimally adjust their product mix as they expand their core competency. Consequently, if firms reduce supply in non-core markets as they grow their core competency,

then this results in substitution effects captured by our estimates. We consider two dimensions of substitution. First, multiproduct firms may use export promotion to expand their core competency at the cost of other products. Second, single and multiproduct firms may use export promotion to expand sales in core markets substituting from marginal export markets, or, they may take advantage of emerging opportunities of growth markets, sacrificing their core export markets. We apply several strategies to examine this concern.

First, remember that the treatment effect is specified at the destination level. Therefore, even if treatment was not applicable across all products in the destination and perhaps sales declined in these products, our intent to treat effect captures the net effect across all of these products. Second, firm-product and firm-product year fixed effects account for differences and changes in average export sales across firms' product mix in on treated markets. In this case, a positive treatment effect is not informative about total export sales, because the positive treatment effect may come at the cost of reduced average export sales across non-treated products and markets. Therefore, we examine how treatment of a product in a given destination market affects export sales of the firm's non-treated export markets.

3.5 Mechanisms

In the previous subsections we discussed identify the effect of destination specific export promotion on exports across products and destinations. Next we use structural estimates at the firm-product-year level for marginal costs and inputs to further distinguish mechanisms that support export promotion. Based on the results from the previous sections there are several cases to distinguish. Across all results, we expect that export promotion raises export values.

Eckel, Iacovone, et al. (2015) show that firms' core competency may be characterized by their high quality product. Rodrigue and Tang (2019) show that firms invest into quality to grow their export markets. If export promotion supports firms effort to produce and sell higher quality products on foreign markets, then in this case we expect that positive export promotion effects go along with higher prices and greater marginal costs of production.

Alternatively, Eckel and Neary (2010) argue that firms core products are characterized by their high productivity. Bustos (2011) shows in theory and empirics

the liberalization of export markets leads firms to invest to lower marginal costs of serving the foreign market and increase export sales. Therefore, if export promotion supports firms investments to upgrade productivity and increase export sales, then we expect that positive export promotion effects are associated with lower prices, greater productivity and lower marginal costs.

Rotemberg (2018) shows that if subsidies mitigate distortions, then this results in lower prices. However, if these distortions are not captured by input prices and observed inputs, then marginal costs are unaffected. Therefore, if export promotion is a policy to mitigate export related distortions, then we expect that export promotion allows firms to lower prices in destination markets to increases sales with constant or lower marginal costs.

Instead of affecting the cost and production structure of exporting firms, export promotion may simply be a way to increase demand without much effect on marginal costs and prices (Arkolakis 2010; Fitzgerald, Haller, and Yedid-Levi 2016). In this case we expect that export promotion raises sales without effects on marginal cost and prices. If marginal cost adjust along without associated changes in prices, then export promotion results in markup changes as a consequence of advertising or marketing activity.

4 Results

In this section we discuss our regression results. We start with the effect of export promotion on export values and prices. Next we examine the effect of export promotion on mechanisms. We finish with robustness checks.

4.1 Export Promotion, Exports, and Prices

Table 4 reports estimates for both of our main empirical models applying OLS and Two-Stage-Least-Squares estimators. In addition to estimates and standard errors clustered at the firm-destination-year level, the bottom panel reports the fixed effects included in each specification. First stage statistics support our instrumental variable approach.

As expected, columns 1 to 6 show that export promotion has a positive and significant effect on export values. Across the columns destination-year, firm-destination, firm-year, firm-product, product and product-year fixed effects ac-

count for unobserved destination specific heterogeneity, product characteristics at the firm level, and firm productivity. In the last two columns we estimate with firm-product-destination fixed effects, firm-year, firm-product year and destination year fixed effects. These specifications allow for destination specific trade frictions that vary over time, product differentiation across destinations, and, changing productivity at the firm-year-product level that could be correlated with firm's self-selection to purchase trade promotion. Across these specifications the estimates are remarkably stable and imply that export promotion raises export values by about 4-5 percent. For the average Danish exporter, this is equivalent to a revenue boost of x percent.

Remember that in our empirical model export values are exactly log separable into quantities and prices. Below the results for export values, the effects of export promotion on prices show that, at least for the OLS estimates, a bit over half to the export value is driven by increases in export prices. The remaining effect must be driven by associated increases in export quantities.

Below the OLS estimates we report our instrumental variable estimates. Magnitudes of export promotion effects are similar to the the OLS estimates. As is often the case, due to the inferior efficiency properties of 2SLS compared to OLS, standard errors increase.

The IV estimates on prices do not follow the same pattern as the OLS estimates. The coefficient magnitudes are closer to zero and they are not significant. Therefore, while self-selection does not seem to matter to examine effectiveness of export promotion, it does make a difference to examine channels and mechanisms. We conclude that high priced firms and firms planing to increase prices perhaps associated with quality investment self-select to purchase export promotion to succeed in export markets. Accounting for this endogeneity, we find no price effects, but a significant export value effect. Consequently, we conclude that export promotion itself does not lead firms to adjust prices on export markets. This addresses the potential policy concern that perhaps export promotion is a government financed strategy to increase firm's competitiveness on foreign markets. The positive effect on export values is consistent with a export promotion driven shift in demand.

The First-Stage statistics reported at the bottom of Tables 4 and 5 confirm that the instrument is predictive and not weak. As we only have one instrument we cannot test if the instrument also satisfies the exclusion restriction. However,

we do examine if firms that were approached by the trade council or purchased promotion services already had superior export performance before these two types of traeatments in Table 6.

The left hand panel of Table 6 reports several lead and lagged effects of receiving export promotion on contemporenious export values in period t. We report results for our two most rigorous specifications in terms for fixed effects and draw two conclusions. First, firms that receive promotion in years t+1 and/or t+2 do not have systematically different export flows in year t before they receive promotion.[3] Therefore, we rule out that treated firms were already outperforming non-treated firms before receiving promotion services. Second, although the effects of promotion in t and $t-1$ on exports in t are indistinguishable from a statistical point of view, lagged promotion effects in $t-1$ are stronger than contemporaneous effect in period t. There are several reasons for this result. It takes firms some time to digest promotion services and translate them into export performance. Also, export promotion services may have been received at the end of the year, leading to mitigated effects or partial year effects (Bernard, Boler, et al. 2017). These results highlight the specification benefits of considering the effect of export promotion in either $t-1$ or t on export values in t as developed by Broocks and Van Biesebroeck (2017).

The right hand panel of Table 6 reports results from specification similar as in the right hand panel, but examine the effects of being approached by the trade council in leading or lagged time periods on export performance. The conclusion are the same. In period t, firms approached in either $t+1$ or $t+2$ do not have systematically different export performance compared to firms that were not approached. This confirms that the trade council does not select based on observable export performance. In addition we find that the approach of the trade council has a significant lag effect.

In summary, the first stage statistics and the results in Table 6 support our identification assumptions. Firms' purchasing of promotion services and the trade councils approach of firms to sell services is independent of pre-existing trends.

[3]Adding further leads thus not change this conclusion, but drops a significant part of the sample as we require that firms are active on the same export market in these consecutive time periods.

4.2 Multi-Product Firms

Next we examine potential heterogeneity in export promotion effects across firms' products. We have two objectives. First, most of international trade is driven by multi-product firms and we want to understand how these firms may use export promotion across their product mix. Second, to examine mechanisms in later sections we must assign the observed firm-destination-year specific treatment at the firm-product-year level. For firms that export multiple products to a treated destination, and, firms that export multiple products across destinations this section will facilitate our approach to identify promotion effects on firm-product level mechanisms in later sections.

To examine heterogeneity of treatment effects across products firms export to their treated destinations, Table 5 reports results from weighted regressions. For both weighted OLS and weighted IV results, export promotion raises export values, but does not affect export prices, consistent with the IV results in Table 4. Across the coefficient, weighted estimates in Table 5 tend to greater than the unweighted estimates in Table 4. This suggests that for multi-product firms that sell multiple products in the same market, export promotion may be particularly effective among firm's core competencies to improve export performance.

In Table 7 we define a firm's core-export product as that product that has the greatest total export sales over our sample period. We then augment our baseline specifications with an interaction terms of promotion with an indicator that equals one for a firm's core product. A given firm may export its core product and several non-core products to a treated destinations. On the other hand, a given firm may export it core product to a treated destination and a non-core products to a different treated destination. Therefore, Within treated destinations and across destinations, if the interaction effect is positive, then core products have greater treatment effects relative to non-core products.

Columns 1 and 2 of Table 7 show that in OLS regressions export promotion has a positive and significant direct effect. The interaction terms is small and insignificant. Results in columns 3 and 4 show that as we instrument for both, promotion and the interaction of promotion with the core indicator, the direct effects maintains its magnitude and the interaction effect increases substantially. This suggests that as we account for endogeneity and for on trade council selected firms, core products do see a stronger impact of promotion than non-core products. A challenge is that the effects are insignificant. The potential issues is

inefficiency due to instrumenting two endogenous variables using non-linearity. To examine this, we we split our sample to examine promotion effects on core products.

Columns 5 and 6 report OLS and IV results when we estimate promotion effects over the sample of firms' core products. These total effects for core products are significant and similar in magnitude to the total promotion effects for core products in columns 3 and 4 using interaction terms.

Nocke and Yeaple (2014) model firms marginal costs of supplying a product as a function of managerial or organizational capital. There is a trade-off, to expand one product requires reallocation of managerial capital at the loss of greater marginal production costs of other products. Therefore, within destinations, as firms focus on their core products, this could imply that firms drop non-core products to reallocate managerial capital across products to support heir core competencies.

Table 8 reports results where we regress the number of of products a firm exports at the destination-year level on export promotion. According to OLS and IV estimates, we do not find singificant effects on the product mix.

We draw several conclusions. First, within and across destinations, evidence shows that export promotion has a stronger effect to promote firms' core products on export markets. To identify mechanisms in later sections, this means we will consider firm's main export products and avoid small carry along products, or, products that are still in the experimental stages. As a consequence, standard methods to estimate and back out structural cost and technology parameters apply.

Second, effects of promotion on the product mix are not significant. Therefore, the promotion effects we report are due to export adjustments within the existing firm-destination level product baskets and not driven by attrition of low performing products. In the theory of Nocke and Yeaple (ibid.), export promotion is therefore consistent with an expansion of managerial export capital as opposed to a reallocation across products.

4.3 Mechanisms

The results in the previous sections show that export promotion raises export sales and quantities, but does not significantly affect prices. Even at constant

prices, a question is whether firms increase quality associated with export promotion and raise sales but at the cost of lower markups. On the other hand, scale may reduce firms marginal costs and raise profitability due to greater markups.

Table 9 examines the effect of export promotion on the marginal costs, input expenditure shares on treated products, quantity produced of the treated product, and the materials input cost elasticity.

The results show that export promotion is associated with an increase in production and expenditure shares of treated products. Therefore, export promotion is associated with specialization in treated products consistent with the notion that firms develop competency in treated products. The effects are large. Within firm-product and firm-year firm-product observations, export promotion raises output by up to 50 percent. This is significantly larger than what we see in the export results. This highlights several issues. First, identifying the effect of export promotion with firm level data may cause omitted variable bias that leads to an over-estimation of export promotion effect. Here, the problem is that we may be comparing firms that export to different destinations. We will examine this in the robustness checks. In addition, at the firm product level the estimates combine the effect of export promotion on expanding existing export market and entry into new markets. In our export regressions we mostly focus on the intensive margin.

Given that export promotion does have a significant effect on output. we next examine adjustment margins. We expect that an increase in product quality would be associated with greater marginal production costs and a greater materials input elasticity. If firms purchase higher quality inputs, then a dollar of expenditure in materials does not go as far in producing the same unit of output. The results show that in our most rigorous specifications export promotion does not affect marginal costs, but if anything marginal costs decrease as a result of export promotion. Export promotion is associate with lower output elasticities to materials, perhaps due to firms receiving quantity discounts as they expand production.

In all, contrary to existing results that examine the effect of input and output tariff liberalizations on firms' production structure, these results show that export promotion does not have strong effects on the production structure of firm. It is mostly consistent with an effort to shift demand and expand output along relatively constant or slightly decreasing marginal cost curves. Firms' motivation to engage export promotion in this case are variable profits realized by selling

greater quantities and relatively constant prices and markups.

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Table 1: Sample coverage of population

	SALES	EMPLOYEES	CAPITAL	EXPENDITURES	EXV	FIRM-YEARS
2002	0.90	0.85	0.89	0.91	0.87	0.36
2003	0.90	0.85	0.90	0.92	0.87	0.37
2004	0.90	0.85	0.89	0.92	0.87	0.36
2005	0.89	0.84	0.88	0.91	0.87	0.36
2006	0.89	0.84	0.89	0.91	0.89	0.36
2007	0.89	0.84	0.88	0.90	0.90	0.35
2008	0.90	0.84	0.87	0.91	0.91	0.34
2009	0.90	0.84	0.88	0.92	0.89	0.36
2010	0.92	0.85	0.89	0.93	0.96	0.36
2011	0.92	0.85	0.90	0.93	0.96	0.37
2012	0.93	0.86	0.92	0.94	0.95	0.38
2013	0.93	0.86	0.92	0.94	0.95	0.37
2014	0.93	0.87	0.93	0.95	0.95	0.39
2015	0.93	0.86	0.92	0.94	0.95	0.39
Total	0.91	0.85	0.90	0.92	0.91	0.37

Table 2: Summary Statistics

	SALES	CAPITAL	EXPEND.	EXV	EMPLOY.	DEST.	PRODUCTS
UU							
MEAN	92.54	21.40	54.17	37.02	44	8	9
MEDIAN	21.04	3.63	9.14	1.78	16	3	4
UA							
MEAN	175.91	37.60	96.81	93.84	84	17	17
MEDIAN	51.00	7.80	21.85	14.75	33	13	9
TU							
MEAN	257.16	73.92	138.45	128.85	126	19	19
MEDIAN	63.26	12.35	27.90	22.86	43	15	10
TA							
MEAN	676.15	191.83	335.33	280.68	265	22	25
MEDIAN	82.70	16.09	38.44	35.51	55	19	13
Total							
MEAN	155.57	39.84	84.82	64.86	69	10	11
MEDIAN	24.82	4.39	10.82	3.15	18	4	5

All values in million DKK

Table 3: Export and treatment density across destination-years

	p25	p50	p75	mean
FIRM-YEARS	155	366	650	500.8
TREATED FIRM-YEARS	0	3	8	7.550
SHARE OF TREATED FIRM-YEARS	0	0.00679	0.0184	0.0125

Table 4: Export Value and Price Effects

Estimator	Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
OLS	Export Value	0.0437***	0.0496***	0.0458***	0.0467***	0.0449***	0.0443***
		(0.0155)	(0.0141)	(0.0135)	(0.0142)	(0.0134)	(0.0140)
	Price	0.00981	0.0285***	0.0278***	0.0300***	0.0294***	0.0314***
		(0.0095)	(0.0091)	(0.0088)	(0.0091)	(0.0097)	(0.0103)
IV	Export Value	0.0322	0.0440*	0.0445*	0.0374	0.0457*	0.0467*
		(0.0297)	(0.0245)	(0.0235)	(0.0245)	(0.0242)	(0.0255)
	Price	0.000561	0.0100	0.00376	0.00328	-0.0015	0.000987
		(0.0170)	(0.0149)	(0.0138)	(0.0142)	(0.0153)	(0.0161)
Observations		1,947,665	1,940,724	1,806,516	1,612,479	1,587,159	1,404,082
Fixed Effects		FD DY DP	FY FD DY P	FY FP FD PY DY	FPY FP FD DY	FY FPD PY DY	FPY FPD DY
IV F-Stat(VB)		4381	4073	3731	3559	3282	3085
IV F-Stat(CP)		2172	2280	2089	2001	1871	1784

Standard errors clustered at the firm-destination-year level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 5: Export Value and Price Effects

Estimator	Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)
WOLS	Export Value	0.0398***	0.0399***	0.0421***	0.0454***	0.0410***	0.0454***
		(0.0136)	(0.0134)	(0.0131)	(0.0134)	(0.0135)	(0.0139)
	Price	0.00628	0.0129*	0.00625	0.00455	0.00552	0.00369
		(0.00669)	(0.00659)	(0.00623)	(0.00634)	(0.00654)	(0.00672)
WIV	Export Value	0.0597**	0.0558**	0.0514**	0.0512**	0.0566**	0.0550**
		(0.0244)	(0.0241)	(0.0237)	(0.0243)	(0.0241)	(0.0250)
	Price	-0.0089	-0.0008	-0.0040	-0.0095	-0.0029	-0.0088
		(0.0122)	(0.0120)	(0.0113)	(0.0115)	(0.0116)	(0.0120)
Observations		1,165,162	1,157,985	1,123,800	1,034,574	1,050,784	958,980
Fixed Effects		FD DY DP	FY FD DY P	FY FP FD PY DY	FPY FP FD DY	FY FPD PY DY	FPY FPD DY
IV F-Stat(VB)		18462	17771	16692	15724	13716	12682
IV F-Stat(CP)		10429	10420	9737	9182	8194	7586

Standard errors clustered at the firm-destination-year level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 6: Parallel Trends

Treatment	(1)	(2)	Treatment	(3)	(4)
Promotion in t+2	-0.0265 (0.0217)	-0.0288 (0.0225)	Approached in t+2	0.0341 (0.0239)	0.0350 (0.0240)
Promotion in t+1	-0.0191 (0.0199)	-0.0197 (0.0199)	Approached in t+1	0.00137 (0.0253)	0.00520 (0.0252)
Promotion in t	0.0222 (0.0176)	0.0178 (0.0176)	Approached in t	0.0704*** (0.0225)	0.0675*** (0.0228)
Promotion in t-1	0.0392** (0.0188)	0.0349* (0.0188)	Approached in t-1	0.0863*** (0.0227)	0.0922*** (0.0225)
Promotion in t-2	0.0190 (0.0181)	0.00999 (0.0182)	Approached in t-2	0.0207 (0.0226)	0.0177 (0.0232)
Fixed Effects	FY FPD PY DY	FPY FPD DY		FY FPD PY DY	FPY FPD DY
Observations	418,647	392,653		418,647	392,653
Joint F for all leads (p-val)	1.130 (0.323)	1.236 (0.291)		1.048 (0.351)	1.144 (0.319)
Joint F contemporenous plus lags (p-val)	1.976 (0.115)	1.378 (0.247)		7.813 (3.28e-05)	7.935 (2.75e-05)

Standard errors clustered at the firm-destination-year level in parentheses.*** p<0.01, ** p<0.05, * p<0.1. Alle coefficients estiamted with OLS.

Table 7: Export Promotion Effects on Core and Non-Core Products

	(1)	(2)	(3)	(4)	(5)	(6)
Estimator	OLS	OLS	IV	IV	OLS	IV
Sample	All Exports				Exports of Core Products	
Promotion	0.0423***	0.0401**	0.0391	0.0406	0.0705***	0.0857***
	(0.0151)	(0.0161)	(0.0273)	(0.0294)	(0.0174)	(0.0314)
Promotion	0.0177	0.0246	0.0419	0.0349		
×Core	(0.0224)	(0.0231)	(0.0403)	(0.0421)		
Observations	1,587,159	1,404,082	1,587,159	1,404,082	320,388	320,388
Fixed	FY FPD	FPY FPD	FY FPD	FPY FPD	FPY FPD	FPY FPD
Effects	PY DY	DY	PY DY	DY	DY	DY
IV			1257	1111		13646
F-Stat(VB)						
IV			728.8	654.1		8250
F-Stat(CP)						

Standard errors clustered at the firm-destination-year level in parentheses.*** p<0.01, ** p<0.05, * p<0.1

Table 8: Promotion Effects on Product Mix

	(1)	(2)	(3)	(4)
Estimator	OLS	OLS	IV	IV
Promotion	-0.0995	-0.0448	0.168	0.150
	(0.0912)	(0.0906)	(0.162)	(0.161)
Observations	453,690	453,690	453,690	453,690
Fixed	FY FD	FY FD	FY FD	FY FD
Effects		DY		DY
IV			17593	17990
F-Stat(VB)				
IV			10440	10719
F-Stat(CP)				

Standard errors clustered at the firm-destination-year level in parentheses.*** p<0.01, ** p<0.05, * p<0.1
Unit of observation: Firm-destination-year

Table 9: Mechanisms

Estimator	Dependent Variable	(1)	(2)	(4)	(5)
OLS	Marginal Cost	-0.370***	-0.651***	-0.080***	-0.0215
		(0.0381)	(0.0407)	(0.0209)	(0.0415)
	Expenditure Share	0.0781**	1.735***	0.0657***	0.268***
		(0.0397)	(0.0486)	(0.0217)	(0.0522)
	Quantity	1.599***	2.351***	0.187***	0.295***
		(0.0525)	(0.0589)	(0.0224)	(0.0570)
	Output Elasticity Materials	-0.039***	-0.00142	-0.00485*	-0.00306
		(0.00562)	(0.00373)	(0.00269)	(0.00282)
IV	Marginal Cost	-0.477***	-0.754***	-0.0797**	-0.0525
		(0.0511)	(0.0564)	(0.0344)	(0.0692)
	Expenditure Share	0.167***	2.088***	0.0895**	0.402***
		(0.0530)	(0.0692)	(0.0352)	(0.0883)
	Quantity	2.144***	2.813***	0.252***	0.485***
		(0.0688)	(0.0834)	(0.0345)	(0.0982)
	Output Elasticity Materials	-0.057***	-0.0059	-0.00897*	-0.00910*
		(0.00687)	(0.00489)	(0.00494)	(0.00483)
Observations		28,695	24,764	27,017	14,772
Fixed Effects			FY	FP	FY FP PY
IV F-Stat(VB)		38839	13382	5648	1425
IV F-Stat(CP)		26175	11918	5177	1538

The top and bottom 3 percent of the productivity distribution are excluded as outliers. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1