CAT exports in Turkish manufacturing

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Abstract

How much does the manufacturing firms' trade activity reflect their own production activity? With this paper we argue that a large part of good exports recorded by manufacturing firms are indeed produced by other national actors. This phenomenon, known as Carry-Along-Trade, . We confirm its importance for an emergent country too, Turkey. It emerges the existence of a certain degree of proximity among the goods object of the pure trading activity and the production activity of manufacturing firms.

Keywords: CAT, regular exports, intermediary exporters
JEL classification codes: F12, F13, F14, L11

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1 Introduction

Are exported goods also produced by the manufacturing firm which trades them? This paper answers this question and presents some new facts concerning the international trade activity and for manufacturing firms in an emergent country, Turkey.

A very recent and still limited strand of literature has highlighted the relevant role of the Carry-along-Trade (CAT) phenomenon The latter is the detachment of the production task from the export task even when the foreign sales activity is performed by a manufacturing firm, whose main efforts are devoted to production. More specifically, Bernard, Blanchard, van Beveren, and Vandenbussche (2012) have displayed for the case of Belgium the importance - in terms of share on the total exports - of the manufacturing firms' exports of trading products, that is goods that those firms do not produce and for which they simply act as "trade intermediaries". Similar evidence has been shown for Italy (De Angelis, De Nardis, and Pappalardo, 2011). However, with the exception of these two studies this topic stays unexplored and no analysis has delivered a picture of the CAT phenomenon in developing and emergent countries.

We then try to fill this gap and contribute to the literature by adding some new evidence for a middle income country, Turkey, and by shedding light on the characteristics, drivers and reasons behind CAT export flows.

The importance of investigating this phenomenon rests on the understanding of the trade consequences for the countries' productivity and growth. A large and dynamic strand of literature at micro-level has focused on the effects of manufacturing firms' export activity in terms of productivity, profitability, innovation, technological transfers and product upgrading (Wagner, 2007, 2012; Salomon and Shaver, 2005; Bratti and Felice, 2012; Hahn and Park, 2011). It is reasonable to expect that firms would benefit from their export activity because of i) the support delivered by very productive and innovative foreign customers that may help their supplier in improving their efficiency and develop new and more sophisticated products, ii) the facing of a stronger competition from foreign firms, iii) the contacts with more advanced technologies, and iv) the exploitation of scale economies. All these mentioned channels require that the operator which deals with the trade activity is also directly involved in the production activity and the benefits obtained from the foreign markets are indeed exploited in its production processes. However, as long as a large number of existing empirical analysis make use of trade data directly collected by customs, the exporter - even if a "natural" manufacturer - may not correspond to the actual producer of the good. The export-production linkage then may be lacking and, as a consequence, the premise for the existence of learning effects from exports may fail. It would then follow the need of a re-visitation of all the pre-existing evidence. And it emerges the importance to investigate the scope, characteristics and reasons of CAT trade flows carried by manufacturing firms.

In order to investigate the CAT phenomenon we link production and trade data at firm-product level for Turkey and we follow the analysis in Bernard, Blanchard, van Beveren, and Vandenbussche (2012) in order to compare the experience of a developing country with the one of a developed country. First of all, we analyse the determinants of CAT and regular export propensity and search for a relationship between previous export experience as a regular or as a CAT exporters and the probability to star exporting as a CAT or as a regular in the future. Second we explore firm, product and destination country level determinants of CAT flows. Finally, we search for evidence on demand complementarity and technological relatedness between CAT and firm products. Within the limited literature, we contribute in some directions. First, we complement the existing evidence on advanced economies by focusing on a rapidly growing and emergent country increasingly involved in the global production networks. Second, we extend the analysis to a panel dimension, by exploring the evolution of the phenomenon over time. Third, we investigate the causes behind the existence of these flows by exploring the linkage between the production and export activity in terms of both demand and offer complementarity. More specifically we add to the literature by exploring the technological proximity between CAT and regular exports (Hidalgo, Klinger, Barabasi, and Hausmann, 2007).

Anticipating some of our findings, we find, as for Belgium, that multi-product firms considerably contribute to the country's international trade flows and moreover a large number of exporters are trading some goods that they do not produce. More than 50% of the export value of firms for which we can observe production data concerns goods that are not produced by these firms. In addition, as in Bernard, Blanchard, van Beveren, and Vandenbussche (2012) we find that in Turkey CAT exporters are in general larger, more productive and more internationalised firms than regular exporters. However, in a multivariate analysis the impact of firm level characteristics on the export value is more important for regular flows than CAT flows. Thus, the high firm efficiency is a more relevant determinant in the expansion of firm flows of regular goods than CAT goods. The difficulty to access a market, in terms of geographical distance and market size, has a more detrimental effect on the expansion of regular flows than CAT flows.

The paper is organised as follows: section 2 describes the data; section 3 analyses the role of CAT exports in the Turkish economy: section 4 explores firm, product and destination market heterogeneity; section 5 explores demand and technological linkages between CAT and regular exports and section 6 concludes.

2 Data

2.1 Sources

The paper relies on the matching of trade and production data at firm-product level for Turkish manufacturing firms. While Bernard, Blanchard, van Beveren, and Vandenbussche (2012) link trade and production data only for 2005, we are able to analyse the panel 2005/2009[1].

Trade data: The overall value and volume of trade flows are available at product-market level over the period 2002-2009 and are recorded according to the 12-digit Gümrük Tarife Istatistik Pozisyonu (GTIP) classification that undergoes annual changes. Whereas the last 4 digits of GTIP classification are national, the first 8 digits coincide to the Combined Nomenclature (CN) classification and, consequently, the first 6 digits correspond to the HS classification. Data are collected from customs declarations and cover the universe of exporters and importers regardless of their sector of activity and size. The recorded export flows may then refer to goods that are produced by the trade recorder or goods that are just exported by the recorder and produced by another firm.

Production data: Production data are available for the period 2005-2009 and contain the value and volume of the production and sales of goods produced by all firms employing at least 20 people and with primary or secondary activity in either Manufacturing Industry or Mining & Quarrying[2]. Production data are recorded according to the 10-digit PRODTR 2006 classification that is homogeneous over the period 2005-2009. The first 8 digit of the PRODTR 2006 codes correspond to PRODCOM 2006, and, as a consequence, the first 6 digit correspond to CPA codes and the first 4 digits correspond to NACE rev 1.1 codes.

Both trade data and production data are provided by Turkstat and for most of the following analysis they are complemented by information available from the Annual Industry and Service Statistics (AISS) over the period 2003-2008. More specifically, AISS contain information on firm revenues, input costs, employment, investment activity, the primary 4 digit NACE (rev 1.1) sector of activity and the region of location.

In the paper we focus on the population of firms for which we observe the sales of

[1]The recording of production data according to an uniform classification over the analysed period allowed us to link production and trade data at product-firm level over time.

[2]In 2005 all production data have been obtained through TURKSTAT's Annual Industrial Products Survey, while since 2006 this survey has been completed by the Monthly Industrial Production Survey, used for Short Term Business Statistics.

produced goods, that are then firms with primary or secondary activity in either Manufacturing Industry or Mining. Firms with primary or secondary activity in Mining are however few and the bulk of the firms are the ones involved mainly in manufacturing.[3] Since, as argued above, production and trade data make use of different product classifications we harmonised and merged the two datasets and the details are presented in Appendix A.

3 Which Role for CAT exports?

In this section we present an empirical analysis of the CAT phenomenon in Turkey. We start giving a picture of the production and trade activity of firms involved in some production activity in manufacturing or mining and quarrying industry in our sample. Table 1 shows that the majority of exporters are actually multiproduct exporters (columns 1 and 2) and they are predominant, as the average shipment value is increasing in the number of exported products (column 8).[4] The average number of produced products is also increasing with the number of exported goods. In particular, we find that the production scope is larger than the export one only for firms exporting one good. The number of exported products indeed increases exponentially as the number of produced products increases. This is in line with the evidence in Bernard, Blanchard, van Beveren, and Vandenbussche (2012) and De Angelis, De Nardis, and Pappalardo (2011).

We then explore the magnitude of this discrepancy between trading and production activity across firms and goods and in terms of export value coverage. We adopt the definition of regular, CAT, mixed CAT, pure CAT exports and exporters introduced by Bernard, Blanchard, van Beveren, and Vandenbussche (2012).

A regular export, x_{fj}^{reg}, is an export flow of firm f in product j which either entirely corresponds to or is lower than the firm production flow, y_{fj}; a CAT export, x_{fj}^{CAT}, is an export flow which is either higher than or equal to the firm production flow for the good j. When the production value is zero and the export value for a given product j is positive, such a flow is defined as a pure CAT export flow, $x_{fj}^{pureCAT}$. When the production value is positive but the corresponding export flow is higher, such a flow is defined as a mixed cat flow, $x_{fj}^{mixedCAT}$, as it is a mixture of the firm production and of the exports of goods not produced by the firm. Summing up:

[3] Throughout the paper we will use the terms *manufacturing firms* and *manufacturers* to refer to our sample of firms.

[4] Even if the displayed statistics concern our sample of firms covered by AIPS, we can draw the same conclusions when we extend the analysis to the whole population of exporters. These statistics are available from the authors upon request.

Table 1: Produced Goods, Export values and Destinations by Firm number of exported goods. (Year 2007)

N_J^{exp}	N_F	$\bar{N}_J^{prod}$	$\bar{X}_f$	$\bar{Y}_f$	$\bar{C}_f$	$\bar{X}_{fc}$	$\bar{X}_{fj}$	$\bar{X}_{fjc}$
0	7958	1.94	-	6820	-	-	-	-
1	1939	1.74	824	11514	2.23	370	352	370
2	1338	1.75	1935	17659	3.94	491	609	395
3	953	1.87	2189	16747	5.18	422	529	295
4	731	2.07	3174	18137	6.04	525	602	316
5	537	2.06	3477	19968	7.29	477	558	268
6-10	1638	2.24	4275	27606	8.76	488	481	219
11-20	1298	2.71	8256	39451	11.24	735	518	228
21-30	488	3.59	26714	110000	13.4	1994	998	439
31-50	345	3.23	28657	64785	17.05	1681	727	291
>50	267	3.32	83317	190000	20.77	4012	836	353

N_J^{exp} stands for the number of exported products in the product set J; N_F is the number of firms; $\bar{N}_J^{prod}$ stands for the average number of produced products in the product set J; $\bar{X}_f, \bar{X}_{fc}, \bar{X}_{fj}, \bar{X}_{fjc}$ stand for the Turkish Lira average export value per firm, firm-destination, firm-product, firm-product-destination, respectively; $\bar{Y}_f$ stands for the average production value per firm in Turkish Lira; $\bar{C}_f$ is the average number of destinations per firm.

$$
\begin{aligned}
x_{fj} \equiv x_{fj}^{reg} \qquad & if\ x_{fj} \leq y_{fj} \\
x_{fj} \equiv x_{fj}^{CAT} \qquad & if\ x_{fj} > y_{fj} \\
x_{fj} \equiv x_{fj}^{pure\ CAT} \qquad & if\ y_{fj} = 0 \\
x_{fj} \equiv x_{fj}^{mixed\ CAT} \qquad & if\ x_{fj} > y_{fj}\ and\ y_{fj} \neq 0
\end{aligned}
$$

It follows that a firm is defined as a regular exporter when all of its export flows are regular exports, as a CAT exporter when at least one of its export flows is a CAT flow, and a pure CAT exporters when all its export flows are CAT flows. Table 2 shows that regular exports account for about 40% of total exports recorded by Turkish firms and, as a consequence, CAT flows account for about 60% of exports. In particular, the most of CAT exports are Pure CAT flows.

From the bottom panel of Table 2, 90% of exporters exports at least one CAT product and roughly the same percentage exports at least one pure CAT product. This means that almost the totality of exporters is engaged in foreign sales of goods that they do not actually produce. Only a tiny share of exporters is engaged in CAT and regular export activity within the same good code and more than 90% of products are exported by at least one firm as a CAT flow. Finally, about 70% of product-firm export combinations are made up of CAT exports. From this and the previous Table it emerges that the CAT phenomenon appears to be rather stable across years. It follows that the CAT phenomenon is pervasive

Table 2: CAT Exports and Exporters

Weight of CAT exports in Total Exports

year	Total Export Value	Regular Exports %	Pure CAT Exports %	Mixed CAT Exports % CAT Products	Regular exports from Mixed CAT Products	CAT exports from Mixed
2005	47,907,783	40.85	52.26	6.89	4.19	2.69
2006	63,069,486	41.87	52.39	5.74	4.02	1.72
2007	73,352,223	38.46	54.53	7.01	4.89	2.12
2008	90,627,013	40.42	51.29	8.29	4.95	3.34
2009	77,904,697	41.05	52.37	6.58	4.60	1.98

CAT exports across firms and products

year	Exporters	CAT firms	Firms with at least 1 Pure CAT product	Firms with at least 1 Mixed CAT product	# Products	CAT products %	# Firm-Products	CAT Firm-Products %
2005	8,883	90.36	89.67	5.81	3682	93.86	105,905	67.57
2006	9,638	90.38	89.88	5.64	3752	94.11	118,861	69.71
2007	9,537	91.22	90.76	5.19	3761	94.28	123,821	71.04
2008	9,379	91.12	90.49	5.85	3762	95.08	123,587	70.46
2009	9,433	91.15	90.35	7.31	3762	94.34	125,514	69.94

Export Values are in Turkish Lira

both across producers and across products. Also, Table 3 shows that CAT exports are relevant even when linking trade and production data at a higher aggregation level to account for possible mistakes and inaccuracy in the recording of trade and product flows. Even by exploiting the most conservative NACE 4 digit/HS matching it emerges that CAT exports account for about $20/25\%$ of total exports, and pure CAT exports account for about half of this share. Discerning the real CAT flows from the ones misreported or misclassified and displayed in Table 2 is indeed a difficult task. However, even if we can admit the existence of a misassessment of the CAT flows, the CAT phenomenon is widely spread and still cover a relevant role in trade flows.

It is worth stressing that the longitudinal dimension of our data shows that the CAT phenomenon is rather stable across the years and, compared to regular exports, CAT flows are not particularly affected by the economic and financial downturn that hit the Turkish economy in 2009.

Finally, we show some firm level statistics on CAT, regular and mixed exporters. The definition and the description of the investigated firm level variables is contained in Table B.4 of the Appendix. From Table 4 it emerges that CAT exporters are larger and more productive than regular exporters. They are more likely to be foreign owned and to be importers. Mixed CAT exporters are larger and trade a higher number of products than the remaining export groupings. It then emerges that, in line with the existence of export sunk costs, the selling of trading goods is characterised by the existence of some scale economies. A manufacturer need to enjoy a certain degree of productivity and have a

certain size in order to act as trade intermediary for other producers. However, it emerges the issue of which kind of relationship exists between the produced goods by these firms and the ones they just traded. Is the advantage enjoyed by these firms in trading production of other operators related to their production activity?

Table 3: Weight of CAT exports in Total Exports - Lower Disaggregation

Year	PRODTR/GTIP		CPA/HS		4d NACE/HS	
	Regular %	Mixed CAT CAT %	Regular %	Mixed CAT %	Regular %	Mixed CAT %
2005	40.85	6.89	63.34	8.86	76.51	11.43
2006	41.87	5.74	65.27	7.68	78.38	9.18
2007	38.46	7.01	57.82	14.42	76.60	10.25
2008	40.42	8.29	56.92	16.15	76.09	12.00
2009	41.05	6.58	58.68	12.43	72.81	13.52

Table 4: Descriptive Statistics by Exporter Typology

	All Exporters	Regular Exporters	CAT Exporters	Mixed CAT Exporters	Only Pure CAT Exporters
l	4.19	3.81	4.22	4.27	4.10
lp	9.68	9.48	9.70	9.63	9.68
$foreign$	0.07	0.03	0.07	0.08	0.06
imp	0.78	0.61	0.79	0.84	0.75
N^{exp}_{reg}	0.86	1.11	0.83	1.76	0
$N^{exp}_{mixedCAT}$	0.07	0	0.07	1.29	0
$N^{exp}_{pureCAT}$	9.16	0	10.04	15.87	6.88

N^{exp}: number of exported products. N_C: number of export destinations.
Superscript reg, CAT, $mixed\ CAT$ and $pure\ CAT$ denote Regular, CAT, Pure CAT and Mixed CAT flows, respectively.

4 A deeper investigation of the CAT phenomenon: which firms? which countries? which goods?

4.1 Firm level determinants of CAT vs Regular Export Activity

In this subsection we try to shed some light on the determinants behind manufacturers' involvement in the trade activity. Table 5 shows the estimation results of a multinomial logit for the status (columns 1 to 3) and the start of export activity (columns 4 to 6) of pure CAT, regular and CAT&Regular exporter.

We define as regular/CAT/mixed export starters firms which start to export own produced goods/trading goods/ both produced and trading goods in *t* and did not export them either in *t-1* or in *t-2*, regardless of their experience in CAT (regular) export activity.

From the first two columns it emerges that the role of size, skill intensity - so as proxied by average wage (Bernard and Jensen, 2004)- and productivity are more pronounced for pure CAT and mixed exporters. Regular and CAT exporters substantially differ in the role of the share of R&D workers and of intangible investments. Also, subcontractors are less likely to be CAT exporters, whereas firms outsourcing part of their production are more more likely to export trading goods. Finally, multi-plant firms are more likely to be regular exporters, while a higher involvement in imports is rather relevant for being a CAT exporter.

Comparing this evidence to the results on the export start in columns 4 to 6, we find some interesting differences. First of all, productivity and size emerge as important elements for the first time entry in the export market, regardless of the type of export activity, but the role of productivity is more significant for regular exporters. Also, foreign ownership matters to enter the regular export market for the first time while subcontractors are less likely to start a regular export activity, thus revealing that the manufacturer involved in the whole production process have an advantage in trading their own products. Finally, whereas the share of R&D workers and of intangible investments are important drivers of the CAT export status, they do only drive the regular export entry. Finally, multiplant and importing firms perform rather similarly in terms of export status and first time entry in the export market. Summing up, those factors that seem to grant firm survival in the CAT export market (e.g. R&D labour share and intangibles) turn into non significant drivers of the first time entry in such export activity and into important determinants of the regular export start. It could be the case that most of CAT firms enter foreign markets as regular exporters and turn into CAT exporters. The omission of their first access as a regular exporter could thus drive the importance of R&D labour share and intangibles for CAT exporting. In other words, the two export activities may be intimately related and it is rather likely that starting with one export activity facilitates the entry and the survival

in the other activity. In our sample, indeed, 60% of regulare export starters already were CAT exporters the year before the regular export entry and while only 21% of CAT export startes were regular exporters the previous year.

Then, in order to understand whether and to what extent each of the trade activity facilitates the other, we have tested the determinants of the entry in Regular export activity and in CAT export activity by shedding light on the relevance of the firms' previous experience in the other export activity. We then estimate the two following probit models:

$$Start\_exp_{it}^{regular} = \alpha + BW_{i,t-2} + \gamma exp_{i,t-2}^{CAT} + \delta_j + \delta_t + \epsilon_{it} \quad (1)$$

$$Start\_exp_{it}^{CAT} = \alpha + B'W_{i,t-2} + \gamma exp_{i,t-2}^{regular} + \delta_j + \delta_t + \epsilon_{it} \quad (2)$$

where W_{t-2} denotes the firm level characteristics two years before the export entry and are defined as above. Then, we add the lagged status of CAT and regular exporter for the export entry in regular and CAT export activity, respectively. Finally, we include two digit NACE Rev. 1.1 sector fixed effects, δ_j, and year dummies, δ_t. Table 6 displays the estimates of the marginal effects which convey interesting insights about the previous export experience. First of all, results mostly confirm significance and sign of firm level determinants and the differences we find, compared to Table 5, reflect the different composition of the reference group that in the previous Table was made up by non exporters and that now also includes exporters of the other typology. As a matter of fact, apart from the opposite sign on the wage coefficient, there are not important differences in the determinants of the export activity between the two typologies but the magnitude of the impact changes. When looking at the role of the past export experience in the alternative export category, we see that the trade activity as a regular exporter is much more relevant for the start of CAT exports than the activity as a CAT exporter for the start as a regular exporter.

From this evidence, it emerges indeed a strict linkage between the regular and CAT export activity. One activity may then determine the firm's involvement in the other one. It then arises the question about the relationship between the products produced by the firm, that may also be traded by the firm, and the trading goods for which they act as simple trade intermediary. Section 5 is devoted to the investigation of this issue.

We, then, move to the exploration of the drivers behind the CAT export share. Due to the focus on a share as dependent variable which is a left-censored variable we both apply a simple OLS regression and a Tobit estimator on the population of exporters. We also take into account the potential bias stemming from selection into exporting by means of the Heckman two-step estimator on the whole firm population, made up of both exporters and non exporters, by using the firm remoteness as exclusion restriction. Interestingly enough, from Table 7, we find that the firm's average wage, subcontractor status and for-

Table 5: Exploration of firm characteristics by export status

	(1)	(2)	(3)		(4)	(5)	(6)
	Export Status				Export Starter		
	Pure CAT	Regular	Mixed		Pure CAT	Regular	Mixed
lp	0.178***	0.043	0.175***	lp_{t-2}	0.087*	0.273***	0.139*
	[0.020]	[0.029]	[0.020]		[0.046]	[0.051]	[0.082]
l	0.310***	0.041	0.526***	l_{t-2}	0.325***	0.467***	0.349***
	[0.021]	[0.031]	[0.022]		[0.045]	[0.046]	[0.068]
w	0.141***	0.071	0.150***	w_{t-2}	0.284***	0.035	0.127
	[0.043]	[0.065]	[0.044]		[0.095]	[0.095]	[0.154]
$foreign$	0.724***	0.576***	0.832***	$foreign_{t-2}$	0.025	0.676***	-0.826
	[0.119]	[0.168]	[0.117]		[0.256]	[0.206]	[0.610]
imp	1.379***	1.075***	1.572***	imp_{t-2}	1.245***	1.664***	0.957***
	[0.035]	[0.054]	[0.036]		[0.072]	[0.074]	[0.116]
$multi$	0.022	0.109**	0.182***	$multi_{t-2}$	0.098	0.144*	0.159
	[0.034]	[0.054]	[0.035]		[0.072]	[0.074]	[0.120]
$subcont$	-0.168***	-0.045	-0.281***	$subcont_{t-2}$	-0.128	-0.454***	-0.547***
	[0.047]	[0.078]	[0.049]		[0.103]	[0.112]	[0.191]
$outs$	0.398***	0.115**	0.647***	$outs_{t-2}$	0.271***	0.382***	0.223**
	[0.030]	[0.046]	[0.030]		[0.065]	[0.067]	[0.111]
$EmpRD$	0.020***	0.002	0.018***	$EmpRD_{t-2}$	0.01	0.016*	0.01
	[0.005]	[0.009]	[0.005]		[0.008]	[0.008]	[0.013]
$intang$	0.634**	-0.397	0.332	$intang_{t-2}$	-0.667	1.291**	0.37
	[0.307]	[0.545]	[0.309]		[0.879]	[0.642]	[1.292]
Obs	60,503	60,503	60,503	Obs	21,017	21,017	21,017
Pseudo-R^2	0.137	0.137	0.137	Pseudo-R^2	0.217	0.217	0.217
Log-lik	-63071.3	-63071.3	-63071.3	Log-lik	-9484.5	-9484.5	-9484.5

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm.
NACE 4 digit sector and time dummies included in all specifications.

Table 6: Determinants of firm entry in regular and CAT exporting - The role of CAT and regular export experience

	$Start\_exp^{regular}$				$Start\_exp^{CAT}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lp_{t-2}	0.005**	0.008***	0.008***	0.009***	0.006**	0.008**	0.014***	0.013***
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]
l_{t-2}	0.013***	0.012***	0.005*	0.004	0.032***	0.031***	0.031***	0.029***
	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
w_{t-2}	-0.003	-0.006	-0.012**	-0.013**	0.027***	0.024***	0.018**	0.017*
	[0.005]	[0.005]	[0.005]	[0.006]	[0.007]	[0.007]	[0.009]	[0.009]
$foreign_{t-2}$	0.007	0.007	-0.002	-0.001	-0.005	-0.004	-0.016	-0.013
	[0.012]	[0.012]	[0.013]	[0.013]	[0.020]	[0.021]	[0.022]	[0.022]
imp_{t-2}	0.064***	0.060***	0.046***	0.045***	0.106***	0.103***	0.098***	0.096***
	[0.004]	[0.004]	[0.005]	[0.005]	[0.007]	[0.007]	[0.008]	[0.008]
$multi_{t-2}$		0.008**		0.010**		0.008		0.009
		[0.004]		[0.005]		[0.005]		[0.006]
$subcont_{t-2}$		-0.022***		-0.012*		-0.015**		0.004
		[0.005]		[0.006]		[0.007]		[0.010]
$outs_{t-2}$		0.013***		0.007*		0.021***		0.019***
		[0.004]		[0.004]		[0.005]		[0.006]
$EmpRD_{t-2}$		0.000		0.000		0.001		0.001
		[0.001]		[0.001]		[0.001]		[0.001]
$intang_{t-2}$		0.060*		0.067*		-0.025		-0.019
		[0.036]		[0.040]		[0.061]		[0.072]
exp_{t-2}^{CAT}			0.078***	0.077***				
			[0.006]	[0.006]				
$exp_{t-2}^{Regular}$							0.189***	0.187***
							[0.018]	[0.018]
Obs	22,461	22,446	19,538	19,525	15,517	15,509	13,201	13,194
Pseudo-R^2	0.064	0.067	0.079	0.08	0.121	0.124	0.136	0.138
Wald Chi^2	688.169	714.454	829.081	837.912	976.579	989.176	1031.222	1045.093
Log-Likelihood	-5960.84	-5938.95	-5618.5	-5609.54	-4820.8	-4798.94	-4473.33	-4458.35

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm.
NACE 4 digit sector and time dummies included in all specifications.

eign ownership which matter for being an exporter do not really determine the weight of CAT exports in total exports. On the contrary, apart from size and productivity both displaying a positive effect, the share of R&D workers is confirmed as an important determinant of the CAT phenomenon.

Table 7: CAT export share over total exports

	Regressors Time t				Regressors Time t-1			
	OLS	Tobit	Heckman		OLS	Tobit	Heckman	
			Share	Selection			Share	Selection
lp	0.014***	0.016***	0.014***	0.093***	0.011***	0.013***	0.011***	0.085***
	[0.003]	[0.003]	[0.003]	[0.008]	[0.003]	[0.003]	[0.002]	[0.007]
l	0.017***	0.022***	0.018***	0.232***	0.019***	0.023***	0.019***	0.245***
	[0.003]	[0.003]	[0.003]	[0.007]	[0.003]	[0.003]	[0.003]	[0.007]
w	-0.003	-0.002	-0.002	0.069***	0.005	0.006	0.005	0.082***
	[0.007]	[0.007]	[0.005]	[0.016]	[0.007]	[0.007]	[0.004]	[0.015]
$foreign$	0.01	0.012	0.011	0.433***	0.01	0.013	0.011	0.426***
	[0.014]	[0.015]	[0.009]	[0.039]	[0.014]	[0.015]	[0.008]	[0.035]
imp	0.027***	0.038***	0.030*	0.868***	0.022***	0.030***	0.025	0.835***
	[0.006]	[0.006]	[0.017]	[0.013]	[0.005]	[0.006]	[0.015]	[0.012]
$EmpRD$	0.002***	0.002***	0.002***	0.010***	0.002***	0.002***	0.002***	0.009***
	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.000]	[0.002]
$intang$	0.083*	0.102**	0.083**	0.203	0.022	0.037	0.023	0.400***
	[0.045]	[0.049]	[0.043]	[0.139]	[0.045]	[0.049]	[0.042]	[0.141]
$multi$	-0.002	-0.002	-0.002	0.057***	0.004	0.004	0.004	0.050***
	[0.005]	[0.006]	[0.004]	[0.013]	[0.005]	[0.005]	[0.003]	[0.012]
$subcont$	-0.003	-0.005	-0.003	-0.127***	0	-0.001	0	-0.133***
	[0.007]	[0.008]	[0.006]	[0.019]	[0.007]	[0.007]	[0.005]	[0.018]
$outs$	0.028***	0.035***	0.028***	0.274***	0.020***	0.027***	0.021***	0.244***
	[0.005]	[0.005]	[0.006]	[0.012]	[0.004]	[0.005]	[0.005]	[0.011]
$remot$				-8.077***				-6.862***
				[1.098]				[1.003]
$Cons$	0.215	0.128	0.202	5.021***	0.138	0.04	0.127	3.791***
	[0.134]	[0.148]	[0.130]	[1.367]	[0.120]	[0.136]	[0.117]	[1.270]
Obs	33,943	33,943	60,502	60,502	40,370	40,370	71,062	71,062
R^2	0.05				0.05			
mills				0.004				0.005
				[0.031]				[0.028]
sigma		0.337***				0.336***		
		[0.001]				[0.001]		

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm.
NACE 4 digit and time dummies included in all specifications.

4.2 Determinants of export values

Till now we explored the CAT and regular exports by focusing on the firm level. We now move to the analysis of export flows and we analyse their firm and destination country determinants. More specifically, we investigate whether there exists some heterogeneity

in the magnitude and significance of their impact according to the export typology, i.e. CAT or regular export flows. In table 8 we present the results of the following regression run on the pooled 2005-2009 sample:

$$x_{fjct} = \alpha + B'Z_{ct} + \phi cat_{fjt} + \Gamma' Z_{ct} * cat_{fjt} + \Lambda' W_{ft} + K' W_{ft} * cat_{fjt} + \delta D_t + \epsilon_{fjct} \quad (3)$$

where x_{fjct} represents the export flow of firm f in the product j to country c at time t. Z_{ct} denotes the vector containing the country level characteristics that are the country's capital distance from the Turkish border, $dist$, its contiguity - a dummy taking the value one if the export destination country shares a border with Turkey -, $contig$, and GDP, gdp. W_{ft} is instead a vector of the firm level characteristics, defined as before. The variable cat_{fjt} is a dummy capturing the type of firm-product flow, and assumes the value one for CAT flows and the value zero for regular flows.[5] Year fixed effects, D_t, are always included, while product-firm and product-country fixed effects are alternatively added. While the dependent variable and firm level characteristics are retrieved from the Turkstat databases described in the data section, the country level characteristics are obtained from CEPII database and World Trade Indicators of World Bank. Although we present the estimates on the pooled sample, the same analysis has been implemented for each year of our sample period. The results are unchanged and are not shown here for brevity, nevertheless they are available from the authors upon request. Table 8 confirms some previous findings from the gravity equation literature, such as the negative linkage between distance and export flows and the positive impact of contiguity and country size. Turning to firm level characteristics, firms with higher wages, more productive, larger, foreign owned and importing firms export higher values. On the contrary, within a given product-market combination outsourcers, subcontractors, multiplant firms and firms with a higher share of R&D workers display, *ceteris paribus*, smaller export values. It is rather likely that subcontractors are generally less involved in exports, as they are involved in developing single phases of a specific good production process. At the same time, the smaller export value of outsourcing, R&D intensive and multiplant firms may be related to their higher specialisation and their larger scale of operation in terms of the number of destination markets: if these firms export to a higher number of destinations it may well be the case that they show a smaller export value per destination. This issue should be however investigated in more detail.

Looking at the heterogeneity between the typology of export flows, we find that the role of destination market characteristics is less pronounced for CAT flows. The negative

[5]The definition of CAT and regular flows, as already argued, comes from the matching of trade and production data at firm-product level. As a consequence, we attribute the same status of CAT or regular flow to exports of a given firm in a given product to different countries.

impact of distance is reduced for CAT flows, so that for a given distance they are higher than regular flows. The same is true for the contiguity variable. Furthermore, the positive impact of the country's size is lower for CAT flows. Thus CAT flows are higher, the longer is the distance from the destination market the lower is its size. This hints at the fact that indirect exports are more likely to occur when the combination of long distance and small final market hamper the exploitation of scale economies from the fixed cost of exporting.

Turning to the interaction term of firm determinants with the CAT dummy, we find that none of these terms is significant when product-firm fixed effects are included, so that no particular difference exists between CAT and regular exports in the firm level determinants across destination markets. On the contrary, from the last two columns in the Table, we show that the coefficients on the interaction between the CAT dummy and the traditional export determinants, such as size, productivity, average wage and foreign ownership, all bear a negative sign thus suggesting a reduced role for these firm level characteristics in explaining the scope of CAT phenomenon among firms within a given product-destination. On the contrary, CAT flows are larger than regular exports for importers and for subcontractors. The finding on importers is particularly interesting as it may reveal that CAT exports are intimately related to the firm import activity. Part of trading goods may be actually represented by imported goods. Also, the firms' involvement in the import activity may allow firms to create contacts with potential foreign customers and facilitate the firms' trade activity that may also become trade intermediary for indirect exporters which have not the resources to enter in foreign markets and sell directly their own produced goods.

Table 8: Heterogeneity of Country and Firm level determinants of CAT and regular exports

	(1)	(2)	(3)	(4)
	Product-Firm Fixed Effects		**Product-Country Fixed Effects**	
Country-Level				
cat	0.540**	0.54	1.962***	1.962***
	[0.254]	[0.345]	[0.702]	[0.501]
$dist$	-0.224**	-0.224***		
	[0.112]	[0.018]		
$dist$*cat	0.068***	0.068***	0.202***	0.202***
	[0.018]	[0.016]	[0.055]	[0.018]
gdp	0.187***	0.187***	0.200**	0.200*
	[0.023]	[0.009]	[0.100]	[0.104]
gdp*cat	-0.034***	-0.034***	-0.059***	-0.059***
	[0.007]	[0.010]	[0.019]	[0.009]
$contig$	0.347**	0.347***		
	[0.167]	[0.026]		
$contig$*cat	-0.103**	-0.103***	-0.218**	-0.218***
	[0.048]	[0.030]	[0.104]	[0.032]
Firm-Level				
lp	0.047***	0.047***	0.145***	0.145***
	[0.011]	[0.015]	[0.011]	[0.020]
lp*cat	0.005	0.005	-0.120***	-0.120***
	[0.011]	[0.015]	[0.013]	[0.024]
l	0.126***	0.126***	0.192***	0.192***
	[0.019]	[0.025]	[0.017]	[0.024]
l*cat	0.009	0.009	-0.080***	-0.080***
	[0.012]	[0.014]	[0.012]	[0.022]
w	0.045**	0.045	0.208***	0.208***
	[0.022]	[0.031]	[0.029]	[0.047]
w*cat	-0.014	-0.014	-0.151***	-0.151***
	[0.022]	[0.031]	[0.036]	[0.051]
$foreign$	0.159**	0.159*	0.314***	0.314***
	[0.073]	[0.096]	[0.036]	[0.080]
$foreign$*cat	0.006	0.006	-0.272***	-0.272***
	[0.049]	[0.065]	[0.035]	[0.096]
imp	0.072***	0.072**	0.145***	0.145***
	[0.025]	[0.030]	[0.040]	[0.041]
imp*cat	-0.04	-0.04	0.075**	0.075*
	[0.029]	[0.032]	[0.038]	[0.044]
$multi$	0.003	0.003	-0.245***	-0.245***
	[0.017]	[0.023]	[0.026]	[0.035]
$multi$*cat	-0.021	-0.021	-0.014	-0.014
	[0.019]	[0.025]	[0.024]	[0.041]
$subcont$	-0.002	-0.002	-0.107***	-0.107**
	[0.025]	[0.028]	[0.020]	[0.049]
$subcont$*cat	-0.025	-0.025	0.245***	0.245***
	[0.028]	[0.032]	[0.037]	[0.054]
$outs$	0.005	0.005	-0.089***	-0.089***
	[0.016]	[0.020]	[0.020]	[0.030]
$outs$*cat	-0.018	-0.018	0.011	0.011
	[0.018]	[0.023]	[0.022]	[0.040]
$EmpRD$	-0.002	-0.002	-0.009***	-0.009**
	[0.002]	[0.003]	[0.002]	[0.004]
$EmpRD$*cat	0	0	-0.007**	-0.007
	[0.002]	[0.002]	[0.003]	[0.006]
$intang$	-0.073	-0.073	-0.243	-0.243
	[0.151]	[0.250]	[0.194]	[0.315]
$intang$*cat	-0.092	-0.092	0.126	0.126
	[0.183]	[0.276]	[0.255]	[0.412]
Cluster	Country	Firm	Country	Firm
Observations	742,192	742,192	741,802	741,802
R-squared	0.649	0.649	0.489	0.489

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors are in brackets.

5 Linkages between CAT and Regular Products

Why should firms engaged in own manufacturing activity sell goods produced by other firms? We look for an answer to this question by exploring the linkage between CAT products and Regular products in the consumption/demand side and the production/supply side. Thus, we test if there exist a demand complementarity in consumer preferences and/or a supply complementarity in firm sales. We exploit the setting suggested by Bernard, Blanchard, van Beveren, and Vandenbussche (2012) in order to test the former following their hypothesis that consumers prefer to buy products from firms offering a wide product portfolio. The same mechanism is highlighted by Eckel, Iacovone, Javorcik, and Neary (2011) even if the latter also take into account the possibility of a cannibalisation effect.

In addition, we rest on Hidalgo, Klinger, Barabasi, and Hausmann (2007) in order to explore the position of CAT products in terms of the firm production space. In this respect, on one hand Turkish manufacturing firms may have the convenience to sell trading goods because they may be complementary with own produced goods in the consumption of foreign customers and, as a consequence, they may represent a profit opportunity for firms as they may better bear fixed export costs. Thus. there may exist some cost synergies in firms' offer of CAT products jointly with own produced products. On the other hand, firms may also use some inputs in their production process that may represent tradable goods in foreign markets both alone and in conjunction with own produced goods. In both cases, it would exist a complementarity in the supply of own produced goods and CAT trading goods, and it is likely that the latter especially stems from technological relatedness.

5.1 Demand Complementarity in Preferences

Following Bernard, Blanchard, van Beveren, and Vandenbussche (2012) we test the hypothesis that the demand for the firms' products increases with their product scope, which may consist of both CAT and Regular goods. There may be, indeed, some benefits for the final customers or the downstream firms from buying products from the same supplier. We then estimate a foreign demand function at firm-product level where we explore the role of the overall product scope, the CAT product scope and the Regular product scope. The estimated equation is the following:

$$uv_{fjt} = \alpha + \phi q_{fjt} + \gamma n\_exp^{p}_{fjt} + \delta d_{fj} + \epsilon_{fct}, \text{where } p = ALL, CAT, REG \quad (4)$$

where uv_{fjt} is the export unit value charged by firm f in the export market for the product j at time t, q_{fjt} is the exported quantity and $n\_exp^{p}_{fjt}$ is the firms' overall, CAT or regular product scope. We are interested in the coefficient of the latter variable

since it captures the existence of demand complementarity across the offered products. From results in Table 9 it follows that the firm's export unit value of a product is positively related to the firm's export scope, thus confirming the evidence highlighted by Bernard, Blanchard, van Beveren, and Vandenbussche (2012). More specifically, when we split the export scope between the CAT export scope and the Regular export scope the former emerges as the main driver fostering the firms' product demand. Thus, the firms' involvement in the CAT export activity may be justified by the preference of consumers/downstream firms to buy from a supplier offering a large range of products.

Table 9: Export Unit Value

	(1)	(2)	(3)	(4)	(5)	(6)
q	-0.171***	-0.174***	-0.110***	-0.171***	-0.174***	-0.110***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
n_exp	0.026***	0.042***	0.015***			
	[0.002]	[0.002]	[0.003]			
n_exp^R				0.003	0.014***	0.004
				[0.004]	[0.004]	[0.004]
n_exp^C				0.024***	0.037***	0.014***
				[0.002]	[0.002]	[0.003]
$Cons$	3.415***	3.375***	3.043***	3.420***	3.382***	3.043***
	[0.011]	[0.011]	[0.012]	[0.011]	[0.011]	[0.012]
Fixed Effects	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product
Cluster	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product
Obs	1143183	1143183	1143183	1143183	1143183	1143183
R^2	0.733	0.796	0.902	0.733	0.796	0.902

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm.

However, when we split flows between CAT and regular exports in Tables 10 and 11, the comparison of column 6 from these Tables with column 6 from Table we find that the demand complementarity result is mainly driven by CAT export flows. In addition, when cat and regular flows are calculated according to the CPA/HS concordance the result based on within firm-product pair variation totally disappears.

5.2 Technological Relatedness

In this section we try to investigate whether there are some technological connections and linkages between the firm production activity and the type of goods they simple export. To this aim, borrowing from Hidalgo, Klinger, Barabasi, and Hausmann (2007) we compute a measure of proximity across goods. As in their work we call ϕ_{ij} the proximity between the goods i and j that is measured as the minimum of the pairwise conditional probabilities

Table 10: CAT export value

	PRODTR/GTIP						CPA/HS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
q	-0.185***	-0.189***	-0.125***	-0.185***	-0.189***	-0.125***	-0.188***	-0.192***	-0.125***	-0.188***	-0.192***	-0.125***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
n_exp	0.026***	0.045***	0.018***									
	[0.002]	[0.002]	[0.004]									
n_exp^R				-0.005	0.004	0.007						
				[0.004]	[0.004]	[0.005]						
n_exp^C				0.027***	0.043***	0.018***						
				[0.002]	[0.002]	[0.004]						
$n\_exp_g^R$							0.051***	0.054***	0.015	0.061***	0.069***	0.017
							[0.013]	[0.012]	[0.011]	[0.013]	[0.013]	[0.011]
$n\_exp_g^C$										0.105***	0.114***	0.009
										[0.006]	[0.006]	[0.005]
$Cons$	3.524***	3.480***	3.179***	3.528***	3.485***	3.177***	3.622***	3.642***	3.237***	3.587***	3.605***	3.234***
	[0.011]	[0.012]	[0.015]	[0.011]	[0.011]	[0.015]	[0.007]	[0.007]	[0.009]	[0.007]	[0.007]	[0.009]
Fixed Effects	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product
Cluster	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product
Obs	930525	930525	930525	930525	930525	930525	930525	930525	930525	930525	930525	930525
R^2	0.702	0.775	0.894	0.702	0.775	0.894	0.701	0.775	0.894	0.702	0.775	0.894

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm-product.

Table 11: Regular export value

	PRODTR/GTIP						CPA/HS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
q	-0.100***	-0.102***	-0.063***	-0.101***	-0.102***	-0.063***	-0.101***	-0.101***	-0.063***	-0.101***	-0.101***	-0.063***
	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]	[0.001]	[0.002]	[0.002]	[0.001]
n_exp	0.032***	0.043***	0.005									
	[0.006]	[0.006]	[0.005]									
n_exp^R				-0.031**	-0.005	-0.009						
				[0.015]	[0.014]	[0.012]						
n_exp^C				0.033***	0.038***	0.005						
				[0.005]	[0.005]	[0.004]						
$n\_exp_g^C$							0.022*	0.036***	0.001	0.025*	0.041***	0.003
							[0.013]	[0.012]	[0.009]	[0.013]	[0.012]	[0.008]
$n\_exp_g^R$										0.038	0.061***	0.016
										[0.024]	[0.022]	[0.019]
Constant	2.701***	2.679***	2.447***	2.743***	2.707***	2.458***	2.779***	2.775***	2.459***	2.773***	2.766***	2.456***
	[0.025]	[0.026]	[0.019]	[0.027]	[0.028]	[0.021]	[0.020]	[0.022]	[0.014]	[0.020]	[0.022]	[0.014]
Fixed Effects	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product	Product	Product-Country	Firm-Product
Cluster	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product	Firm-Product
Observations	212658	212658	212658	212658	212658	212658	212658	212658	212658	212658	212658	212658
R-squared	0.871	0.92	0.935	0.871	0.92	0.935	0.87	0.919	0.935	0.871	0.919	0.935

*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in brackets are clustered by firm-product.

of a country exporting a good given that it exports another one:

$$\phi_{ij} = min[P(RCAx_i|RCAx_j), P(RCAx_j|RCAx_i)] \tag{5}$$

where RCA[6] denotes the revealed comparative advantage and tells whether the share of the country's exports in a product is higher/lower than the world export share in that product. A higher proximity between two products is supposed when there is a high probability that countries produce them both. In order to compute this indicator we exploit six digit HS trade data from the WITS-COMTRADE database that - through the correspondence with the CPA - have been collapsed into our unified classification for products. Once obtained the raw proximity indexes for each pair of goods, we compute for each produced good the firm average and maximum value of the proximity indicator with the firm's CAT goods, that we call $\widetilde{\phi}_{f,CAT}$ where the subscript f denotes the firm and the subscript CAT denotes the CAT product. As term of comparison, we calculate the proximity indicators of each good produced by Turkish firms with all existing traded products in the World, $\overline{\phi}_{TUR,n}$. Figure 1 compares the two distributions for $\widetilde{\phi}_{f,CAT}$ and $\overline{\phi}_{TUR,n}$. We report the figure for both the maximum value and the simple average of the proximity across the investigated product pairs. It emerges a higher proximity of CAT products with firms' produced goods compared to the average proximity of a general Turkish product with all other potential traded goods in the world. This suggests that CAT products are often technologically very proximate to the ones a firm produces in terms if input requirements, and knowledge involved in the production processes. Also, CAT products may constitute some outcomes coming from upper and lower production phases with respect to the firm activity, thus representing some intermediates used in the firm production or, in the opposite point of view, they may be the output obtained making use of the firms' intermediate products even if they are not directly produced by the firm. Alternatively, CAT and Regular products may share the same distribution costs, so that their joint selling by the same firm may leads to important cost savings and, as a consequence, profit gains. We intend to investigate this issue in more detail in the future.

It is then difficult to identify which is the real driver behind these CAT flows. However, all the above presented explanations - both from the demand and technological proximity - seem to have been confirmed by ad-hoc interviews implemented by Bernard, Blanchard, van Beveren, and Vandenbussche (2012) in order to dig into this phenomenon for the case of Belgium. From that survey it emerges a great heterogeneity about the reasons behind

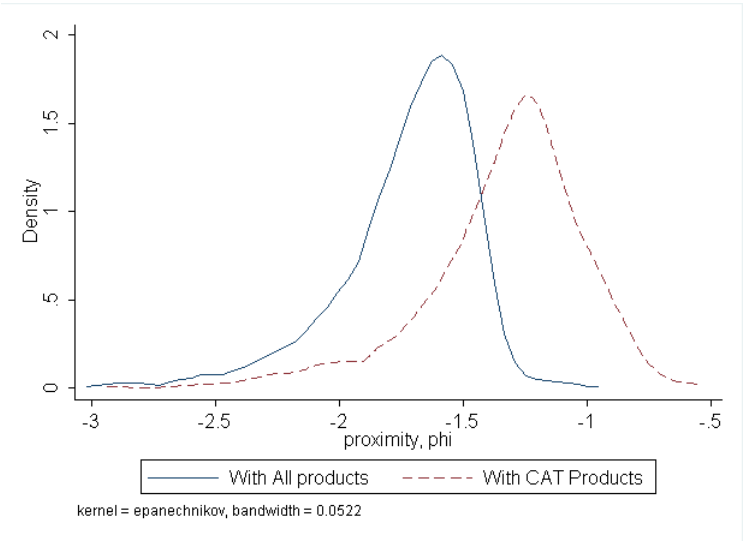
[6]RCA is computed as follows

$$RCA = \frac{x_{ci}/\sum_i x_{ci}}{\sum_c x_{ci}/\sum_c \sum_i x_{ci}}$$

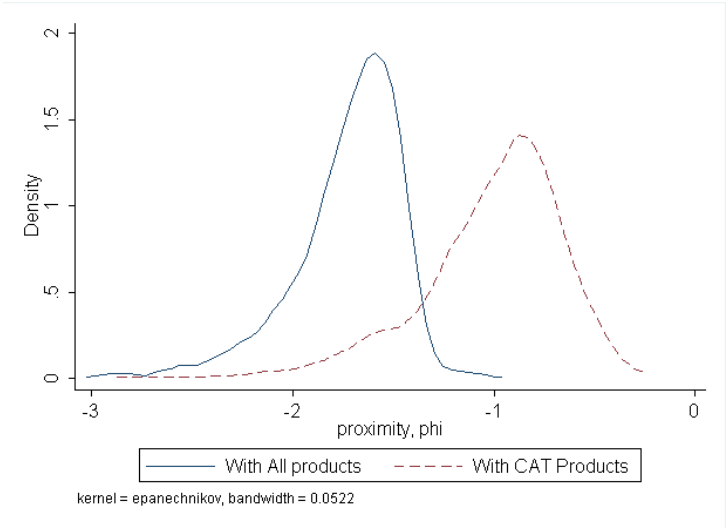
where x_{ci} labels the exports of country c in the product i.

Figure 1: Distribution of Proximity of CAT products with produced goods by firm versus proximity of Turkish Produced Goods with all products

AVERAGE



MAXIMUM



CAT export activity. In some cases the aim of some CAT exporters was to offer a larger range of products and exploit the demand complementarity in consumption. In other cases the reason was linked to the supply side: the exploitation of the established distribution network.

6 Conclusions

The high relevance of CAT trade flows by manufacturing firms contrasts with the small research literature has devoted to this topic. With this paper we then contributed to fill this gap and we investigated this phenomenon for a high-growing middle income country, Turkey. As disclosed by Bernard, Blanchard, van Beveren, and Vandenbussche (2012) for Belgium, we confirm that CAT exports are widespread and relevant in terms of export value share, and in terms of coverage of exporting firms, exported products and, more in general, firm-country-product level trade flows.

We heavily build on Bernard, Blanchard, van Beveren, and Vandenbussche (2012) but we extend the analysis to a middle-income country and to a panel.

Finally, we showed that demand complementary and technological relatedness may explain the existence of CAT flows. In particular across firms selling abroad the same product regular exports demand increases with the number of CAT products. Also the distribution of technological proximity of firm CAT and own products witnesses a stricter linkage between these two sets of products than between firm own products and all the possible products sold in Turkish economy. Future research should focus on shedding more light on the CAT phenomenon for a larger spectrum of countries. Understanding the weight of this kind of export flows in the world trade is crucial in order to investigate knowingly the causal nexus between firm export activity and its performance in terms of productivity, growth, employment and innovation. Also, a further relevant issue concerns the role of CAT flows for the evolution of the sophistication level of traded products. It would, then, be useful to explore in more depth whether the probability of CAT exports increases with product level quality and sophistication or, in opposite, whether the selling of goods with a high technology, quality or knowledge content calls for the direct involvement of the firm producing them. Furthermore, some interesting insights could be gathered by the joint analysis of both produced exports and CAT exports by manufacturing firms and exports by intermediary firms, which are CAT exports by definition.

Acknowledgments

Appendix

A Merge between Trade and Production Data at the firm − product level

Production data are recorded according to the 10 digit PRODTR 2006 classification over the whole 2005-2009 period, and they are then already harmonised over time.

Trade data, instead, are recorded according to the 12 digit GTIP classification, whose codes undergo annual changes. We first matched trade codes across years in the available 2002-2009 time span. The correspondence table for each couple of consecutive years is available from TurkStat. From one year to another a change in GTIP codes can be simple, that is a code changes into a new code in the following year, or complex, that is one code corresponds to multiple new codes in the following year or multiple codes are aggregated into one new code. So, in order to harmonise GTIP codes across the available years, we rest on the Pierce and Schott's 2009 procedure. The latter allows for the formation of families of codes by grouping all codes that undergo some changes. So, each GTIP code in each year (GTIPy) was matched with a uniform code, that we labelled $GTIP\_unif$. The correspondence between GTIPy and $GTIP\_unif$ is a correspondence N codes to 1 code (N to 1).

At this point we had all production data harmonised in PRODTR 2006 and all trade data harmonised in the new $GTIP\_unif$ code.

Then, in order to link trade and production codes we exploited the correspondence between PRODTR 2006 with GTIP 2006 provided by TurkStat.[7] The latter is a N to N correspondence. In order to get a 1 to 1 correspondence we created a uniform code, *CodeUnique*, to map the GTIP 2006 families into the PRODTR 2006. In other words, the correspondences between PRODTR 2006 and *CodeUnique* and between GTIP2006 and *CodeUnique* are both N to 1. Then, each GTIP 2006 code and each PRODTR 2006 code was matched with only one *CodeUnique*.

Once obtained the matching between product and trade codes for 2006 by means of *CodeUnique*, we exploited the correspondence between $GTIP\_unif$ and GTIP 2006

[7] In the matching between trade and production data we had to exclude those GTIP and PRODTR products that were not present in the original PRODTR-GTIP correspondence table provided by Turkstat for 2006. The latter includes 5,219 PRODTR codes and 17,536 GTIP codes. 259 PRODTR codes over 5,219 had no correspondence with GTIP codes. Furthermore, not all PRODTR codes were produced by Turkish firms, as well not all GTIP codes were traded by Turkish firms. The total number of codes included in the original AIPS dataset - that is the goods produced by Turkish firms - in 2009, for example, is 3,373, and 3,186 of them can be matched with trade codes, so that 5.5% of production codes in 2009 are neglected in the matching with trade data.

trade codes and between the latter and *CodeUnique* to obtain the correspondence between $GTIP\_unif$ and *CodeUnique*. We ended up with a correspondence N:N, and, again, we grouped the families of codes, in order to obtain our final code *CodeFinal* (both correspondences $GTIP\_unif$ to *CodeFinal* and *CodeUnique* to *CodeFinal* are N to 1 correspondences).

Thus, we translated PRODTR 2006 production codes into *CodeUnique* codes and, finally, the latter into *CodeFinal*. At the same time we applied the correspondence between $GTIP\_unif$ and *CodeFinal* to trade data.

In conclusion, we used the *CodeFinal* codes to identify produced good export flows in our elaborations. Despite of the harmonisation and matching procedure described above we are able to work with a high level of product disaggregation. Then, the multiple aggregations and harmonisation in our procedure do not drive to the loss of a large quantity of information. As an example, when we harmonised production and trade codes in 2009, we collapsed the 3,186 PRODTR codes in the original AIPS database - for which we can retrieve a correspondence with trade codes[8] - in 2,769 CodeFinal codes for production data. Obviously, not all these produced goods are traded by Turkish firms. These figures reveal that we are able to preserve more than 70% of the original PRODTR 2006.

Figure A.1 gives a graphical sketch of our matching procedure between the GTIP trade codes and the PRODTR production ones.

We checked the robustness of our procedure in a number of ways. First, to account for possible recording mistakes at high levels of disaggregation, we collapsed the original PRODTR/GTIP correspondence table in a CPA/GTIP and NACE/GTIP tables and we exploited these two tables following the same procedure as above, to identify produced good export flows at 6 and 4 digit level of aggregation, respectively.

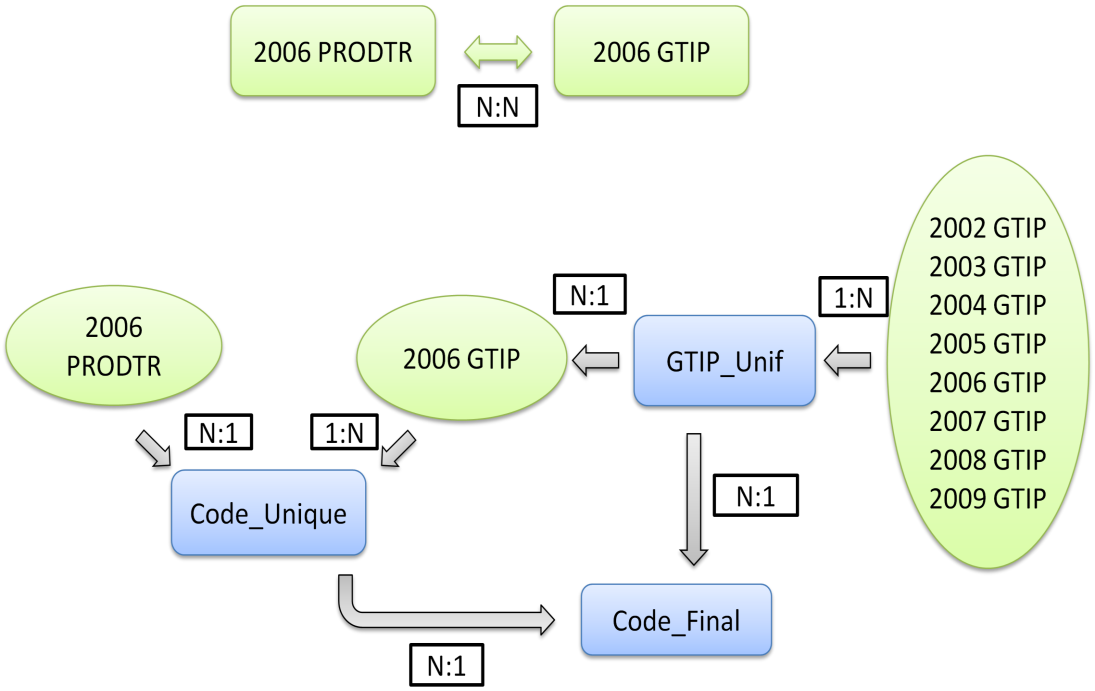
Second, as PRODTR 2006 first six digits are the CPA 2002 codes, the GTIP first eight digits correspond to the CN and the GTIP first six digits correspond to the HS, we tried to use the correspondence CN/CPA2002 and HS/CPA2002, available from Eurostat Ramon. CN classification undergoes some changes every year over the period of our analysis, so we applied again the Pierce and Schott's 2009 procedure in order to harmonise trade data. Differently, HS classification underwent some changes in product codes only in 2006. Since our data are from 2002, we have created an uniform code through the creation of families of codes exploiting the correspondence between HS2002 and HS2006.

By means of the procedures described above we then identified those goods that are traded but not produced by firms and those ones are both produced and exported. Even when we make use of more aggregated correspondence between codes from trade and production data the CAT phenomenon reveals to be widespread across firms and products

[8]The total number of codes included in the original AIPS dataset in 2009 is 3,373, of which 3,186 can be matched with trade codes, so that 5.5% of production codes are neglected in the matching with trade data.

and represents a substantial fraction, even if reduced, of exports by manufacturing firms.

Figure A.1: Merge between Trade and Production Data



B Additional Figures and Tables

Table B.1: Number of products in Harmonised Classifications that are Produced by Turkish firms

Year	PRODTR-GTIP	CPA-CN	CPA-HS	NACE4d-HS
2005	2,477	957	911	168
2006	2,707	983	933	169
2007	2,696	979	932	168
2008	2,714	982	937	169
2009	2,769	988	939	168
2005/2009	3,045	1038	984	160

Table B.2: Number of products in Harmonised Classifications that are Exported by Turkish firms

Year	Original	CPACN	CPAHS	NACE4dHS
2005	3,499	1,140	1,080	175
2006	3,571	1,153	1,094	173
2007	3,587	1,155	1,094	172
2008	3,614	1,160	1,095	172
2009	3,586	1,145	1,085	174
2005/2009	3,983	1,236	1,165	178

Table B.3: Number of products in Harmonised Classifications

Year	Original	CPACN	CPAHS	NACE4dHS
2005	3,686	1,177	1,113	178
2006	3,752	1,191	1,127	175
2007	3,763	1,190	1,125	176
2008	3,764	1,189	1,122	175
2009	3,762	1,184	1,119	175
2005/2009	4,051	1,245	1,172	178

Table B.4: Description of country and firm level variables

Variable	**Description**
COUNTRY LEVEL	
$dist$	the country's capital distance from the Turkish border
$contig$	dummy taking value one if the export destination country shares a border with Turkey
gdp	export destination country GDP
FIRM LEVEL	
lp	log of labour productivity measured as the log of value added per worker
l	log of size, measured as the log of the number of employees
w	log of unit wage, measured as the log of total salaries over the number of employees
$multi$	dummy taking value one for multiplant firms, zero otherwise
$foreign$	dummy taking value one for foreign owned firms, zero otherwise
$EmpRD$	share of R&D workers in the total firm workforce
$outs$	dummy taking value one for firms outsourcing part of their production, zero otherwise
$subcont$	dummy taking value one for subcontractors, zero otherwise
$intang$	share of investments in intangible assets over firm output

References

BERNARD, A., E. BLANCHARD, I. VAN BEVEREN, AND H. VANDENBUSSCHE (2012): "Carry-along Trade," Working Paper 18246, NBER.

BERNARD, A., AND J. JENSEN (2004): "Why some firms export," *The Review of Economics and Statistics*, (86), 561–569.

BRATTI, M., AND G. FELICE (2012): "Are Exporters More Likely to Introduce Product Innovations?," *Forthcoming in The World Economy*.

DE ANGELIS, E., S. DE NARDIS, AND C. PAPPALARDO (2011): "Produttori ed esportatori multi-prodotto," in *Italy in the World Economy. ICE-ISTAT Report 2010-2011*, ed. by ISTAT, pp. 307 – 316.

ECKEL, C., L. IACOVONE, B. JAVORCIK, AND J. P. NEARY (2011): "Multi-Product Firms at Home and Away: Cost- versus Quality-based Competence," CEPR Discussion Papers 8186, C.E.P.R. Discussion Papers.

HAHN, C. H., AND C.-G. PARK (2011): "Direction of causality in innovation-exporting linkage: evidence from microdata on Korean manufacturing," *Korea and the World Economy*, 12(2), 367–398.

HIDALGO, C. A., B. KLINGER, A. L. BARABASI, AND R. HAUSMANN (2007): "The Product Space Conditions the Development of Nations," *Science*, 317.

PIERCE, J. R., AND P. SCHOTT (2009): "Concording U.S. Harmonized System Categories Over Time," NBER Working Papers 14837, National Bureau of Economic Research, Inc.

SALOMON, R. M., AND M. J. SHAVER (2005): "Learning by Exporting: New Insights from Examining Firm Innovation," *Journal of Economics & Management Strategy*, 14(2), 431–460.

WAGNER, J. (2007): "Exports and Productivity: A Survey of the Evidence from Firm-level Data," *The World Economy*, 30(1), 60–82.

——— (2012): "The Microstructure of the Great Export Collapse in German Manufacturing Industries, 2008/2009," Working Paper Series 233, University of Lüneburg.