

EFFECT OF TARIFF LIBERALIZATION UNDER THE DCFTA WITH THE EU ON UKRAINE'S EXTENSIVE MARGIN OF TRADE

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ABSTRACT

The purpose of the article is to investigate the impact of EU tariff liberalization under the DCFTA on Ukraine's extensive margin of trade and to capture the effects of tariffs at a disaggregated product level. The effects of tariff reductions on the extensive margin of trade (zero exports pre DCFTA that subsequently increased) are examined. Through examining the probability that firms start exporting a product under different conditions and linking this to the tariff reductions, it shows some of the increase in new exports of Ukraine to the EU post DCFTA were due to tariff liberalization. The results show that the liberalization of the tariff has increased the probability of firms exporting and increased Ukraine's extensive margin of trade. This effect is much greater when examining relative margins of preference rather than absolute tariff changes suggesting the market access of competing suppliers in the EU market. There is also a slightly bigger effect on non-agricultural exports. However, these the impact on the extensive margin of trade of tariff liberalization (standard or relative) is extremely small and therefore, has had little influence on overall trade performance.

Keywords: Tariff liberalization, Deep and Comprehensive Free Trade Area, Economic growth, Extensive margin of trade, Exports, Preferential trade agreements, Firm's decision.

INTRODUCTION

Recently, economists (Helpman et al., 2008) have been examining the impact a reduction in applied tariffs faced on exporting markets from zero trade flows turning positive (the extensive margin) differentiating the impact on the value of existing export flows (the intensive margin). There has been considerable debate about the relative impact of each margin; some authors (Foster et al., 2011) have concluded the extensive margin is the primary avenue for export growth whilst others have found that the intensive margin plays the dominant role.

The traditional empirical literature on the trade effects of tariff liberalization policies focused primarily on the impact existing exports (intensive margin). However, the focus on separation of the extensive and intensive margin has been growing, partly due the increasing availability of disaggregated product and country data being available. Therefore, to fully understand the tariff liberalization effects of the DCFTA, it is important to examine if it generates significant export diversification, including the extensive margin into the analysis of the impact of the DCFTA on Ukraine's exports.

LITERATURE REVIEW

Some scientists (Klenow & Rodriguez-Clare, 1997) show that, a one per cent decrease in tariffs is

associated with an increase in import variety (extensive margin) of around 0.5 per cent. Other studies (Feenstra & Kee, 2007; Disdier et al., 2013) support this initial finding that tariff liberalization increases the export variety, that is, cuts in the applied tariffs faced on exporting markets led to zero trade flows turning positive (the extensive margin). A comprehensive study of all US preferential and FTA regimes (Debaere & Mostashari, 2010) showed that whilst tariff changes are statistically significant in explaining increases in exports, it however, found that 12 per cent of newly traded goods can be attributed to tariff reductions.

Whilst the intensive margin can be measured based on international trade models with demand elasticity estimates for countries that trade differentiated products with varying degrees of substitutability, the extensive margin of trade relates more to firm activity and a decision that it takes as whether or not to export under the new conditions (better market access).

Melitz detailed firm heterogeneity and market-specific setup costs whereby firms need large enough sales to make it profitable to cover the sunk costs of entering foreign markets (Melitz, 2003). As a result, the range of firms that export is endogenously determined and related to firm-level productivity. This corresponds to the empirical observation that large firms export while small firms do not. Only firms with sufficiently low marginal costs are able to sell to foreign markets, since only they are able to cover the fixed market-entry costs. Thus, the export threshold determines which domestically produced goods are exported. According to Diez et al. (2016), since the marginal cost is inversely proportional to firm-level productivity and, in extended models, can be a function of factor and input prices, which for exports include trade costs as input to price, these trade costs raise the marginal cost and makes a firm less likely to be able to export and vice versa. This paradigm provides a solid theoretical foundation to the investigation of diversification issues by considering zero trade flows in a trade matrix whereby direct market access conditions (the tariffs faced by exporters) contribute to the probability of initiating new trade flows.

Debaere and Mostashari developed a model that examines the probability that a firm that does not currently export with the existence of a tariff, may begin exporting when the tariff is removed or reduced (Debaere & Mostashari, 2010). A dependent variable is set as the probability of having a new bilateral trade flow between two countries and two time periods, that is the probability that a product not bilaterally traded in the first period is exported by the partner country in the second period. This is equivalent to the probability of a switch from 0 and a new existing flow and so the dependent variable is binary variable equal to 1 if the good is bilaterally traded in second period but not the first and 0 otherwise.

The model investigates whether the probability of a country exporting a product is related to changes in bilateral market access conditions, controlling for various other determinants using a probit estimation (where a number of variables and fixed effects to control for other possible changes in the determinants of the probability of exporting). Through this formulation, it is possible to identify the impact of tariffs on extensive margin of trade which is now a commonplace methodology for measuring export diversification resulting from tariff liberalization. For the most recent review of literature that use of model see Arkolakis et al. (2016).

Some aspects of trade liberalization in the post-Soviet countries have already been considered by such scholars as Langbein et al. (2021), Duhinets & Tronko (2015), etc. However, they have studied other issues than will be explored in this article.

Traditional trade theories do not align with explaining diversification patterns (extensive margin) due to the inability to provide an explanation of zero-trade flows. Whilst partial equilibrium models show the potential of tariff liberalization on existing trade flows (static effects), it does not consider the increase in exports from Ukraine of products arising not previously exported (dynamic effects). For diversification an examination at a firm level is required to explain why, in the same sector in the same country, some producers export and others do not.

However, the existence of an extensive margin does imply that the reduction of tariff was the cause. The extent to which tariffs will be a factor in a firm's decision to export or not, will depend upon a whole range of producer costs and whether, given the reduction in tariff, with current productivity, this provides the tipping point whereby the profitability (or prospect thereof) creates the conditions for a firm previously not exporting, to begin exporting.

MATERIALS AND METHODS

In order to examine the impact of tariffs on Ukraine's export diversification under the DCFTA, we first need to identify the existence of any extensive margin of trade by product and for those products identified, did any face tariffs prior to the DCFTA. Hummels & Klenow (2005) introduced the notion of examining zeros in bilateral trade flows at highly disaggregated product-category levels to determine those products that in one time period with zero exports, which then have exports in a second period.

In order to construct a measure of the extensive margin in international trade, Cho & Diaz (2018) define the set of new goods to include products initially traded in small volumes, or not traded at all. In addition, in order to avoid any distortions implied by a potentially anomalous initial year, the trade value of goods over a three year period is averaged. Many authors such as Evenett & Venables (2002) then have used a fixed cut-off value to classify a good as not traded at a certain level such as \$50,000 across all countries in an analysis. However, depending on the specific country pair being investigated, an arbitrary value can either over estimate or underestimate the extensive margin of trade. For example, for a small exporting country \$50,000 export per year is relatively higher than in a larger exporting country. Therefore, the selection of a "threshold" for "not traded" can have significant impact on measuring the extent of the extensive margin of trade.

The methodology developed by Kehoe & Ruhl (2013) determines whether a good is least-traded or not by using a threshold that considers its relative, rather than absolute, importance in total trade. Products are ordered small to large, by average three year exports and the smallest valued exports that cumulatively account for 10 per cent of trade are considered the least traded goods. These "least trade goods" are then considered not traded. This "variable" threshold based on relative importance in total trade is useful when dealing across multiple countries (for example much of the literature, the effect of trade policies on the importing country involving many partners, such a flexible threshold is important). This is less important when dealing with a single trade pair, as is the case in the bi-lateral relationship between Ukraine and the EU, although using the least traded product ratio may be useful in determining the non-traded threshold itself.

Examining Eurostat COMEXT database of external trade, there are 12,000 customs codes detailed at an 8-digit level of disaggregation. Data on EU imports from Ukraine were used at an 8-digit level averaged for the period 2011-13 (three year average prior to implementation of the DCFTA), 2015-17 (three year average immediately after implementation of the DCFTA) and 2017-19 (latest 3 year average). In the initial period (2011-13), Ukraine exported 5,969 products to the EU. Taking the second period immediately after implementation (2015-17), Ukraine increased the total number of products exported to 6,918 with a slight decline three years after implementation of DCFTA provisions (2017-19) to 6,498. This shows some instability in the number of products exported from Ukraine to the EU over the period. However, this analysis is based on the absolute zero definition, that is, in the number of products exported are products where exports averaged only seven euro in a three year period. By increasing the definition of zero exports to those over €50,000 exports, a more stable growth trend in new products is seen with: 2,192; 2,390 and; 2,522 products exported to the EU in the three time periods. This suggests when low traded goods are excluded from the

analysis, there appears to have been some degree of diversification of the export base under the DCFTA.

However, as described above, setting a threshold for low traded is arbitrary and so least traded methodology is followed. However, the distribution of least traded with 10 per cent (lowest valued exported products cumulatively representing 10 per cent of total exports) being excluded also seems rather arbitrary as in the case of Ukraine, includes products whose annual exports are €3.6 million which seems rather high to be considered non-traded products, as seen from Table 1.

Least Trade Products Definition (cumulative Percentage of total Trade)	Max. Value of trade excluded (Threshold equivalent), €	Product lines exported pre DCFTA (2011-3)	Product lines exported post DCFTA (2015-7)	Product lines exported post DCFTA+3 (2017-9)
0	0	5,969	6,918	6,498
0.5%	75,000	1,893	2,104	2,235
1%	175,000	1,423	1,571	1,698
1.75%	290,000	1,194	1,308	1,385
2.5%	525,000	912	1,029	1,107
5%	1.35 million	578	660	725
10%	3.6 million	332	354	414

Whilst all the literature uses 10 per cent least traded as the “non-zero”, intuitively this is far too high in the case of Ukrainian exports to the EU. Similarly, five per cent least traded also would exclude annual exports of products of over €1.35 million as non-traded.

In order to find a normalised level for the maximum value of non-traded goods that is appropriate to exports of Ukraine to the EU, the change in number of product lines between the periods at different relative levels of least traded products were analysed, as presented in Table 2. A similar pattern of change in number of products is exhibited for least traded products with cumulative values of 0.5 per cent – 5 per cent.

Taking into account, a normal distribution between 1 per cent, 1.75 per cent and 2.5 per cent (excluding the highest and lowest 2 sets of least traded products), the average increase in number of products traded post DCFTA is 10.93 per cent and 7.18 per cent DCFTA plus three years. The closest to this “average” is 2.2 per cent of least traded products where the growth in lines is 11.2 per cent and 8.1 per cent respectively, with a maximum export value of €450,000 being considered non-traded. Again, intuitively this seems reasonable so that exports of a product of half million euro per annum from Ukraine to EU would be considered non-zero. The number of product lines exported at 2.2 per cent least traded being zero are: 978 products pre DCFTA; 1,088 post DCFTA and; 1,178 three years post DCFTA. By comparing trade patterns between pre DCFTA (2011-3) and post DCFTA (2015-7), we are able to identify the existence of the extensive margin of trade. A product is considered “newly traded” post DCFTA if the product is “traded” (exports > €450,000) to the EU at an 8-digit level in the second time period but, was not traded in the first (exports < €450,000).

In terms of extensive margin of trade under the DCFTA, Table 3 shows that there was a considerable increase in the number of newly traded products post DCFTA with 477 new products traded, accounting for 44 per cent of all products traded. However, there were also a large number of products (367) that ceased trading after the DCFTA that is 38 per cent of products exported to the EU prior to the DCFTA ceased trading after its implementation.

Least Trade Products Definition (cumulative Percentage of total Trade)	Max. Value of trade excluded (Threshold equivalent), €	Change in number of product lines (2011-3)-(2015-7)	Change in number of product lines (2015-7)-(2017-9)	Average growth (2011-3)-(2015-7)	Average growth (2015-7)-(2017-9)
0	0	15.90%	-6.07%	13.52%	0.08%
0.5%	75,000	11.15%	6.23%		
1%	175,000	10.40%	8.08%	10.93%	7.18%
1.75%	290,000	9.55%	5.89%		
2.5%	525,000	12.83%	7.58%		
5%	1.35 million	14.19%	9.85%	10.41%	13.40%
10%	3.6 million	6.63%	16.95%		

This is purely observational and not attributed to any event, that is, the number of products ceased trading is not necessarily related to the adoption of the DCFTA. Newly traded agricultural products represent 61 per cent of traded products post DCFTA, whereas agricultural products disappearing post DCFTA were only 23 per cent of traded agricultural products pre DCFTA. Newly traded nonagricultural exports were 41 per cent of post DCFTA trade but disappearing non-agricultural exports were 39 per cent of pre DCFTA trade.

Products	Traded pre DCFTA	Traded post DCFTA	Newly Traded post DCFTA	Disappearing Goods post DCFTA	Continuously Traded post DCFTA
Total	978	1,088	477	367	611
Agricultural Products	91	178	108	21	70
Non-Agricultural Products	887	910	369	346	541

Taking a longer term view, Table 4 shows the extensive margin of trade between pre DCFTA and three years after implementation of the DCFTA.

Products	Traded pre DCFTA	Traded post DCFTA	Traded DCFTA +3	Newly Traded DCFTA +3	Disappearing Goods post DCFTA +3	Continuously Traded post DCFTA +3
Total	978	1,088	1,178	604	404	574
Agricultural Products	91	178	193	121	19	72
Non-Agricultural Products	887	910	985	483	385	502

Newly traded products three years after implementation of the DCFTA compared with pre DCFTA are considerably higher than immediately post DCFTA, suggesting a continuing trend. However, the number of disappearing exports is only slightly higher. Newly traded exports are 51 percent of all products exported three years after implementation of the DCFTA (compared with 44

percent post DCFTA), and 41 per cent of products exported pre DCFTA disappeared three years after implementation of the DCFTA (compared with 38 per cent post DCFTA).

A similar pattern follows for agricultural products with 62 per cent of products newly exported three years after implementation of the DCFTA (compared with 61 per cent post DCFTA), and 21 per cent of agricultural products exported pre DCFTA disappearing three years after implementation of the DCFTA (compared with 23 per cent post DCFTA). For non-agricultural products, 49 per cent of products were newly exported three years after implementation of DCFTA (compared with 41 per cent post DCFTA), and 43 per cent of non-agricultural products exported pre DCFTA disappearing three years after implementation of the DCFTA (compared with 39 per cent post DCFTA). This shows that on balance, there is very little difference between the movements on newly traded products and disappearing products in the short and medium term.

Whilst the above analysis shows the extent of the extensive margin of trade post DCFTA, it does assess the extent of extensive margin caused by tariff liberalization. Therefore, the disaggregated product analysis needs to focus on those products that faced a duty under the GSP (prior to the DCFTA) but were liberalised under the DCFTA as shown in Table 5.

The number of newly traded dutiable products followed the same pattern as the overall extensive margin between Ukraine and EU with an increase of 45 per cent of dutiable products traded (compared with 41 per cent for all products). However, compared with overall exports, none of the dutiable products that were traded pre DCFTA disappeared after the DCFTA. For agricultural products, 74 per cent increase in the number of dutiable products newly exported post DCFTA (compared with 61 per cent of total products). For non-agricultural products 33 per cent increase in the number of dutiable products newly exported post DCFTA (compared with 41 per cent of total).

Products	Dutiable Products Traded pre DCFTA	Newly Traded (dutiable) post DCFTA	% of Dutiable products (number of lines)	Newly Traded (dutiable) post DCFTA	Disappearing Goods post DCFTA	% value of Dutiable Exports
Total	121	55	45%	55	0	9.3%
Agricultural Products	31	23	74%	23	0	5.8%
Non-Agricultural Products	98	32	33%	32	0	15.91%

When comparing the number of products newly exported three years after implementation of the DCFTA with pre DCFTA, the number of newly exported dutiable products fell to 51 (4 products less), 20 for agricultural and 31 for non-agricultural exports, whilst again there were no dutiable exports ceasing exports, which indicates a few products did not survive. This is a relatively small number and supports the hypothesis that there is little difference between the short and medium term extensive margin of trade.

Whilst there was a considerable increase in the number of previously dutiable agricultural products that became newly traded under the DCFTA, these exports represented only 5.8 per cent of total dutiable agricultural exports post DCFTA whereas, with only 33 per cent increase in dutiable non-agricultural products, these represented 15.9 per cent of non-agricultural dutiable exports. This suggests that newly exported dutiable non-agricultural exports are fewer in number but larger in value than new agricultural exports that previously faced a duty pre DCFTA.

However, newly traded exports from Ukraine to EU that previously faced duties pre DCFTA

represent only 1.4 per cent of the value of total exports to the EU. Similarly, newly traded agricultural exports (which previously faced duties) represent 1.7 per cent of agricultural exports and newly traded dutiable non-agricultural, 1.2 per cent. This shows that whilst there was an extensive margin of trade post DCFTA, it has had limited impact on overall exports to the EU.

Moreover, the existence of the extensive margin of trade, even when isolating for previously dutiable products, does not necessarily indicate a causal link between removal or reduction of tariff under the DCFTA and a rise in number or value of newly traded exports.

To provide an indication of the relative potential effect of tariff liberalization under the DCFTA, the extensive margin on dutiable exports was plotted against the reduction in tariff (difference between GSP rate and DCFTA rate) as shown in Figure 1 to highlight any potential correlation.

To avoid bias in the plot, the highest and lowest 2.5 per cent (by value) of new export products under the DCFTA that previously faced a tariff, were excluded (that is, 22 lines from each end).

Note that one of the newly traded products saw a worsening of its tariff position under the DCFTA (that is the initial DCFTA tariff was higher than under GSP).

A trend line was added to correlate change in tariff to size of the value of newly traded products. This shows a slightly downward trend that could suggest that tariffs were not a factor (a small fall in tariff associated with higher value of exports in newly traded products. Of course, the size of tariff may not be the only relevant factor as the mere presence of any tariff may have been previously prohibitive for firms to export to EU in many products.

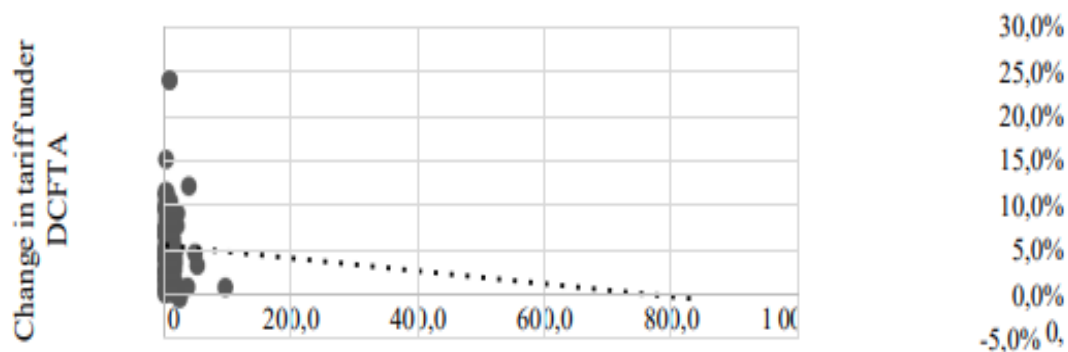


FIGURE 1
SCATTER PLOT OF EXTENSIVE MARGIN ON DUTIABLE EXPORTS AND
TARIFF LIBERALIZATION UNDER DCFTA

However, as previously discussed, the absolute change in the tariff applied to exports from Ukraine (from GSP to DCFTA) does not take account of the complex structure of the EU tariff regime where many of Ukraine's competitors (third country suppliers to the EU) receive preferences. Therefore, a better indication of the impact of the improved market access under the DCFTA on the extensive margin is the relative margin of preference (weighted average difference between tariffs faced by Ukraine against major suppliers to the EU of the same product).

Figure 2 plots the magnitude of newly traded dutiable products under the DCFTA against the difference in the relative margin of preference pre DCFTA (under GSP) and post DCFTA. A trend line was added to correlate change in Ukraine's relative margin of preference to the value of newly traded products under the DCFTA. This shows an upward trend whereby the size of exports of newly traded

products under the DCFTA is directly proportional to the change in the relative margin of preference (that is, a decrease in Ukraine's tariff in EU markets for each product compared with weighted average tariffs placed on actual third country exports).

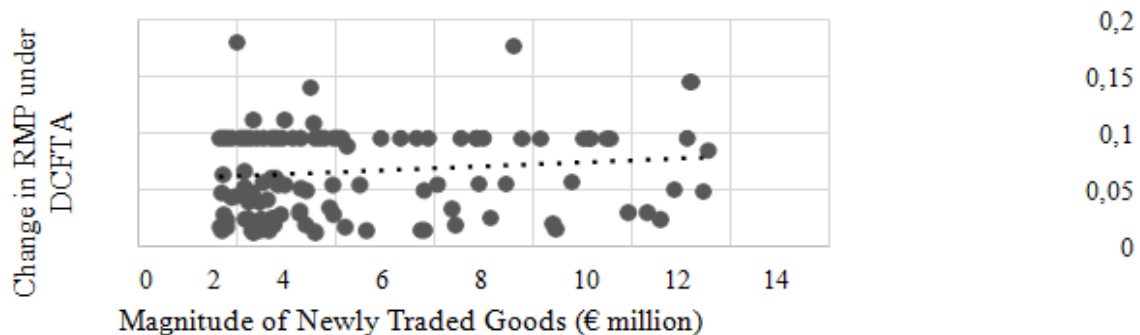


FIGURE 2
SCATTER PLOT OF EXTENSIVE MARGIN ON DUTIABLE EXPORTS AND CHANGE IN RELATIVE MARGIN OF PREFERENCE UNDER DCFTA

Whilst there is an observed correlation between the extensive margin of trade and relative margin of preference, this does not determine a causal link between the number and size of Ukraine's newly traded exports to the EU under the DCFTA and the change in Ukraine's market access relative to competing third countries. Therefore, to determine whether or not, and if so, the extent to which, the change in market access under the DCFTA affected the extensive margin of trade observed post DCFTA, a probit estimate of the model specified in Equation (1) will be used.

Probit models have been used by a number of authors as reviewed in Hinz et al (2019) to isolate market access effects on the probability that a firm will begin exporting under certain conditions, specifically with the lowering of a tariff. An Ordinary Least Squares (OLS) Regression is inappropriate for binary outcome variables as a linear probability model violates several assumptions of OLS regression (like normality of errors). Therefore, Long (1997) and other scientists do not recommend that OLS is used with binary outcome variables as any results from hypothesis tests will be invalid.

$$y^* = \beta_1 + \beta_2 \Delta \ln(1 + T_i) + \beta_3 \text{status}_i + \lambda X' + s_i, \dots (1)$$

where for a product i , y^* is the probability of exporting (1 or 0) in second time period; $\Delta \ln(1 + T_i)$ is the difference in tariff applied between the two time periods; status_i is the existence or not of trade in the product in the initial time period; X' is a vector of country-specific explanatory variables for bilateral trade resistance, which could include the change in GDP, distance, language and other factors as relevant between the two countries.

To isolate the effects of the improved market access and the extensive margin versus other firm level determinants, other factors have to be specified in the vector X' which is an array of variables and their associated coefficients (λ) that are not interesting from the point of view of this investigation, but important for isolating tariff effect. The range of traded products might vary with trade costs for a number of reasons that then influence the selection of variables for X' (Cheong et al, 2018). First, goods produced in different locations (origin and destination) can be homogeneous and therefore, if production

costs in origin and destination are very similar, or the trade costs are sufficiently large, these goods will not be traded. Second, if goods are differentiated by country of origin, each country producing a different variety has to incur a fixed cost to sell the product in each destination country. Therefore, not all the varieties will be shipped to each destination and the number of varieties traded will depend negatively on the magnitude of trade costs. Finally, not all varieties are consumer goods but intermediate inputs that are used in the production of final goods and would therefore only be exported to a destination if the country produces the final good. Due to “just in time” production processes, intermediates are more likely to be traded over shorter distances.

The vector of costs takes account of other trade costs to enable the isolating of the tariff effects on the probability that a firm will begin exporting with changing conditions. Generally, the vector includes the usual gravity model specifications such as distance (as a proxy for trade costs and delivery time), relative size (GDP and population) and for established relationships, common border, common language and former colony. However, such specifications can only be used in cross country samples that highlight variations. In the case of Ukraine and the EU, these factors are constant and therefore will be accounted for in the intercept coefficient of the estimation.

Therefore, to investigate the impact of the DCFTA on the extensive margin of trade between EU and Ukraine, a modified version of the model employed by Nicita & Rollo (2013) that examines the effect of both the change in tariff faced by the exporter in the importer country and the relative change in position versus existing third country suppliers (relative margin of preference which is measured by the difference in average weighted tariff in EU less tariff faced by Ukraine under DCFTA). In addition, to take account of market demand, the change in total imports is used and for export supply capacity, total exports are used. In the case of exports from Ukraine, data is only available at such a disaggregated level from Eurostat, the supply response in terms of exports to the EU are used as a proxy for a capacity response. The adapted model specification is given in Equation (2):

$$y_i | 1 \text{ or } 0 = \beta_1 + \beta_2 \ln(1 + T_i) + \beta_3 status_i + \beta_4 \Delta \ln(1 + MR_{OW}) + \beta_5 \Delta \ln(1 + X^{UA}) + \beta_6 \Delta \ln(1 + RMP_i) + s, \dots\dots\dots(2)$$

where: y_i is binary order for probability a firm would export product i under DCFTA, 1 for export, 0 for not exported; ΔT_i is the difference in tariffs faced in the EU by Ukrainian exports of product i , pre and post DCFTA; $status_i$ is the export status pre DCFTA, 1 for exported, 0 for not exported; ΔMR_{OW} is the change in the EU demand for product i ; ΔX^{UA} is the change in Ukrainian exports of product i , proxy for supply capacity; ΔRMP is the change in the relative margin of preference between Ukraine and 3rd country supplies (weighted to account for tariffs faced by each 3rd country).

RESULTS AND DISCUSSION

Following the methodology and model specification of Nicita & Rollo (2013), probit regressions on the probability of exporting on products that faced duties pre DCFTA was undertaken first without relative margins of preferences. Table 6 shows the probit regression results for total trade.

Table 6						
DIRECT MARKET ACCESS EFFECT ON PROBABILITY TO EXPORT ON TOTAL TRADE						
	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	0.76541369	0.1215768	39.636112	3.0597E-10	0.52712754	1.00369983

dt	-5.0218888	1.37834304	13.2745421	0.00026903	-7.7233915	-2.3203861
Status	-0.3208245	0.126913	6.39032349	0.01147441	-0.5695694	-0.0720796
dMROW	-0.0054071	0.01198645	0.20348851	0.65191963	-0.0289001	0.01808595
dXua	0.03474543	0.00965051	12.9626937	0.00031776	0.01583079	0.05366008

The coefficient for change in tariff is negative (as expected) indicating a one per cent fall in tariff on products not previously exported would increase the likelihood of a Ukrainian firms beginning to export by five per cent. The status coefficient of trade is the incorrect sign, but a small value which means whether a product is traded or not pre DCFTA has limited influence on the probability it is traded post DCFTA, which can account for the relatively high number of disappearing products observed in the trade data.

Market demand is not the expected sign, but since the coefficient is negligible, changing market demand does not seem to influence whether or not Ukrainian firms probability of exporting. Finally, export capacity proxy is the correct sign, but the coefficient is small and so not significant in influencing whether or not the product is traded.

Examining agricultural trade (Table 7), there is a much lower coefficient for agricultural exports than in total trade with a coefficient of -2.78. A one per cent tariff fall would increase the probability of exporting post DCFTA by around three per cent.

	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	1.25374785	0.29384988	18.2041066	1.9845E-05	0.67781267	1.82968303
dt	-2.7823868	3.10555686	0.80270514	0.37028581	-8.8691664	3.30439278
Status	-0.4440323	0.30883435	2.06717827	0.15049975	-1.0493365	0.1612719
dMROW	-0.0271151	0.04015063	0.45607525	0.49946395	-0.1058088	0.05157872
dXua	0.02759121	0.0317941	0.75309261	0.38549886	-0.0347241	0.08990649

The status of trade pre DCFTA and the import demand coefficients are again the incorrect sign, but the coefficients are small / negligible so that these factors appear to have limited influence on the probability of Ukrainian agricultural products being traded post DCFTA. The export capacity proxy is the correct sign, but the coefficient is small and so not significant in influencing whether or not the product is traded post DCFTA.

For non-agricultural trade, the coefficient is higher than agricultural exports with at -4.82 (Table 8). That is, a one per cent tariff fall would increase the probability of exporting post DCFTA by around five per cent.

	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	0.63995426	0.13768384	21.603888	3.3517E-06	0.37009889	0.90980963
dt	-4.8207626	1.55939141	9.55699192	0.00199189	-7.8771136	-1.7644116
Status	-0.2205513	0.1432212	2.37139988	0.12357619	-0.5012597	0.06015705
dMROW	0.00365401	0.0128912	0.08034377	0.77683208	-0.0216123	0.02892031
dXua	0.03226472	0.01033288	9.75019546	0.00179304	0.01201265	0.05251679

The coefficient of status of trade pre DCFTA is again the incorrect sign, but is small. Whilst import demand and export capacity is the correct sign, the coefficients are small. However, the probability of firms in Ukraine deciding to export post DCFTA will also be influenced by the relative

margin of preference that is the price preference over third country competitors in the EU. The decrease in actual tariff faced in the EU may still influence a firm to export so this is also left in the model specification.

Table 9 shows the probit regression results for the full model specification on total trade. The coefficients for tariff reductions and relative margin of preference over third country competitors in Ukraine are the signs expected with coefficients of -1.6 and 5.7 per cent respectively. However, although the absolute change in tariff faced by Ukrainian suppliers to EU does affect the probability to export post DCFTA, the relative margin of preference has a greater influence in increasing probability to export.

	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	0.73120404	0.1231208	35.2707159	2.8691E-09	0.4898917	0.97251638
dt	-1.6486813	2.07537264	0.6310754	0.42696112	-5.7163369	2.41897432
Status	-0.2854352	0.12880743	4.91058473	0.0266926	-0.5378931	-0.0329773
dMROW	-0.0056772	0.01196204	0.22524351	0.63507334	-0.0291223	0.017768
dXua	0.03356936	0.00965706	12.0836051	0.00050867	0.01464188	0.05249685
RMP	5.69186281	2.64120132	4.64414569	0.03115964	0.51520334	10.8685223

As with the models specifying change in direct market access only, status and EU import demand signs are incorrect, but again the size of coefficients are small and negligible. Similarly, although the sign for export supply is correct, the size of coefficient is negligible.

For agricultural trade, the coefficient for direct market access is much higher than for total exports with at -3.2 but the relative margin of preference coefficient is the wrong sign, albeit small with 0.53 (Table 10).

	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	1.25648633	0.29542174	18.0896695	2.1074E-05	0.67747036	1.8355023
dt	-3.2222259	6.8400189	0.22192048	0.63758049	-16.628417	10.1839648
Status	-0.4460627	0.30982395	2.07282127	0.14994392	-1.0533065	0.16118108
dMROW	-0.0267167	0.04047334	0.43573935	0.50918609	-0.106043	0.05260961
dXua	0.02764885	0.03181203	0.75539023	0.384775	-0.0347016	0.08999928
RMP	-0.5302558	7.02283074	0.00570094	0.93981326	-14.294751	13.2342395

The signs for Status and import demand are also incorrect whereas the sign for export capacity is as expected. However, the coefficients of all these variables are small and do not influence probability of exporting. For non-agricultural exports, the signs for both direct market access and relative margin of preference are as expected, and the relative margin of preference is much more influential than the overall tariff change. The coefficient of tariff change being -0.98 and relative margin of preference being 6.81 (Table 11).

	coeff b	s.e.	Wald	p-value	lower	upper
Intercept	0.60295086	0.13927922	18.7409309	1.4973E-05	0.3299686	0.87593313
dt	-0.9839896	2.2481603	0.19156955	0.66161349	-5.3903028	3.4223236
Status	-0.1806968	0.14517906	1.54914749	0.21326134	-0.4652425	0.10384897
dMROW	0.0038856	0.01288409	0.09095132	0.76297122	-0.0213667	0.02913795
dXua	0.03117459	0.01033671	9.09571637	0.00256209	0.01091501	0.05143416
RMP	6.81357325	2.98992327	5.19313692	0.02267625	0.95343133	12.6737152

The sign for status of the product traded pre DCFTA is the wrong sign but the coefficient is small and although the sign for import demand and export capacity is correct, the size of the coefficient is extremely small.

	Direct Market Access Increase	Direct and Relative Market Access Increase	
	$\Delta \ln (1+T)$	$\Delta \ln (1+T)$	RMP
Total Exports to EU	-5.02	-1.65	5.69
Agricultural Exports to EU	-2.78	-3.20	-0.53
Nonagricultural Exports to EU	-4.82	-0.98	6.81

Table 12 summarizes the model findings on likelihood of Ukraine exporting products to the EU post DCFTA. Similar results are shown for non-agricultural exports under the DCFTA with a slightly smaller influence of tariffs with coefficient of -0.98 and greater influence of the relative margin of preference,

6.81. However, for agricultural a much small overall influence of tariffs (direct market access model) was observed and a negligible (and negative sign) impact of relative margin of preference. This could be explained by the more complex factors such as product approval whereby for example, products of animal origin and not allowed to be exported to the EU without prior authorization of a country and production facility, not matter the tariff preference.

Whilst the models showed that in general, the probability of Ukrainian firms exporting to the EU under the DCFTA is influenced by both the absolute and relative changes in margin of preference, and these were the most influential factors in the models, the impact is relatively small.

In reality, post DCFTA, absolute tariffs fell by an average weighted 0.37 per cent fall in EU tariffs on Ukrainian imports (difference between DCFTA and GSP rates) and an increase in Ukraine's relative margin of preference over third country suppliers to the EU increased by 0.9 per cent. Accordingly, the probability of exporters exporting post DCFTA would increase by a total of 5.2 per cent be comprised of 0.08 per cent from direct tariff reductions (-0.165 x 0.47) and 5.12 per cent from improved relative margin of preference of third country competitors in the EU (5.69 x 0.9).

This is an extremely small increase in probability to start trading as a result of improved access. Given the actual small value of extensive margin (value of newly exported products) of 1.4 per cent of total trade, the likely impact of tariff reductions on the extensive margin of preference is small. Attributing to tariff liberalization to the extensive margin, a 5.2 per cent increase in probability of exporting would mean five in 100 new products exported post DCFTA would be caused by tariff liberalization and assuming pro rata, these products had equal value of exports, then the dynamic impact of DCFTA preferences on Ukraine's exports to the EU post DCFTA would be 0.07 per cent (5.2 per cent probability of 1.4 per cent of total trade which was the extensive margin). This equates to €9.9

million of new exports post DCFTA of the €13.8 bn total trade after implementation and as a result of improved market access.

CONCLUSIONS

The overall results across product groups indicate that the liberalization of the tariff has an effect on the probability of exporting, but the change in relative margin of preference has a greater influence and increasing probability to export of more than three times that of the direct tariff change. That is, a one per cent increase in Ukraine's relative margin of preference would increase the likelihood of that product being traded post DCFTA by almost six per cent whereas a one per cent fall in the tariff under the DCFTA would increase the likelihood of Ukraine trading that product by less than two per cent. Of course, the actual changes in absolute tariffs and relative margins of preference differ which will affect the probability of exporting post DCFTA.

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