The role of the Generalised System of Preferences (GSP) in determining carnation demand in the United Kingdom: implications for Colombian and Kenyan exports

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Abstract

The goal of this paper was to assess how the EU Generalised System of Preferences incentive scheme to combat drugs production and trafficking (GSP+) affected carnation imports in the United Kingdom (UK). Colombian carnations enter the EU duty-free under the GSP+ incentive scheme which is less secure than the trade agreement between the EU and Kenya. If the EU withdrew preferences from Colombia, would Kenyan flower exporters be better off in the UK carnation market? The results of study showed that Colombian exports benefited from tariff-free access to the UK where the benefit was due to both trade creation and trade diversion. Additionally, the competition between Colombian and Kenyan carnations was found to be insignificant and there was no evidence that GSP+ negatively affected Kenyan carnations. The results showed that competing exporters (Kenya, the Netherlands and Spain) could actually be better off when Colombian carnations are given duty-free to the EU.

Keywords: UK; Kenya; Colombia; carnations; GSP; preferential trade agreements

1. Introduction

The United Kingdom (UK) is the largest importer of carnations in the world. According to the United Nations, world carnation trade was valued at $498 million in 2007 and UK imports were valued at $126 million, which was 25% of total world trade that year. The United State (US) was the next largest importer at $88.9 million. Carnations in the UK were mostly sourced from Colombia, Kenya, the Netherlands and Spain. In 2007, these countries represented 90% of total carnation imports in the UK and individually represented 38%, 23%, 19% and 10%, respectively (UNCOMTRADE, 2008).

Being EU member states, no trade barriers exist between the UK, Netherlands and Spain. Additionally, Kenya has had tariff-free access to the EU under the

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Lomé Convention and continues to have access under the Economic Partnership Agreement (EPA) between the EU and the East African Community (Hughes, 2001; Ministry of Trade and Industry, 2007). Unlike the EPA, the preferential treatment granted to Colombia is less secure. Colombian carnations enter the EU duty-free under the Generalised System of Preferences (GSP) incentive scheme to encourage sustainable development and good governance in developing countries (GSP+). The GSP+ scheme specific to Colombia includes those special arrangements given to developing countries that combat drug production and trafficking (European Commission, 2004).[3]

Preferential access under the GSP+ scheme is not guaranteed. First, to be eligible, developing countries must implement key international conventions on human and labour rights, sustainable development and good governance. Access to the EU could be denied if found in non-compliance. For instance, in June 2007, the EU withdrew trade preferences from Belarus over labour rights issues, and GSP+ eligibility for Sri Lanka and El Salvador is currently subject to pending investigations due to reports of human rights violations and non-compliance with international labour standards. Colombia may be at risk in the future because allegations have surfaced about violence against trade unionists and weak enforcement of International Labour Organisation rules (Bolle, 2008).

Second, GSP+ eligibility requires that a developing country be classified as "vulnerable". The vulnerable status requires that a country is not classified by the World Bank as a high income country. Additionally, at least 75% percent of a country's total GSP exports to the EU must be concentrated within five sectors, and a country's total GSP exports to the EU must be less than 1% of total EU GSP imports from all countries. Thus, an increase in export diversity and activity could result in a loss of preferential access.

Third, GSP+ eligibility is approved for only two years. This requires that developing countries reapply and prove compliance every two years. Before 2005, GSP was negotiated every 10 years where the last round of preferential arrangements lasted from 1995-2005. After 2005, GSP+ was re-authorised for 2006-2008 only. In October of 2008, qualifying countries had to reapply for 2009-2011. Colombia was among those countries approved for 2009-2011. However, with recent allegations regarding labour rights violations, eligibility for 2012-2014 may be in question.[4]

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[3] The EU also grants duty-free access to certain countries that comply with international labor standards and implement production practices to protect the environment. The GSP+ was first implemented in 1990.

[4] All information pertaining to GSP+ was obtained from various documents found at http://trade.ec.europa.eu/doclib/cfm/doclib_section.cfm?order=date&sec=160&lev=2&sta=1&en=20. There are 16 GSP+ beneficiaries for 2009-2011: Armenia, Azerbaijan, Bolivia, Colombia, Costa Rica, Ecuador, El

The goal of this paper is to assess the effects of GSP+ in the UK carnation market. Of particular interest is how Kenyan carnation exports are affected by GSP+ preferences. In 2007, Kenyan carnation exports to the EU were value at €26.1 million where the UK accounted for 80.34%. In contrast, of total Colombian carnation exports in 2007 (US$222.6 million), 52% went to the US and only 14% to the UK. Given the importance of the UK market to Kenyan carnations, the question arises, if EU access is not granted to Colombia in 2012, would Kenya be better off?

Panagariya (2002) notes that the degree to which developing countries benefit from preferential access is not always obvious as the preferences given to one developing country may come at the expense of another. Thus, it may be the case that GSP+ preferences work against the preferences given to Kenya under the EPA. Muhammad (2009) found that if the trade creation effect of preferential treatment outweighs the trade diversion effect, there is the possibility that a competing exporter could be better off. Thus, Kenyan carnation exporters could be better off with GSP+. While past studies have focused on preference utilisation, and the impact of preferential agreements on aggregate trade, the trade balance and economic performance of developing countries, this study addresses how preferential agreements affect a specific sector in a developing economy.

In this study, we estimate the demand for fresh cut carnations in the UK where carnation imports are assumed differentiated by country of origin (Armington, 1969). Given the role of intermediaries and retailers in UK flower trade, imports are treated as inputs and a production version of the Rotterdam model is used in demand estimation (Laitinen, 1980; Theil, 1980). Sanyal and Jones (1982) note that even when imports are not physically altered, activities such as handling, insurance, transportation, storing, repackaging, and retailing still occur, resulting in a significant amount of domestic value added before final demand delivery. Thus, it would be proper to treat imports as intermediate goods even when products are imported in final form. In treating imports as such, we specify and estimate a system of import demand equations by exporting country and a total expenditure function (aggregate carnation expenditures as a function of domestic, import and resource prices). Model estimates are used to compute country-specific expenditure and price elasticities. The elasticities are used to derive the trade creation and trade diversion effects of the GSP+ incentive scheme in the UK carnation market.

Salvador, Georgia, Guatemala, Honduras, Mongolia, Nicaragua, Paraguay, Peru, Sri Lanka and Venezuela. The eligibility of El Salvador and Sri Lanka is under investigation. Panama was among the beneficiaries in 2006-2008 but did not reapply.

2. Import demand model

The production version of the Rotterdam model (differential production model), which is derived from the differential approach to production theory (Laitinen, 1980), is used in estimating UK demand for imported carnations. The consumer-based Rotterdam model has been used more frequently in import demand analysis. Examples include Winters and Brenton (1993), and Seale, Sparks and Buxton (1992). However, given the intermediate nature of traded goods, firm theory may be more appropriate for modelling import demand (Sanyal & Jones, 1982). It should also be noted that the original "Rotterdam" applications to import demand utilised the differential production model and not the more popular consumer-based specification (Theil & Clements, 1978). Recent import demand applications using the differential production model include Washington and Kilmer (2002) and Muhammad (2007). Unless specified, what follows can be attributed to these studies.

Following Armington (1969), it is assumed that carnations from each exporting country are individual goods (e.g. Kenyan carnations) that make up the product group *carnations*. Following Theil and Clements (1978), it is also assumed that carnation imports are intermediate goods weakly separable from domestic inputs such as labour and fuel. This implies that the impact of domestic labour and fuel prices on carnation imports is independent of the country of origin. For instance, while an increase in UK wages may decrease total carnation imports which in effect will decrease imports from each country, there is no reason to believe that higher wages would directly affect imports from Kenya differently from Colombia or the Netherlands. The weak separability of domestic inputs and imports obviates the need to model domestic resource demand as part of the import allocation system. We employ this assumption because while resource prices were readily available, industry-specific resource quantities were not.

Let the total number of inputs be denoted by n, the number of individual imports/source countries by n_1, and the number of domestic resources by n_2. Further, let x and w represent the quantity and price of carnation imports, and i and j denote the product origin. The demand for carnations from country i can be expressed as

$$f_i' Dx_{it} = \theta_i DX_t + \sum_{j=1}^{n_1} \pi_{ij} Dw_{jt} + \sum_{h=1}^{12} \delta_{ih} d_h + \varepsilon_{it} . \qquad (1)$$

D is the log-difference operator where for any x or w,

$$Dx_{it} = \ln(x_{it} / x_{it-1}) \text{ and } Dw_{it} = \ln(w_{it} / w_{it-1}) .$$

f_{it} is the share of total carnation expenditures allocated to carnation exports from country i

$$f_{it} = \frac{w_{it} x_{it}}{\sum_{i=1}^{n_1} w_{it} x_{it}}.$$

$f'_{it} = 0.5(f_{it} + f_{it-1})$ which is the expenditure share averaged over periods t and t-1. DX_t is the Divisia index which is a measure of change in total carnation expenditures (in real terms) and is calculated as

$$DX_t = \sum_{i=1}^{n_1} f'_{it} Dx_{it}.$$

θ_i is the marginal share coefficient which measures the impact of changes in total expenditures on carnation imports from country i. π_{ij} is the Slutsky price coefficient or relative price effect which measures the impact the j^{th} country's price on imports from country i. To account for the seasonal variation in carnation demand, monthly dummy variables (d_h) are included in equation (1) where δ_{ih} measures the impact of seasonality on UK demand. θ_i, π_{ij} and δ_{ih} are assumed constant for estimation. ε_{it} is a random disturbance term.

The import allocation model requires that the following parameter restrictions be met in order to conform to theoretical properties:

$$\sum_i \theta_i = 1,\ \sum_i \pi_{ij} = 0 \text{ and } \sum_i \delta_{ih} = 0 \text{ (adding up);}$$

$$\sum_j \pi_{ij} = 0 \text{ (homogeneity);}$$

$$\pi_{ij} = \pi_{ji} \text{ (symmetry).}$$

The matrix of price effects $\Pi = [\pi_{ij}]$ should also be negative semidefinite (negativity). The negativity property is confirmed when all own-price effects are nonpositive ($\pi_{ii} \leq 0$). The system of equations represented by (1) satisfies adding-up by construction, homogeneity and symmetry must be imposed on the parameter estimates, and negativity is verified by inspection.

Equation (1) explains how total expenditures are allocated across carnation suppliers given changes in total expenditures, import prices and seasonality. Equally important are the factors that determine total expenditures. Based on the work of Laitinen (1980), the determination of total carnation expenditures is specified as

$$DX_t = \eta Dp_t + \sum_{j=1}^{n_1} \pi_j Dw_{jt} + \sum_{k=1}^{n_2} \pi_k Dw_{kt} + \sum_{h=1}^{12} \delta_h d_h + \varepsilon_t. \qquad (2)$$

The dependent variable in (2) is the Divisia index from (1). Equation (2) states that total carnation expenditures are a function of the domestic market price (p), import prices (w_j), resource prices (w_k) and seasonal dummies (d_h). η, π_j, π_k and δ_h are assumed constant for estimation. ε_t is a random disturbance term.

Equations (1) and (2) form a system where (1) is the allocation of real import expenditures across the exporting sources and (2) is the determination of real import expenditures given domestic, import and resource prices. Substituting (2) for the Divisia index term in (1), we solve for the unconditional elasticities of import demand with respect to the domestic price, resource prices, and import prices. These are respectively specified as

$$\eta_{xp} = \frac{Dx_i}{Dp} = \frac{\theta_i}{f_i'}\eta \tag{3}$$

$$\eta_{xw_k} = \frac{Dx_i}{Dw_k} = \frac{\theta_i}{f_i'}\pi_k \tag{4}$$

$$\eta_{xw_j} = \frac{Dx_i}{Dw_j} = \frac{\theta_i\pi_j + \pi_{ij}}{f_i'}. \tag{5}$$

Equations (3) and (4) are the responsiveness of imports from country i to changes in the UK domestic price (p) and domestic resource price (w_k), respectively. Equation (5) is the responsiveness of import i to changes in own-price ($i = j$) or the price of a competing imports ($i \neq j$). Equation (5) is comprised of two effects. The first term in the numerator is the indirect or expenditure effect of a change in price. The second term is the relative or conditional price effect. In a trade context, $\theta_i\pi_j$ is the trade creation effect because it measures the increase in an import due to an increase in total expenditures induced by a decrease in price. π_{ij} is the trade diversion effect because it measures the rate at which any two imports are substituted for one another given a change in their relative prices.

3. Empirical results

The External Trade Section of the Statistical Office of the European Communities (Eurostat, 2008) provided the import data used in this study which was the harmonised system classification "fresh cut carnations and buds of a kind suitable for bouquets or for ornamental purposes". Monthly data were used for estimation and the time period was from January 2000 to February 2008. Source-specific imported quantities of fresh cut carnations for the UK were measured in units of 100 kg, and values were in euros. Import values were on a cost-insurance-freight basis. The exporting countries were Spain, the Netherlands, Kenya, Colombia and the rest of the world (ROW). The ROW was an aggregation of UK imports from non-EU countries other than Colombia and Kenya. Given that carnations from Spain and the Netherlands accounted for the overwhelming majority of UK imports from EU countries, imports from other EU countries were negligible and were excluded from this analysis. Domestic carnations (UK production) were also excluded for the same reason.[5]

Import prices were calculated by dividing the value of the commodity by the quantity which resulted in a euro per 100 kg unit of measurement. The UK consumer price index (CPI) for garden plants and flowers was used as a proxy for the domestic price (*p*), and a wage index for the retail trade sector was used to account for the cost of labour. Both were provided by the UK Statistics Authority, Office for National Statistics. Diesel fuel prices in euros per litre were used to account for in-country transportation cost and other energy expenses. Fuel prices were provided by Eurostat (2008). Descriptive statistics for all variables are presented in Table 1.

Table 1: Descriptive statistics for the UK (monthly): January 2000 – February 2008

	Spain	Netherlands	Kenya	Colombia	ROW
Price (€/100 kg)					
Mean	318.93	524.62	401.53	489.83	274.58
Standard deviation	92.26	147.53	89.47	77.31	88.11
Minimum	149.77	92.21	223.89	304.49	116.33
Maximum	879.56	952.88	603.20	674.62	553.15
Import quantity (100 kg)					
Mean	4,914	2,849	2,658	6,642	2,772
Standard deviation	2,736	1,470	1,756	1,422	2,125
Minimum	782	1,072	339	3,822	20
Maximum	12,435	12,260	6,548	10,130	9,256
Import value (€)					
Mean	1,523,870	1,395,701	1,154,383	3,232,261	655,074
Standard deviation	912,240	532,771	885,495	806,149	399,669
Minimum	306,874	542,413	114,106	1,803,969	11,063
Maximum	4,148,160	3,171,778	3,306,040	5,726,876	1,530,212
Value share (%)					
Mean	18.95	17.25	13.88	40.85	8.05
Standard deviation	10.27	4.84	10.05	8.20	4.65
Minimum	4.27	8.36	1.44	25.61	0.15
Maximum	47.66	30.12	38.88	63.75	18.28
Total Expenditure Variables	UK Price (index)	Fuel Price (€/litre)	Wages (index)		
Mean	101.68	1.25	114.11		
Standard deviation	2.06	0.10	8.73		
Minimum	98.30	1.05	98.20		
Maximum	107.10	1.44	127.40		

ROW is the rest of the world.

[5] *In 2006, UK carnations accounted for less than 0.5% of total available supply.*

The import allocation system (1) and total expenditure equation (2) were estimated using the LSQ procedure in TSP version 5.0. This procedure uses the multivariate Gauss-Newton method to estimate the parameters in the system (Hall & Cummins, 2005). Due to the adding up property, the import allocation system was singular and required that an equation be deleted for estimation. The ROW equation was deleted for this purpose; however, as shown by Barten (1969), maximum likelihood estimates are invariant to the chosen deleted equation. The ROW parameters were recovered using the adding-up property.

Likelihood ratio (LR) tests were used to test for first-order autocorrelated disturbances [AR(1)] in the import allocation system (1) and total expenditure equation (2). The AR(1) parameter in (1) was estimated using the full maximum likelihood procedure for singular equation systems developed by Beach and MacKinnon (1979) and constrained to be the same across all import equations to preserve the adding-up property. The AR(1) parameter for equation (2) was allowed to differ from equation (1). The benefit of the Beach and MacKinnon (1979) method is that the log likelihood function is specified such that the error process is stationary (the characteristic roots of the AR(1) parameter lie within the unit circle) and the errors of the initial period have some effect on the parameter estimates. The hypothesis of no autocorrelation was rejected at any reasonable significance level in the import allocation system and failed to be rejected in the total expenditure equation. Likelihood ratio (LR) tests were also used to test the economic properties homogeneity and symmetry. Both properties were accepted at the 0.01 significance level. All reported estimates are homogeneity and symmetry constrained and the error structure in (1) follows an AR(1) process.

Conditional import demand estimates (marginal share and price coefficients) for the UK are presented in table 2. The seasonality estimates can be furnished upon request. Most of the variation in origin-specific import demand was explained by the import allocation model. The marginal share estimates (θ_i) indicated a positive and significant relationship between total import expenditures and origin-specific imports. These estimates measured how a one-euro increase in total carnation expenditures was allocated across the supplying countries. Given an increase in total import expenditures, imports from Colombia was the most responsive (0.349). The marginal share estimates for Spain (0.199) and the Netherlands (0.214) were relatively smaller but still larger than Kenya (0.171) and the ROW (0.067).

Table 2: Conditional import demand estimates for the UK

Exporting country	Marginal share θ_i	Price coefficients π_{ij}				
		Spain	Netherlands	Kenya	Colombia	ROW
Spain	0.199[a] (.043)	-0.042[b] (.020)	0.004 (.013)	-0.003 (.014)	0.026 (.019)	0.014 (.011)
Netherlands	0.214[a] (.039)		-0.093[a] (.026)	0.026[b] (.012)	0.054[a] (.016)	0.009 (.010)
Kenya	0.171[a] (.037)			-0.027 (.022)	0.022 (.022)	-0.019 (.013)
Colombia	0.349[a] (.046)				-0.165[a] (.036)	0.062[a] (.017)
ROW	0.067[b] (.029)					-0.067[a] (.015)
	Equation R^2	0.68	0.63	0.37	0.81	0.82

Homogeneity and symmetry are imposed. Asymptotic standard errors are in parentheses.
[a] Significance level = 0.01; [b] Significance level = 0.05;
AR(1) parameter = -0.246.

The conditional own-price effects (π_{ii}) were all negative which is to be expected and significant for all countries except Kenya. This sufficiently ensures that the matrix of price effects is negative semidefinite. See the diagonal elements in table 2. Colombia had the largest own-price estimate (-0.165). The own-price estimates for the remaining countries were: -0.042 (Spain), -0.093 (the Netherlands), -0.027 (Kenya) and -0.067 (ROW). The conditional cross-price estimates (π_{ij}) indicated that carnations from the Netherlands and Kenya were substitutes (0.026). Colombian carnations were substitutes for carnations from the Netherlands (0.054) and the ROW (0.062). No significant relationship existed between Spain and any country, and no significant relationship existed between Kenya and Colombia. The insignificance of the Kenya/Colombia cross-price effect has important implications for the effects of GSP+ on Kenya. This is further discussed later in this section.

Table 3 reports the estimates for the total expenditure equation. Note that each of these estimates measure the change in total expenditures given changes in the independent variables and can be interpreted as elasticities (e.g., %Δ in total carnation expenditures given a %Δ in domestic fuel prices). To account for domestic price expectations, a one-period lag in p was used in estimating equation (2). The domestic price estimate (1.704) was positive as expected and significant at the 0.05 level indicating that for every percentage increase in UK flower prices, total carnation expenditures increase by 1.7%. This is to be expected because if importers/intermediaries are able to resell carnations in the UK at higher prices, they are likely to increase there purchases from the exporting countries. Although the price of fuel and labour had the expected negative signs (-0.560 and -0.491), neither was significant. While labour was highly insignificant, fuel prices were not. Given the rise in fuel cost in more recent years, we expect that fuel prices have had a more significant effect. The impact of import prices on total expenditures was negative (as expected) and significant for all exporting countries except Kenya and ROW. These estimates measure the responsiveness of total carnation expenditures to changes in exporter prices. Given that Colombia is the largest supplier, the price of Colombian carnation had the largest effect on total import expenditures (-0.296). The effects for Spain and the Netherlands were relatively smaller (-0.160 and -0.129).

Table 3: Total carnation expenditure estimates for the UK

Variable	Estimate
(η) Domestic price	1.704 (.872)[b]
(π_j) Import prices	
Spain	-0.161 (.041)[a]
Netherlands	-0.129 (.035)[a]
Kenya	0.053 (.069)
Colombia	-0.296 (.119)[b]
ROW	-0.016 (.053)
(π_k) Resource prices	
Fuel	-0.560 (.399)
Labour	-0.491 (.919)
(δ_h) Seasonal Dummies	
January	-0.276 (.040)[a]
February	0.187 (.038)[a]
March	0.199 (.034)[a]
April	-0.207 (.044)[a]
May	0.042 (.035)
June	-0.183 (.036)[a]
July	0.002 (.039)
August	-0.028 (.039)
September	0.037 (.034)
October	0.024 (.034)
November	0.058 (.035)
December	0.235 (.038)[a]

R^2 = 0.79
Asymptotic standard errors are in parentheses.
[a] Significance level = 0.01; [b] Significance level = 0.05.

3.1 Unconditional import demand elasticities

The unconditional import demand elasticities are reported in table 4. The domestic price elasticities, which measure the impact of percentage changes in the domestic price on individual imports, were relatively large when compared to the other elasticities. These elasticities were significant at the 0.10 level with the exception of ROW which was insignificant. The Netherlands and Kenya were the most responsive to changes in the domestic price where a percentage increase the UK price resulted in a 2.12% and a 2.11% increase in carnation imports from the Netherlands and Kenya, respectively. The domestic price elasticity for Spain and Colombia was 1.78 and 1.46, respectively. With the exception of Kenya, the unconditional own-price elasticities were all significant where demand was inelastic for each exporting country. ROW carnations were the least inelastic (-0.84). The unconditional own-price elasticities for the Netherlands and Colombia were relative smaller in absolute value (-0.70 and -0.66), but larger than the estimate for Spain (-0.39).

Table 4: Unconditional import demand elasticities for the UK carnation market

Exporting country	Domestic price	Own price	Cross price				
			Spain	Netherlands	Kenya	Colombia	ROW
Spain	1.78 (0.99)	-0.39[a] (0.19)		-0.11 (0.08)	0.04 (0.10)	-0.17 (0.18)	0.06 (0.08)
Netherlands	2.12 (1.09)	-0.70[a] (0.10)	0.18 (0.09)		0.22[b] (0.11)	-0.05 (0.19)	0.03 (0.09)
Kenya	2.11 (1.17)	-0.13 (0.22)	-0.22[b] (0.11)	0.03 (0.09)		-0.20 (0.23)	-0.16 (0.11)
Colombia	1.46 (0.77)	-0.66[a] (0.14)	-0.07 (0.06)	0.02 (0.09)	0.10 (0.08)		0.14[b] (0.06)
ROW	1.41 (0.95)	-0.84[a] (0.19)	0.05 (0.14)	0.00 (0.12)	-0.19 (0.17)	0.53[b] (0.27)	

Elasticities are evaluated at mean expenditure shares. Asymptotic standard errors are in parentheses.
[a] Significance level = 0.01; [b] Significance level = 0.05.

The cross-price elasticities show that carnations from each country were mostly unrelated or substitutes (unconditionally) with the exception of the complementary effect of Spain on Kenya (-0.22). This is due to carnations from Kenya and Spain being unrelated (conditionally) and the significant negative effect of Spain's price on total import expenditures. Given that total import expenditures were statistically invariant to changes in the price of Kenyan carnations, the conditional competitive relationship between Kenya and the Netherlands held unconditionally. For Colombia, the cross-price elasticities were insignificant for all countries except the ROW where Colombia and ROW were both positively affected by each other's price.

3.2 Policy simulation procedure

An objective of this study is to simulate the impact of GSP+ on UK carnation demand. Following Kastens and Brester (1996), origin-specific import demand projections are derived using an elasticity-based forecasting equation where the projected quantity of the i^{th} import is given as

$$x_{i1} = \left(\eta_{xp} \left[\frac{p_1 - p_0}{p_1} \right] + \sum_{j=1}^{n_1} \eta_{xw_j} \left[\frac{w_{j1} - w_{j0}}{w_{j0}} \right] + \sum_{k=1}^{n_2} \eta_{xw_k} \left[\frac{w_{k1} - w_{k0}}{w_{k0}} \right] \right) x_{i0} + x_{i0} . \qquad (6)$$

Equation (6) states that the projected quantity of the i^{th} import (x_{i1}) is a function of the starting quantity (x_{i0}), and the percentage changes in the domestic price, resource prices, and the prices charged by each exporting country where the η's are the unconditional elasticities defined by equations (3)-(5).

Carnation imports from countries without special agreements are assessed at the third country duty rate of 12.0% (Taxation and Customs Union, 2008). We apply this tariff rate to carnation imports from Colombia to asses the impact of GSP+ on import demand. Using equation (5) and (6), and assuming no change in p and w_k, as well as no change in w_j when $j \neq$ Colombia, the impact of the 12% tariff on the ith import is as follows:

$$x_{i1} = \frac{\theta_i \pi_j}{f_i'} (0.12) x_{i0} + \frac{\pi_{ij}}{f_i'} (0.12) x_{i0} + x_{i0} . \qquad (7)$$

Country j is Colombia in this instance where equation (7) gives the impact of a change in Colombia's price on the i^{th} import.[6]

The first term on the right hand side measures the trade destruction (negative trade creation) effect of the tariff, which is the decrease in x_{i1} due to a tariff-induced decrease in aggregate expenditures. The second term is the trade diversion effect of the tariff, which is the substitution of j with i due to a tariff-induced increase in the price of j relative to i.

UK carnation imports with and without the 12% tariff are reported in table 5. Import quantities with the tariff (x_{i1}) represent the effects of withdrawing GSP+ preferences from Colombia. The "without-tariff" quantities (x_{i0}) are carnation imports in 2007. When the tariff was imposed, total UK imports decreased from 21,770,600 kg to 21,202,200 kg, a 568,400 kg decrease. As

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[6] *Here we assume that the change in import price fully reflects the tariff where* $(w_{j1} - w_{j0}) / w_{j0} = 0.12$.

expected, Colombia is the primary beneficiary of GSP+ preferences where imports with and without the tariff were 6,318,000 and 6,858,000 kg, respectively, a difference of 540,000 kg. UK carnation imports from competing countries were also greater without the tariff (ROW is the exception). However, since the unconditional cross-price effects for Colombia were mostly insignificant, the projected difference for Spain, the Netherlands and Kenya should not be statistically different from zero.

Table 5: Impact of 12.0% tariff on UK carnations imports

Country	Without tariff on Colombia	With tariff on Colombia	Difference	Trade creation	Trade diversion
	Quantity (kg)				
Spain	2,708,700	2,652,600	56,100	100,600	-44,500
Netherlands	4,553,400	4,524,100	29,300	200,900	-171,600
Kenya	4,864,400	4,744,900	119,500	213,600	-94,100
Colombia	6,858,000	6,318,000	540,000	208,400	331,700
ROW	2,786,100	2,962,700	-176,600	82,000	-258,600
Total	21,770,600	21,202,200	568,400	805,500	-237,100

Results show that the GSP+ preferences given to Colombia is mostly trade creating in the UK carnation market. The increase in total UK imports was due to trade creation (800,500 kg) which outweighed the decrease due to trade diversion (-237,100 kg). The increase in UK imports from Colombia (540,000 kg) is due to both trade creation (208,400 kg) and trade diversion (331,700 kg) where the trade diversion is primarily the substitution of ROW imports with imports from Colombia. There is little difference in carnation imports from Kenya with and without the tariff. The diversion effect of the tariff on Kenya was only 94,100 kg which is only about 2.5% of total Kenya exports to the UK. This is the result of the insignificant cross-price relationship between Kenya and Colombia. Interestingly, the trade creation effect for Kenya exceeded the diversion effect resulting in Kenya actually being better off without the tariff. However, the increase in Kenyan imports may not be statistically significant.

5. Summary and conclusions

In this study, we estimated the demand for fresh cut carnations in the UK where it was assumed that carnation imports were differentiated by country of origin. Given the role of intermediaries and retailers in the UK carnation trade, imports were treated as inputs and a production version of the Rotterdam model was used in demand estimation. Estimates were then used to derive the unconditional price effects for each exporting country and estimate the trade creation and diversion effects of GSP+ in the UK carnation market.

Results showed that carnation exporters in Colombia benefit from preferential access to the UK. Given the insignificant competition between Kenya and Colombia, there was no evidence that carnation exporters in Kenya were worse off as a result of GSP+. Like Kenya, Spain was better off, or at worse unaffected by GSP+. In contrast, ROW was worse off due to significant competition with Colombia. The projections indicated that the preferential access afforded to Colombia is for the most part trade creating in the UK carnation market and that the main competing suppliers (Kenya, the Netherlands and Spain) would not be better off if the preferential arrangements under GSP+ are withdrawn from Colombia in 2012. However, those countries that make up "the rest of the world" would be better off but these countries account for a small percent of the UK market. In closing, flower exporters in Kenya should not be concerned with the preferential access given to Colombia. While this may not be the case for all sectors of the economy, in the UK carnation market, Colombia and Kenya appear to be independent.

References

Armington PS (1969). A theory of demand for products distinguished by place of production. *International Monetary Fund Staff Papers* 16:159-176.

Barten AP (1969). Maximum likelihood estimation of a complete system of demand equations. *European Economic Review* 1:7-73.

Beach CM & MacKinnon JG (1979). Maximum likelihood estimation of singular equation systems with autoregressive disturbances. *International Economic Review* 20:459-464.

Bolle MJ (2008). *Proposed Colombia Free Trade Agreement: labor issues*. CRS Report for Congress, Washington DC.

European Commission (2004). *The European Union's Generalised System of Preferences GSP*. European Commission, Directorate-General for Trade, Belgium.

Eurostat (2008). External trade detailed data [Online]. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136217,0_45571467&_dad=portal&_schema=PORTAL (Accessed various dates).

Hall BH & Cummins C (2005). *TSP 5.0 reference manual version*. Palo Alto: TSP International.

Hughes A (2001). Global commodity networks, ethical trade and governmentality: organizing business responsibility in the Kenyan cut flower industry. *Transactions of the Institute of British Geographers* 26:390-406.

Kastens TL & Brester GW (1996). Model selection and forecasting ability of theory-constrained food demand systems. *American Journal of Agricultural Economics* 76:301-312.

Laitinen K (1980). *The theory of the multiproduct firm*. New York: North Holland Publishing Company.

Ministry of Trade and Industry (2007). Kenya signs interim framework EPA agreement with European Commission under East African Community. Government of Kenya, Nairobi, Kenya [Online]. http://www.tradeandindustry.go.ke/news.asp?ID=14 (accessed 14/02/2008).

Muhammad A (2009). Would African countries benefit from the termination of Kenya's economic partnership agreement (EPA) with the EU? An analysis of EU demand for imported roses. *Journal of Agricultural Economics* 60(1):220-238.

Muhammad A (2007). The impact of increasing non-agricultural market access on EU demand for imported fish: implications for Lake Victoria chilled fillet exports. *European Review of Agricultural Economics* 34:461-477.

Panagariya A (2002). EU preferential trade arrangements and developing countries. *World Economy* 25:1415-1432.

Sanyal KK & Jones RW (1982). The theory of trade in middle products. *American Economic Review* 71:16-31.

Seale JL, Sparks AL & Buxton BM (1992). A Rotterdam application to international trade in fresh apples: a differential approach. *Journal of Agricultural and Resource Economics* 17:138-149.

Taxation and Customs Union (2008). TARIC database. European Commission, Brussels, Belgium [Online]. http://ec.europa.eu/taxation_customs/dds/tarhome_en.htm (Accessed various dates).

Theil H (1980). *The system-wide approach to microeconomics*. Chicago: The University of Chicago Press.

Theil H & Clements KW (1978). A differential approach to US import demand. *Economics Letters* 1:249-252.

UNCOMTRADE (United Nations Commodity Trade Statistic Database) (2008). New York: United Nations [Online]. http://comtrade.un.org/db/ (Accessed various dates).

Washington AA & Kilmer RL (2002). The production theory approach to import demand analysis: a comparison of the Rotterdam model and the differential production approach. *Journal of Agricultural and Applied Economics* 34:431-443.

Winters LA & Brenton PA (1993). Modelling quantitative trade restrictions: rationing in the Rotterdam model. *De Economist* 141:112-126.