The Journal of International Trade & Economic Development, 2016
Vol. 25, No. 3, 377–402, http://dx.doi.org/10.1080/09638199.2015.1069884

Routledge
Taylor & Francis Group

Impact of EU agricultural policy on developing countries: A Uganda case study

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(*Received 24 September 2014; accepted 16 June 2015*)

Despite substantial reforms, the European Union (EU)'s Common Agricultural Policy (CAP) is still criticised for its detrimental effects on developing countries. This paper provides updated evidence on the impact of the CAP on one developing country, Uganda. It goes beyond estimating macrolevel economic effects by analysing the impacts on poverty. The policy simulation results show that eliminating EU agricultural support would have marginal but nonetheless positive impacts on the Ugandan economy and its poverty indicators. From the perspective of the EU's commitment to policy coherence for development, this supports the view that further reducing EU agricultural support would be positive for development.

Keywords: Uganda; common agricultural policy; poverty; trade policy; domestic support; computable general equilibrium-microsimulation

JEL Classifications: D58, F14, O10, O55

1. Introduction

Agricultural protectionism in developed countries has long been a sticking point in the negotiations on further trade liberalisation in the World Trade Organisation's (WTO) Doha Round. Support to farmers in OECD countries remains at more than one-sixth of farm receipts, and the potentially most distorting support still represents around half of the total (OECD 2014). The European Union (EU) has also provided extensive support to its farmers, through both higher prices and budget support, and its Common Agricultural Policy (CAP) has long been criticised for its damaging effects on developing countries, and developing country agriculture in particular. The resulting stimulus to production, and disincentives to consumption meant that the EU emerged as a significant export competitor to developing country exporters, while its use of export subsidies enabled surpluses

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to be dumped at low prices on the markets of importing developing countries. Case studies undertaken by non-governmental organisations (NGOs) have highlighted the alleged impact of EU exports of particular commodities (milk powder, pig and poultry meat, tomato paste, etc.) in particular countries (Curtis 2011; APRODEV 2007; GermanWatch 2008, 2009; Fowler 2002; Fritz 2011). At the same time, the EU's high level of border protection for many CAP commodities has prevented low-cost developing country exporters from selling to the EU market except under preferential access arrangements.

Model simulations confirm that the CAP has in the past distorted both the level and the volatility of world market prices to the detriment of farmers in developing countries (Adenäuer and Kuiper 2009; Costa et al. 2009; Gohin 2009; Gouel, Guillin, and P. 2008; Nowicki et al. 2009). However, the impacts on developing countries are very diverse. By encouraging agricultural production in the EU, the CAP hurts those developing countries that are net food exporters and that would, otherwise, supply a larger share of the EU or world market. But the situation is less clear for developing country exporters which have preferential access to the protected EU food market or which are net food importers. Defenders of the CAP point to Europe's openness to agricultural imports and underline that the EU is by far the largest importer of agricultural products from developing countries (CEC 2012). Consumers and net importing developing countries could have reaped some benefits from lower world market prices (Panagariya 2005); these countries, at least in the short run, are potential beneficiaries of protected EU agricultural markets. Thus, there will be winners and losers among developing countries from the operation of the CAP (Matthews 2008).

Policy coherence for development (PCD) means that the EU should take account of the objectives of development cooperation in all policies that it implements which are likely to affect developing countries, and that these policies should support development objectives where possible. The EU has adopted both a strong political and legal commitment to PCD (Carbone 2008). Article 208 of the present EU Treaty defines the overall objective of European development cooperation as follows: *The Union's development cooperation policy shall have as its primary objective the reduction and, in the long term, the eradication of poverty. The Union shall take account of the objectives of development cooperation in the policies that it implements which are likely to affect developing countries.*

In the EU's latest work programme on policy coherence, food security in developing countries is one of the five topics chosen for particular emphasis (Engel et al. 2013). The European Commission in 2009 revised the guidelines for its *ex ante* impact assessment process for policy proposals under development to include PCD-relevant assessment indicators, noting the estimated impact of the proposed policy on third countries in general, and particularly on its social, security and environmental impacts. In accordance with these guidelines, the impact assessment accompanying the Commission's legislative proposals for the recent CAP reform included a discussion of the impacts of the reform on developing countries. The assessment noted that 'impacts should be assessed on a case by case basis, as the economic, social, cultural and demographic heterogeneity among and within

developing countries, as well as the multitude of factors that affect food security policies and situations in the short-, medium- and long-term, make generalisations difficult. The assumption of direct price transmission mechanisms calls for a methodological approach that combines aggregate/national with household level data' (EC 2011: 4).

There is an extensive literature on the ways in which the CAP impacts on developing countries, but much of this is qualitative in nature and there are relatively few empirical studies. Empirical studies fall into two groups. On the one hand, case studies have been undertaken, often by NGOs, examining the impact of EU exports of particular commodities (milk powder, pig and poultry meat, tomato paste, etc.) in particular countries (see references above). A problem in interpreting these studies is that they do not develop a clear counterfactual of what would happen in the absence of the CAP. Another criticism is that case studies usually focus on the impact of EU exports in importing countries. But EU agricultural protection may also adversely affect the interests of developing country exporters, either directly by restricting access to the EU market, or indirectly by competing with these exporters in third country markets. Again, the main problem in identifying these effects on exporters is establishing the counterfactual of what trade flows would occur in the absence of the CAP.

Modelling helps to address these two criticisms, but at the cost of introducing a new set of difficulties. In recent years, a wide array of simulation results has been published examining the impact of agricultural protection in OECD countries on developing countries (Anderson and Martin 2005; Anderson, Martin, and van der Mensbrugghe 2006; Brooks 2014; McMillan, Zwane, and Ashraf 2007; OECD 2007). There is wide variation in the published empirical results. Partly, this variation reflects improvements that have taken place in the models and databases over time. In part, the variation reflects the inherent complexities in modelling the causal links between EU policies (and OECD policies more generally) and their impacts in a developing country as well as the impact of the assumptions that the modellers must make. However, relatively few studies publish the impacts of the CAP alone, simulated by a unilateral EU liberalisation of its agricultural policy. Of those published studies which do identify the impact of the CAP on world markets, many are now considerably dated and are no longer a reliable guide to CAP impacts.

During the past two decades, the CAP has undergone significant reform. The effect has been to substitute direct payments (DPs) for market price support, and to gradually decouple these payments from the level of production on farms. Import levies were converted into bound tariffs and their overall level reduced as a result of the WTO's Uruguay Round Agreement on Agriculture. Intervention prices have been steadily reduced and now operate only at safety-net levels. Because of these reforms, but also because of the rise in world market prices, the EU now only uses export subsidies in exceptional market circumstances. These changes need to be taken into account in assessing the impact of the CAP on third countries. We, therefore, undertake an updated analysis using more recent data and, following the Commission's advice, with a specific focus on identifying the impacts on

Uganda combining both national and household-level impacts. Our model and database represent the situation in the second half of the 2000's first decade; in the conclusions, we reflect on the implications of further changes in the CAP since then.

Uganda's economic structure is typical for many low-income developing countries. It is one of the world's least developed countries ($572 Gross Domestic Product (GDP) per capita, current US$ in 2013) and has a high share of 19.7% of its population living in poverty (at the national poverty line, in 2012/2013; UBOS 2014). According to Uganda's Statistical Abstract 2014 (UBOS 2014), in 2012/2013, the agricultural sector engaged 72% of the working population and contributed 20.9% of total GDP. Households spent a high share of 46% of their expenditure budget on food, beverages and tobacco. The 2013 trade balance showed a large deficit. Uganda's merchandise exports are dependent on just a few products: coffee accounted for 17.7% and cotton, tea and tobacco for another 9.9% of merchandise exports. Agricultural products accounted for 72% of exports but only 12.8% of imports (UN comtrade 2015). The EU is among the most important trading partners of Uganda accounting for 24.0% of exports and 11.8% of imports. Agricultural products account for 94.2% of its exports to and 6.6% of its imports from the EU. In total, 31.4% of Uganda's agricultural exports are destined for and 6.1% of such imports originate from the EU. Uganda benefited from preferential market access to the EU under the Cotonou Agreement and now enjoys duty- and quota-free access for all products to the EU market under its interim Economic Partnership Agreement with the EU. It is also eligible for similar preferential access by way of the Everything but Arms scheme which benefits all least-developed countries. Thus, Uganda is typical of many low-income countries which benefit from the EU's development co-operation programmes.

Our objective is to examine the impact of EU agricultural policy by modelling the removal of trade and agricultural policy instruments supporting EU farmers and assessing the impact of the policy changes on prices and poverty in Uganda. Our simulations show that, on balance, further unilateral CAP reform would have positive but very small overall effects on Uganda in terms of its GDP, poverty rates and food security.

The paper is structured as follows. Section 2 briefly describes the two models and the databases used. Section 3 describes the scenarios, how the models are linked to derive the poverty impacts of the CAP and the results of our simulations. Section 4 concludes.

2. Methodology

2.1. Model framework and database

2.1.1. Model framework

The model framework for the policy simulations consists of a sequence of two comparative-static Computable General Equilibrium (CGE) models. First, we use the GTAP model with version 8 of the database based on 2007 data to simulate the

CAP changes in the EU and its impacts on prices and trade between the different regions of the world. Then, the resulting changes in Ugandan trade prices and quantities are passed to a detailed national model of Uganda as exogenous simulation shocks. Their impacts on both the overall economy as well as households are then assessed.

2.1.1.1. CAP-tailored GTAP model. The CAP reform in the EU and its world market impacts are simulated using a specially tailored CAP version of the multi-regional Global Trade Analysis Project (GTAP) CGE model. The standard GTAP model (Hertel 1997) is extended with policy variables and equations making it possible to distinguish specific CAP budgetary payments, both national or EU financed payments, within the model. Also, the financing of the CAP is modelled as a homogenous percentage contribution of national GDP by individual member states to the EU budget, whereby the model captures net transfers of payment between EU countries. Given these additional variables and equations, the specially tailored CAP GTAP model is run on a database where each EU member country is specified individually. The macroeconomic closure is neoclassical where investments are endogenous and adjust to accommodate any changes in savings. This approach is adopted at the global level, and investments are then allocated across regions so that all expected regional rates of return change by the same percentage. Although global investments and savings must be equal, this does not apply at the regional level, where the trade balance is endogenously determined as the difference between regional savings and regional investments. The quantities of endowments (capital, land, labour and natural resources) in each region are fixed exogenously within the model. The Ugandan Consumer Price Index (CPI) is used as the numéraire for the model.

2.1.1.2. Uganda model. For the detailed analysis of the Ugandan impacts, we adopt the single-country International Food Policy Research Institute (IFPRI) Standard Computable General Equilibrium Model in GAMS (Löfgren, Harris, and Robinson 2002). This choice is motivated by its excellent documentation and public availability which increase the transparency and ease of discussing the model and the results. The reader is referred to the documentation in Löfgren, Harris, and Robinson (2002) for an exhaustive description and mathematical formulation of the model. Only model adaptations and closure assumptions are presented here. To facilitate the microeconomic analysis of income distribution and poverty effects, the standard model is extended to incorporate the full set of household observations from the nationally representative Uganda National Household Survey (UNHS) 2005/06 as individual households into the CGE model, also called an 'integrated CGE-microsimulation model'.[1] Each household's livelihood is characterised by its individual pattern of expenditures and income sources. But households are differentiated further. As in the IFPRI standard model, the consumption behaviour of households follows the linear expenditure system (LES) functional form. However, consumption preferences differ for each household as its LES is individually parameterised by an own, idiosyncratic set of demand elasticities which is cal-

culated from an econometrically estimated flexible demand system (see Boysen 2012). On the income side, each household differs by the quantities of the various factors it owns but also by the extent to which each of its labour types is utilised. Its labour utilisation adapts to wage changes within the extremes of unemployment and full employment. The potential for additional labour supply (un- and underemployment) of individual households has been derived from the UNHS data on unemployment, inactivity and time-related underemployment of households' members.[2]

In the standard model, commodities produced and sold on the domestic market are regarded as imperfect substitutes to imported commodities ('Armington assumption'). But as the CAP reform affects trade flows between Uganda and the EU differently than those between Uganda and other regions, it is important to further distinguish the external account according to origin and destination of trade. Thus, the regions EU, East African Community (EAC) and the rest of the world (ROW) are distinguished and imports from these regarded as imperfect substitutes. This is implemented in two levels. The higher level constant elasticity of substitution (CES) function aggregates imports from the EU, the EAC and the ROW together to a single imported commodity. The lower level CES function combines imported and domestic goods into a final composite good which is sold on the domestic market. The elasticities of substitution between imports and domestically produced goods have been adopted from Hertel et al. (2007). The elasticities of substitution between imports from different origins are twice the value of the preceding ones.[3] To facilitate the link to the results of the global CGE model, as explained later, the constant elasticity of transformation export supply functions of the standard model are replaced by downward-sloping export demand functions, separately for each export destination.[4]

The choice of 'closures' has been guided by the goal to keep them as closely aligned with those of the CAP GTAP model while introducing some country-specific detail into the factor markets. However, these closures allow effects on household welfare which cannot be measured in the model. This includes future welfare effects from saving, borrowing, and investment and non-monetary welfare provided through public goods and services. Changes in government consumption cause unaccounted welfare effects through changed provision of public goods and services. Likewise, changes in government savings imply unaccounted welfare effects in the future. In this model, the government reacts to changed revenue by adapting its spending on non-education, non-health services while keeping savings constant.[5] The exchange rate adapts so that foreign savings remain constant. Investment is determined by total savings which depends on the fixed savings rates of the households and the enterprise.

The way factor markets work has been modified compared to the standard IFPRI model. Our analysis looks at a long-term horizon. Accordingly, capital can depreciate and be reinvested in other sectors and is thus assumed to be fully mobile at a fixed supply level with rents clearing the market. Wage rates vary to clear the labour markets. But also the supplies of unskilled and skilled labour are assumed

to increase with the associated real wage levels based on the so-called *wage curve* relationship introduced by Blanchflower and Oswald (1995). They empirically found a relationship between the level of the real wage and unemployment with an elasticity of unemployment with respect to the real wage level of approximately −0.1 valid across a large number of countries. Subsequently, this relationship and elasticity have been empirically confirmed by numerous studies for various countries, including the African countries Burkina Faso, Côte d'Ivoire and South Africa. Nijkamp and Poot (2005) subject the findings of the wage curve literature to a meta-analysis, confirm the stability of the negative real wage to unemployment relationship, and suggest a publication-bias corrected elasticity of −0.07. Here, an elasticity of −0.1 is adopted. While the wage curve is observed on a macrolevel and thus is implemented to affect the aggregate supplies of skilled and unskilled labour, respectively, individual households might be limited in their potential to increase (fully employed) or decrease (unemployed) their labour supply. Accordingly, the labour supply of each household is modelled as being restricted from below by the state of unemployment and from above by full employment. More specifically, the labour utilisation rate adapts in terms of percentage point changes uniformly for all households but some households are unaffected if their individual labour utilisation rates are already at a limit. UBOS (2006, Table 4.13) reports a time-related underemployment rate of 12.1% and an unemployment rate of 1.9%.

Also, the land market is assumed to clear through rent adjustments. As climate and soil conditions vary strongly across Uganda, crops, trees and pastures cannot be grown with the same productivity in all areas. To reflect these differences in productivity when reallocating land between different crop uses, an approach presented by Keeney and Hertel (2009) is adopted. According to this, each land owner has a fixed area of land and rents it out to different activities with the goal of maximising returns from land subject to limitations on the transformation of land from one use to another. As this limits the mobility of land, rents differ between sectors. Here, the model formulation consists of a two-level constant elasticity of transformation function nesting structure. On level one, the land owner decides on renting to annual or permanent crops or pastures. On the second level, the owner decides on renting to a particular use within each group. The transformation of land use between the annual and permanent crop and pasture groups as well as within the permanent group is assumed to be rather sluggish with an elasticity of transformation of −0.25. By contrast, switching land between uses for different annual crops is easier and an elasticity of transformation of −1.1 is assumed and a quasi-perfect elasticity of transformation between pastures for different livestock types of −20. The CPI is fixed and serves as the numéraire for the model.

2.1.2. Data

2.1.2.1. GTAP database. The simulations of global impacts of the EU CAP reform employ a modified version of the standard GTAP version 8 database (Narayanan, Aguiar, and McDougall 2012).

The GTAP database is a system of multi-sector economy-wide input/output tables (countries) linked at the sector level through trade flows between commodities used both for final consumption and intermediate use in production. The database version 8 employed in this analysis represents the global economy in the year 2007 and divides the global economy into 112 countries/regions where the present EU 27 member states are specified as individual countries. The database specifies 57 commodities where 12 are primary and 8 are secondary agricultural commodities. In this analysis, the GTAP database is aggregated to 28 regions with 25 EU member countries/regions specified together with Uganda, rest of EAC and the ROW.[6] On the commodity side, the database is aggregated in a way to best match the commodity representation used for the national Uganda model resulting in 32 commodities where the 12 primary agricultural plus the forestry and fishing commodities are maintained.[7]

The modifications to the standard GTAP database identify the CAP agricultural domestic support payments by country and sector and enable direct modelling of the corresponding policy changes. Specifically, the agricultural domestic support payments found in the standard GTAP database originate from the OECD's Producer Support Estimate (PSE) tables. These correspond to the EU's Pillar 1 decoupled payments to farmers and are reported by the EU as Green Box payments under the WTO Agreement on Agriculture. A condition for Green Box payments is that they should have no or minimal impact on trade. The literature, however, has brought forward evidence that the EU's DPs are not fully decoupled from production but there is little evidence on the degree of such coupling (Urban, Jensen, and Brockmeier 2014). This study adopts the assumption that DPs are coupled to output to some degree and thus bias the production pattern. To modify the standard GTAP database, the PSE table for the EU year 2007 has been disaggregated so that domestic support payments are allocated to individual member countries and calibrated into the model as input, output and land-, capital-, labour-based subsidies (for details, see Urban, Jensen, and Brockmeier 2014).

In the CAP-tailored GTAP database used in our simulations, the standard calibration of the DPs and the single farm payment (SFP) into the GTAP database is maintained. This implies that the DPs are allocated in the database as a generic homogenous input subsidy rate to land, labour and capital employed in the primary agricultural sectors. Given the initial distribution of factor incomes in the primary agricultural sectors found in the data, this means that roughly 85% of the DPs removed in the CAP liberalisation scenario are, to some degree, coupled to production. The remaining 15% are decoupled from production representing the average share of land rents found in the EU 27 countries. Given this calibration, the effects on Uganda resulting from our simulations of cuts of the EU DPs are among the strongest effects we would expect to happen if the CAP were liberalised. If we decoupled the SFPs and other DPs to a larger extent in the calibration of the database, then production patterns and prices would change less when these payments are abolished. (see Urban, Jensen, and Brockmeier 2014, for a discussion on the subject).

Table 1. EU border protection and direct payment support for primary and processed agricultural products, percentage.

			Direct payments		
	Import tariff	Export subsidy	Land	Labour	Capital
Paddy rice	9	0	10	10	10
Wheat	6	0	14	15	15
Other cereal grains	3	0	13	14	14
Vegetables, fruit, nuts	6	1	13	13	13
Oil seeds	0	0	13	14	13
Sugar cane, sugar beet	0	0	14	14	14
Plant-based fibers	0	0	16	17	17
Other crops	1	0	13	13	13
Bovine cattle, sheep and goats, horses	3	3	18	17	14
Other animal products	2	0	14	14	14
Raw milk	0	0	15	15	15
Wool, silk-worm cocoons	0	0	15	15	14
Meat products	17	5	0	0	0
Processed rice	24	0	0	0	0
Sugar	75	98	0	0	0
Other food products	6	0	0	0	0
Beverages and tobacco products	6	0	0	0	0

Source: Own computations from the CAP-tailored GTAP 8 database. Direct payment subsidies as percentages of the respective factor input value.

Details of the CAP protection by sector in the CAP-tailored GTAP 8 (2007) database are shown in Table 1.

In 2007, the EU had two digit tariffs on processed meat, rice and sugar while processed sugar was the main receiver of export subsidies. Export refunds amounted to 1.4 billion euro in 2007 with 509 million euro spent on sugar and 513 million euro on milk products (included in the meat sector). Direct aid in the EU amounted to 37 billion euro in 2007 with roughly 32 billion euro being accounted for by SFP and single area payment scheme. The remainder of roughly 5 billion euro of direct aid mainly represents the remaining coupled payments still found in France, Spain and Greece in 2007. Henceforth, the term 'direct payments' is used to comprise the named three types. Table 1 shows that this is equivalent to an input subsidy rate of between 10% to 17% when aggregated up to EU averages by sector. The CAP reform scenario reduces these input subsidy rates to zero removing roughly 32 billion euro of support together with the 5 billion euro of other direct support still remaining in France, Spain and Greece (not shown in Table 1). In addition, all primary and processed agricultural import tariffs and export subsidies are reduced to zero.

2.1.2.2. Data for the Uganda model. The detailed national Uganda model builds on the data from the 2007 social accounting matrix (SAM) for Uganda constructed by Thurlow (2008) which is extended to include the complete set of households from the UNHS 2005/06.[8] The final, extended Uganda SAM comprises 21 agricultural and 29 non-agricultural sectors, unskilled and skilled labour, land and capital as factors of production, as well as accounts for an enterprise, the government, household transfers, the ROW, and finally 7,421 households. The SAM data (based on the national accounts) and the household data (drawn from the household survey) are reconciled by a series of procedures.[9] The structure of the final SAM is summarised in Table 2.

Additionally, trade values and tariffs from the TRAINS database (UNCTAD 2010) are used for disaggregating Ugandan imports and exports by origin as well as for construction of the tariff scenarios.

2.2. *Poverty lines and measures*

For measuring poverty, we employ an absolute poverty line and the measures P_α introduced by Foster, Greer, and Thorbecke (1984). The measure is defined as $P_\alpha = \frac{1}{N} \cdot \sum_{i=1}^{N} \left(\frac{z-y_i}{z}\right)^\alpha \cdot I_i$ with N: population size, z: poverty line, y_i: income of individual i and $I_i = 0$ if $y_i < z$ and $I_i = 1$ otherwise. Setting the parameter α to 0, 1 or 2 computes the poverty headcount, gap or severity index, respectively. The poverty headcount index P_0 measures the percentage of people falling below the poverty line. The poverty gap P_1 measures what percentage of the poverty line the average poor person needs as additional income to reach the poverty line.

The construction of poverty lines for our model is guided by that of the official poverty lines adopted by UBOS. These are based on the *cost of basic needs approach*, which accounts for the cost of meeting physical calorie needs and allows for vital non-food expenditure, such as clothing and cooking fuels, valued using the average consumption basket of the poorest 50% of the population (UBOS 2006, Section 6.3). Different poverty lines are constructed for rural and urban populations to account for the differences in their prices and consumption baskets. Per capita consumption is used as the welfare measure. To facilitate the poverty analysis from our CGE-MS results, household consumption is measured as the sum of the values of market consumption and home consumption of own produce, both valued at market prices, which then is deflated by the household-specific CPI. We set the rural and urban poverty lines at levels which, together with the household consumption data of the Uganda SAM, reproduce the rural and urban poverty headcount indices of 34.2% and 13.7%, as reported in the UNHS Report on the Socio-Economic Survey (UBOS 2006, Table 6.9). It should be noted that our classification of individual households as poor or non-poor is not necessarily identical with the classification as derived for the official report by UBOS (2006) due to differences in data adjustments.

Table 2. The structure of Uganda's domestic industry and trade in 2007, percentage.

	Share in total production value	Share in total value added	Share in total exports	Export share in output of the sector	Share in total imports	Import share in demand for commodity	Import tariff	Share in total import tariff revenue	Share in total household home consumption	Share in total household market consumption
Maize	1.2	1.7	1.9	18.6	0.8	13.3	0.1	0.0	2.4	0.2
Rice	0.3	0.4	–	–	–	–	–	–	–	–
Other cereals	1.0	1.4	1.7	22.8	1.9	33.8	0.3	0.0	2.7	0.4
Cassava	1.7	2.4	–	–	–	–	–	–	10.2	1.3
Irish potatoes	0.4	0.3	–	–	–	–	–	–	1.2	0.3
Sweet potatoes	1.9	2.5	–	–	–	–	–	–	12.3	0.8
Beans	2.2	2.6	4.3	27.1	–	–	–	–	7.3	1.8
Vegetables	0.6	0.9	0.0	0.5	–	–	–	–	2.6	2.0
Matooke	2.6	4.0	–	–	–	–	–	–	15.7	2.4
Fruits	0.7	1.0	0.1	4.2	0.1	4.4	7.9	0.0	3.8	0.9
Oil seed crops	0.7	0.9	0.2	3.3	0.1	4.5	0.1	0.0	1.8	1.0
Cotton	0.1	0.1	1.1	100.0	–	–	–	–	–	–
Tobacco	0.4	0.5	3.5	96.5	–	–	–	–	–	–
Coffee	0.8	0.8	7.4	100.0	–	–	–	–	–	–
Tea leaves	0.2	0.3	2.3	100.0	–	–	–	–	–	–
Other export crops	0.2	0.2	1.5	63.0	–	–	–	–	–	–
Cattle	1.3	1.6	–	–	–	–	–	–	–	–
Poultry	0.4	0.3	0.0	1.8	0.0	1.9	3.8	0.0	1.9	0.4
Other livestock	0.2	0.3	0.2	11.3	–	–	–	–	0.1	0.4
Total primary agriculture	16.8	22.2	24.2	16.4	2.9	5.2	0.4	0.1	62.1	12.0
Fish	1.4	2.1	5.4	37.0	–	–	–	–	0.2	1.3
Forestry	1.8	2.1	1.6	8.5	–	–	–	–	1.2	4.1
Grain milling	1.9	0.6	–	–	1.1	8.6	8.6	0.6	3.9	4.1
Meat processing	1.4	0.1	0.7	4.1	0.8	7.1	0.4	0.0	3.4	5.1
Fish processing	0.7	0.1	5.7	58.3	0.5	13.3	2.0	0.1	0.0	0.9
Other food processing	2.9	0.9	8.1	23.8	4.0	18.5	6.9	1.8	0.6	6.4
Animal feed processing	0.3	0.1	–	–	–	–	–	–	–	–
Beverages and tobacco	1.1	0.5	0.5	3.5	1.0	10.5	9.7	0.6	0.6	3.3
Total food processing	8.4	2.3	15.0	14.5	7.4	12.2	6.5	3.0	8.6	19.8
Manufacturing	6.3	4.0	9.5	11.5	66.6	45.9	22.9	96.9	0.1	18.2
Services	65.4	67.3	44.4	7.0	23.0	6.3	0.0	0.0	27.9	44.7
Total	100.0	100.0	100.0	10.6	100.0	15.6	15.7	100.0	100.0	100.0

Source: Own computations from the extended 2007 Uganda SAM.

3. Simulation scenarios and results

3.1. Scenarios

3.1.1. Global scenarios. The basic scenario (CAP) modelled in this paper is the elimination of CAP protection to EU agriculture. This is measured as removing all import tariffs and export subsidies on agri-food products and all Pillar 1 DPs to farmers in the model base year which is 2007. Milk and sugar quotas are implicitly in place in the database, but are not removed in the simulation, with the result that the impact of eliminating the CAP on these markets may be over-estimated (high sugar and dairy tariffs and export subsidies are removed which is expected to lower EU production of these products, but we do not allow for an offsetting increase in production due to the removal of quotas). Pillar 2 payments to farmers are kept in place as these are not viewed as providing protection and income support but rather as responding to market failures or providing regional assistance, such as agri-environment payments or payments to farmers in areas of natural constraints.

The respective contributions of the two main sets of instruments of the CAP to the total effect of the CAP scenario are disentangled by first simulating these in isolation before looking at the full CAP reform scenario. The scenario *Border* eliminates only border measures (import tariffs and export subsidies) and keeps total EU budgetary payments constant. The scenario DPs only abolishes the DP measures.

3.1.2. Uganda scenarios. As the 2007 Uganda SAM is based on 2003 supply and use tables, it does not well reflect the current import tariff structure which changed substantially when Uganda formed the EAC customs union together with Burundi, Kenya, Rwanda and Tanzania and correspondingly adopted the EAC's common external tariff (CET). To update Uganda's tariff structure to the CET, a first scenario (*2009*) simulates the implementation of the EAC CET by adopting the tariff changes observed between 2003 and 2009 according to the UNCTAD TRAINS database (UNCTAD 2010). These results are not of interest by themselves for this study and thus are not shown but they serve as a synthetic baseline for the following simulations.[10]

The three scenarios for the simulations with the national Uganda CGE model are given through the changes in import prices and export prices and quantities between Uganda and the three regions EAC, ROW and EU as determined by the results from the GTAP model simulations. To apply these results as external shocks to the Uganda CGE model, we adopt an approach suggested by Horridge and Zhai (2006). In order to align the trade behaviour of the single country model with that of the GTAP model, exports are determined by downward-sloping export demand functions with elasticities corresponding to the import substitution elasticities of the GTAP model.[11] For the policy simulations, the locations of the export demand functions are shifted by changing the corresponding location parameter *FP* calculated from the GTAP simulation results for export prices and quantities

together with the elasticities.[12] As for the import side, these authors argue that the consistency is sufficiently established by applying the import price change for the respective country from the global model results as import price changes to the single country model. The parameter changes representing the CAP scenario are shown in Table 5.

To illustrate the interpretation of the shocks to the location parameter, assume a negative percentage change in the location parameter of the demand function for exports from Uganda. This implies that the curve gets steeper (more L-shaped) and shifts towards the origin. Thus, *ceteris paribus*, the export price and the quantity exported of this product decrease.

3.2. Results

For each scenario, we first explain the global effects from the GTAP model which cause the specific trade price and quantity changes that are applied as exogenous shocks to the national Uganda model and then continue with the Uganda model results. Note, only aggregate totals are shown for the non-food manufacturing and the services sectors, respectively, to reduce the size of the Uganda model-related tables. Moreover, economic values are given in real terms unless stated otherwise.

According to economic intuition, the removal of each of the three CAP policy measures (import tariffs, export subsidies and DPs) leads to increasing world market prices in the agri-food sectors affected. In addition, the reallocation of factors in the EU towards more efficient sectors reduces prices in the non-food manufacturing and services sectors as well as in the sectors which initially received less CAP support.

The effect on non-EU countries arises from both the direct changes in their trade with the EU and the changes in their terms of trade as implied by the changes in world market prices. The direction of the change in the terms of trade of each country depends on the composition of its import and export trade. In addition, if the EU cuts tariffs on imports from some particular country more than those from another country, then the relative competitiveness of the latter country on the EU market and hence the quantity of imports from that country will be reduced. Such preference erosion concerns, in particular, developing countries which already have quota- and duty-free access to the EU for their imports. The EU can be expected to improve its welfare from the removal of distortions and resulting more efficient allocation of resources. For other countries, however, the direction of welfare effects is ambiguous *ex ante*.

3.2.1. Border scenario

3.2.1.1. Global results. The border scenario has two elements: the removal of the EU's tariffs on agri-food imports from, and the EU's subsidies on agri-food exports to, non-EU countries. Together, both elements lead to gains in the EU's

GDP of 0.04% in total. Lowering the EU's agri-food border protection drives down domestic food prices through cheaper imports and exports and stimulates domestic demand. With lower prices, EU agri-food production decreases – while manufacturing and services expand – and EU demand increases resulting in excess demand on the ROW market and hence rising prices in the ROW. This shortage also causes trade prices between the ROW and Uganda to rise. As in the ROW resources are drawn into the agri-food sectors, factor costs and in consequence also prices in the non agri-food sectors increase there. However, as imports to the EU from different origins are regarded as imperfect substitutes (due to the Armington assumption) and agri-food imports from Uganda are now relatively more expensive compared to those from other countries for which import tariffs are now removed, the EU demand for agri-food imports from Uganda decreases (the EU demand curve for exports from Uganda shifts to the left). In general, EU export prices to Uganda tend to fall as a consequence of lower EU domestic prices. This is counter-balanced in the meat processing and other food processing sectors (which includes sugar) where the removal of previously high EU export subsidies means that Ugandan prices for EU imports increase for these products. Imports from the EAC to Uganda also become cheaper because the removal of EU import tariffs shifts trade from exporters with preferential trade arrangements, such as the EAC, to other exporters; thus, EU demand for EAC agri-food products and, consequently, prices decrease as well.

3.2.1.2. Uganda results. The removal of EU agri-food tariffs has no direct impact on Ugandan trade which, in 2007, already had duty and quota free access to the EU market on basis of the Cotonou Agreement and the Everything but Arms scheme.[13] Nevertheless, Ugandan trade is affected indirectly because the EU's import tariffs against third countries are dropped. This leads to a loss of preferences vis-à-vis other exporters to the EU (preference erosion) and hence to a decrease in EU demand for Ugandan exports. Other exporters faced tariffs of up to 9% for primary agricultural products and up to 75% for processed food. At the same time, the import tariff abolition reduces EU internal prices for these products increasing EU demand and correspondingly prices on the world market. The removal of EU export subsidies, in contrast, affects Ugandan imports from the EU (mainly the fruits, meat processing and other food processing sectors) directly by increasing their prices.

The overall outcome is a matter of empirical analysis. Table 3 shows that the elimination of CAP border measures will lead to a deterioration in Uganda's terms of trade. In quantity terms, imports decrease by 0.13% while exports increase by 0.05%. The detailed results (not provided) show imports in all sectors but poultry declining. The picture on the export side is mixed. Exports from the majority of agri-food sectors including fish decline by 6% or less with the most notable exceptions being oil seed crops, cotton and processed meat exports which rise by 1%–2%. Exports from the important manufacturing and services sectors, amounting to 9% and 44% of total exports, rise by 1.3% and 0.3%, respectively. GDP

Table 3. Macroeconomic results.

	Base	Border	DP	CAP
GDP components (real)	Percentage of GDP	Percentage change from base		
Private consumption	76.96	−0.06	0.20	0.15
Investments	20.78	−0.06	0.26	0.21
Government consumption	11.80	−0.01	0.02	0.00
Total absorption	109.77	−0.06	0.19	0.14
Exports	15.59	0.05	−0.40	−0.36
Imports	−25.37	−0.13	0.40	0.29
GDP at market prices	100.00	−0.02	0.05	0.03
Net indirect taxes	9.13	−0.12	0.37	0.26
GDP at factor cost	91.09	−0.00	0.01	0.00
Government revenue	Share in total	Percentage change from Base		
ROW transfers	43.01	0.02	−0.06	−0.04
Direct taxes	23.73	−0.08	0.16	0.09
Import taxes	11.09	−0.26	0.25	−0.02
Sales taxes	22.16	−0.02	0.05	0.03
Factor income distribution	Share in total	Point change from base share		
Labour unskilled	38.62	−0.00	−0.02	−0.02
Labour skilled	12.89	−0.00	−0.00	−0.01
Land	8.53	0.01	0.06	0.07
Capital	39.96	−0.00	−0.04	−0.05
Closure variables		Change from base		
Terms of trade (%)		−0.03	0.06	0.03
Real exchange rate (%)		0.04	−0.09	−0.05
Nominal exchange rate (%, UGX/USD)		0.02	−0.06	−0.04
Government spending on administration (%)		−0.01	0.03	0.01

Source: Own computation from CGE simulation results.

decreases marginally (−0.02%). Output increases marginally in aggregate and there is a slight shift in production towards those expanding export sectors. Private consumption decreases by 0.06% distributed across all sectors. The government reduces spending marginally to compensate for lower revenue. The real incomes of the poor tend to decrease in similar magnitude for rural and urban households as shown in Table 4. This scenario causes an increase of 0.01 percentage point in

Table 4. FGT poverty indices and consumer price indices for the poor.

	Base	Border	DP	CAP
National				
Headcount	30.01	0.01	−0.09	−0.06
Gap	8.85	0.01	−0.03	−0.02
Rural				
Headcount	33.25	0.01	−0.09	−0.07
Gap	9.84	0.01	−0.03	−0.02
Urban				
Headcount	12.68	0.02	−0.08	0.00
Gap	3.57	0.01	−0.01	−0.01
Poor only-CPI	100.00	−0.01	0.11	0.11

Source: Own computation from CGE simulation results. The columns show point changes in the indices from the base column. The poverty figures use rural and urban poverty lines, respectively.

the national poverty headcount equivalent to 2,720 additional people falling into poverty. Equally, the poverty gap increase by 0.01 points. Figure 1 illustrates that the overall effect of this scenario is a slight increase in the poverty headcount and gap irrespective of the choice of the poverty line.

3.2.2. Direct payments (DP) scenario

3.2.2.1. Global results. EU GDP increases by 0.02%. Within the EU, the reduction in DPs (even if only partially coupled to production) increases production costs and raises prices of the agricultural sectors and their upstream processing industries. The quantity demanded is lower at higher prices causing EU agri-food markets to rebalance in a new equilibrium with higher prices and lower quantities. This creates shortages and increases prices on world markets. Moreover, reduced agri-food production stimulates production in the non-agri-food sectors where market prices tend to fall. Hence, EU demand for imports increases in the agri-food and decreases in the non-agri-food sectors; likewise, prices for exports from the EU tend to increase in the agri-food and to decrease in other sectors. In contrast to the border scenario, the DP scenario causes similar shocks to both the EAC and the ROW. Both regions increase their demand for agricultural commodities from Uganda but decrease it for processed foods and manufacturing and services. Ugandan imports from these regions become more expensive in case of primary agricultural products and cheaper for others.

3.2.2.2. Uganda results. A large share of Ugandan imports is manufactured goods and a large share of its exports is agri-food products (neglecting services exports which are mainly tourism-related), so that the terms of trade improve by

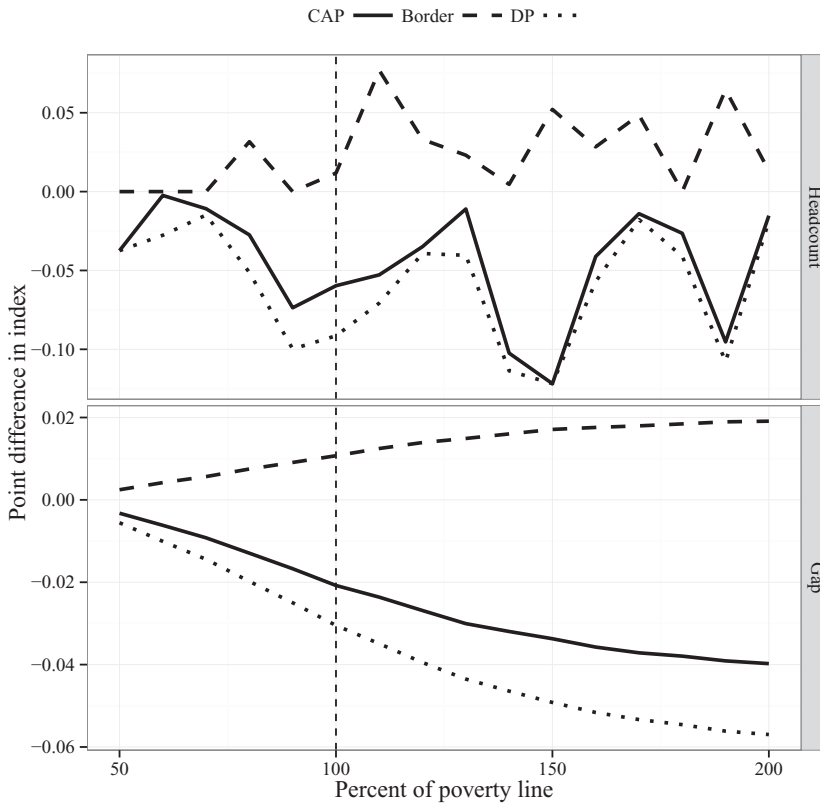

Figure 1. Sensitivity of FGT poverty indices to the choice of the poverty line.

0.06%. Correspondingly, production shifts towards exported agri-food products where output increases the most in the cash crop sectors (by 3% to 6% for tobacco, other export crops, tea and coffee). The strong expansion in those agri-food sectors tends to increase consumer prices for other products through higher prices for primary factors and inputs. By contrast, the price for manufactures drops by 0.3% and its output by 1.2%. Overall, output drops by 0.03%. Uganda's primary agriculture expands but food manufacturing declines; exports become more concentrated on primary commodities and the import dependence for non-food manufactures and services increases. In aggregate, exports decrease by 0.4%, imports increase by 0.4%, GDP at market prices increases by 0.05% and household and government consumption as well as investments increase by 0.2%, 0.02% and 0.26%, respectively.

GDP at factor prices increases marginally (0.01%) and the factor income distribution shifts marginally from capital, and less from unskilled labour, to land

(Table 3) allowing consumption to increase. But for the average poor household, the CPI actually increases because the prices for primary agricultural and food processing commodities increase. Nevertheless, the overall effect is a decrease in the poverty headcount by 0.09 points equivalent to a reduction of 24,480 poor people. The gap to the poverty line for the average poor person narrows by 0.03 points. In terms of the FGT poverty indices, the rural poor benefit slightly more than the urban. Considering a range of alternative poverty lines (Figure 1), the EU's removal of DPs tends to have a slight poverty alleviating effect, even when other poverty lines are considered.

3.2.3. CAP scenario

3.2.3.1. Global results. The CAP scenario combines the previous two policy changes, i.e., the removal of border measures and of DPs, simultaneously. This causes EU GDP to increase by 0.05%. The directions of change of demand for Ugandan exports and of the prices for imports from these regions to Uganda are ambiguous in cases where the two policy changes work in opposite directions. In the simulation results, the EU increases demand for Ugandan agricultural and decreases that for other exports, see Table 5. From the EU, agricultural commodities become more expensive in Uganda, processed food prices tend to remain stable and other products become cheaper. The directions of effects on trade between Uganda and the ROW and the EAC are the same except for demand for Ugandan processed foods which increases.

3.2.3.2. Uganda results. For Uganda, the total effect is an increase in the terms of trade of 0.03% and a negligible increase in GDP of 0.03%. Exports decrease by 0.4% and imports increase by 0.3%. Total output decreases by 0.02% and there is a broad shift in production towards agricultural export sectors which expand by 3.3% on average (Table 6). Other sectors largely shrink including manufacturing (−0.9%) and fish and processed fish (−2.7% and −1.6%). Household consumption increases by 0.2% due to the factor returns distribution shifting mainly from capital to land. How this affects individual poor households depends on the changes in the returns to the factors they own and their individual consumption preferences. The CPI specifically calculated for the population below the poverty line increases reflecting that prices for almost all agri-food products increase. The CAP abolition decreases the national poverty headcount by 0.06 points equivalent to lifting 16,320 out of poverty. The decrease in the poverty gap by 0.02 points indicates a general but minor income gain for people living below the poverty line. Figure 1 highlights that the impact on the headcount varies quite strongly with different poverty lines but both headcount and gap reduce irrespectively of the line chosen. Thus, CAP elimination could have a slightly poverty alleviating effect in Uganda. Rural households turn out to benefit more than urban ones as the headcount remains unchanged for the latter.

Table 5. CAP removal scenario: percentage changes to Ugandan export demand function location parameters and import prices.

	Export function location parameter			Import price			
Uganda model sector	EAC	ROW	EU	EAC	ROW	EU	GTAP sectors mapped
Maize	0.63	1.09	2.99	0.44	0.57	5.15	Grains
Other cereals	0.64	1.11	2.90	0.39	0.73	5.18	Wheat; grains
Beans	1.02	1.27	1.88	–	–	–	Vegetables, fruit, nuts
Vegetables	1.02	1.27	1.88	–	–	–	Vegetables, fruit, nuts
Fruits	1.02	1.28	1.83	0.20	0.85	7.54	Vegetables, fruit, nuts; sugar cane, sugar beet
Oil seed crops	0.76	1.53	1.93	0.34	1.04	3.79	Oil seeds
Cotton	0.46	0.67	2.58	–	–	–	Plant-based fibers
Tobacco	1.54	1.59	2.35	–	–	–	Other crops
Coffee	1.54	1.59	2.35	–	–	–	Other crops
Tea leaves	1.54	1.59	2.35	–	–	–	Other crops
Other export crops	1.54	1.59	2.35	–	–	–	Other crops
Poultry	0.90	1.38	1.60	0.62	0.73	1.20	Animal products nec
Other livestock	0.90	1.38	1.60	–	–	–	Animal products nec
Forestry	−0.11	−0.54	−0.72	–	–	–	Forestry
Fish	−0.13	−0.25	−2.68	–	–	–	Fishing
Grain milling	–	–	–	0.03	−0.02	−0.15	Processed rice; other food products
Meat processing	0.23	0.90	−1.49	−0.03	0.27	2.96	Raw milk; meat
Fish processing	0.04	0.02	−1.69	0.01	−0.09	−0.16	Other food products
Other food processing	0.04	0.18	−1.67	0.06	0.07	0.93	Sugar; other food products
Beverages and tobacco	−0.10	−0.26	−1.10	−0.08	−0.28	−0.40	Beverages and tobacco products
Textiles and clothing	−0.21	−0.39	−0.64	−0.12	−0.34	−0.94	Wool and silk; textiles, apparel, leather
Wood and paper products	−0.38	−0.51	−0.90	−0.14	−0.47	−0.87	Wood and paper products
Mining	−0.63	−0.62	−0.59	−0.60	−0.61	−0.64	Mining
Fuels	–	–	–	−0.57	−0.59	−0.68	Petroleum, coal products
Chemicals and fertiliser	−0.46	−0.55	−0.80	−0.17	−0.47	−0.93	Chemical, rubber, plastic products
Other manufacturing	−0.48	−0.56	−0.78	−0.26	−0.49	−0.93	Other manufacturing
Machinery and equipment	−0.59	−0.55	−0.77	−0.31	−0.49	−0.90	Machinery and equipment
Furniture	−0.48	−0.56	−0.78	−0.26	−0.49	−0.93	Other manufacturing
Utilities	−0.46	−0.58	−0.86	–	–	–	Utilities
Hotels and catering	−0.36	−0.51	−0.83	–	–	–	Trade
Transport services	−0.48	−0.58	−0.72	−0.20	−0.48	−0.92	Transport
Communication services	−0.52	−0.61	−0.90	−0.09	−0.46	−1.10	Communication
Financial and banking services	−0.39	−0.60	−0.81	−0.00	−0.45	−1.05	Banking and insurance
Other private services	−0.51	−0.58	−0.92	−0.02	−0.44	−1.09	Other services

Source: Own computation from GTAP CAP scenario results.

Table 6 CAP removal scenario results: percentage changes from base.

	Quantity				
	Output	Exports	Imports	Household consumption	Consumer prices
Maize	0.12	0.73	−0.86	−0.15	0.43
Rice	−0.12	–	–	–	–
Other cereals	0.21	1.17	−0.68	−0.24	0.50
Cassava	−0.06	–	–	−0.06	0.28
Irish potatoes	0.05	–	–	−0.00	0.14
Sweet potatoes	−0.03	–	–	−0.05	0.22
Beans	0.48	2.78	–	−0.13	0.39
Vegetables	0.05	5.64	–	0.04	0.07
Matooke	−0.03	–	–	−0.07	0.21
Fruits	0.09	5.63	−0.34	−0.02	0.17
Oil seed crops	0.03	5.89	−1.14	−0.10	0.30
Cotton	1.28	1.28	–	–	–
Tobacco	5.94	6.15	–	–	–
Coffee	2.80	2.80	–	–	–
Tea leaves	2.73	2.73	–	–	–
Other export crops	5.09	7.62	–	–	–
Cattle	0.08	–	–	–	–
Poultry	0.11	2.45	−0.75	−0.00	0.13
Other livestock	0.48	3.39	–	0.09	0.09
Total primary agriculture	0.47	3.30	−0.75	−0.04	0.20
Fish	−2.71	−6.11	–	0.10	0.04
Forestry	−0.22	−3.19	–	0.11	0.05
Grain milling	−0.12	–	0.43	−0.04	0.21
Meat processing	0.18	0.88	−1.16	0.02	0.13
Fish processing	−1.57	−2.62	0.16	0.16	−0.00
Other food processing	−0.37	−1.33	−0.06	0.06	0.08
Animal feed processing	0.10	–	–	–	–
Beverages & tobacco	0.03	−0.67	0.19	0.13	−0.01
Total food processing	−0.26	−1.71	−0.07	0.05	0.10
Manufacturing	−0.86	−3.67	0.45	0.46	−0.25
Services	0.03	−0.34	0.03	0.16	−0.01
Total	−0.02	−0.36	0.29	0.18	−0.01

Source: Own computation from CGE simulation results. Household consumption is valued at base market prices and consumer prices are weighted by base quantities.

4. Review and conclusions

The EU's CAP has long been criticised for its incoherence with the EU's development policy objectives, the primary and overarching objective of which is the eradication of poverty in the context of sustainable development (CEC 2005). But, over time, the CAP has been reformed slowly in a more market-oriented direction and developing countries have become more heterogeneous. This has led the

European Commission to conclude: 'With the mostly criticised negative effects largely addressed over the previous consecutive reforms through a decoupling of payments and a gradual elimination of export refunds, the implications of the current CAP reform for development are limited. The CAP has become more market oriented, thereby considerably reducing its potential negative impacts on world markets. Therefore past criticisms about the negative effects on global food security are no longer relevant' (CEC 2013, 106).

While we broadly agree with this assessment, the CAP retains a number of protectionist features which potentially can impact on third countries (Matthews 2015). The impact of the CAP on developing countries is an empirical question; this impact will differ depending on the economic, trade and poverty characteristics of each country. In this paper, we investigate the impact of the CAP on Uganda. Uganda is an appropriate country for analysis as a least developed country with a high dependence on agriculture and a high share of agri-food exports in total exports. It also benefits from unrestricted access (subject to rules of origin) to the EU market for agri-food products under preferential trade agreements. While we do not expect to find large impacts from further reform of the CAP, the approach we have adopted facilitates the identification of the transmission channels between CAP reform and its household and poverty impacts in Uganda.

Our empirical results in simulating the removal of remaining border protection and DPs to EU farmers suggest, indeed, that the impact on Uganda will be marginal but nonetheless positive. Its terms of trade, GDP and household consumption all improve slightly as do the poverty indicators. These results are driven largely by the assumption that DPs in the EU are only partially decoupled and encourage a higher level of agricultural production than in the absence of the CAP. Note that the database employed implies a rather high degree of coupling of DPs to production and thus the simulated effects of the CAP elimination are at the high end of what can be expected. The removal of border measures turns out to have a smaller impact and partly in an offsetting direction. A lower degree of coupling would further diminish the effect of the DPs abolition and would reduce the measured poverty effect of overall CAP reform.

To derive these results, we had to make a number of assumptions about the presumed behaviour of firms, households and the government in Uganda which could, no doubt, be improved in further work. A challenge facing all research on the poverty impact of trade reform (though mostly overlooked in the literature to date) is to keep separate the poverty impact of the trade reform itself from the poverty impact of the measures the government has to take to maintain equilibrium and the modelling choices for the savings and investment and the foreign account balances. In the results of the full CAP elimination, however, government spending and real investment increase while foreign savings are constant. Thus, these indicate potentially positive welfare effects in addition to the poverty reduction.

Another limitation of our results is that we cannot take proper account of the imperfect price transmission of price changes not just across the Uganda border

(international to Uganda transmission) but, more importantly, within Uganda. The Armington structure in the Uganda CGE model determining the demand for imports does imply that changes in border prices are only imperfectly transmitted to domestic prices, but within Uganda we assume that all households, independent of their location or whether urban or rural, experience the same price effects. In reality, factors and goods are susceptible to frictions in relocating spatially (depending, e.g. on geography and infrastructure) and thus prices as well as their changes differ across Uganda's area as shown, e.g. in Boysen (2009). In addition, the vertical transmission of prices along the marketing chain can differ for households in different locations depending on marketing costs and the strength of market competition in different areas. For these reasons, the induced reactions and welfare implications may vary widely between households in different locations. The transmission of price changes requires time and hence welfare effects also vary with time. Some households are shielded from world market price shocks in the short run, e.g. by poor infrastructure, and thus experience smaller impacts, while others are exposed immediately to the full shocks, i.e., before the economy can adapt and mitigate them. These latter households may thus experience larger shocks in the short-run than in the longer run. As a result of ignoring these frictions, we likely over-estimate the likely reallocation of resources within Uganda in response to CAP reform. Because greater mobility of factors and goods helps a specific household to better cope with an adverse price shock but restricts the extent to which it can benefit from a positive price shock, the effect on the overall welfare and poverty results of this restriction is ambiguous. The strength of the poverty impacts will also vary over time as households and factor markets adjust. Our analysis looks at a long-term horizon. In the short and medium term, when adjustment of capital use in particular will be sluggish, prices for food as well as capital returns will be higher than in the long-run equilibrium. This would likely increase the poverty impacts over these shorter time horizons.

However, our study is important in demonstrating the range of channels whereby CAP reform can impact on developing countries like Uganda. The effects are felt not just in the markets for agri-food commodities but also in the markets for manufactures and services. The distribution of factor incomes changes, away from labour and capital towards land. Food prices become relatively more expensive, benefiting surplus producers but hurting poor consumers. Moreover, preference erosion adds a negative effect to the overall consequences for developing countries. In the Ugandan case, it appears that the CAP, as it existed in the late 2000s, had some minor impact in lowering consumption and increasing poverty, but we stress that the magnitude of these effects was very small. We expect these impacts have become even less significant since then. The rise in global food prices since 2007 has resulted in a further convergence of world market and EU domestic prices and thus lowered the effective protection given to EU farmers. Further reforms of the CAP took place in 2008 (Health Check) and in 2013 (Cioloş reform). The latter introduced additional conditions which farmers must observe to be eligible for a new 'green payment' component of DPs, decreasing the distortions in the

production structure which are reflected in the partially coupled nature of DPs in our model. Assuming that DPs are, in fact, less coupled to production would also decrease the negative poverty impacts we report. Furthermore, under the multi-annual financial framework which establishes the size of the CAP budget to 2020, the value of EU support payments continues to decrease in real terms over time. Eliminating the CAP would thus have even smaller effects on third countries than we report in this paper.

Acknowledgements

We are grateful to two anonymous referees for their valuable comments.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. For a detailed discussion on various approaches for analysing household-level impacts on the basis of CGE model extensions, see Bourguignon, da Silva, and Bussolo (2008), Boysen and Matthews (2008) or Bussolo and Cockburn (2010).
2. Adopting the definition from the report on the UNHS (UBOS 2006), time-related underemployment refers to individuals from the workforce which have worked less than 40 hours per week and are willing and able to provide more labour hours. For the present study, the actual number of additional labour hours available is required.
3. See Hertel et al. (2007) for a brief discussion of this "rule of two".
4. Thereby giving up the small country assumption and the assumption that goods for the domestic and export markets are differentiated.
5. The intention with this closure is to limit the effect of changes in government revenue on the provision of public goods with a direct effect on the welfare of poor households.
6. The results for the individual 25 EU member countries/regions are aggregated to EU 27 results within the CAP-specific GTAP model providing results for the EU 27 which are transmitted to the Uganda model.
7. The 8 secondary agricultural commodities are aggregated to 5, the 20 manufacturing commodities to 7 and the 15 services commodities to 6 commodities.
8. Although a newer household survey is available for Uganda, the UNHS 2005/06 has been adopted as it also was the basis to construct the 2007 Uganda SAM.
9. A technical appendix describing the reconciliation is available from the authors on request.
10. The more detailed results not reported in this paper are available from the authors on request.
11. Export demand functions are of the form $QE = \left(\frac{FP}{PWE}\right)^{ESUBM}$ with FP: location parameter, PWE: the domestic price of exports and $ESUBM$: the GTAP Armington elasticity.
12. The shock for FP is calculated $\Delta FP = \frac{FP_1}{FP_0} = \left(\frac{QE_1}{QE_0}\right)^{\frac{1}{ESUBM}} \cdot \frac{PE_1}{PE_0}$ where QE_0, QE_1: the export quantities and PE: the corresponding export prices from the results of the respective GTAP model scenario simulations.
13. The EU introduced the Everything but Arms scheme as a special arrangement under its Generalised System of Preferences in 2001. It provides duty-free and quota-free

access to all least developed countries for all export commodities except arms. Duty-free access was delayed for bananas until January 2006, for sugar until July 2009 and for rice until September 2009 so trade barriers on these products from Uganda remain in the GTAP database.

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