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Can Agriculture Benefit from a Potential Free Trade Agreement Between SACU and the US?

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Abstract

The Trump administration signalled a shift toward protectionism in U.S. trade policy, imposing tariffs on imports from both strategic partners and competitors, which generated renewed uncertainty in international trade relations and the future of existing frameworks such as the African Growth and Opportunity Act (AGOA) and the Generalised System of Preferences (GSP). Earlier analysis has shown that a Free Trade Agreement (FTA) between the Southern African Customs Union (SACU) and the United States can be trade-creating and lead to improved macroeconomic outcomes in SACU countries. However, these positive effects decline over time, with varying impacts across different industries, influenced by initial tariff levels and export orientation relative to the US. This paper examines whether there are economic and strategic incentives for SACU to negotiate a more beneficial agreement than a simple across-the-board elimination of ad valorem import tariffs. Using a dynamic computable general equilibrium (CGE) model, the paper examines the outcomes if cereals, poultry, dairy products, red meat, and sugar products—often classified as sensitive due to their labour intensity, food security implications, and exposure to import competition—were to retain some level of protection under a SACU–US Free Trade Agreement. The results suggest that while the FTA boosts key macroeconomic indicators in the short run, gains taper off over time. Crucially, real wages and employment remain stagnant, and terms of trade deteriorate, raising questions about the inclusivity and sustainability of such a deal. Shielding vulnerable sectors initially enhances SACU's exports and supports some industry growth, particularly in agriculture. However, without broader reforms and export diversification, long-term competitiveness remains weak. A nuanced FTA design, combined with structural support policies, is essential to unlock lasting and inclusive trade benefits.

Keywords: computable general equilibrium model; GTAP-Dyn; Free Trade Agreement; SACU; agriculture

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1. Introduction

In an era of increasingly volatile international trade policies, particularly under the administration of President Donald Trump, a new dynamic of uncertainty has been introduced into global markets through frequent tariff threats and the renegotiation of trade agreements. This shifting landscape necessitates a thorough re-evaluation of established trade agreements and non-reciprocal and unilateral arrangements such as the African Growth and Opportunity Act (AGOA) and the Generalised System of Preferences (GSP).

This paper critically examines the potential impact of a potential Free Trade Agreement (FTA) between the Southern African Customs Union (SACU) and the United States (US), with a particular focus on the agricultural sector, which remains vital to SACU's economy.

Building on the findings of Sirang [1], who has demonstrated that a SACU-US FTA could be trade-creating and lead to improved macroeconomic outcomes across SACU member countries, this paper extends the analysis to assess whether such benefits would be sustainable and evenly distributed. Previous evidence suggests that these gains may vary across sectors and diminish over time due to differences in initial tariff structures and export orientations relative to the US market. This disparity raises an important question: should SACU pursue a more favourable agreement beyond the mere elimination of ad valorem import tariffs when negotiating the now increasingly likely FTA with the US? To address this, the paper explores the differentiated impacts of the proposed FTA, concentrating on key agricultural products—cereals, poultry, dairy products, red meat, and sugar. These sectors are particularly sensitive due to their importance for food security, employment, and rural livelihoods, and their exposure to global market distortions such as subsidies and dumping. These factors underscore the need for careful negotiation to safeguard domestic priorities while advancing regional trade interests.

Within the broader trade landscape, the US remains one of SACU's largest trading partners, alongside the EU-27—the region's top trading partner—and other key economies such as China, Germany, the United Kingdom, and Japan [2]. While SACU's bilateral trade with the US is mainly concentrated in non-agricultural products, the significance and relevance of the region's regional trade agreements (RTAs) vary across member states. To this end, preference utilisation rates under SACU's trade agreement with both the EU and the US are relatively high. WTO [2] estimates that 92.9% of SACU exports entered the European Union duty-free, while 90.4% reached the US market under AGOA/GSP. Understandably, SACU members are concerned about the future of this preferential access, particularly considering the US signalling that a formal FTA should be negotiated. These concerns are further compounded by the recent protectionist stance of US trade policy, an inclination to negotiate FTAs that prioritise American interests, and even threats to withdraw from the WTO [1].

To inform these negotiations, this study employs a dynamic computable general equilibrium (CGE) model to examine various scenarios in which protective measures for key agricultural commodities are selectively adjusted. This approach allows for a detailed examination of how different levels of protection could affect SACU's agricultural sector, providing critical insights that could help policymakers negotiate terms that not only safeguard but also strengthen this vital economic segment.

The structure of this paper is as follows: Section 2 reviews the historical performance of SACU-US agricultural trade under existing agreements, such as AGOA/GSP, to establish a contextual baseline. Section 3 details the simulation methodology and baseline assumptions applied in the GTAP model. Section 4 presents and discusses the simulation results, highlighting the economic impacts of the proposed FTA under different protective scenarios. Finally, Section 5 concludes by summarising the key findings and outlining their implications for SACU's strategic trade and economic policies, particularly in the agricultural sector.

2. The Performance of SACU-US Agricultural Trade Under AGOA/GSP

Agriculture remains one of the most important economic activities in Africa, supporting livelihoods, ensuring food security, and serving as a primary source of employment, particularly in rural areas [3]. Although a large share of Africa's agricultural production is subsistence-based and intended for local consumption, Africa's agricultural exports have

grown strongly in recent decades [4]. These exports have become increasingly diversified, ranging from citrus, grains, nuts, fish, tobacco, cocoa, coffee, sugar, vegetables, and fruit, and have benefitted significantly from preferential trade agreements such as AGOA and the GSP [5]. This evolution is illustrated in Figure 1, which shows the composition and value of Africa's AGOA-eligible agricultural exports to the US since 2000, highlighting the sustained rise and changing patterns across product groups.

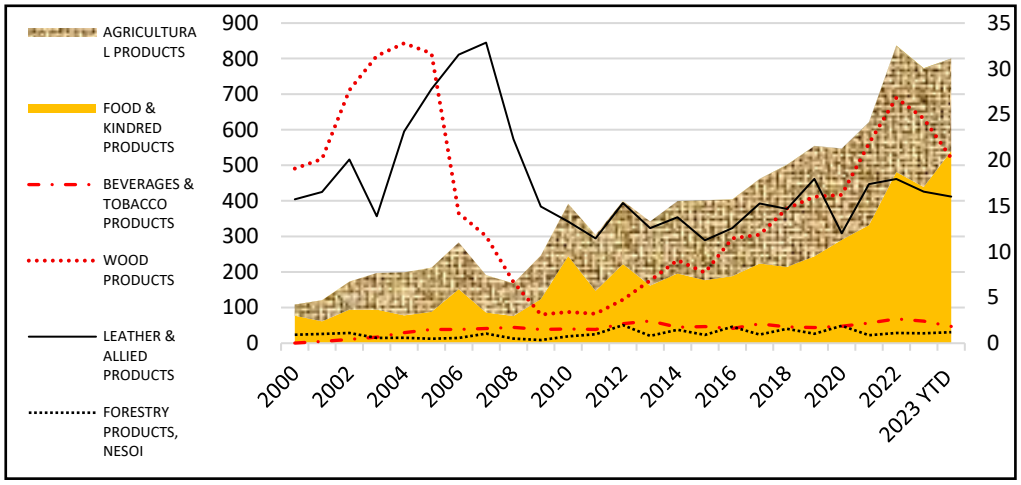

Figure 1. Africa AGOA-US Agricultural trade (2000–2024 YTD, USD million). Source: Authors' own compilation based on data from AGOA [4].

Under AGOA, Africa's agricultural exports to the US increased from approximately USD 760 million in 2000 to nearly USD 2.8 billion in 2024 [4]. This impressive growth, however, is unevenly distributed across countries and products. Much of the trade still takes place under normal tariffs, without preference claims, due to product eligibility limits for AGOA/GSPs, existing MFN duty-free access, or regulatory constraints.

Understanding these patterns requires situating them within the broader framework of regional trade agreement theory. The growth of SACU–US agricultural trade should therefore be considered through this lens. As first articulated by Jacob Viner, the theory distinguishes between trade creation—where liberalisation encourages more efficient intra-regional trade—and trade diversion, when cheaper imports from non-members are replaced by more expensive imports from a partner country [6]. Existing literature confirms that trade creation dominates when export capacity, infrastructure, and regulatory alignment are in place, but that trade diversion and underutilisation occur in their absence [7,8].

The impact of an FTA on agriculture depends on how tariff adjustments influence producers' decisions and expected returns. In the SACU region, the extent to which producers can respond to these shifts is determined by the structure of agricultural production and their ability to take advantage of emerging market opportunities.

In the agricultural sector, RTAs often give rise to both trade creation and trade diversion effects, particularly in developing economies where competitiveness and vulnerability to external shocks differ widely across sectors [8]. The influence of non-tariff measures (NTMs), especially sanitary and phytosanitary (SPS) standards, has become increasingly important in shaping these outcomes [9]. In some cases, they enhance trade creation by improving compliance and facilitating market access. However, when regulatory barriers are high, they limit the effective use of trade preferences and reinforce existing structural disparities [9–11].

These dynamics are clearly reflected in the structure of the Southern African Customs Union (SACU) economies. The extent to which SACU members benefit from preferential access under AGOA and GSP is determined mainly by their production capacity, economic

diversification, and ability to meet SPS and other technical requirements. In this context, the limited structural transformation of the agricultural sector constrains its potential to translate trade opportunities into broader economic gains. While agricultural exports have increased, the sector remains primarily a source of rural livelihoods, contributing about 3% to regional value-added GDP [2]. However, its indirect impact through employment creation and income generation is far greater.

Economic structures within SACU differ significantly: South Africa's diversified economy combines agriculture, manufacturing, and services, while Botswana and Namibia are dominated by mining, and Eswatini and Lesotho rely more heavily on manufacturing. At the SACU level, services account for roughly 70% of GDP, manufacturing 13%, and mining 8.9% [2]. These structural differences shape each country's ability to engage in agricultural trade, with SACU's main agricultural exports to the US under AGOA/GSP consisting of citrus (mainly oranges and mandarins), grapes, macadamia nuts, fresh vegetables, cassava, peppers, animal products, wine, and forest products [2].

Given this context, it is clear that the AGOA/GSP provide an essential opportunity for SACU countries to expand market access into the US. In 2024, SACU's total exports to the US were valued at approximately USD 15.6 billion. In 2000, exports more than tripled from USD 4.5 billion to USD 16.2 billion in 2021, with much of this trade benefiting from the AGOA/GSP duty- and quota-free provisions [12].

As shown in Figure 2, the AGOA and GSP schemes collectively offer duty-free access to nearly 7000 product lines, of which about 46% are agricultural. Textiles and clothing account for 12%, while only 3% of SACU's exports face standard US import duties, and 39% enter under MFN tariffs [13]. In 2023, SACU exports to the US under MFN terms were approximately USD 11.4 billion, while AGOA/GSP exports amounted to USD 2.8 billion. In the same year, SACU imported goods worth USD 2.5 billion from the US [14], with agricultural products accounting for a small but notable share of this trade. These exports from the US, mainly destined for South Africa, include frozen cuts and edible offal of fowls, almonds, whiskies, food preparations and maize seed for sowing.

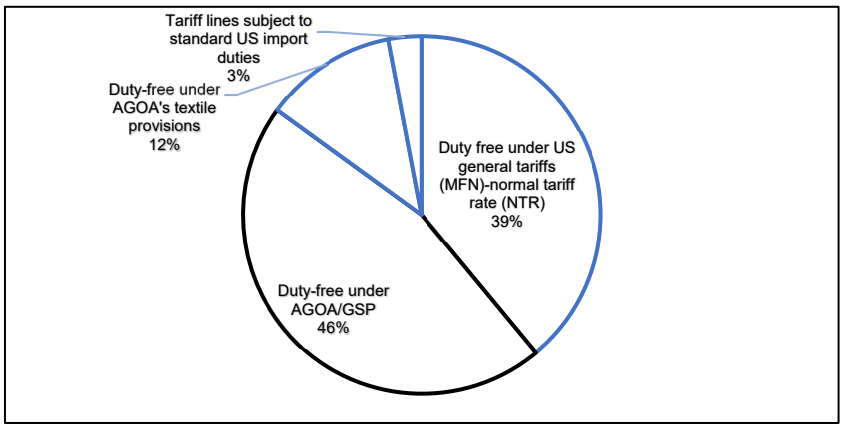

Figure 2. Prevailing duties: US-SACU AGOA/GSP and other tariffs. Source: Authors' own compilation based on AGOA [4].

While agricultural imports from the US remain limited, SACU members' ability to export agricultural goods to the US under AGOA and GSP has been even more constrained. Most SACU countries, except for South Africa, export only small volumes under these preferential schemes. As in many other parts of Africa, a notable share of trade still occurs under non-preferential terms, mainly due to stringent sanitary and phytosanitary (SPS) requirements and other non-tariff measures (NTMs) imposed by the US, which can limit market access for agricultural exporters. Meeting these standards remains a key constraint for the BELN countries (Botswana, Eswatini, Lesotho and Namibia). In 2000, their collective

exports under AGOA/GSP were approximately USD 11.9 million, peaking at nearly USD 27 million in 2023 (see Figure 3). When including non-preferential exports, the total is somewhat higher but still modest.

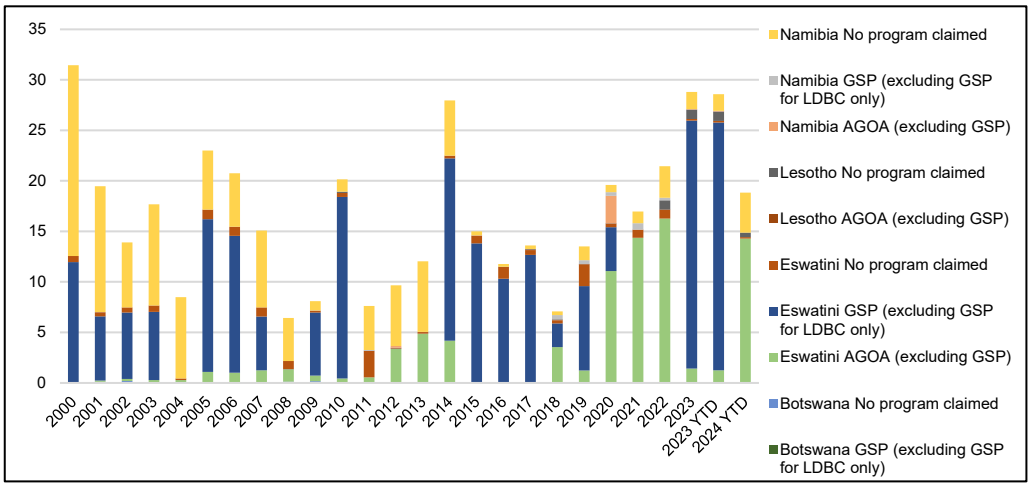

Figure 3. BELN's agriculture exports to the US (2000–2024, USD million). Source: Authors' own compilation based on AGOA [4].

In contrast, Figure 4 shows that South Africa's agricultural exports to the US have increased significantly, particularly under AGOA. High-value exports like citrus, wine, and nuts dominate its export basket, while GSP use remains limited. This highlights South Africa's greater export readiness, more diversified agricultural base, and stronger capacity to comply with US market requirements.

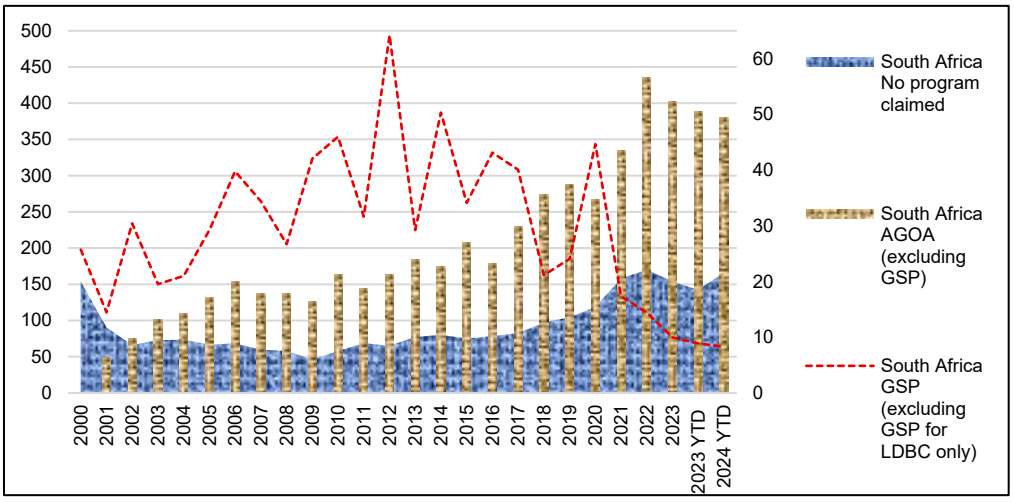

Figure 4. South Africa's agriculture exports to the US (2000–2024, USD million). Source: Authors based on AGOA [4].

These figures demonstrate the broader story: while AGOA and GSP have opened valuable opportunities for SACU exporters, only South Africa has been able to take full advantage of these preferences. For the rest, structural and compliance barriers continue to limit participation. Recent firm-level and sectoral studies confirm this uneven pattern. Zondo and Dube [15] find that while AGOA has substantially boosted South African orange exports to the US, similar gains have not been realised for less competitive products or for other SACU members, mainly due to supply chain inefficiencies and compliance challenges. Likewise, Fernandes, Forero, Maemir and Matthtoo [16] show that although AGOA supported growth in non-oil and agricultural exports from sub-Saharan Africa to

the US, its benefits have been concentrated in countries and sectors with pre-existing export capacity and strong regulatory compliance. For exporters with weaker capabilities, the gains remain limited. These studies suggest that the benefits of trade preferences remain highly uneven, closely reflecting the performance trends observed within SACU.

Building on this evidence, recent research has sought to explain why such uneven outcomes persist despite similar levels of preferential access. A growing body of work links trade performance to structural constraints, non-tariff barriers, and institutional capacity. In recent years, both scholars and policymakers have paid increasing attention to the interaction between RTAs, NTMs, and structural transformation in Africa. Studies by Mhonyera and Meyer [7] and Seti and Daw [8], using updated CGE and partial-equilibrium models, show that while further liberalisation—such as under the AfCFTA or a potential SACU–US FTA—could enhance welfare and stimulate trade creation, it also poses risks for less competitive sectors and lagging economies. This literature underscores the importance of institutional reform, public investment, and targeted support for sensitive subsectors. As such, phased liberalisation and safeguard mechanisms are essential to achieving inclusive outcomes.

Evidence also shows that successful agricultural export upgrading depends on compliance with increasingly stringent global standards, alignment of domestic regulations, and improvements in trade facilitation [9,10,17]. Where these elements are lacking, the use of preferences remains low, and the risks of trade diversion or market exclusion increase [9,10]. Recent data from 2024 to 2025 reaffirm both the strengths and limitations of the current arrangement: South African agricultural exports to the US continue to outperform the rest of the region, while the BELN countries remain marginal participants under AGOA/GSP [18,19]. This pattern reinforces the need for comprehensive trade support that extends beyond market access alone.

Taken together, these findings highlight the need to understand how future liberalisation under a SACU–US FTA could strengthen agricultural competitiveness and promote more inclusive regional integration. To explore these potential effects, the following section applies a dynamic computable general equilibrium (CGE) model.

3. Method of Analysis

This study employs the Dynamic Global Trade Analysis Project (GTAP-DYn) model, a multi-sector, multi-region/country recursive dynamic computable general equilibrium (CGE) model, to simulate the economic impacts of a potential Free Trade Agreement (FTA) between SACU and the US. The GTAP model is selected for its robust capability to analyse bilateral and multilateral trade agreements and policy changes, providing detailed sector-specific insights that are crucial for understanding the complex interactions between trade policies and national economies.

The GTAP-10 database characterises the world economy for the reference years 2004, 2007, 2011, and 2014 [20]. The GTAP database covers 121 countries and 20 aggregate regions of the world for each reference year, including SACU with over 65 products and services. It describes global bilateral trade patterns, international transport margins and protection matrices that link individual countries/regions. For each country/region, the database presents values of production, intermediate and final consumption of commodities and services in millions of U.S. dollars [20]. To ensure relevance to the current analysis, historical data is adjusted using projected growth rates and recent trade data to model economic conditions accurately up to the present and into the forecast period.

Dynamic GTAP is a multi-sector, multi-region/country recursive dynamic CGE model developed by Ianchovichina and McDougall [21]. It has been extended to incorporate dynamic behaviour while retaining most features of the GTAP model, including bilateral trade

flows, a sophisticated consumer demand function, and inter-sectoral factor mobility [21,22]. The model is recursive and solves a sequence of static equilibria in which the end-of-period capital stock in one year is the beginning-of-period capital stock in the next year [23]. Equilibrium is a set of prices that clears markets at every point in time. The assumptions about how the economy adjusts are captured in the behavioural equations of the CGE model—the responsiveness of producers and consumers to relative price and income changes —and therefore have an essential bearing on the simulations. These are the model elasticities of substitution in value-added (that govern the substitutability of the primary factors of production); the Armington elasticities (that determine the substitutability between the domestic and imported composite products); and the households' or consumers' demand and income elasticities [20].

The paper first shows what would happen to the global economy if there were no FTA between the two parties (scenario A), where all duties between the parties are completely liberalised, before proceeding to outline key considerations regarding tariffs on agriculture and related industries (scenario B) (see Table A1 in Appendix A for the concomitant variables and parameters used in the model).

In generating baseline projections, the paper undertakes forecasts of important supply-side macroeconomic and other key variables (see Table A2 in Appendix A). The forecasts for key supply-side macroeconomic variables in GTAP 10 are based on the Global Economic Perspectives Database by the World Bank, which was updated from the 2014 baseline with CEPII data from Fouré et al. [24] and Fouré et al. [25] who derive long-run growth projections for the macro economy from 1981 to 2100 for the global economy, incorporating a three-factor production function comprising capital, labour and energy. The baseline projections for key macroeconomic variables, including population, skilled and unskilled labour supply, capital, and real GDP, were calibrated using the Shared Socioeconomic Pathways (SSPs) database, specifically the SSP2 "Middle of the Road" scenario, which provides consistent projections up to 2040. This approach provides a standard, peer-reviewed basis for the long-term assumptions regarding population growth and factor accumulation. The model is then calibrated to these exogenous macroeconomic drivers using a standard 'dynin' file method, which solves for the implied rates of factor-augmenting technical progress necessary to achieve the projected GDP growth, given the projected growth in primary factors. This ensures that the baseline reflects a consistent and dynamically stable growth path for the global economy up to 2040.

Countries from the SACU region, as designated under the GTAP-10 database, include Botswana, Namibia and South Africa as "SACU" while Eswatini and Lesotho are classified under "the Rest of SACU". Industry output projections across the regions, as indicated by the annual average percentage changes for all industries, are derived from the baseline. Industry output in the US and SACU will average 1.8 per cent and 3.5 per cent over the period, respectively, slightly above the rate in the Rest of SACU, which will grow at an average annual rate of 2.9 per cent. Growth rates are higher in the primary agricultural industries at 2.9 and 3.1 per cent, respectively, for the Rest of SACU and SACU, and lower at 2.1 per cent for the US. Agriculture-related industries are forecast to grow at 1.8 per cent in the US, 2.9 per cent in SACU, and 2.9 per cent in the Rest of SACU. Meanwhile, all other industries are forecast to grow slightly stronger, at 1.8 per cent for the US, 3.8 per cent for SACU, and 2.9 per cent for the Rest of SACU.

Similarly, baseline projections for the volume of bilateral trade between the US and SACU by commodity show that the volume of bilateral trade from the SACU to the US is expected to grow at an annual average of 0.8 per cent, and exports from the Rest of the SACU to the US are forecast to grow at −1.3 per cent.

Along with scenarios A and B outlined above, there are additional policy assumptions. Concerning the labour markets for full employment of both skilled and unskilled labour simulations, it is assumed that deviations in the average real wage rate (being the average real wage rate deflated by the CPI) from its baseline increase in proportion to the changes (deviations) in total employment from the baseline model. This assumption accounts for the notion that, over the long run, employment is influenced by demographic factors but, to a lesser extent, by changes in trade policies. Hence, the long-run rate of employment is treated as constant [23].

Regarding taxes, this study assumes that FTA-related shocks do not affect commodity taxes outside the US and SACU. It also assumes there will be no deviations in the trajectory of government balances, driven by implicit adjustments in direct tax rates or transfer payments. Essentially, this is a fixed trade balance assumption wherein the domestic savings are allowed to adjust to maintain a fixed ratio between the trade balance and national income.

Private and government consumption expenditures and nominal savings are assumed to move with regional income. In each region, it is assumed that investment will move from the baseline, with deviations in capital.

The model allows for short-run divergences in the rate of return to capital on regional capital stock from the baseline. These divergences lead to divergences in capital stock and investment. The divergences in capital stock generally reduce divergences in returns to capital, so that, over the long run, rates of return in each region revert to their baseline levels. Accordingly, GTAP contains several types of technological change variables. In the deviation simulations, it is assumed that all technological variables have the same values as in the baseline.

This paper extends the work of Adams and Horridge [23] in several ways. Ref. [23] introduce the model dynamism through aggregates of primary production, sectoral outputs, exports, and imports using GTAP-6—which represents the world economy with a 2001 base year, covering 87 regions and 57 commodities—this study employs the updated GTAP-10 framework. GTAP-10 captures 121 countries and 20 aggregate regions for each reference year, including 65 products and services. Unlike GTAP-6, GTAP-10 incorporates the necessary data and theoretical improvements, allowing this paper to use the model without additional modifications. Moreover, global macroeconomic projections in GTAP-10 are updated to reflect data advanced using the CEPII data by [24,25] from the 2014 baseline. Further, this paper undertakes a 25-year recursive dynamic simulation but departs from Adams and Horridge [23] by simulating a 5-year progressive tariff phase-down from 2025 to 2029. This is customary in most SACU FTA negotiations and is also motivated by the observation that, after 5 years of tariff reductions, percentage deviations around the baseline typically peter out over the long run. These modifications help us shed light on the background of data developments and updates inherent in the CGE database regarding macroeconomic variables, tariffs, trade volumes, transport margins, and other key parameters, enabling more realistic simulations given advances in data and modelling.

This paper further benefits from a much broader database, improved underlying parameters, factors and sectoral aggregation compared to Adams and Horridge [23]. The paper aggregates about 10 sectors into 30 industries, which is limited in the study by Adams and Horridge [23]. This paper benefits from more granular sectoral details for grains; fruits and vegetables; meat and meat products; and other sectors such as chemicals; pharmaceuticals; metals; mining; motor vehicles and parts; electrical machinery, among others, in the AGOA/GSP and the potential SACU-US FTA. It also considers sensitive product designations obtained in key SACU FTAs with third parties like the AfCFTA and the EU-SADC EPA, which have inspired the US's interests for an FTA.

This paper assesses the economic impact of the FTA through the following scenarios: (a) Fixed long-run employment (no exemptions)—Scenario A—a central case FTA which entails the elimination of all import protection by both parties. Next is Scenario B, which entails a fixed long-run employment (less conservative tariff), which is similar to Scenario A, but allows the exemption of some products from tariff cuts, while others are cut at less than 100 per cent, as stated below. Based on the above, in Scenario B, all SACU tariffs against the US are cut by 100 per cent, except tariffs relating to cereal grains nec, including processed rice (gros), poultry (omt), dairy (mil), and non-agricultural manufactured goods (other manufacturing). Instead, protection on the US's non-agricultural manufactured goods is cut by 95 per cent. The protection afforded to dairy (mil) and poultry (omt) is not changed (remains fixed), while protection in cereal grains (nec) is cut equally from 2025 to 2035 in this study. In addition, the US's protection of non-agricultural manufactured goods is cut by 95 per cent.

On the other hand, all US tariffs against SACU are cut by 100 per cent, except those on red meat (cmt), dairy products (mil), sugar (sgr) and non-agricultural manufactured goods. Instead, protection for SACU non-agricultural manufactured goods is cut by 95 per cent. Similarly, red meat (cmt) and dairy products (mil) protection remains unchanged. Sugar is modelled through an increase in TRQ. The scenario is assessed by analysing its effects on various macroeconomic and final demand variables, including long-run regional deviations in exports to the US. The simulation results are presented in the next section.

4. Discussion of Results

This section presents the key findings of the dynamic CGE model simulation. It explores how the proposed FTA affects SACU's economic performance under selective liberalisation, focusing on macroeconomic indicators, household consumption, labour market outcomes, and sector-specific trade effects over a long-run period, assuming the FTA is concluded in 2025 and a 5-year progressive tariff liberalisation as is customary in other SACU FTAs with third parties. Results are reported relative to the baseline and disaggregated by SACU and the Rest of SACU to highlight regional variation in GTAP-10.

Scenario A: Fixed long-run employment (no exemptions)—a central case FTA, which entails eliminating all import protection by both parties with full employment of both skilled and unskilled labour. The complete elimination of all duties initially increases macroeconomic and final demand variables, which then decline over the long run (see Table A5 in the Appendix A). In terms of bilateral exports from all SACU countries to the US, following the immediate elimination of tariffs from 2025 to 2029, exports rise. For the Rest of SACU, bilateral trade is stronger across several product lines.

The FTA has only mild effects on industry output in the SACU economies. Fewer industries experience growth in output within the SACU. In the Rest of SACU, more industries gain output. Industry output varied across industries and largely depended on prevailing tariffs at the time, the industry's export orientation, and its performance in the face of US competition (see Tables A5 and A6 in the Appendix A). Overall, the long-run impact on primary agricultural industries and agricultural-related industries in SACU is negative but positive for the Rest of SACU. From the perspective of the SACU countries, the free trade agreement is trade-creating, with little evidence of trade diversion shown in the regional contributions to the long-run percentage deviations in SACU's exports to the US.

For the US, the effects of the FTA are generally positive. At the industry level, the FTA largely mirrors SACU's long-run output changes. US industries, for example, have achieved the largest output in leather and leather products, while all SACU countries are losing output.

Scenario B is similar to scenario A, has the same labour market assumptions, but with tariff exemptions on selected agricultural products. Each subsection (Sections 4.1–4.9) addresses a specific economic dimension of the FTA's impact, while Table A4 (see Appendix A) provides a list of the parameters and variables used in the model.

4.1. Real GDP

Figure 5 presents the simulated impact of the selective tariff cuts on real GDP for SACU and the Rest of SACU. In the early years of the simulation (2025–2029), both regions experience slight gains relative to the baseline. However, these effects reverse from 2029 onward, with real GDP deviating below baseline levels for most of the simulation period. The long-run gains remain modest, with deviations of 0.068 per cent for SACU and 0.033 per cent for the Rest of SACU by 2040.

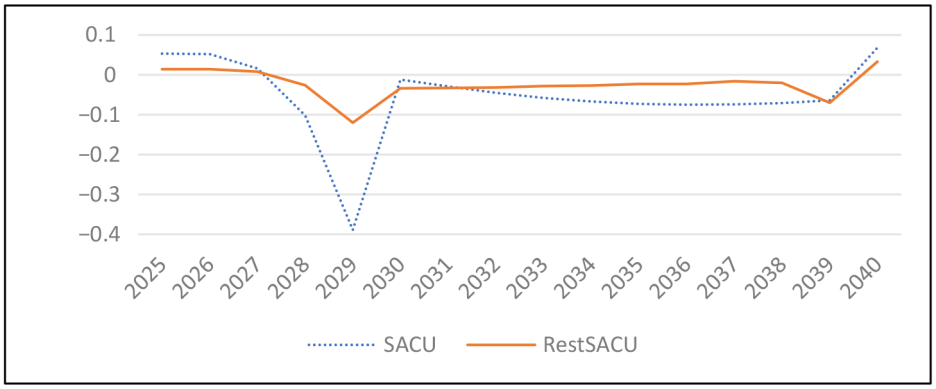

Figure 5. Effects on real GDP (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

These trends reflect the cumulative effect of selective tariff liberalisation and capital cost dynamics. The results indicate that exempting specific industries from full liberalisation—such as maintaining partial protection in dairy and poultry, and capping the US' tariff cuts for non-agricultural manufacturing at 95 per cent—appears to contribute to this marginal long-run positive result, mitigating the negative deviations seen in the medium term and stabilising the long-run trajectory of GDP, albeit at a very modest level. In particular, the less aggressive cut to other manufacturing tariffs appears to dampen adverse effects on capital accumulation and output in the long term.

The findings suggest that strategic, phased liberalisation—rather than blanket tariff removal—may be more effective in managing economic adjustment while still achieving moderate GDP gains, especially for smaller, more vulnerable economies within SACU.

4.2. Real Private Consumption

Figure 6 shows the impact of the proposed FTA on real private consumption in SACU and the Rest of SACU. In SACU, private consumption declines sharply during the early years of tariff liberalisation, reaching its lowest point around 2029 with a deviation of nearly −1.5 per cent from the baseline. This reflects the pressures on households arising from structural change and competition from US imports. Although some recovery follows, consumption levels remain below the baseline for most of the simulation period, with only a slight positive deviation of 0.085 per cent by 2040.

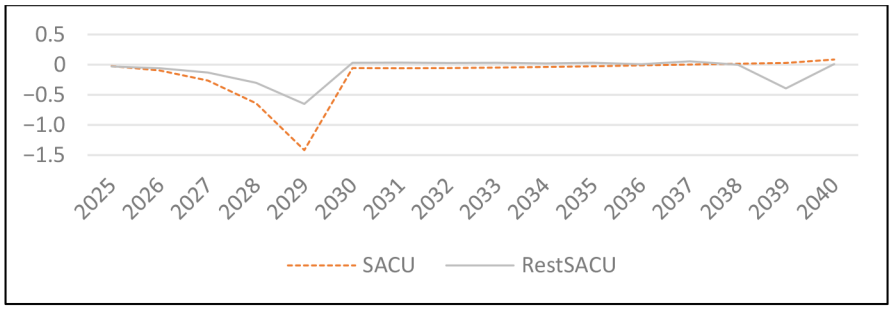

Figure 6. Effects on real private consumption (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

By contrast, the Rest of SACU experiences a smaller initial decline and recovers more quickly. From 2030 onward, real private consumption stays consistently above the baseline, reaching a long-run deviation of 0.010 per cent in 2040.

These trends suggest that tariff liberalisation—if not carefully phased—can reduce household welfare, especially in more exposed economies. The pronounced dip in SACU's consumption highlights the vulnerability of domestic demand during adjustment. This reinforces the importance of shielding sensitive sectors in trade negotiations to protect livelihoods and sustain welfare during the transition.

4.3. Real Government Consumption

Figure 7 illustrates the percentage deviations in real government consumption from the baseline. The pattern closely mirrors that of private consumption, with both SACU and the Rest of SACU experiencing a decline during the early phase of liberalisation.

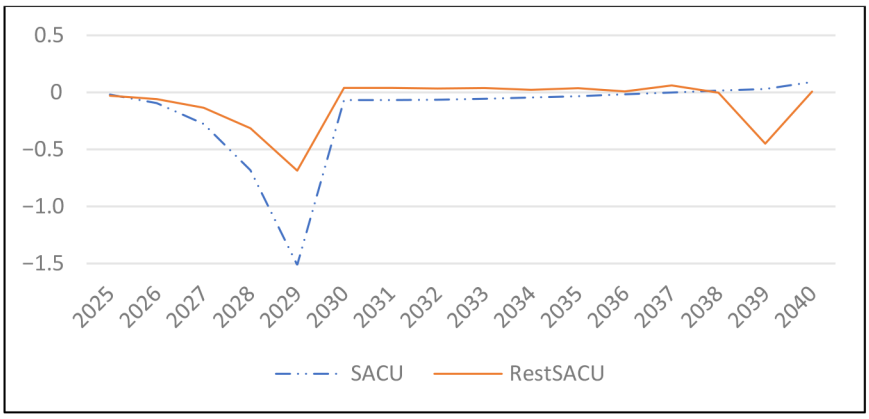

Figure 7. Effects on real government consumption (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

Throughout the simulation period, the magnitude of deviation in government consumption is smaller than in private consumption. This suggests that the FTA stimulates greater demand for private goods—typically traded and liberalised—than for government services, which are less directly affected by trade policy.

This shift indicates a form of structural adjustment, where resources and demand begin to reallocate toward liberalised sectors. It also highlights the importance of complementary policies to strengthen public service delivery, ensuring that essential services are not sidelined during the transition to a more open trade environment.

4.4. Employment and Capital

Figures 8 and 9 present the deviations in employment and capital relative to the baseline for SACU and the Rest of SACU, respectively. With selective tariff cuts, both

skilled and unskilled employment in SACU show a slight increase in 2025, but these gains are not sustained. Throughout the tariff phase-down period, employment deviations remain relatively flat in both regions.

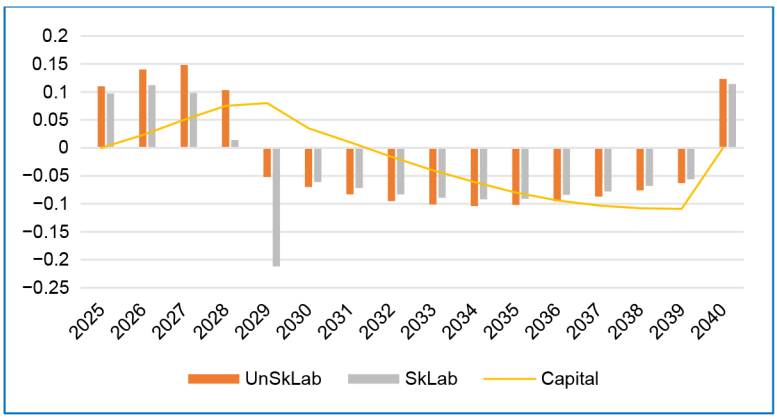

Figure 8. Effects on employment and capital-SACU (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

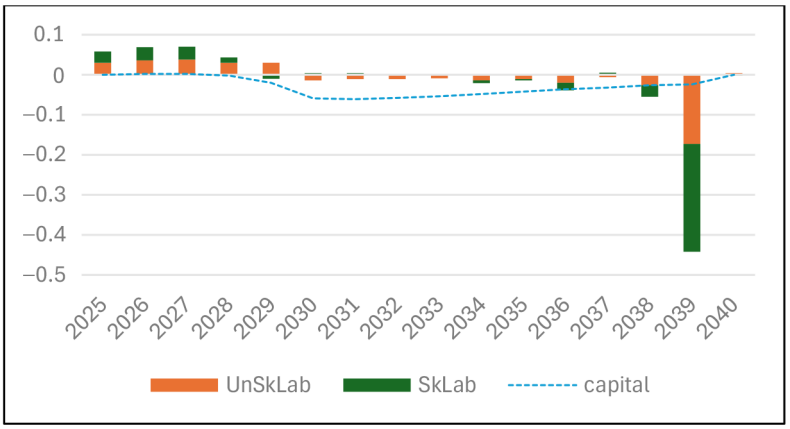

Figure 9. Effects on employment and capital, Rest of SACU. Source: Authors' own compilation based on GDYn simulations.

It is important to clarify that the observed wage stagnation is not an assumption of wage rigidity, but rather an endogenous result of the simulation. This study uses a standard long-run CGE closure that assumes full employment, where real wages are flexible and adjust to clear the labour market, ensuring employment returns to its baseline path. The flat wage result seen in Figures 8 and 9 therefore indicates that the net economic impact of this specific FTA scenario is insufficient to generate a significant increase in aggregate labour demand. The weak capital response is a direct consequence of this; with no significant change in the relative price of labour (wages), there is no strong incentive for firms to alter their capital-labour ratios. This finding underscores the modest scale of the FTA's impact relative to the entire SACU economy.

In the dynamic GTAP model, when employment rises above baseline levels, upward pressure on real wages can increase labour costs. This incentivises producers to substitute labour with capital, raising the capital–labour ratio [23]. However, in this scenario, real wages for both skilled and unskilled labour remain essentially unchanged throughout the simulation period in all SACU economies. This lack of wage pressure limits producers' incentive to substitute labour for capital, and, in turn, weakens the capital response over time. As a result, the expected feedback loop—higher employment leading to wage increases and greater capital investment—does not materialise.

In SACU, both capital and employment follow a steady path with little deviation from baseline levels beyond the initial year. In the Rest of SACU, employment and capital remain essentially unchanged throughout, reflecting muted responsiveness to liberalisation. The persistence of wage stagnation also suggests that the benefits of the FTA may be limited in terms of inclusivity, as households do not experience real income gains without additional policy support for labour markets.

These outcomes suggest that, without more flexible wage-setting mechanisms or broader labour-market reforms, SACU countries may struggle to convert trade liberalisation into meaningful labour or investment gains. The results underscore the need for domestic policy support to unlock the full employment and productivity potential of external trade agreements.

4.5. Real Investment

Unlike other macroeconomic indicators, real capital formation shows a more distinct upward trend in both SACU and the Rest of SACU, albeit with different dynamics. As shown in Figure 10, SACU experiences an initial rise in investment, followed by a sharp dip around 2029, and a steady recovery thereafter, culminating in a long-run deviation of 0.432 per cent above the baseline by 2040. In contrast, investment in the Rest of SACU remains relatively stable, with fewer fluctuations and a more minor long-run deviation of 0.090 per cent.

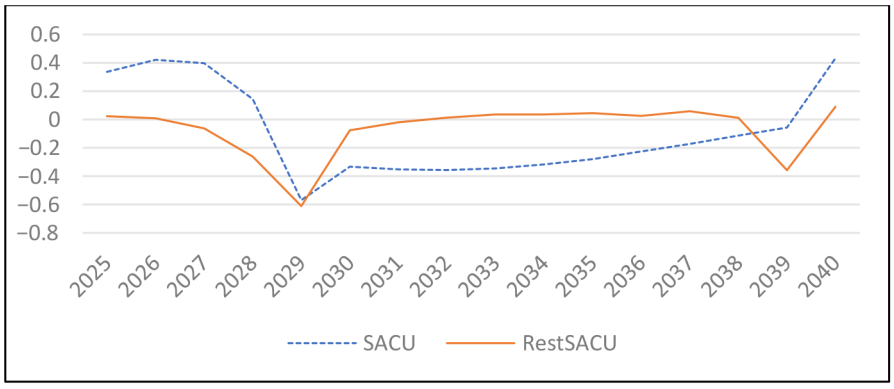

Figure 10. Effects on real investment (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

These results suggest that while liberalisation can stimulate capital accumulation, the volatility in SACU's trajectory reflects sensitivity to external shocks or uncertainty during adjustment periods. This underscores the importance of sequencing reforms and maintaining policy predictability to sustain investor confidence and long-term capital formation.

4.6. Terms of Trade

The effects of the FTA on terms of trade are mixed across the SACU region. As illustrated in Figure 11, SACU experiences a notable decline in terms of trade during the early years of liberalisation, reaching its lowest point in 2030 at nearly −0.4 per cent relative to the baseline. In contrast, the Rest of SACU sees a mild improvement in its terms of trade over the same period, peaking just above 0.04 per cent before tapering off slightly toward the end of the simulation.

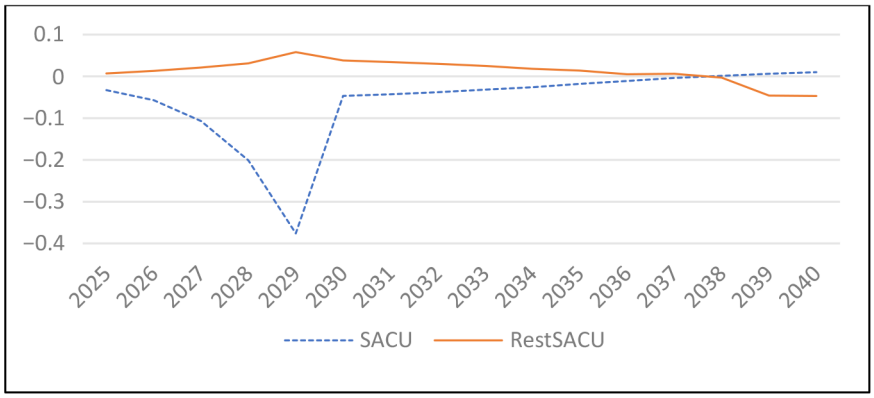

Figure 11. Effects on terms of trade (% deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

Weak terms of trade generally have adverse effects on real GDP and household consumption. Under typical conditions, tariff reductions should boost exports and raise world prices for SACU's export products. However, these gains are often offset by exchange rate devaluation, which lowers the domestic currency price of exports. In this case, the initial boost from tariff cuts dominates temporarily, but over time, real devaluation effects outweigh the gains, resulting in deteriorating terms of trade—particularly for SACU.

This outcome highlights a critical policy consideration: without complementary efforts to enhance competitiveness and maintain exchange rate stability, SACU risks undermining the very export and GDP gains trade liberalisation is meant to achieve.

4.7. Bilateral Trade Volumes

Early export gains to the US are evident in the initial years of the policy, particularly due to the exclusion of dairy products (mil) from liberalisation. As shown in Figure 12, SACU's bilateral exports increase across all major sectors—primary agriculture, agro-processing, and other industries—peaking in 2029 before declining sharply.

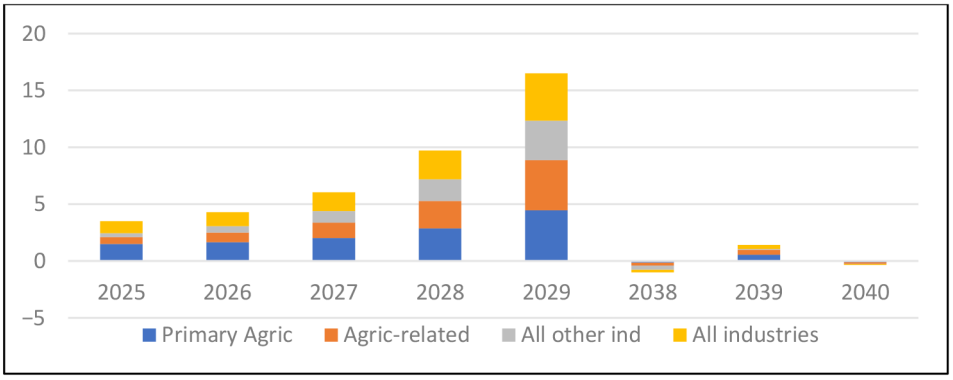

Figure 12. Bilateral trade volume (SACU-US, % deviations from the baseline). Source: Authors' own compilation based on GDYn simulations.

Although not shown in Figure 12, product-level results from the simulation indicate that the long-run industry output for dairy products is −0.039 per cent for SACU and 0.036 per cent for the Rest of SACU. In the case of sugar, which is not fully liberalised but subject to an increased US tariff-rate quota (TRQ), output rises over several years, reaching −0.071 per cent in SACU and 0.525 per cent in the Rest of SACU by the end of the simulation. For reference, a separate complete liberalisation scenario (Scenario A, not reported here) showed more pronounced output declines for sugar: −0.576 per cent for SACU and −0.216 per cent for the Rest of SACU.

These results suggest that shielding vulnerable sectors in a phased liberalisation scenario can help secure short-term export gains. However, without deeper structural reforms or productivity improvements, long-run competitiveness—particularly in SACU—remains weak. A similar pattern is observed for bilateral exports from the Rest of SACU to the US, although the magnitude of change is more muted.

4.8. Industry Output

The exemption of particular products from tariff liberalisation under the FTA results in improved industry output across all SACU countries. As shown in Figure 13, SACU and the Rest of SACU exhibit varying performance across primary agriculture, agro-processing, and other sectors.

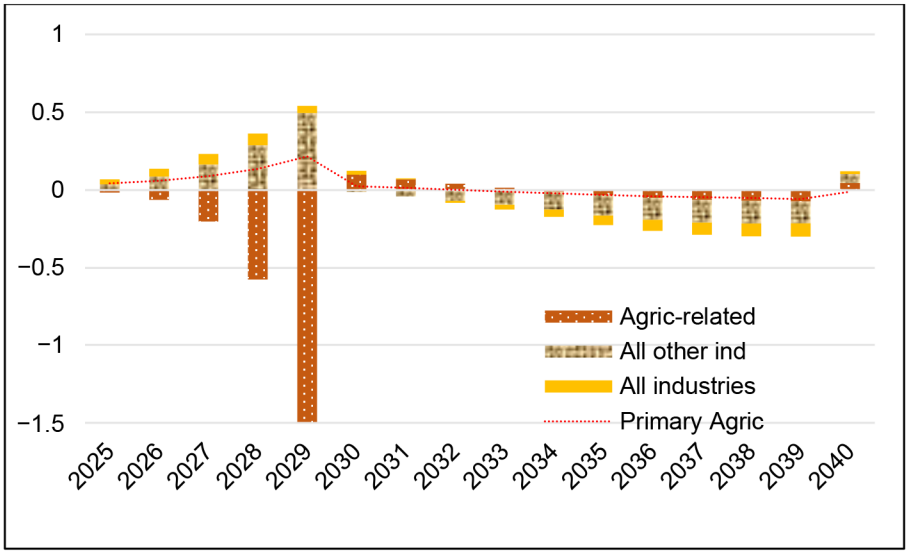

Figure 13. Industry output SACU (% deviations from the baseline). Source: study based on GDYn simulations.

For SACU exports to the US, tariff rates on products such as red meat (ctl), dairy (mil), poultry (omt), sugar (sgr), vegetables, fruits and nuts (v_f), and highly processed foods (ofd) essentially similarly to scenario A, but deviations from the baseline for key variables are less pronounced than in 90 percent rather than eliminated for the US.

Products benefiting most from this selective liberalisation approach include livestock and meat products (cmt), poultry (omt), raw sugar (sgr), wheat (wht), cereals and grains nec including processed rice (gros), and various high-value crops such as plant-based fibres (ocr), fruits, vegetables, and paddy rice (pdr). Notably, exempting meat products nec (omt) leads to improved output in meat related industries, such as livestock and meat products (cmt), while the FTA can generate trade-creation, as surplus labour is absorbed into these expanding sectors.

In contrast, under Scenario A (complete tariff elimination by all parties), industry output for meat products nec (omt) declines by −0.073 per cent in SACU. It rises by 0.213 per cent in the Rest of SACU. In the current scenario (C), the respective changes are far more muted, with a reduction of only 0.005% in essential CU and −0.033 per cent in the Rest of SACU. This comparison illustrates how selective tariff exemptions can help balance overall growth while still supporting the expansion of export-oriented sectors.

These results suggest that targeted protection helps SACU safeguard and even grow high-potential agricultural industries. However, they also reveal underlying structural weaknesses in non-agricultural manufacturing competitiveness. This points to the need for aligning trade policy with broader industrial and agricultural support programmes.

In the Rest of SACU, gains are more concentrated in raw wheat (wht), raw sugar (sgr), sugar cane and sugar beet (c_b), as well as chemicals, rubber, and plastics (crp). Conversely, sectors such as textiles and clothing (textwapp), leather products (lea), and meat products nec (cmt) record losses. Exempting cereal, through a few notable exceptions, appears to have little effect on its industrial output, including textiles and clothing (textwap), among other macroeconomic and final demand variables,

4.9. Regional Contributions to Long-Run Percentage Deviations in the SACU Exports

In the long run, export volumes increase across many industries relative to their baseline levels, with a few notable exceptions. Industries such as other sugar (sgr), textiles and clothing (textwapp), other macroeconomic and final demand variables rise during the first few years of simulation relative to the baseline across all economies, but then contribute positively to SACU's export performance. More industries return higher regional contributions to long-run deviations in SACU exports, but these gains are concentrated in a narrow range of sectors.

Overall, when accounting for the selective tariff cuts under this scenario, most of the macroeconomic and final demand variables rise during the first few years of simulation relative to the baseline for all economies but decline in the long run. The FTA does not inspire the real wage; hence, the real wage does not change relative to baseline levels.

Bilateral trade on dairy products between all SACU countries and the US is currently limited under AGOA. Exempting certain products from tariff negotiations, results in some improved SACU exports to the US. Bilateral trade in livestock and meat products (cmt) and poultry (omt) increase, agriculture-related, and total output in SACU countries in the long run relative to baseline levels (see Table A7 in Appendix A).

Overall, scenario B largely behaves like scenario A, but deviations from the baseline for key variables are less pronounced compared to scenario A, where duties are completely eliminated. In this scenario, the FTA raises primary agriculture, agriculture-related, and total output in SACU countries in the long-run period relative to the baseline levels (see Table A6 in Appendix A). The regional contributions to the long-run percentage deviations in SACU's exports contributions to SACU's exports are positive for most industries, indicating trade creation.

This concentration of export growth suggests that while the FTA can generate trade creation effects, it does not automatically lead to broad-based industrial expansion. Without targeted efforts to support sectoral diversification, SACU remains exposed to external shocks in a few key industries. As such, trade policy should be accompanied by export diversification strategies to ensure more sustainable and inclusive growth.

While these findings are instructive, it is important to reflect on some limitations of the CGE model framework used in this study and offers suggestions for a future re-appraisal of this work. Standard models, including GTAP, rely on the Armington assumption, which treats domestic and imported goods as imperfect substitutes with fixed trade shares. This constrains the model's ability to reflect firm-level adjustments or capture gains along the extensive margin.

Scholars such as Nilsson [26] and Fontagné et al. [27] have highlighted these shortcomings in the context of FTA analysis. In response, Akgul et al. [28] propose a firm heterogeneity extension to the GTAP model, which aligns with the Melitz [29] framework and aims to capture productivity effects of increased market access. The Melitz model emerged as part of the new trade theory, addressing key limitations identified in classical trade theories [29].

According to Melitz and Trefler [30], the new trade theory holds that firms and industries, rather than countries, are the new units of international trade, unlike in the

classical/traditional international trade theory. New trade theory incorporates product differentiation and differences in consumer tastes and preferences within the underlying market structure of monopolistic competition.

Melitz motivates a trade model with firm heterogeneity in productivity and a fixed cost of entering export markets, and the model synthesises elements from trade theory and industrial organisation theory on Krugman's [31] model. In the Melitz treatment, previous industry models with heterogeneous firms are used to examine the role of international trade in promoting reallocation between firms within an industry [28,30].

As they note, "the main objective in the GTAP firm-heterogeneity model is to capture the effect of increased exposure to external markets on average industry productivity" [28]. Incorporating such extensions could offer deeper insights into the dynamic productivity effects of trade liberalisation and show that the productivity threshold for the US-Japan export market decline primarily results from a reduction in fixed export costs per sale. Therefore, the scale effect largely contributes to reducing the productivity threshold and the resultant rise in the number of US manufacturing firms exporting to Japan, while less-efficient domestic firms are forced to exit the market due to intense competition [28].

An estimation of the Melitz-type model and the welfare effects of the mega-FTA—the Regional Comprehensive Economic Partnership (RCEP) is found in Balistreri and Tarr [32] and they demonstrate that preferential tariff reduction contributes less to welfare compared to models accounting for firm heterogeneity, in which deep regional integration contributes substantially to welfare. In the African context, Mburu et al. [33] study the impact of the African Continental Free Trade Area (AfCFTA) on Kenya in a Melitz setting using GTAP-HET, finding that imports and exports double compared to the Armington and Krugman models. Exports of rubber and plastic grow faster than those of other sectors, while Kenya's trade with Central Africa and Southern Africa grows significantly due to the FTA.

Meng and Huang [34] use the Melitz-type model to study the decision to impose a Section 301 trade restriction on China by the US. They conclude that research should model firm heterogeneity when a policy shock—either a tariff or a non-tariff policy—is imposed on sectors characterised by imperfect competition, such as the targeted Chinese electronic products and mechanical equipment, which are mainly from imperfectly competitive industries. On the other hand, the standard GTAP model is more appropriate when policy is directed at perfect-competition sectors; otherwise, firm heterogeneity would not yield any significant differences in the estimation results.

Despite the empirical sophistication of the GTAP-HET model, the application of Melitz-type CGE models remains limited, primarily due to their greater complexity compared to the standard Armington assumptions widely used in conventional GTAP frameworks [35]. Other authors, for instance [36], argue that Melitz models are not necessary, since Armington models can replicate their trade impacts with higher-than-usual elasticities of substitution. As such, this paper does not incorporate firm heterogeneity. Despite operating within a customs union where tariff revenue is distributed among member states using a formula that differs from the country-specific import data, the present study does not account for the role of non-tariff barriers (NTBs), such as sanitary and phytosanitary standards or border controls, which are highly relevant in agricultural trade. Expressing NTBs in tariff-equivalent terms could enhance the simulation's realism.

Finally, the model does not capture SACU's internal revenue-sharing arrangement, where tariff revenue is distributed among member states using a formula that differs from the country-specific imports underlying the GTAP database. As suggested by McDonald and Walmsley [37], incorporating an 'alter tax' closure could help align model outcomes more closely with SACU's institutional reality.

5. Conclusions

This paper set out to assess whether SACU should pursue a more favourable Free Trade Agreement (FTA) with the United States—beyond simply eliminating ad valorem tariffs—by focusing on the differential impacts of selective liberalisation, particularly in agriculture. Building on earlier findings by Sirang [1], this study used a dynamic CGE model to simulate the effects of phasing in tariff cuts while protecting sensitive products such as dairy, poultry, and sugar.

The results show that while the proposed FTA initially raises key macroeconomic and trade indicators, most gains are modest and taper off over time. SACU's real GDP and investment benefit slightly from gradual liberalisation, especially where protection is retained in strategically sensitive sectors. The simulation also confirms that blanket tariff elimination is suboptimal, as gradual and selective reductions are more effective in limiting long-term adjustment shocks, particularly for smaller economies, even though the overall macroeconomic gains are modest at best.

However, the FTA does not lead to meaningful improvements in employment or real wages. Labour market rigidity, particularly the absence of upward wage pressure, limits both inclusivity and productivity gains. The FTA may therefore remain narrow unless supported by domestic labour reforms.

Consumption patterns shift toward goods rather than services, highlighting the need for complementary social and public service policies. SACU's terms of trade worsen under this scenario, suggesting that without competitiveness improvements and exchange rate stability, the focus should be on the Gulf Cooperation Council and East Asia as niches for high-value fruit/nuts and on value-added variants, especially where tariff protection is retained. However, the gains are concentrated, and long-run competitiveness remains weak in the absence of structural reforms. Industrial output in non-agricultural sectors remains uneven, and bilateral trade gains are not broad-based.

What does this mean for policy beyond broad structural reforms? (i) Selective liberalisation should be coupled with specific, monitorable reforms that raise productivity and lower trade costs in SACU's priority agriculture value chains. Economy-wide, the priorities into future work could strengthen policy relevance, enhance trade creation, and expanded cold-chain capacity to cut border/port dwell time by 30–50 per cent); (ii) reliable conceptualised corridor-level digital coverage for cold rooms and traceability; (iii) competitive input and transport markets (open access to rail sidings and fertilizer/seed market audits); and (iv) Sanitary and Phytosanitary (SPS) governance (for example, a standing SACU SPS Committee, pre-clearance for priority products, and transparency dashboards). These measures directly address the medium-term weaknesses identified in the model's results—specifically, a weak employment/wage response, a consumption dip, and terms-of-trade pressure—by durably lowering firms' costs and boosting total factor productivity (TFP).

Special attention can be paid to value-chain pathways. For citrus/fruit, we propose additional certified cold-treatment capacity, area-wide Integrated Pest Management (IPM), and Animal and Plant Health Inspection Service (APHIS) pre-clearance. For red meat, maintain Food and Mouth Disease-free zoning, upgrade traceability, and optimise US/EU Tariff Rate Quotas. For poultry, improve feed logistics (rail priority for grain) and upgrade Hazard Analysis and Critical Control Points (HACCP); for dairy, deploy chilling-tank networks and residue-testing programs; for sugar, accelerate cane replanting, mill cogeneration, and speciality-sugar/ethanol pivots. These actions mirror successful experiences in peer exporters (e.g., Morocco/Chile for fruit, Namibia for beef, Thailand for processed poultry, Peru for value-added horticulture) (See Bentaleb [38], Prinsloo [39], and NaRanong [40]).

Other best-practice cases include Ghana, where warehouse receipts and value chain funds for cereals and horticulture led to measurable increases in smallholder participation and product standards [41]. In Ethiopia and Kenya, the adoption of improved cultivation and livestock management, plus cooperative supply networks, scaled up exports and improved incomes [42]. In the case of Asia, export growth occurred where donor and government interventions combined to finance, provide skills training, and facilitate cross-border trade [43].

It would be possible to set quantified targets using the CGE outputs. We recommend TFP "neutralisers" where long-run sectoral output is slightly negative (e.g., dairy −0.04%, sugar −0.07%), it may be possible to lift on-farm/plant TFP by ≥0.1–0.2 per cent over 3–5 years via the measures above. To convert output gains into jobs, policymakers can apply conservative output–employment elasticities (0.3–0.6) to set sector job targets. At the macro level, mitigate the temporary private-consumption dip with a time-bound export working-capital window (0.2–0.3% of agriculture GDP), and reduce reefer logistics costs 10–15% to counter terms-of-trade losses.

For diversification beyond the US market, the focus should be on the Gulf Cooperation Council and East Asia as niches for high-value fruit/nuts and on value-added variants (for example, jerky/biltong, cooked poultry, speciality sugars, premium juices).

Ultimately, the simulation underscores that selective liberalisation can protect key sectors and promote trade. Still, it must be paired with deeper productivity reforms, export diversification strategies, and support for industrial policy to achieve sustainable growth.

Finally, while the CGE approach provides valuable insights, the model does not account for non-tariff barriers, SACU's revenue-sharing mechanism, or firm-level heterogeneity in productivity. Incorporating these dimensions in future work could strengthen the policy relevance, enhance trade creation and improve the accuracy of the results.

Author Contributions: The study was conceptualized jointly by T.A.S., W.K., L.F. and R.R. T.A.S. led the methodological design, software development, data curation, and formal analysis, with validation support from R.R. T.A.S. conducted the investigation and prepared the original draft, while L.F., W.K. and R.R. contributed extensively to the review, editorial refinement, and revision of the manuscript. T.A.S., undertook visualisation and project supervision was provided by W.K., L.F. and R.R. L.F. oversaw project administration. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Behavioural parameters in the GTAP model.

	Parameters	Set Index	Description
σD	ESUBD(c,r)	c ∈ COMM ∈ REG	Armington elasticity of substitution between domestic and imported goods at regional level
σM	ESUBM(c,r)	c ∈ COMM r ∈ REG	Armington elasticity of substitution for imports at regional level
σV	ESUBVA(a,r)	a ∈ ACTS r ∈ REG	Elasticity of substitution between primary factors in the production at regional level
	ESUBT(a,r)	a ∈ ACTS r ∈ REG	Elasticity of substitution between composite intermediate inputs and value-added at regional level
σT	ENTRAE(a,r)	a ∈ ENDW r ∈ REG	Elasticity of Transformation for sluggish primary endowments
	ENDOWFLAG	a ∈ ENDW r ∈ ENDWT	Binary Flag for endowment mobility (i.e., ENDWT is either mobile, sluggish or fixed)
	RORFLEX(r)	r ∈ REG	Expected net rate of return flexibility parameter
	RORDELTA		Binary switch coefficient which determines the mechanism of allocating investment funds across regions
β	SUBPAR(c,r)	c ∈ COMM r ∈ REG	The substitution parameter in the CDE minimum expenditure function
γ	INCPAR(c,r)	c ∈ COMM r ∈ REG	The expansion parameter in the CDE minimum expenditure function

Source: study derived from GTAP10.

Table A2. Macroeconomic inputs-supply-side variables (average annual % changes).

	Real GDP	Skilled Labour	Unskilled Labour	Population	Investment	Land	Capital	Natural Resources
US	1.7	0.9	0.1	0.6	1.7	0.0	1.8	0.0
SACU	3.4	2.4	0.6	1.3	4.2	0.0	3.5	0.0
RestSACU	3.5	3.2	1.1	0.9	3.9	0.0	3.1	0.0
CanadaMex	2.5	1.8	0.3	0.7	2.7	0.0	2.5	0.0
EFTA	1.8	1.8	0.4	0.7	2.0	0.0	2.3	0.0
SthAmerica	2.8	2.9	0.9	0.6	3.0	0.0	3.0	0.0
JapKorTwnSng	3.4	1.4	0.3	0.1	3.9	0.0	2.9	0.0
ChinaHK	2.3	1.9	0.6	0.1	3.1	0.0	4.8	0.0
EU	2.4	2.5	0.3	0.0	2.4	0.0	2.9	0.0
RestSSA	4.4	3.1	1.6	2.0	3.9	0.0	4.0	0.0
RestofWorld	3.4	2.5	0.7	0.7	3.6	0.0	3.7	0.0

Table A3. Sectoral and product aggregation.

Code	Description
1 wht	Wheat
2 gross	Cereal grains nec, including processed rice.
3 v_f	Vegetables, fruit & nuts.
4 osd	Oil seeds
5 c_b	Sugar cane, sugar beet
6 ocr_	Crops nec, including plant-based fibres
7 ctl	Bovine cattle, sheep and goats
8 oapw	Other animal prod nec, including wool
9 rmk	Raw milk
10 sgr	Raw and refined sugar
11 of	Food products nec
12 b_t	Beverages and tobacco products
13 mil	Dairy products
14 cmt	Livestock and meat products
15 omt	Meat products nec
16 vol	Vegetable oils and fats
17 pdr	Paddy rice.
18 otherPrimary	Forestry; Fishing; Coal; Oil; Gas; Minerals nec.
19 TextWapp	Textiles and Clothing
20 lea	Leather products
21 lum	Wood products.
22 ppp	Paper products, publishing
23 otherManufac	other Manufacturing
24 mvh	Motor vehicles and parts
25 crp	Chemicals, rubber, plastic products
26 bph	Basic pharmaceutical products
27 metals	Ferrous metals; Metal products.
28 Util_Cons	Electricity; Gas manufacture, distribution; Water; Construction.
29 TransComm	Trade; Accomm, Food and servic; Transport nec; Water transport; Air transport; Warehousing and support activi; Communication.
30 OthServices	Financial services nec; Insurance; Real estate activities; Business etc.

Source: Authors based on GTAP-10.

Table A4. Factor aggregation.

Aggregation Group	GTAP Code	Factor of Production	Factor Mobility
Unskilled labour	UnSkLab	Agricultural and Unskilled	Mobile
	UnSkLab	Clerks	Mobile
	UnSkLab	Service/Shop workers	Mobile
Skilled labour	SkLab	Technicians/Associate Professionals	Mobile
	SkLab	Officials and Managers	Mobile
Land	Land	Land	Sluggish (ETRAE = −1.000)
Natural resources	NatRes	Natural Resources	Sluggish (ETRAE = −0.001)
Capital	Capital	Capital	Mobile

Source: Authors based on GTAP-10.

Table A5. Bilateral trade (exports) of SACU to the US-scenario A.

	SACU								Rest of SACU							
	2025	**2026**	**2027**	**2028**	**2029**	**2038**	**2039**	**2040**	**2025**	**2026**	**2027**	**2028**	**2029**	**2038**	**2039**	**2040**
wht	0.443	0.868	1.751	3.496	6.517	−0.386	−0.482	−0.400	−0.058	−0.030	0.194	0.806	1.882	−0.173	−1.400	0.250
gros	0.202	0.422	0.887	1.816	3.468	−0.110	−0.167	−0.147	−0.164	−0.181	−0.056	0.373	1.208	−0.090	−1.685	0.448
v_f	0.131	0.267	0.559	1.147	2.175	−0.079	−0.107	−0.084	−0.340	−0.472	−0.502	−0.319	0.145	−0.066	−1.769	0.501
osd	0.277	0.483	0.895	1.718	3.118	−0.161	−0.210	−0.148	−0.601	−0.874	−1.049	−1.050	−0.768	−0.081	−2.791	0.797
c_b	0.089	0.255	0.685	1.622	3.294	−0.310	−0.393	−0.364	−3.439	−5.064	−7.084	−10.109	−14.245	0.117	−0.327	0.180
ocr_	0.359	0.539	0.913	1.676	2.997	−0.126	−0.184	−0.117	4.400	4.088	3.978	4.344	5.135	−0.165	−2.550	0.631
ctl	0.149	0.387	0.927	2.065	4.143	−0.101	−0.152	−0.112	−0.449	−0.622	−0.674	−0.481	0.101	−0.153	−2.427	0.608
oapw	5.475	5.803	6.435	7.842	10.359	−0.161	−0.226	−0.188	−0.392	−0.526	−0.466	−0.002	1.087	−0.163	−2.567	0.623
rmk	0.295	0.694	1.562	3.407	6.745	−0.255	−0.353	−0.268	−0.801	−1.070	−1.077	−0.630	0.552	−0.114	−3.493	0.938
sgr	49.646	49.540	50.210	51.116	52.843	−0.442	−0.503	−0.576	50.386	49.572	49.063	48.883	48.721	−0.341	−2.015	0.216
ofd	4.621	4.922	5.522	6.741	8.874	−0.197	−0.258	−0.251	4.607	4.751	5.019	5.672	6.740	−0.177	−0.931	0.115
b_t	0.662	0.847	1.239	2.016	3.393	−0.130	−0.170	−0.167	0.620	0.697	0.855	1.195	1.745	−0.103	−0.477	0.052
mil	28.176	28.669	29.584	31.859	35.815	−0.375	−0.484	−0.469	33.699	33.856	33.363	34.476	36.093	−0.335	−1.760	0.239
cmt	1.604	2.180	3.335	5.752	10.080	−0.329	−0.440	−0.390	1.032	1.066	1.440	2.583	4.714	−0.324	−3.332	0.726
omt	0.634	1.293	2.623	5.304	10.030	−0.427	−0.544	−0.483	−0.278	−0.273	0.129	1.345	3.647	−0.416	−4.112	0.891
vol	0.711	1.153	2.044	3.742	6.683	−0.221	−0.315	−0.307	0.169	0.255	0.636	1.630	3.420	−0.195	−2.574	0.599
pdr	0.079	0.299	0.890	2.284	4.838	−0.202	−0.247	−0.207	−1.256	−1.645	−1.719	−1.453	−0.483	−0.216	−4.951	1.315
otherPrimary	−0.065	−0.099	−0.099	−0.034	0.147	0.118	0.089	0.068	0.058	0.063	0.061	0.050	0.045	0.035	−0.027	0.010
TextWapp	17.518	18.256	19.677	23.356	30.585	−0.401	−0.554	−0.582	0.887	1.279	2.218	4.333	8.263	−0.244	−2.857	0.663
lea	8.295	8.947	10.207	13.099	18.468	−0.251	−0.420	−0.448	8.084	8.544	9.456	11.439	14.895	−0.170	−2.954	0.775
lum	0.525	1.003	1.930	3.717	6.793	−0.377	−0.452	−0.423	0.280	0.557	1.199	2.554	4.771	−0.289	−2.362	0.494
ppp	2.400	2.874	3.773	5.527	8.548	−0.286	−0.370	−0.361	2.144	2.448	3.094	4.429	6.673	−0.221	−1.950	0.381
otherManufac	0.480	0.917	1.815	3.546	6.531	−0.418	−0.490	−0.483	0.359	0.641	1.270	2.578	4.731	−0.263	−1.991	0.360
mvh	1.875	3.105	5.147	8.513	13.764	−0.415	−0.481	−0.474	0.426	0.782	1.517	2.975	5.362	−0.283	−2.018	0.356
crp	1.560	2.083	3.090	4.993	8.263	−0.270	−0.368	−0.363	0.825	1.134	1.812	3.209	5.524	−0.202	−2.030	0.442
bph	0.430	0.934	2.005	4.126	7.880	−0.300	−0.416	−0.420	0.289	0.581	1.265	2.743	5.182	−0.190	−2.560	0.679
metals	0.603	1.126	2.177	4.199	7.711	−0.294	−0.396	−0.400	0.328	0.626	1.286	2.652	4.908	−0.268	−2.070	0.383
Util_Cons	0.340	0.669	1.317	2.566	4.712	−0.359	−0.395	−0.375	0.260	0.500	1.021	2.095	3.881	−0.251	−1.487	0.213
TransComm	0.265	0.598	1.309	2.722	5.245	−0.210	−0.282	−0.286	0.190	0.381	0.820	1.762	3.334	−0.155	−1.694	0.405
OthServices	0.276	0.628	1.368	2.845	5.485	−0.179	−0.257	−0.261	0.188	0.379	0.812	1.747	3.329	−0.176	−1.925	0.455
Primary Agric	***5.503***	***5.801***	***6.474***	***7.859***	***10.316***	***−0.236***	***−0.308***	***−0.275***	***5.126***	***4.913***	***4.826***	***5.133***	***5.864***	***−0.176***	***−2.304***	***0.537***
Agric-related	***6.568***	***7.027***	***7.929***	***10.035***	***13.998***	***−0.228***	***−0.334***	***−0.346***	***2.849***	***3.207***	***3.992***	***5.689***	***8.651***	***−0.231***	***−2.531***	***0.578***
All other ind	***0.793***	***1.347***	***2.409***	***4.381***	***7.729***	***−0.324***	***−0.404***	***−0.400***	***0.358***	***0.626***	***1.219***	***2.455***	***4.503***	***−0.218***	***−1.969***	***0.419***
All industries	***4.269***	***4.655***	***5.459***	***7.093***	***9.983***	***−0.255***	***−0.334***	***−0.316***	***3.382***	***3.381***	***3.596***	***4.328***	***5.686***	***−0.189***	***−2.170***	***0.492***

Source: Authors' calculation based on GTAP-10. Note: Italicised and bold rows represent aggregated sector groupings. The colour shading in the table illustrates percentage deviations from baseline values: dark green indicates the highest positive deviations; yellow reflects slight increases; orange represents modest declines; and red denotes the deepest reductions below baseline levels.

Table A6. Industry output-SACU (percentage deviations from the baseline)-scenario A.

SACU	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
wht	0.140	0.273	0.549	1.096	2.058	0.092	0.091	0.052	0.022	−0.006	−0.034	−0.064	−0.087	−0.105	−0.117	−0.137
gros	0.054	0.114	0.236	0.474	0.900	0.088	0.080	0.069	0.055	0.040	0.024	0.007	−0.011	−0.021	−0.017	−0.054
v_f	0.021	0.095	0.262	0.607	1.221	0.015	0.008	−0.003	−0.014	−0.024	−0.034	−0.046	−0.051	−0.060	−0.076	−0.067
osd	−0.054	0.008	0.169	0.524	1.196	0.140	0.131	0.108	0.083	0.056	0.029	−0.003	−0.028	−0.050	−0.068	−0.091
c_b	0.279	0.423	0.641	0.988	1.569	0.114	0.128	0.117	0.114	0.109	0.101	0.092	0.080	0.076	0.085	0.053
ocr_	0.033	0.129	0.343	0.786	1.562	−0.020	−0.030	−0.038	−0.049	−0.059	−0.068	−0.076	−0.083	−0.087	−0.089	−0.094
ctl	0.027	−0.007	−0.105	−0.333	−0.783	0.028	0.020	0.015	0.009	0.003	−0.001	−0.006	−0.011	−0.012	−0.010	−0.016
oapw	0.041	0.041	0.041	0.041	0.047	0.072	0.057	0.037	0.019	0.002	−0.013	−0.030	−0.041	−0.050	−0.057	−0.065
rmk	0.053	0.053	0.018	−0.092	−0.323	0.041	0.033	0.023	0.014	0.005	−0.003	−0.010	−0.019	−0.022	−0.014	−0.033
sgr	0.791	1.215	1.865	2.918	4.641	0.139	0.167	0.132	0.115	0.095	0.069	0.041	0.007	−0.008	0.008	−0.071
ofd	−0.001	0.013	0.042	0.098	0.206	0.082	0.075	0.065	0.053	0.040	0.027	0.013	0.000	−0.010	−0.013	−0.033
b_t	0.010	0.004	−0.027	−0.111	−0.287	0.035	0.030	0.025	0.018	0.012	0.005	−0.001	−0.008	−0.011	−0.009	−0.021
mil	0.060	0.059	0.039	−0.020	−0.123	0.071	0.065	0.057	0.048	0.039	0.028	0.021	0.006	0.004	0.026	−0.021
cmt	0.027	−0.011	−0.117	−0.362	−0.846	0.035	0.027	0.020	0.013	0.007	0.001	−0.006	−0.012	−0.014	−0.013	−0.020
omt	−0.052	−0.161	−0.381	−0.819	−1.611	0.038	0.023	0.008	−0.006	−0.018	−0.031	−0.041	−0.055	−0.056	−0.037	−0.073
vol	0.151	0.290	0.569	1.111	2.081	0.218	0.205	0.180	0.148	0.112	0.076	0.034	−0.004	−0.035	−0.055	−0.100
pdr	0.202	0.313	0.476	0.740	1.152	0.001	−0.009	−0.022	−0.033	−0.044	−0.051	−0.063	−0.065	−0.076	−0.100	−0.074
otherPrimary	0.007	0.017	0.035	0.069	0.123	−0.011	−0.011	−0.010	−0.010	−0.011	−0.011	−0.011	−0.011	−0.011	−0.011	−0.010
TextWapp	−0.060	−0.406	−1.389	−4.027	−10.331	0.522	0.484	0.467	0.453	0.437	0.417	0.397	0.382	0.375	0.370	0.356
lea	0.152	0.179	0.168	0.011	−0.619	0.261	0.237	0.214	0.184	0.149	0.111	0.069	0.034	0.000	−0.034	−0.062

Table A6. *Cont.*

SACU	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
lum	−0.004	0.074	0.219	0.486	0.960	−0.021	−0.055	−0.089	−0.125	−0.157	−0.189	−0.212	−0.240	−0.252	−0.237	−0.280
ppp	−0.069	−0.010	0.126	0.395	0.876	0.113	0.088	0.056	0.023	−0.012	−0.045	−0.077	−0.104	−0.129	−0.152	−0.164
otherManufac	0.119	0.314	0.655	1.246	2.207	0.041	−0.002	−0.042	−0.086	−0.127	−0.163	−0.195	−0.219	−0.239	−0.254	−0.255
mvh	−0.198	−0.282	−0.368	−0.339	0.138	0.007	−0.011	−0.050	−0.079	−0.104	−0.127	−0.141	−0.154	−0.161	−0.159	−0.158
crp	−0.152	−0.067	0.163	0.663	1.622	0.163	0.133	0.093	0.051	0.008	−0.033	−0.075	−0.109	−0.141	−0.172	−0.187
bph	0.126	0.210	0.341	0.547	0.850	0.153	0.127	0.100	0.069	0.036	0.006	−0.028	−0.054	−0.078	−0.100	−0.116
metals	0.047	0.234	0.628	1.425	2.910	0.228	0.196	0.158	0.116	0.070	0.027	−0.022	−0.057	−0.097	−0.143	−0.152
Util_Cons	0.342	0.463	0.483	0.275	−0.349	−0.221	−0.252	−0.269	−0.277	−0.275	−0.267	−0.244	−0.225	−0.197	−0.155	−0.131
TransComm	0.066	0.124	0.194	0.264	0.314	0.071	0.051	0.028	0.006	−0.016	−0.036	−0.056	−0.070	−0.083	−0.092	−0.097
OthServices	0.062	0.047	−0.038	−0.276	−0.781	0.035	0.023	0.012	0.002	−0.008	−0.017	−0.025	−0.031	−0.036	−0.041	−0.041
Primary Agric	***0.105***	***0.168***	***0.272***	***0.450***	***0.745***	***0.070***	***0.065***	***0.050***	***0.036***	***0.022***	***0.007***	***−0.008***	***−0.022***	***−0.032***	***−0.033***	***−0.054***
Agric-related	***0.005***	***−0.029***	***−0.168***	***−0.613***	***−1.798***	***0.173***	***0.149***	***0.128***	***0.105***	***0.081***	***0.057***	***0.033***	***0.012***	***−0.003***	***−0.013***	***−0.032***
All other ind	***−0.012***	***0.082***	***0.284***	***0.708***	***1.545***	***0.118***	***0.089***	***0.052***	***0.014***	***−0.023***	***−0.058***	***−0.092***	***−0.119***	***−0.143***	***−0.166***	***−0.174***
All industries	***0.074***	***0.125***	***0.195***	***0.280***	***0.353***	***0.084***	***0.070***	***0.050***	***0.031***	***0.012***	***−0.007***	***−0.025***	***−0.041***	***−0.053***	***−0.058***	***−0.074***
Rest of SACU																
wht	−0.111	−0.128	−0.009	0.384	1.103	−0.023	0.024	−0.016	−0.001	−0.046	0.002	−0.088	0.125	−0.129	−1.204	0.240
gros	−0.104	−0.164	−0.248	−0.381	−0.634	−0.006	−0.004	0.009	0.015	0.024	0.027	0.042	0.037	0.051	0.073	0.050
v_f	−0.147	−0.218	−0.318	−0.478	−0.722	0.040	0.036	0.042	0.041	0.041	0.035	0.042	0.027	0.036	0.068	0.018
osd	−0.060	−0.088	−0.127	−0.195	−0.338	0.009	0.008	0.018	0.015	0.028	0.011	0.045	−0.023	0.053	0.364	−0.053
c_b	2.059	2.932	4.151	5.944	8.346	−0.275	−0.156	−0.182	−0.124	−0.130	−0.037	−0.100	0.172	−0.084	−1.266	0.388
ocr_	−0.185	−0.292	−0.423	−0.608	−0.867	0.064	0.062	0.073	0.080	0.072	0.080	0.069	0.108	0.056	−0.173	0.121
ctl	−0.015	−0.031	−0.055	−0.110	−0.241	0.018	0.011	0.021	0.011	0.026	−0.003	0.041	−0.061	0.048	0.508	−0.115
oapw	−0.147	−0.215	−0.311	−0.467	−0.744	0.026	0.023	0.033	0.033	0.040	0.033	0.052	0.022	0.056	0.188	0.013
rmk	0.023	0.024	0.003	−0.078	−0.263	−0.002	−0.004	0.002	−0.003	0.010	−0.007	0.025	−0.042	0.031	0.372	−0.032
sgr	2.385	3.397	4.797	6.846	9.565	−0.281	−0.143	−0.171	−0.101	−0.108	0.003	−0.068	0.258	−0.045	−1.471	0.525
ofd	−0.151	−0.209	−0.290	−0.421	−0.681	−0.020	−0.011	−0.002	0.003	0.017	0.016	0.039	0.010	0.053	0.234	0.025
b_t	0.035	0.048	0.055	0.032	−0.070	0.008	0.002	0.012	−0.003	0.021	−0.020	0.042	−0.107	0.058	0.750	−0.182
mil	−0.039	−0.099	−0.232	−0.523	−1.140	−0.147	−0.145	−0.131	−0.132	−0.100	−0.114	−0.045	−0.132	0.003	0.493	−0.116
mt	−0.044	−0.084	−0.144	−0.253	−0.480	−0.006	−0.007	0.006	0.005	0.018	0.004	0.037	−0.020	0.045	0.309	−0.043
omt	−0.219	−0.394	−0.665	−1.128	−1.941	−0.085	−0.070	−0.047	−0.020	−0.010	0.025	0.028	0.121	0.046	−0.362	0.213
vol	−0.172	−0.269	−0.394	−0.576	−0.917	−0.065	−0.052	−0.031	−0.011	0.002	0.024	0.034	0.079	0.052	−0.135	0.137
pdr	−0.095	−0.154	−0.242	−0.391	−0.652	0.025	0.026	0.037	0.041	0.048	0.047	0.060	0.049	0.063	0.108	0.054
otherPrimary	0.005	0.010	0.020	0.043	0.075	−0.013	−0.011	−0.009	−0.006	−0.006	−0.003	−0.005	0.002	−0.005	−0.033	0.007
TextWapp	−0.030	−0.575	−1.963	−5.140	−10.612	0.114	0.172	0.203	0.298	0.304	0.452	0.351	0.764	0.391	−1.382	1.149
lea	−0.199	−0.585	−1.475	−3.542	−8.687	0.110	0.137	0.169	0.239	0.235	0.349	0.243	0.580	0.237	−1.286	0.863
lum	−0.678	−0.956	−1.290	−1.634	−2.096	−0.459	−0.463	−0.481	−0.465	−0.496	−0.434	−0.518	−0.278	−0.556	−1.762	−0.069
ppp	−0.379	−0.443	−0.464	−0.379	−0.199	−0.068	−0.046	−0.041	−0.010	−0.023	0.038	−0.027	0.169	−0.039	−0.969	0.328
otherManufac	0.072	0.199	0.478	1.064	2.014	−0.035	−0.018	−0.010	0.016	−0.010	0.050	−0.042	0.167	−0.083	−1.111	0.322
mvh	−0.855	−1.311	−1.956	−2.834	−3.989	0.113	0.106	0.111	0.113	0.119	0.122	0.129	0.131	0.133	0.138	0.207
crp	−0.797	−0.876	−0.795	−0.333	0.578	−0.007	0.022	0.022	0.059	0.020	0.110	−0.021	0.302	−0.066	−1.665	0.519
bph	0.133	0.256	0.543	1.159	2.096	−0.026	−0.006	0.009	0.028	0.017	0.057	−0.003	0.131	−0.031	−0.722	0.236
metals	−0.084	−0.099	−0.109	−0.104	−0.110	−0.109	−0.095	−0.094	−0.072	−0.079	−0.034	−0.072	0.063	−0.077	−0.650	0.249
Util_Cons	0.103	0.179	0.267	0.337	0.472	0.145	0.109	0.095	0.059	0.047	−0.009	0.010	−0.130	−0.036	0.581	−0.139
TransComm	−0.055	−0.058	−0.048	−0.018	0.063	0.069	0.074	0.077	0.081	0.076	0.081	0.064	0.086	0.043	−0.090	0.117
OthServices	0.065	0.104	0.161	0.235	0.308	0.059	0.053	0.063	0.048	0.068	0.028	0.079	−0.065	0.082	0.740	−0.141
Primary Agric	***0.177***	***0.239***	***0.326***	***0.447***	***0.548***	***−0.042***	***−0.024***	***−0.019***	***−0.009***	***−0.003***	***0.007***	***0.015***	***0.037***	***0.023***	***−0.067***	***0.073***
Agric-related	***−0.256***	***−0.510***	***−1.034***	***−2.130***	***−4.304***	***−0.063***	***−0.042***	***−0.032***	***0.011***	***0.003***	***0.080***	***0.009***	***0.247***	***0.006***	***−1.086***	***0.456***
All other ind	***−0.177***	***−0.201***	***−0.182***	***−0.062***	***0.179***	***0.026***	***0.031***	***0.034***	***0.042***	***0.032***	***0.051***	***0.018***	***0.086***	***−0.004***	***−0.347***	***0.171***
All industries	***0.010***	***−0.003***	***−0.036***	***−0.118***	***−0.359***	***−0.028***	***−0.012***	***−0.007***	***0.008***	***0.008***	***0.031***	***0.015***	***0.085***	***0.013***	***−0.312***	***0.163***

Source: Authors' calculation based on GTAP-10. Note: Italicised and bold rows represent aggregated sector groupings. The colour shading in the table illustrates percentage deviations from baseline values: dark green indicates the highest positive deviations; yellow reflects slight increases; orange represents modest declines; and red denotes the deepest reductions below baseline levels.

Table A7. Bilateral trade (exports) of SACU to the US-scenario B.

	SACU Exports to US							Rest of SACU Exports to US							
	2025	**2026**	**2027**	**2028**	**2029**	**2038**	**2039**	**2040**	**2025**	**2026**	**2027**	**2028**	**2029**	**2038**	**2039**	**2040**
wht	0.335	0.570	1.048	2.005	3.791	−0.343	−0.347	0.101	0.221	0.370	0.710	1.414	2.699	−0.193	0.202	0.056
gros	0.149	0.272	0.526	1.037	2.009	−0.188	−0.205	−0.060	0.125	0.243	0.511	1.088	2.175	−0.125	0.363	−0.081
v_f	0.113	0.192	0.355	0.683	1.302	−0.096	−0.104	0.030	0.163	0.284	0.558	1.153	2.284	−0.036	0.556	−0.177
osd	0.263	0.399	0.647	1.134	2.017	−0.042	−0.037	0.014	0.125	0.248	0.566	1.295	2.734	0.022	0.966	−0.217
c_b	0.173	0.320	0.633	1.276	2.498	−0.177	−0.200	0.115	−0.797	−0.852	−0.761	−0.508	0.138	0.129	0.530	0.230
ocr_	0.343	0.455	0.673	1.116	1.940	−0.109	−0.106	0.017	5.011	5.002	5.255	6.107	7.697	−0.075	0.752	−0.094
ctl	0.130	0.273	0.581	1.236	2.517	−0.136	−0.151	−0.142	0.096	0.241	0.597	1.412	3.065	−0.054	0.734	−0.279
oapw	5.410	5.592	5.898	6.646	8.082	−0.220	−0.234	−0.041	0.188	0.349	0.737	1.621	3.360	−0.098	0.726	−0.175
rmk	0.243	0.464	0.930	1.939	3.911	−0.261	−0.270	−0.117	0.170	0.401	0.956	2.232	4.735	−0.168	1.013	−0.389
sgr	15.861	16.081	16.524	17.466	19.269	−0.391	−0.439	−0.165	15.707	15.874	16.241	16.999	18.396	−0.231	0.195	0.019
ofd	0.986	1.158	1.497	2.173	3.434	−0.329	−0.352	−0.075	0.951	1.071	1.301	1.777	2.615	−0.253	−0.049	0.049
b_t	0.624	0.730	0.948	1.382	2.201	−0.222	−0.242	−0.044	0.637	0.701	0.820	1.066	1.492	−0.155	−0.056	0.058
mil	0.398	0.712	1.343	2.599	4.964	−0.572	−0.606	−0.130	0.284	0.477	0.866	1.685	3.137	−0.436	−0.018	0.099
cmt	1.498	1.836	2.474	3.844	6.460	−0.446	−0.472	−0.249	1.499	1.763	2.354	3.724	6.337	−0.315	0.634	−0.260
omt	0.478	0.842	1.552	2.998	5.721	−0.618	−0.641	−0.113	0.398	0.712	1.390	2.889	5.690	−0.435	0.771	−0.143
vol	0.590	0.853	1.364	2.331	4.102	−0.327	−0.358	−0.194	0.499	0.720	1.202	2.216	4.085	−0.216	0.475	−0.167
pdr	0.171	0.338	0.706	1.567	3.265	−0.082	−0.064	0.104	0.184	0.440	1.043	2.491	5.336	−0.013	1.701	−0.409
otherPrimary	−0.047	−0.067	−0.065	−0.022	0.104	0.017	−0.039	−0.038	0.032	0.029	0.021	0.005	−0.014	−0.014	−0.016	0.035
TextWapp	7.698	8.156	9.043	11.202	15.552	−0.602	−0.654	−0.279	0.576	0.926	1.666	3.203	6.092	−0.375	0.300	−0.186
lea	1.652	2.033	2.791	4.402	7.519	−0.432	−0.482	−0.414	1.701	2.060	2.783	4.261	6.944	−0.295	0.473	−0.284
lum	0.363	0.624	1.122	2.096	3.893	−0.550	−0.576	−0.016	0.363	0.615	1.136	2.163	3.965	−0.461	0.107	0.017
ppp	0.848	1.105	1.591	2.543	4.303	−0.444	−0.472	−0.116	0.800	1.030	1.490	2.404	4.037	−0.358	0.014	−0.078
otherManufac	0.316	0.557	1.045	1.996	3.758	−0.488	−0.521	−0.009	0.386	0.617	1.093	2.030	3.678	−0.374	0.049	0.014
mvh	1.330	1.981	3.007	4.679	7.408	−0.538	−0.574	−0.035	0.422	0.690	1.209	2.205	3.947	−0.441	−0.030	0.003
crp	0.500	0.781	1.319	2.350	4.250	−0.411	−0.443	−0.165	0.409	0.655	1.157	2.151	3.909	−0.338	0.129	−0.065
bph	0.308	0.591	1.180	2.353	4.572	−0.497	−0.541	−0.222	0.372	0.638	1.192	2.307	4.277	−0.388	0.273	−0.059
metals	0.375	0.656	1.216	2.310	4.347	−0.497	−0.539	−0.146	0.360	0.599	1.087	2.054	3.760	−0.405	0.032	0.013
Util_Cons	0.236	0.418	0.770	1.455	2.717	−0.466	−0.491	0.067	0.277	0.465	0.842	1.587	2.906	−0.399	−0.097	0.041
TransComm	0.193	0.384	0.778	1.565	3.058	−0.362	−0.394	−0.117	0.239	0.409	0.760	1.465	2.719	−0.273	0.103	−0.023
OthServices	0.204	0.405	0.816	1.637	3.193	−0.375	−0.408	−0.119	0.237	0.404	0.745	1.436	2.670	−0.281	0.074	−0.009
Primary Agric	***1.633***	***1.829***	***2.218***	***3.025***	***4.558***	***−0.268***	***−0.284***	***−0.056***	***1.498***	***1.650***	***2.020***	***2.862***	***4.469***	***−0.156***	***0.559***	***−0.111***
Agric-related	***1.781***	***2.032***	***2.531***	***3.631***	***5.773***	***−0.349***	***−0.381***	***−0.127***	***0.609***	***0.850***	***1.357***	***2.421***	***4.393***	***−0.253***	***0.430***	***−0.151***
All other ind	***0.433***	***0.722***	***1.266***	***2.293***	***4.163***	***−0.454***	***−0.489***	***−0.093***	***0.338***	***0.560***	***1.011***	***1.904***	***3.483***	***−0.362***	***0.067***	***−0.011***
All industries	***1.391***	***1.624***	***2.077***	***3.000***	***4.739***	***−0.340***	***−0.365***	***−0.085***	***1.055***	***1.239***	***1.651***	***2.531***	***4.162***	***−0.235***	***0.364***	***−0.082***

Source: Authors' calculation based on GTAP-10. Note: Italicised and bold rows represent aggregated sector groupings. The colour shading in the table illustrates percentage deviations from baseline values: dark green indicates the highest positive deviations; yellow reflects slight increases; orange represents modest declines; and red denotes the deepest reductions below baseline levels.

Table A8. Industry output-SACU (percentage deviations from the baseline)-scenario B.

SACU	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
wht	0.097	0.173	0.326	0.631	1.203	0.048	0.033	0.006	−0.019	−0.043	−0.064	−0.085	−0.100	−0.112	−0.125	0.023
gros	0.039	0.074	0.144	0.279	0.533	0.043	0.031	0.018	0.004	−0.011	−0.024	−0.038	−0.047	−0.057	−0.071	−0.048
v_f	0.005	0.044	0.132	0.318	0.68	0.015	0.007	−0.002	−0.012	−0.021	−0.03	−0.039	−0.045	−0.05	−0.051	0.021
osd	−0.087	−0.07	−0.005	0.161	0.519	0.073	0.057	0.034	0.011	−0.013	−0.034	−0.057	−0.073	−0.087	−0.101	−0.017
c_b	0.079	0.098	0.127	0.177	0.264	0.035	0.03	0.023	0.015	0.007	−0.001	−0.01	−0.017	−0.024	−0.034	−0.073
ocr_	0.01	0.054	0.158	0.385	0.828	0.005	−0.004	−0.014	−0.024	−0.033	−0.04	−0.047	−0.051	−0.054	−0.057	0.052
ctl	0.015	−0.01	−0.077	−0.232	−0.553	−0.003	−0.012	−0.019	−0.025	−0.03	−0.032	−0.033	−0.032	−0.03	−0.027	0.056
oapw	0.069	0.096	0.142	0.222	0.359	0.027	0.013	−0.002	−0.017	−0.03	−0.04	−0.05	−0.056	−0.059	−0.062	0.003
rmk	0.039	0.045	0.035	−0.013	−0.142	0	−0.012	−0.023	−0.032	−0.04	−0.045	−0.049	−0.049	−0.049	−0.05	0.022
sgr	0.208	0.269	0.38	0.587	0.981	0.071	0.059	0.039	0.019	−0.004	−0.026	−0.051	−0.069	−0.088	−0.115	−0.159
ofd	−0.005	0.009	0.036	0.084	0.167	0.03	0.019	0.006	−0.007	−0.019	−0.03	−0.04	−0.047	−0.052	−0.059	−0.008
b_t	−0.003	−0.007	−0.021	−0.062	−0.158	0.005	−0.003	−0.011	−0.018	−0.024	−0.028	−0.032	−0.034	−0.034	−0.036	0.01
mil	0.049	0.062	0.069	0.06	0.017	0.022	0.012	0.001	−0.009	−0.019	−0.027	−0.033	−0.037	−0.041	−0.052	−0.011
cmt	0.007	−0.03	−0.118	−0.318	−0.722	0	−0.01	−0.019	−0.026	−0.032	−0.036	−0.038	−0.038	−0.036	−0.034	0.089
omt	0.055	0.065	0.068	0.051	−0.014	0.009	−0.002	−0.013	−0.023	−0.032	−0.039	−0.045	−0.046	−0.048	−0.056	0.005
vol	0.104	0.182	0.334	0.63	1.19	0.111	0.09	0.063	0.033	0.001	−0.028	−0.058	−0.081	−0.102	−0.125	−0.127
pdr	0.092	0.128	0.183	0.275	0.435	0	−0.013	−0.024	−0.034	−0.042	−0.047	−0.052	−0.053	−0.054	−0.056	−0.001
otherPrimary	0.006	0.011	0.021	0.04	0.073	−0.007	−0.007	−0.008	−0.008	−0.009	−0.009	−0.009	−0.009	−0.008	−0.008	0.002
TextWapp	−0.115	−0.404	−1.129	−2.909	−6.939	0.319	0.285	0.264	0.244	0.225	0.205	0.19	0.181	0.181	0.184	−0.044

Table A8. *Cont.*

SACU	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
lea	0.069	0.072	0.057	−0.008	−0.205	0.106	0.078	0.049	0.02	−0.009	−0.036	−0.06	−0.078	−0.091	−0.102	−0.03
lum	0.017	0.075	0.173	0.341	0.633	−0.058	−0.087	−0.117	−0.144	−0.167	−0.185	−0.196	−0.203	−0.206	−0.211	0.189
ppp	−0.035	0.007	0.093	0.252	0.536	0.027	0	−0.032	−0.062	−0.09	−0.115	−0.135	−0.15	−0.16	−0.164	0.063
otherManufac	0.092	0.204	0.391	0.709	1.246	−0.029	−0.066	−0.102	−0.136	−0.164	−0.186	−0.199	−0.207	−0.207	−0.202	0.09
mvh	−0.161	−0.195	−0.218	−0.178	0.052	−0.052	−0.077	−0.109	−0.133	−0.152	−0.166	−0.171	−0.172	−0.166	−0.155	0.09
crp	−0.098	−0.036	0.106	0.397	0.96	0.059	0.025	−0.014	−0.053	−0.09	−0.123	−0.15	−0.171	−0.186	−0.193	0.019
bph	0.095	0.146	0.227	0.354	0.548	0.056	0.028	−0.003	−0.033	−0.062	−0.087	−0.109	−0.125	−0.135	−0.142	−0.02
metals	0.063	0.184	0.419	0.874	1.735	0.077	0.039	−0.001	−0.043	−0.082	−0.117	−0.148	−0.171	−0.187	−0.194	−0.082
Util_Cons	0.222	0.287	0.283	0.136	−0.303	−0.208	−0.227	−0.237	−0.236	−0.225	−0.206	−0.175	−0.144	−0.109	−0.072	0.281
TransComm	0.041	0.072	0.106	0.132	0.131	0.006	−0.017	−0.04	−0.061	−0.078	−0.092	−0.102	−0.107	−0.108	−0.106	0.035
OthServices	0.041	0.037	−0.002	−0.122	−0.408	−0.015	−0.03	−0.044	−0.056	−0.064	−0.07	−0.071	−0.071	−0.067	−0.06	0.05
Primary Agric	***0.043***	***0.06***	***0.089***	***0.136***	***0.216***	***0.025***	***0.014***	***0.002***	***−0.01***	***−0.021***	***−0.031***	***−0.04***	***−0.046***	***−0.051***	***−0.058***	***−0.01***
Agric-related	***−0.016***	***−0.063***	***−0.202***	***−0.581***	***−1.494***	***0.099***	***0.069***	***0.041***	***0.015***	***−0.01***	***−0.033***	***−0.05***	***−0.063***	***−0.069***	***−0.073***	***0.045***
All other ind	***0.037***	***0.087***	***0.164***	***0.288***	***0.495***	***−0.013***	***−0.041***	***−0.069***	***−0.094***	***−0.115***	***−0.131***	***−0.141***	***−0.146***	***−0.146***	***−0.141***	***0.058***
All industries	***0.032***	***0.05***	***0.068***	***0.075***	***0.046***	***0.025***	***0.006***	***−0.013***	***−0.031***	***−0.047***	***−0.061***	***−0.071***	***−0.078***	***−0.082***	***−0.085***	***0.018***
Rest of SACU																
wht	0.146	0.252	0.507	1.043	2.034	−0.051	−0.051	−0.071	−0.088	−0.09	−0.113	−0.099	−0.149	−0.106	0.25	0.021
gros	−0.01	−0.008	0.001	0.017	0.026	−0.025	−0.024	−0.022	−0.017	−0.014	−0.007	−0.004	0.005	0.004	−0.019	−0.019
v_f	−0.109	−0.124	−0.14	−0.161	−0.181	0.013	0.009	0.006	0.004	0.001	0.001	−0.002	−0.001	−0.005	−0.024	−0.003
osd	−0.019	−0.021	−0.022	−0.029	−0.059	−0.008	−0.007	−0.007	−0.003	−0.005	0.002	−0.003	0.013	−0.002	−0.119	−0.012
c_b	0.672	0.785	0.964	1.307	1.875	−0.222	−0.212	−0.206	−0.198	−0.178	−0.174	−0.141	−0.161	−0.113	0.17	−0.085
ocr_	0	0.007	0.035	0.099	0.235	0.025	0.022	0.021	0.018	0.017	0.012	0.015	0.004	0.012	0.088	−0.046
ctl	−0.005	−0.025	−0.077	−0.21	−0.532	0.001	−0.001	−0.005	−0.004	−0.011	−0.006	−0.017	0.003	−0.021	−0.184	0.063
oapw	−0.03	−0.025	−0.013	0.009	0.038	−0.004	−0.003	−0.003	−0.001	−0.002	0.001	0	0.007	0.002	−0.042	−0.018
rmk	0.004	−0.01	−0.049	−0.149	−0.371	−0.07	−0.056	−0.047	−0.034	−0.029	−0.016	−0.017	0.007	−0.008	−0.161	0.062
sgr	0.778	0.912	1.121	1.524	2.192	−0.25	−0.238	−0.23	−0.221	−0.197	−0.193	−0.152	−0.18	−0.119	0.245	−0.129
ofd	−0.092	−0.107	−0.125	−0.159	−0.252	−0.07	−0.063	−0.057	−0.046	−0.038	−0.024	−0.019	0	−0.004	−0.091	0.043
b_t	−0.011	−0.018	−0.038	−0.089	−0.211	−0.005	−0.004	−0.006	−0.002	−0.008	0.002	−0.012	0.019	−0.014	−0.257	0.008
mil	−0.019	−0.048	−0.112	−0.258	−0.586	−0.104	−0.096	−0.09	−0.074	−0.064	−0.04	−0.032	0.006	−0.005	−0.174	0.104
cmt	−0.034	−0.103	−0.266	−0.662	−1.599	−0.04	−0.045	−0.05	−0.05	−0.055	−0.051	−0.056	−0.043	−0.057	−0.152	0.302
omt	−0.02	−0.038	−0.063	−0.106	−0.204	−0.062	−0.056	−0.044	−0.031	−0.013	−0.001	0.021	0.021	0.046	0.171	−0.033
vol	−0.037	−0.045	−0.041	−0.019	0.006	−0.068	−0.063	−0.055	−0.044	−0.032	−0.019	−0.007	0.002	0.012	0.041	−0.005
pdr	−0.012	−0.015	−0.018	−0.028	−0.058	−0.014	−0.014	−0.013	−0.01	−0.008	−0.003	−0.002	0.005	0.003	−0.035	−0.025
otherPrimary	0.009	0.012	0.021	0.038	0.065	−0.014	−0.013	−0.011	−0.01	−0.009	−0.008	−0.007	−0.007	−0.005	0.002	0.003
TextWapp	−0.027	−0.379	−1.274	−3.311	−7.124	0.007	−0.004	0.016	0.041	0.088	0.103	0.165	0.142	0.248	0.741	−0.235
lea	−0.001	−0.164	−0.531	−1.337	−3.257	−0.184	−0.194	−0.173	−0.15	−0.099	−0.076	−0.015	−0.032	0.059	0.493	0.136
lum	−0.284	−0.321	−0.314	−0.209	0.002	−0.405	−0.42	−0.425	−0.428	−0.409	−0.408	−0.371	−0.397	−0.338	−0.006	0.736
ppp	−0.19	−0.184	−0.132	0.014	0.281	−0.154	−0.16	−0.158	−0.154	−0.14	−0.134	−0.113	−0.122	−0.088	0.081	0.067
otherManufac	0.134	0.246	0.469	0.905	1.658	−0.194	−0.194	−0.186	−0.18	−0.162	−0.157	−0.132	−0.148	−0.107	0.116	−0.002
mvh	−0.585	−0.808	−1.096	−1.47	−1.971	−0.053	−0.039	−0.027	−0.012	−0.002	0.013	0.019	0.041	0.039	−0.054	−0.017
crp	−0.383	−0.324	−0.121	0.378	1.312	−0.184	−0.202	−0.21	−0.219	−0.205	−0.211	−0.18	−0.219	−0.153	0.263	0.048
bph	0.183	0.301	0.544	1.026	1.836	−0.163	−0.175	−0.178	−0.18	−0.171	−0.168	−0.156	−0.165	−0.141	0.007	−0.016
metals	−0.018	−0.013	0.001	0.031	0.06	−0.228	−0.203	−0.179	−0.155	−0.127	−0.107	−0.078	−0.07	−0.04	0.039	0.119
Util_Cons	0.031	0.033	0.007	−0.086	−0.253	−0.072	−0.034	−0.012	0.005	0.004	0.012	−0.004	0.023	−0.013	−0.3	0.06
TransComm	−0.022	−0.019	−0.011	0.005	0.04	−0.048	−0.05	−0.049	−0.046	−0.043	−0.039	−0.036	−0.031	−0.03	−0.064	0.009
OthServices	0.035	0.046	0.058	0.062	0.039	−0.005	−0.007	−0.013	−0.011	−0.02	−0.011	−0.03	0.004	−0.036	−0.324	−0.018
Primary Agric	***0.067***	***0.022***	***−0.045***	***−0.199***	***−0.547***	***−0.083***	***−0.082***	***−0.077***	***−0.069***	***−0.058***	***−0.05***	***−0.036***	***−0.033***	***−0.017***	***0.041***	***0.048***
Agric-related	***−0.126***	***−0.268***	***−0.22***	***−0.043***	***0.320***	***−0.146***	***−0.149***	***−0.145***	***−0.141***	***−0.127***	***−0.122***	***−0.102***	***−0.112***	***−0.077***	***0.102***	***0.024***
All other ind	***−0.078***	***0.07***	***0.12***	***0.208***	***0.344***	***−0.103***	***−0.094***	***−0.086***	***−0.077***	***−0.071***	***−0.063***	***−0.061***	***−0.048***	***−0.052***	***−0.128***	***0.031***
All industries	***0.003***	***−0.007***	***−0.024***	***−0.061***	***−0.165***	***−0.088***	***−0.087***	***−0.083***	***−0.077***	***−0.067***	***−0.061***	***−0.049***	***−0.047***	***−0.033***	***0.023***	***0.037***

Source: Authors' calculation based on GTAP-10. Note: Italicised and bold rows represent aggregated sector groupings. The colour shading in the table illustrates percentage deviations from baseline values: dark green indicates the highest positive deviations; yellow reflects slight increases; orange represents modest declines; and red denotes the deepest reductions below baseline levels.

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