

Assessing the Economic Impact of the ECOWAS CET and Economic Partnership Agreement on Ghana

Executive Summary

The Economic Community of West African States (ECOWAS) Common External Tariff (CET) has been agreed upon among member countries and is awaiting parliamentary review and approval in Ghana. Once the CET is implemented, it will constitute sizeable changes to Ghana's tariff structure. In Accra, on July 10, 2014, the ECOWAS heads of state announced their decision to endorse the European Union–ECOWAS (plus Mauritania) Economic Partnership Agreement (EPA). Since then, all European Union member countries and most of the 16 West African countries have signed the EPA, with those remaining expected to do so shortly. The EPA will result in the gradual opening of Ghana's market to 75 percent of the tariff lines, equivalent to around 65 percent of the value of imports from the European Union, by 2035.

This study adds value to previous studies by combining a simple partial equilibrium approach with household- and firm-level data, thus limiting assumptions but deriving intuitive and policy relevant results. Working at the detailed product and firm level and with actual customs revenue and tax data, the analytical framework adds precision to the assessment of the potential short-term effects. It is also the only study on Ghana to use the finalized EPA market access offer and trade and customs data at the most detailed (10-digit) product line level. By considering the effects of the major regional trade reform implied by the CET, the study analyzes the EPA in the context of an appropriate counterfactual, which has not been done in previous studies.

Impact of the CET

The CET raises some tariffs and lowers others; the overall impact amounts to an increase in the average tariffs faced by non-ECOWAS countries. The CET thereby leads to an increase in tariff protection from 7.9 to 9.8 percent, an increase in tariff revenues by an estimated 2.8 percent, an increase in ECOWAS imports by 5 percent, and a fall in total imports by an estimated 1 percent.

Although manufacturing firms are split roughly 50/50 into winners and losers from the CET, winners gain more than losers lose in the magnitude of the effect, and very few manufacturing firms become unprofitable as a result of the CET. However, wins from the CET mainly result from higher protection on outputs. This can produce windfall gains for benefiting firms in the short run, but imposes a burden on consumers and may have a detrimental effect on competitiveness and growth in the future.

As a result of higher output prices, Ghanaians in the lowest income households are estimated to experience a 0.8 percent increase in the price of their consumption bundle. At the same time, the CET may slightly raise the cost of imported capital equipment, while its effect on the prices of inputs used by firms in the Ghanaian manufacturing sector is ambiguous. In the short term, losses to manufacturing firms as a result of the CET occur mainly in the food and beverage, apparel, chemical products, and metal products sectors.

Impact of the EPA

The EPA can only be implemented following the CET, as the CET has been used as the basis for the EPA negotiations and is integral to the tariff structure of the EPA. The EPA is therefore modeled on top of the CET. The effect of the EPA on imports is much smaller than that of the CET. This is because the EPA applies to imports originating from the European Union only. Around 35 percent of the value of EU imports is excluded from liberalization, and two-thirds of the value of imports actually included faces low tariffs of between 0 and 5 percent. The EPA implies a meaningful tariff reduction for only 20 percent of the products currently imported from the European Union. The effects occur gradually over the 20-year EPA implementation period.

The EPA causes a moderate decline (from the CET baseline level) in tariff protection to 8.7 percent (from 9.8 percent) and thus a fall in tariff revenue, and an increase in imports and trade diversion toward the European Union. By full implementation in 2035, total government revenue is estimated to fall by 1.6 percent from the CET level as a result of the EPA. However, because the CET precedes this with a larger increase in tariffs, the combined EPA and CET tariff reforms result in a 1.2 percent increase in import revenues.

Ghanaians in the lowest income households are estimated to benefit from a small 0.2 percent reduction in the price of their consumption bundle due to the EPA.

The EPA is estimated to increase profitability for 77 percent of firms in the manufacturing sector, mainly through lower input prices and prices for capital equipment. An estimated 84 percent of workers in the manufacturing sector are employed by firms that benefit from implementation of the EPA. As benefits occur mainly through lower prices for imported inputs and capital equipment, rather than higher output prices, there is no harm to consumers and there is potential for a longer-term boost in productivity and growth. This is consistent with the focus of the EPA being to target tariff reductions on inputs and intermediate products.

Profit losses for manufacturing firms are concentrated in the mineral products and furniture sectors, yet very few manufacturing firms become unprofitable as a result. Although the effect of the EPA on Ghana's exports to ECOWAS markets is ambiguous, continued duty-free access to the EU market particularly benefits many of the priority sectors in Ghana's National Export Strategy, 2013-17. The priority sectors include processed cocoa products, fruit and vegetable products, and fish.

Policy Actions

The precise effect on consumer prices and firm profits, from the CET and the EPA, will depend on how competitive the import market and distribution networks are, as these will determine the extent to which a change in tariffs is passed through to prices. Policy makers can improve the extent to which prices are passed on to consumers by ensuring that consumers have access to information on what these tariff changes are, and by instituting policies to improve the competitiveness of the import markets and distribution networks.

The impact of the CET and EPA is relatively small compared with even a minor acceleration in productivity growth. Examples of potential productivity-enhancing policy reforms—which could form possible targets for EPA Development Programme support, offset negative effects, and boost overall competitiveness—include reducing electricity outages and lowering transport costs. The key point is that the focus of attention should be on making the economy more competitive, which will in turn boost and diversify trade.

Policies to reduce the revenue loss impact of the EPA include the reduction and simplification of tariffs and tax exemptions, which are pervasive in Ghana’s customs structure. These policies would also reduce administration and compliance costs, as well as the potential for rent-seeking and corruption. Such simplifications are envisaged as part of the agreed CET and should be fully implemented.

Although the average effects of the CET and EPA are not very large, both trade reforms and especially the CET may lead to substantial adjustment dynamics with workers and capital likely eventually to move across sectors as well as across firms within given sectors. These dynamics create a policy challenge to ensure that such adjustment, on the one hand, can take place freely so the Ghanaian economy can take full advantage of new market opportunities. On the other hand, it will be equally important to ensure that adequate policy measures are in place to accompany the transition, ensure a socially equitable adjustment process, and prevent those who are affected negatively from dropping out of the labor market.

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This paper is intended to inform the discussions around the EPA between West Africa and Europe. The findings, interpretations, and conclusions are those of the authors and do not necessarily reflect the views of the institutions to which they are affiliated. The World Bank does not guarantee the accuracy of the data included in this work.

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1. Introduction

Careful analysis of trade policy adjustments enables policy makers to make well considered, evidence-based decisions. Such analysis facilitates the judicious evaluation of trade policy adjustments and the identification of the involved effects, which can provide direction for accompanying policy measures. Although a reduction in tariffs can be used to support a competitive, export-oriented development path, it is important to understand and quantify the revenue implications, impact on consumers, and effects on the competitiveness of firms and jobs. A good understanding of these impacts can help inform the design of accompanying policies to lessen the cost of adjustments, particularly when these fall heavily on specific groups, as well as to maximize the benefits.

Ghana is currently facing two major trade policy adjustments. The Economic Community of West African States (ECOWAS) Common External Tariff (CET) is a significant milestone within the long history of regional integration in West Africa. Upon implementation, which is predicted before the end of 2015, the CET will constitute a sizeable adjustment to Ghana's tariff structure. While tariffs on many products will be reduced, tariffs on others will increase, including the introduction of a new 35 percent tariff rate for products considered particularly sensitive. In addition to the CET, Ghana faces the Economic Partnership Agreement (EPA) with the European Union, which has been designed to build on the CET in West Africa. Although the CET will change Ghana's tariffs on all imports from outside ECOWAS, the EPA will change only those tariffs faced by the European Union. The EPA has been signed by all European Union member countries and most of the 16 ECOWAS countries (plus Mauritania), with those remaining expected to do so shortly. Entry into force will require all countries in the West Africa Party to sign and two-thirds to ratify. The EPA will allow duty-free access to the West African countries for a sizeable share of products originating from the European Union, and continued 100 percent duty-free access for exports to the EU market.

Public debate concerning the EPA has been lively. Concern has been expressed over the reduction of protection and the effect this could have on jobs and government revenues. As a result, agreement to the EPA by all the West African countries has been delayed. This study aims to enhance the debate by presenting an intuitive and data-driven technical perspective on the likely effects of the CET and the EPA. To the extent possible, given limited available data, the study provides projections of the impacts on government revenue and imports; the outcome for consumer prices, focusing particularly on the lowest income consumer groups; the effect on firm competitiveness and jobs; and the implications for export market access. By considering the effect of regional trade reform implied by the CET, the study also analyzes the EPA in the context of an appropriate counterfactual. The CET is the basis for the EPA tariff structure and is a prerequisite for implementation of the EPA.

The study seeks to improve the information available to policy makers in Ghana. This is highly relevant, as the CET currently awaits parliamentary approval and the EPA will soon also require ratification. The study also aims to expand the information with which policy makers can develop accompanying policies to support and derive maximum benefit from the CET and EPA trade reforms. The first stage of the study employs the Trade Reform Impact Simulation Tool (TRIST), which was developed by the World Bank. The

study uses the finalized CET and EPA tariff schedules at the most detailed (10-digit) tariff line level, and 2013 Customs Excise and Preventive Service (CEPS) data on imports, exemption rates, tariff revenue, value-added tax (VAT) and National Health Insurance Levy (NHIL) revenue, excise duty, and the over-age penalty for vehicles.

The TRIST tool provides a static partial-equilibrium perspective. Its advantage is in generating results that are intuitive and transparent to a nontechnical audience, and that rely on a limited number of assumptions, while adding product-level precision and detail to the expected results. The level of detail enables the results to be combined with the wealth of firm-level information contained in a 2007 World Bank Enterprise Survey of Ghana and the 2013 Ghana Living Standards Survey (GLSS) on households to analyze effects at the household and firm level (appendixes C and D). This second stage of the analysis follows a new methodology developed in Uexkull and Shui (2014) for analyzing the effect of the CET on Nigeria.

The TRIST tool is well suited to trade policy analysis and has already been used to investigate the effect of the interim-EPA on Nigeria (Andriamananjara et al. 2009); the EPA on Côte d'Ivoire (Hoppe 2010); the EPA on all Common Market for Eastern and Southern Africa countries (Brenton, Hoppe, and von Uexkull 2007); the EPA on Zambia (Cheelo, Malata, and Tembo 2012); and the CET on Zimbabwe (Mugano, Brookes, and Le Roux 2013); as well as for other trade studies on Bolivia, Ethiopia, Jordan, Kenya, Madagascar, Mauritius, Morocco, Syria, Tanzania, and Tunisia. The extension of TRIST results to firm- and household-level effects has been utilized in studies analyzing the effect on Nigeria of the ECOWAS CET (Uexkull and Shui 2014) and the EPA with the European Union (Uexkull et al. 2014).

However, the methodology has several important limitations. First, as is standard for models of this type, our approach excludes general equilibrium effects such as adjustment within and between firms, sectors, and households. The study thus represents a short-term perspective on the true impact of the CET and EPA. In the medium and longer terms, firms are likely to adjust their production patterns in response to changes in domestic prices, capital and labor may shift from one sector to another, and households may adjust their consumption patterns in response to changes in prices and income.

Second, the model is mute on the macroeconomic adjustment process to the trade reform, which typically would take place through the real exchange rate, as well as key long-term macro aggregates, such as economic growth and investment.

Third, the study focuses on the market access aspects of the CET and EPA trade reforms and, within this, on the impact on consumers and the manufacturing sector. To derive a comprehensive impact assessment, further analysis on the effects of the CET and EPA, in particular on investment, trade facilitation, services trade, and the agricultural sector, would be highly desirable.

Fourth, the firm-level survey data (2007) are somewhat dated at this point.

The study is structured as follows. Section 2 summarizes the market access content of the CET and EPA. Section 3 analyzes the effects of each reform on revenues and imports, section 4 looks at the effects on consumers, and section 5 examines the effects on firms' competitiveness and jobs. Section 6 looks at potential accompanying measures and section 7 concludes.

Throughout the report, we present the results for six scenarios: (1) the effect of the CET only, which is to be implemented before the end of 2015; the effect of each stage of the EPA implemented on top of the CET: (2) CET + EPA2020, (3) CET + EPA2025, (4) CET + EPA2030, and (5) CET + EPA2035; and (6) the net effect of the EPA, where the EPA is implemented from a baseline where the CET is already in place (EPA2035 from CET). With the exception of scenario 6, in which the CET is the baseline, the baseline for each scenario is the current trading regime.

2. Summary of CET and EPA

- The CET will reduce tariff protection in some sectors and increase it in others. The CET is estimated to increase the trade-weighted average tariff from 7.9 to 9.8 percent.
- The EPA will reduce average tariffs from the level established by the implementation of the CET. The combined effects of the EPA and the CET will nevertheless leave average tariffs higher than their pre-CET level, at 8.7 percent.
- Although the EPA exclusion list covers 25 percent of the tariff lines, this corresponded to as much as 35 percent of the value of imports from the European Union in 2013.

The CET is to replace Ghana's current tariff schedule with complete free trade for ECOWAS countries and new CET rates for the rest of the world. Although Ghana's tariff rates are already structured similarly to those of the CET, full adoption of the CET will require a reduction of certain tariffs and an increase of others, as well as the introduction of a new 35 percent tariff rate for products considered particularly sensitive, such as printed fabrics, poultry, and other meats. Using 2013 trade data and assuming for now that trade flows remain unaffected by tariff adjustments, the CET would reduce the proportion of imports that enters Ghana duty free from 18 to 3 percent. Those tariffed at 5 percent will increase from 12 to 32 percent. The proportion of imports tariffed at 10 percent will fall from 38 to 27 percent, and those tariffed at 20 percent will increase slightly from 31 to 32 percent. The proportion of imports to be tariffed at the new 35 percent rate will be approximately 5 percent.

Table 1. CET Summary Statistics				
	Proportion of tariff lines		Proportion of value of 2013 imports	
	Pre-reform	CET (2015)	Pre-reform	CET (2015)
0% rate	12%	1%	18%	3%
5% rate	6%	36%	12%	32%
10% rate	39%	23%	38%	27%
20% rate	43%	37%	31%	32%
35% rate	-	2%	-	5%

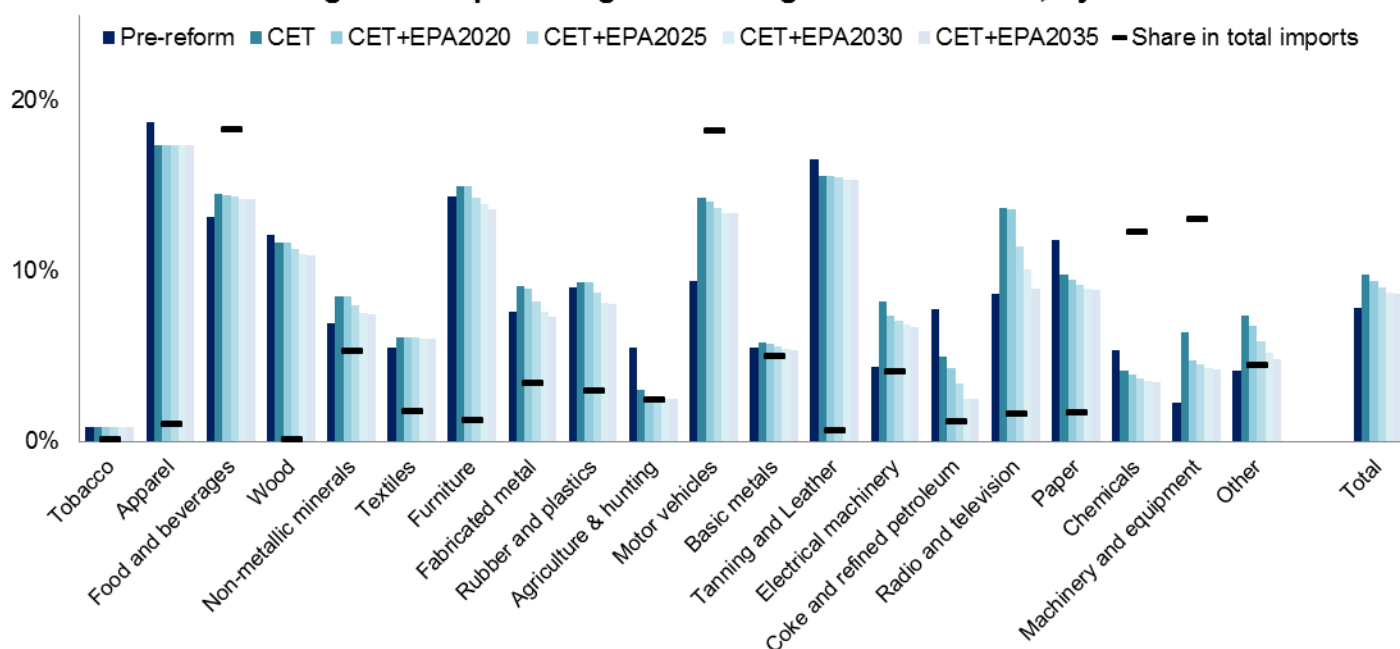
Source: ECOWAS Commission and CEPS.

The EPA has been negotiated at the ECOWAS regional level. It offers the European Union duty-free market access to ECOWAS for 75 percent of tariff lines. Market access opening is to occur gradually over a period of 20 years, including an initial five-year moratorium during which no reduction from the CET rates will occur. Market opening is split into four groups: tariffs on tariff lines included in group A will be eliminated by 2025, those in group B by 2030, and those in group C by 2035 (table 2). Tariff lines included in group D are to be excluded from liberalization. Although this exclusion list extends to about 25 percent of all tariff lines, the impact varies among ECOWAS countries, depending on their import structure, in terms of products and trading partners. For Ghana, the 25 percent of tariff lines excluded corresponded to around 35 percent of the value of imports into Ghana from the European Union in 2013.

Table 2. EPA Summary Statistics						
	2020	2025	2030	2035	Proportion of total tariff lines	Proportion of EU imports (by value, 2013)
Group A	All tariffs to 0	0	0	0	37%	39%
Group B	No change	Tariffs at 5% go to zero, others cut 50%	All tariffs to 0	0	19%	18%
Group C	No change	Tariffs at 5% go to zero, others cut 50%	Tariffs now at 5% go to zero, others cut 50% again	All tariffs to 0	19%	9%
Group D	No change	No change	No change	No change	25%	35%

Source: ECOWAS Commission and CEPS.

B

Figure 1. Import weighted average tariff with EPA, by Sector

Source: Calculation based on TRIST results.

Figure 1 shows the import-weighted average tariff for imports entering Ghana, grouped by sector. The leftmost bar for each sector shows the current (pre-reform) average tariff, the second bar shows the average tariff under the CET, and the final four bars show the average tariff under each consecutive stage of EPA implementation. The rightmost bar hence shows the average tariff for each sector by the time of complete EPA tariff reform in 2035. Unlike the numbers presented in Table 1, these results are derived with TRIST and include an import response to the changes in tariffs. This is important for the effects of preferential liberalization, such as in the case of the EPA, where some imports will be diverted from duty-paying trade partners to duty-free EU firms, thus further reducing the applied level of tariff protection. The horizontal black bars in the figure illustrate the relative importance of each sector by highlighting the proportion of total imports accounted for by each sector before any trade reform.

The weighted-average tariff rate applied under the current tariff regime is 7.9 percent. According to the TRIST results, this would increase to 9.8 percent once the CET is implemented. The EPA is estimated to partially offset this increase, causing the average rate to fall to 8.7 percent by full EPA implementation in 2035. The CET causes a larger impact to Ghana's tariff structure than the EPA for most sectors, and results in a larger change to the total average tariff rate.

The largest tariff increases caused by the CET occur for the radio and television sector, followed by the motor vehicles, machinery and equipment, electrical machinery, and other sectors. The CET reduces tariffs most for the coke and refined petroleum sector, followed by the agriculture and hunting, paper, and apparel sectors.

The EPA reduces tariffs on all sectors with the exception of the tobacco and apparel sectors, where tariffs remain unchanged. The largest tariff reductions accrue to the radio and television sector, followed by the other, coke and refined petroleum, machinery and equipment, fabricated metal, and electrical machinery sectors.

3. Effects on Revenue and Imports

3.1 Import Revenue

- The CET will result in a 10 percent increase in annual revenue from taxes on imports.
- The EPA will gradually reduce the extent of increase in import tax revenue caused by the CET. By full EPA implementation in 2035, import tax revenue will be approximately 5.4 percent lower than under the CET only, but 4.1 percent higher than in a scenario with neither reform.
- Import revenues account for only a small proportion of total government revenue. In the context of total government revenues and a conservative revenue growth rate, the CET will increase total annual government revenue by 2.8 percent. This corresponds to a GHc 464 million (US\$224 million) increase in government revenue in 2015.
- The EPA will reduce total annual government revenue by 1.6 percent (GHc 485 million or US\$234 million) from the CET level by 2035, but leave government revenue 1.2 percent (GHc 352 million or US\$170 million) higher than if neither reform were implemented.
- The CET will cause imports to drop by around 1.0 percent annually. The EPA will offset this negative impact on imports by 0.5 percent by full implementation in 2035.
- The CET will increase the proportion of imports originating in ECOWAS, and the EPA will increase the proportion of imports originating in the European Union, at the expense of other trading partners.

Tariff revenue is not the only revenue collected on imports at the border. In Ghana, excise duty, VAT, and NHIL are also applied on imports. In 2013, tariff revenue accounted for only around 40 percent of total import tax revenue. This proportion is important in assessing tariff reforms such as the EPA, as the proportional change in import tax revenue from such a reform would be exaggerated were other import revenue sources ignored (Brenton et al. 2009). For the TRIST used in this study, data collected by CEPS on excise duty, VAT, NHIL, the over-age penalty, and tariff revenues were used (box 1).

Box 1: The World Bank's Tariff Reform Impact Simulation Tool (TRIST)

TRIST was designed with the specific task of providing policy makers with detailed insights into the short-term effects of trade reform by product and tax instrument. By its comparative static nature, TRIST allows the comparison of two states—one in which the base values of policy instruments (such as tariffs) are unchanged and another in which these base values are exogenously changed. TRIST is an Excel-based tool that does not require expert knowledge in modeling or specialized software and is designed to handle very disaggregated information.

An integral part of TRIST is the trade model that underlies the quantification of the effects of trade reform. The model is based on five core assumptions.

First, the model is derived from standard consumer demand theory and utilizes elasticities to determine the magnitude of the demand response to the price changes that result from a tariff reform.

Second, the calculations are based on the standard Armington (1969) assumption of imperfect substitution between imports from different trading partners, since consumers distinguish products by the place of production. This intuitive assumption is standard in empirical international trade work and implies that a fall in the price of imports from country A relative to country B will only lead to a partial and not complete substitution of imports from country B with imports from country A.

Third, the model does not allow for direct substitution between different products. In other words, each product is modeled as a separate market and in isolation from other markets. This is perhaps the strongest assumption used in the model. However, a relaxation would not only complicate computations, but would also generate a need for a range of additional ad hoc assumptions regarding the precise design of the additional substitution effect and its parameterization.

Fourth, it is assumed that all changes in tariffs are fully passed on and that the world price remains unchanged. That is to say, an infinite supply elasticity of imports is assumed so that changes in demand in the importing country are small enough relative to the world so that they have no effect on the world price of the product.

Fifth, the trade model in TRIST is a partial equilibrium model that treats demand for each product in isolation from the rest of the economy. Hence, it does not take into account inter- and intra-sectoral linkages or the economywide impacts of tariff changes. But this is not the primary objective of TRIST, which is designed to avoid the degree of aggregation of the data that would be necessary to implement economywide computable equilibrium models, and to remain simple and transparent in its assumptions, with the flexibility to adjust the key parameters. A detailed discussion of the trade model in TRIST can be found in Brenton et al. (2009).

As do most partial and general equilibrium trade models, TRIST uses elasticities as the parameters of the model that determine how trade flows react to a given change in prices. Elasticities are notoriously difficult to estimate and so detailed and robust estimates of the required elasticities for import demand and substitutions between imports from different trading partners are not readily available in the literature.

In the absence of empirically estimated country-specific elasticities, the model is calibrated with different scenarios of standard elasticities for substitution between trading partners ("exporter substitution") and the overall effect on import demand ("demand elasticity"). Standard elasticities, shown in TRIST result tables as "low ϵ ," are set at 1.5 for exporter

Source: Brenton et al. 2009.

Using data on revenues actually collected by customs—rather than assuming that tariffs are being collected as scheduled—enables us to account for the many exemptions applied on imports entering Ghana. For instance, many imports by government institutions, international agencies, embassies, nongovernmental organizations, religious bodies, free zone companies, or those entering bonded warehouses are exempted from some or all statutory import duties. In 2013, around 30 percent of all statutory import duties was exempted. If we were to ignore these exemptions, we would exaggerate the

cost of tariff liberalization, as we would include significant amounts of tariff revenue that was never actually collected.

As with most trade models, TRIST results depend on elasticities as the parameters of the model that determine how trade flows react to a given change in tariffs. TRIST uses two sets of elasticities: demand elasticities that determine the extent to which consumption of a given product increases when its price falls, and substitution elasticities that determine the extent to which imports of a given product from one trading partner are replaced with imports of the same product from another trading partner in the case of a preferential tariff reform.¹ The mathematical definitions of these elasticities and other model assumption of TRIST are discussed in detail in Brenton et al. (2009).

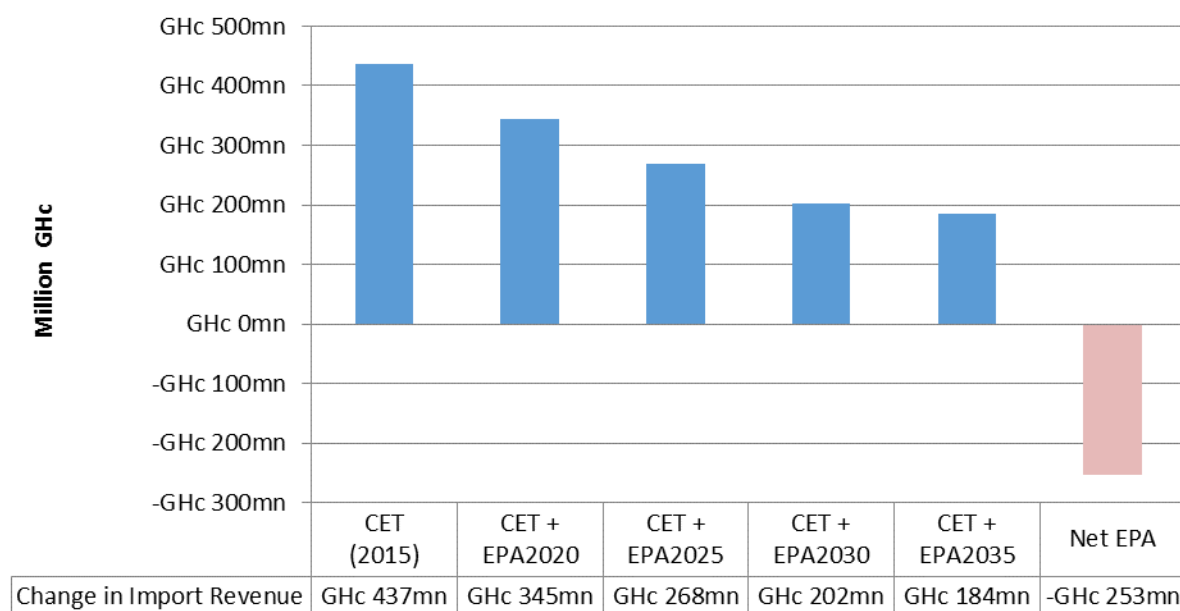
Detailed and robust estimates of elasticities for consumer demand and import substitutability are highly difficult to estimate and no empirically estimated values are currently available for Ghana. The elasticities used hence follow the standard values applied in Brenton et al. (2009) and Andriamananjara et al. (2009). The sensitivity of the results with respect to these elasticities is shown in appendix A. Importantly, the results obtained for revenues, protection levels, and prices, which in turn determine the consumer price and firm profitability effects investigated in sections 4 and 5, are only marginally affected by different elasticities, being primarily determined by the structure of the trade data and the tariff reform scenario. The results for the composition and total volume of imports depend more strongly on the elasticities. However, the total import response is likely to be limited to around a 1-1.9 percent decrease with the CET, and a net 0.5-1 percent increase with the EPA.

The revenue results presented in figure 2 are calculated in TRIST in a static before-after framework. In other words, the results represent only the change in revenue caused by the immediate impact of the CET and EPA implementation. However, tariff changes will be phased in over a period of time, and imports as well as other sources of revenue are likely to grow and be affected by other shocks not accounted for by the model over the same time period. The other effects may well outweigh the impact of the CET and EPA. The results are in constant 2013 cedis; the average GHc/US\$ exchange rate was approximately 2 in 2013.

The CET is found to increase import revenue by an estimated 10 percent, while the EPA is estimated to offset this increase by 5.2 percent when it is fully implemented in 2035. However, import revenue will still remain an estimated 4.2 percent higher than pre-reform even by full EPA implementation. Import revenue accounts for only a small proportion of total government revenues. By 2035, the EPA is estimated to contribute to a 1.6 percent fall in annual government revenue relative to a baseline in which only the CET is implemented; however this still remains 1.2 percent higher than in a scenario in which neither reform is implemented. The opposite is forecast for imports, which are estimated to fall with the CET before partially recovering with the EPA. The CET results in an increase in ECOWAS imports, while the EPA increases the proportion of EU imports.

¹ As sufficient domestic production data were unavailable for Ghana, the demand elasticities are effectively import demand elasticities.

Figure 2. Static Change in Import Revenue

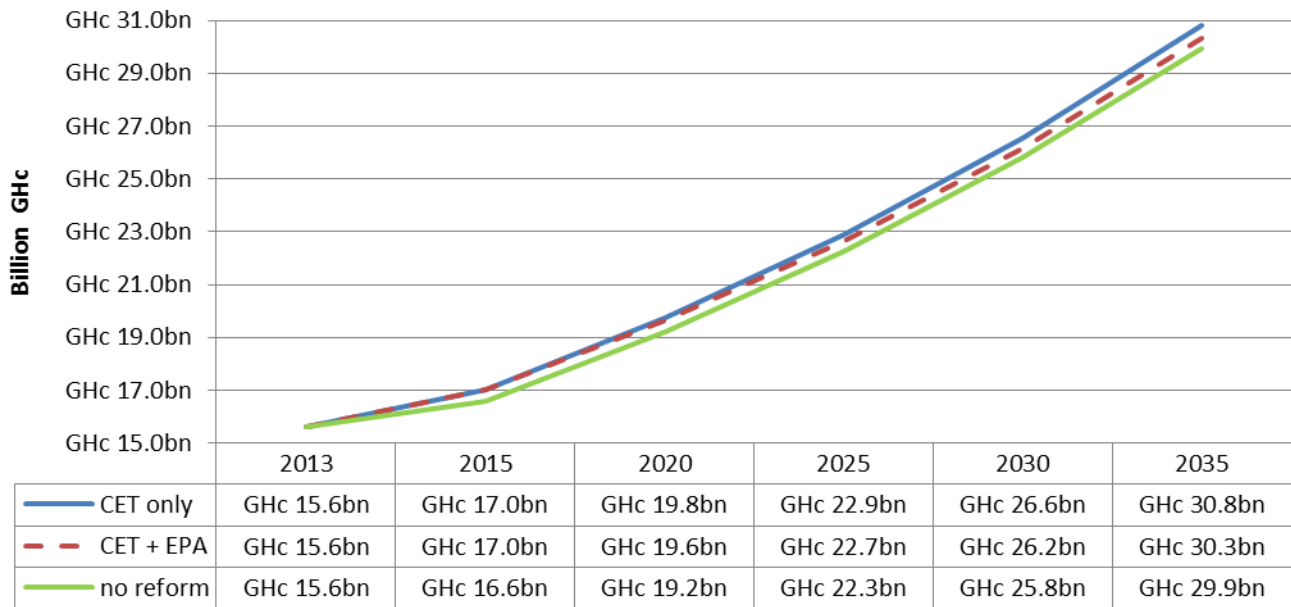


Source: Calculation based on TRIST results.

To demonstrate the relative order of magnitude of these changes over time and in the context of Ghana's overall fiscal situation, the revenue results presented in figure 3 combine the static changes shown in figure 2 with a simple assumption of 3 percent annual growth in all government revenue sources, using fiscal data from the 2013 International Monetary Fund (IMF) Article IV report as the base.² The 3 percent annual growth rate applies to all revenue, including import revenue. This means that the effect of each reform is appropriately magnified to incorporate a higher import revenue base in future years. Other than the growth implied by the 3 percent import revenue growth and the impact of the two reform scenarios, no further assumptions are made as to the structure or evolution of future imports.

² This baseline growth rate is highly conservative compared with forecasts. For instance, the IMF forecasted total government revenue to rise to GHc 25.07 billion by 2015 and GHc 51.77 billion by 2019 (IMF 2014). As other revenue sources increase in importance, the relative reliance on import revenues and hence the noticeable impact of import revenue losses from the EPA will fall.

Figure 3. Projected Impact of CET and EPA on Government Revenue with a 3% Growth Path



Source: Calculation based on TRIST results.

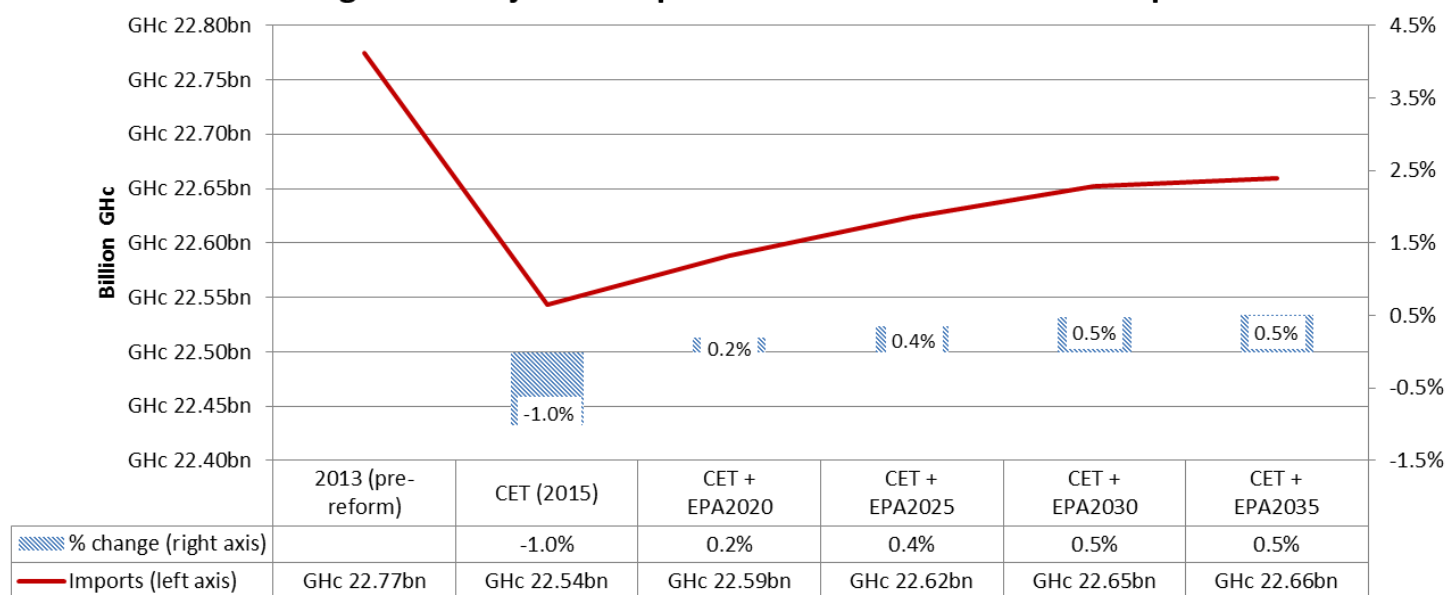
The solid blue “CET only” line in figure 3 shows forecasted government revenue growth in a scenario in which only the CET is implemented. The dashed red “CET + EPA” line shows government revenue growth in a scenario in which both the CET and EPA are implemented, and the final solid green line shows a scenario in which neither reform is implemented. The CET raises the baseline for revenue collected on imports by around 10 percent from 2015, which in turn raises total annual government revenue by 2.8 percent. This corresponds to a GHc 464 million (US\$224 million) increase in revenue in 2015. By the time the EPA is fully implemented in 2035, annual government revenue is estimated to be around 1.6 percent (GHc 485 million or US\$234 million) lower than in the scenario in which only the CET is implemented, but 1.2 percent (GHc 352 million or US\$170 million) higher than in the scenario in which neither reform is implemented.

The revenue impact of the EPA is more than offset by the CET, such that by the time of full EPA implementation, government revenue from imports will actually be higher than it is currently. The effect of the EPA occurs gradually over a 20-year period, allowing time over the implementation process to mobilize alternative revenue sources. These results do not account for any dynamic effects on economic growth, which may be caused by the CET and the EPA, which would also have important implications for government revenue.

3.2 Imports

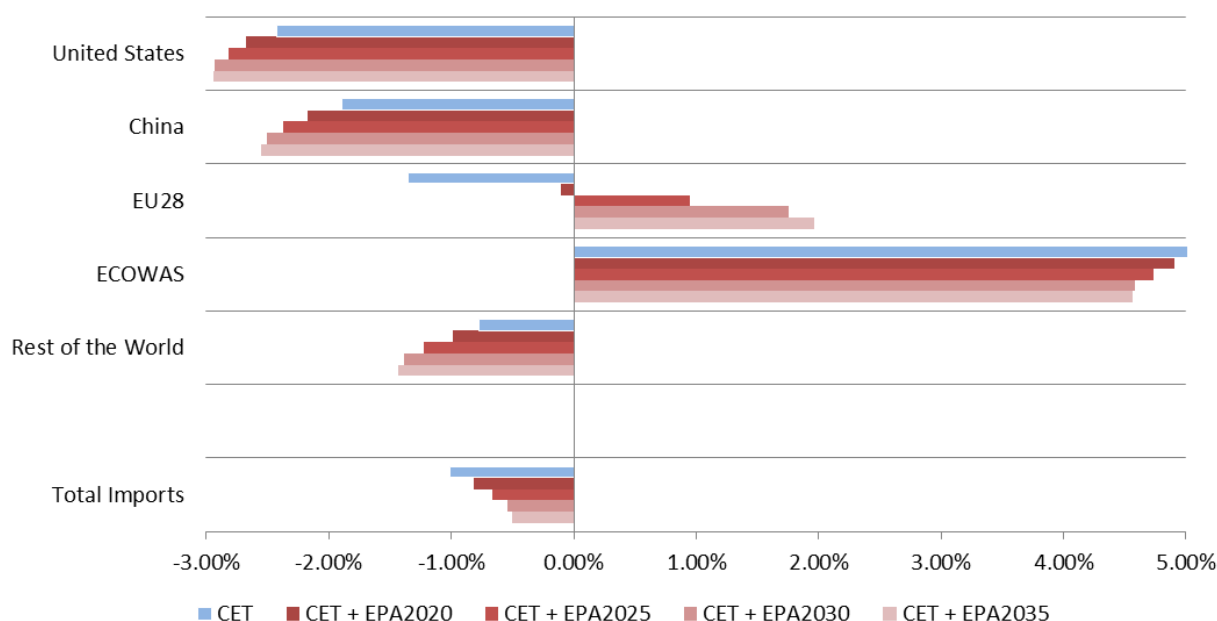
As shown in figure 4, adoption of the CET is expected to cause imports to fall by an estimated 1 percent. Figure 4 also shows the percentage change in imports resulting from the EPA, relative to the CET. Implementation of the EPA is estimated to cause annual imports to increase by 0.2 percent in 2020, by a further 0.2 percent in 2025, 0.1 percent in 2030, and finally by less than 0.1 percent in 2035. By the time the EPA has been fully implemented in 2035, annual imports are forecast to be 0.5 percent higher than they would be under the CET, but 0.5 percent lower than they are currently. Again, this is a static model, and as such does not account for any rise in imports due to causes other than the CET and EPA. The model provides an estimate for the magnitude of import effects compared with a hypothetical benchmark with no change in trade policy. The estimates suggest that the impact of the CET and EPA on total imports will be negative and relatively small. To put these results into perspective, a series of other factors caused imports to fall by 19 percent in the first half of 2014. In addition, these results are in constant 2013 cedis. Imports that did not enter Ghana's internal market, such as those destined for bonded warehousing, have been intentionally excluded.

Figure 4. Projected Impact of CET and EPA on Total Imports



Source: Calculation based on TRIST results.

Figure 5. Change in Composition of Trading Partners



Source: Calculation based on TRIST results.

In addition to changing the volume of imports, the CET and EPA will also change the sources of Ghana's imports. Figure 5 categorizes Ghana's imports by trading partner for the country's most important trading partners and for each partner shows estimates of the percentage change in import composition caused by the CET (top blue bar) and each successive stage of EPA implementation (following four red bars).

The CET is predicted to contribute to regional integration by increasing imports from within the region and reducing those from outside the region. Imports from ECOWAS are predicted to increase by around 5.0 percent in 2015 as a result. The EPA is predicted to reduce imports from all suppliers with the exception of the European Union, from whom imports will gradually increase by 1.8 percent by 2035. Although these results are driven by the structure of current imports and can provide indicative information as to the direction of change in importer composition, the magnitude of change is fairly sensitive to modeling elasticities, as can be seen by comparing the high and low elasticity scenarios in appendix A.

In the past, implementation has been an issue with trade agreements in the region and the magnitude of change in trade is therefore also subject to the extent to which the two trade reforms are implemented. Theoretically, the countries in ECOWAS can trade freely as part of the ECOWAS Trade Liberalization Scheme (ETLS); however, in practice, the ETLS is severely underutilized. The results show the best case scenario, in which ECOWAS trade is fully liberalized through the CET. In a subsequent exercise, we dropped this assumption and ran the scenarios using the implementation rate of the ETLS for ECOWAS imports. Unsurprisingly, when considering the CET, the magnitude of the increase in ECOWAS imports was much smaller, at only 0.34 percent compared with the 5 percent increase in ECOWAS imports with full implementation. In terms of aggregate results, this corresponded to a slightly reduced amount of import substitution from other countries to ECOWAS countries, a slightly higher

increase in import revenue to 11.33 percent compared with 10 percent, and a slightly larger fall in imports to -1.12 percent compared with -1 percent with full implementation. As ECOWAS imports account for only 5.1 percent of total imports, the magnitude of this assumption has only marginal effects on the aggregate results.

An important topic not covered directly by the TRIST model is informal trade. Although there are no reliable estimates on the magnitude of informal trade flows between Ghana and its neighboring countries, anecdotal evidence suggests that such trade flows are substantial and have an important impact on the livelihoods of the poor across the region. Informal trade can thus be an important determinant of the extent to which price changes induced by trade policy are passed on to consumers and firms, a topic that is discussed further in the following sections. Informal trade, by definition, avoids customs duties and other taxes, and products traded informally are thus not directly susceptible to the price changes resulting from trade policy reforms that drive the TRIST results. However, the decision whether to conduct a given transaction informally can be affected by trade policy reform through the opportunity costs of paying the tariff and dealing with customs procedures. A more liberal trade regime may therefore encourage informal traders to formalize their operations.

Regional trade within ECOWAS is already liberalized pre-CET, but the current free trade regime is severely underutilized because of its rather restrictive requirements and lack of effective implementation. Thus, to the extent the CET helps member countries operationalize regional free trade more effectively, it could also have a positive impact on the formalization of currently informal trade by reducing the costs associated with crossing regional borders for small traders. In this context, the most important benefits might in fact derive from the trade facilitation effects that can derive from implementing a CET. Such benefits can be expected from a reduced need for the physical inspection and other measures to prevent smuggling of goods that were previously imported from outside the region. This is the case because with a common external tariff, there is no longer an incentive for traders to smuggle goods imported from other parts of the world once they have entered the ECOWAS territory, given that the entry tariff is the same for all member countries. In addition, Maur (2008) points to the political and economic dynamics resulting from the implementation of a full CET in other regions that have often had positive effects in stimulating cooperation in the area of customs modernization.

Appendix B explains the determinants of trade diversion in the model and breaks down the presence of trade diversion by sector and trading partner.

4. Effects on Consumer Prices

- Implementing the CET is likely to increase the cost of household consumption. Although the poorest Ghanaians will benefit in particular from cheaper rice, this will be outweighed by the adverse effect of tariff increases on fish, soap, chicken, beef, and tomato paste in particular.
- The EPA would see the partial offsetting of the price rises associated with the CET; however, this would be gradual given the 20-year implementation period. The poorest Ghanaians would benefit most from the reduction in the prices of bicycles, motorcycles, and certain food products.

- The precise effects on consumer prices will depend on how competitive the import market and distribution networks are, as these will determine the extent to which changing tariffs are passed through to prices. Policy makers can improve the extent to which lower prices are passed on to consumers by ensuring that consumers have access to information on what these tariff changes are and by instituting policies to improve the competitiveness of import markets and distribution networks.

Tariff reform affects consumer welfare through several channels. Cutting import tariffs can reduce the cost of consumption for consumers, similar to a tax cut. In addition to directly lowering the price of imported products, increased competition from imports can also reduce the price of domestically produced products. Research also increasingly recognizes the welfare gains achieved by increasing affordable access to a greater variety of products (Broda and Weinstein 2004).

Detailed price changes obtained from the TRIST simulations were aggregated to match the 2013 GLSS consumption data. We then calculated the change in price of the average consumption bundle according to household income.

Full price pass-through is assumed; as a result, these figures represent an upper limit to the magnitude of the price effect for each individual product. In reality, the extent to which a reduction in tariff is passed through to prices will be less than unity. The price pass-through is affected by the competitiveness of the import market: in a highly competitive import market, traders are forced to pass lower prices directly on to consumers; in an uncompetitive import market, traders may simply maintain preexisting prices and use lower tariffs to generate higher profits. Price pass-through is similarly affected by the competitiveness of the distribution sector: agents here may again either maintain prices or pass lower prices through to consumers, depending on the competitiveness and efficiency of the distribution sector (box 2).

However, the CET also implies a tariff increase for some products, under which circumstances the price pass-through effect is ambiguous. In a perfectly competitive import market, traders would pass higher tariffs directly on to consumers, but in an uncompetitive market, traders may either absorb part of the tariff increase and reduce the price pass-through, or in certain cases increase their margins, thereby magnifying the price pass-through.

Self-sufficiency in the production of imported goods and segmentation of local markets from international markets also affects the extent to which tariffs are passed through, as in these circumstances prices are determined by local factors, rather than imports. If a country is completely self-sufficient in a certain good, there should be no pass-through. If a country is partially self-sufficient, the pass-through should be diminished. This situation is somewhat incorporated within our results, as products that are not imported do not enter our traded goods index and those that do enter the index are weighted by their import share.

Box 2: Estimating the Price Pass-Through Effect

The tariff price pass-through effect can be estimated by looking at the extent to which local and international markets are integrated using an error correction model. If in the long run local prices move closely with international prices, the two markets are integrated and it is likely that a change in tariff would be directly passed on to prices.

We estimated the price pass-through effect in Ghana for six products for which local and international price data were available at monthly intervals. These products are rice, sorghum, maize, palm oil, oranges, and groundnuts, each measured at 16 different markets across Ghana between January 2006 and December 2014.^a The long-run price pass-through is estimated for each market, by commodity, using the following error correction model specification:

$$\Delta p_{ij,t} = \beta_1 \Delta p_{ij,t-1} + \beta_2 \Delta p_{i,t}^* + \beta_3 \Delta p_{i,t-1}^* + \beta_4 p_{ij,t} + \beta_5 p_{i,t}^* + \beta_6 (\text{monthly dummies})$$

where $p_{ij,t}$ is the price of commodity i in market j at time t , $p_{i,t}^*$ is the international price of commodity i at time t , and Δ is the difference operator. The length of lag is chosen using the Akaike information criterion. The long-run price pass-through estimate is given by β_5/β_4 . Table B2.1 presents the results.

Table B2.1 Long-Run Price Pass-Through
(percent)

Market	Rice	Sorghum	Groundnuts	Maize	Oranges	Palm oil	Market average
Accra	28	72	21	28	1	1	25
Tema	13	1	26	27	1	5	12
Sektdi	20	93	12	26	1	2	26
Kdua	16	96	13	29	1	1	26
Ccoast	11	47	8	18	1	1	14
Mkessim	19	104	11	71	-1	1	34
Kumasi	9	30	13	14	0	3	12
Ejura	39	18	30	9	2	2	17
Sunyani	17	49	15	22	1	-1	17
Ho	25	66	16	8	1	1	20
Bolga	11	30	2	1	0	1	7
Wa	23	90	33	27	2	10	31
Obuasi	14	22	8	44	1	2	15
Tman	25	83	24	18	0	0	25
Tamale	11	34	15	9	1	4	12
Commodity average	19	56	16	23	1	2	20

The results suggest that the price pass-through effect varies substantially across the six commodities investigated. The prices of oranges and palm oil appear largely segmented from international prices, while those of rice, sorghum, and maize appear at least moderately integrated with international markets.

The average price pass-through across all markets and commodities is 20 percent. This implies that only a fifth of any tariff change will be passed on to consumers as a change in price. This likely represents a lower bound of the total price pass-through effect for all imports, however, as all the commodities analyzed here are produced in Ghana and are hence products for which a substantial proportion of the local price is determined by local growing and production conditions.

Policies to improve the pass-through of tariff reductions to benefit consumers include disseminating information about tariff adjustments to help consumers put informed consumer pressure on suppliers, and policies to improve the competitiveness of the import and distribution markets.

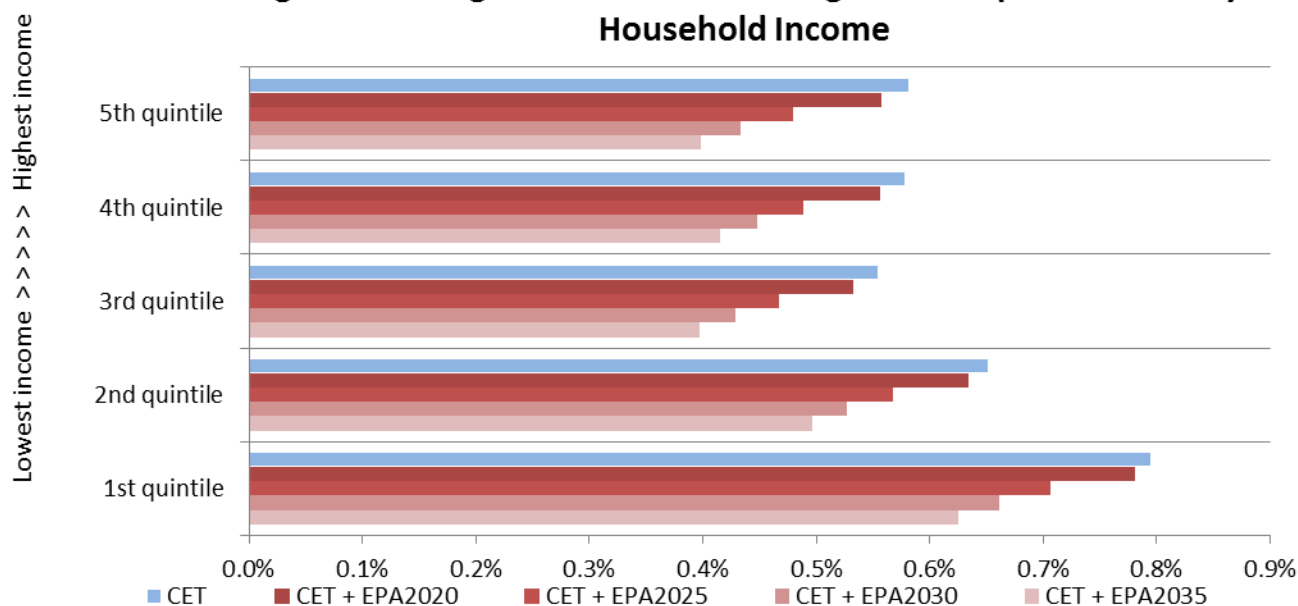
a. The consistency of data collection varies across regions and commodities, with data missing for some products for some months.

Implementation of the CET is found to increase the price of the average household consumption bundle by around 0.6 to 0.8 percent. It is unsurprising that consumer prices increase, given the total increase in tariff protection imposed by the CET, yet somewhat unexpected that consumer prices do not increase even further, given the number of important consumer products tariffed at the new 35 percent rate. The reason for this is twofold. First, a large share of household consumption comprises nontraded goods and services. Thirty percent of the expenditure of the poorest households and 40 percent of the expenditure of the richest households is on nontraded goods and services. This dilutes the impact of the tariff reform, which only affects the price of traded goods. Second, many of the products for which tariffs increase are produced and traded within ECOWAS and hence avoid higher tariffs, which apply only to external countries. As our model assumes duty-free trade within ECOWAS, this effect is accentuated as Ghana substitutes foreign imports with ECOWAS imports to benefit from duty-free tariffs.

The impact of the CET on the poorest Ghanaians occurs principally through the increase in tariffs on fish, soap, chicken, beef, and tomato paste; however, this is partially offset by reductions in the price of rice.

By full implementation in 2035, the EPA, in contrast, will have reduced the price of the average household consumption bundle by around 0.2 percent from that of the CET. For the poorest Ghanaians, the most beneficial impact occurs through a reduction in tariffs on bicycles, motorcycles, and certain food products.

Figure 6. Change in Price of the Average Consumption Bundle by Household Income



Source: Calculation based on TRIST results and 2013 Ghana Living Standards Survey.

In figure 6, for each quintile, the top blue bar denotes the change in price caused by implementation of the CET. The red bars below this denote how prices change with each successive stage of EPA

implementation. All price changes are relative to the pre-reform consumption bundle price. The first and second quintile groups are those considered to be below the poverty line.

Implementation of the CET, denoted by the top bar in each quintile division, is predicted to raise consumption prices for the average consumer in all quintiles. The effect is moderate: the largest increase amounts to a 0.8 percent increase in consumption prices. However, the effect is slightly regressive, affecting the poorest households most. This is largely because richer households spend a larger proportion on nontraded items, such as services, which are unaffected by tariff reforms.

The prediction is that, with implementation of the EPA, denoted by the four following bars in each quintile division in figure 6, there will be a gradual reduction in the impact of the price increases caused by the CET. The largest incremental fall in the price of the average consumption bundle for each quintile comes with the second stage of EPA implementation in 2025. Although the EPA is somewhat compensatory, the magnitude of the CET dominates. Even after full EPA implementation, the consumption bundles remain 0.4 to 0.6 percent more expensive than they were pre-reform.

The figures on the impact of total spending per household mask substantial variation in the impact of the tariff reforms by product category. Figure 7 shows the contribution of the CET by product to the overall price of the consumption bundle for households in the lowest income quintile. It is clear that lower income households in particular gain from reductions in tariffs on rice, but are most adversely affected by increases in tariffs on fish, soap, chicken, beef, and tomato paste.

Figure 7. Contribution to the Change of the Price of the Average Consumption Bundle for Households in the Lowest Income Quintile, by Product

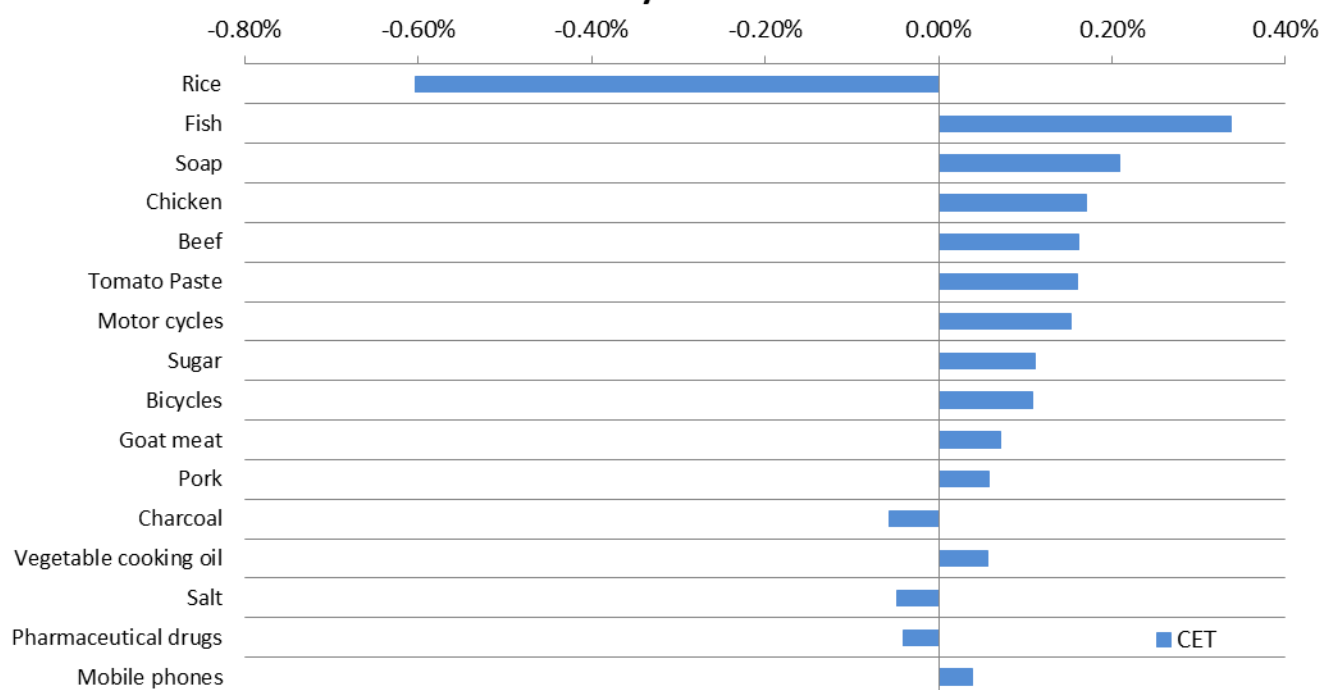
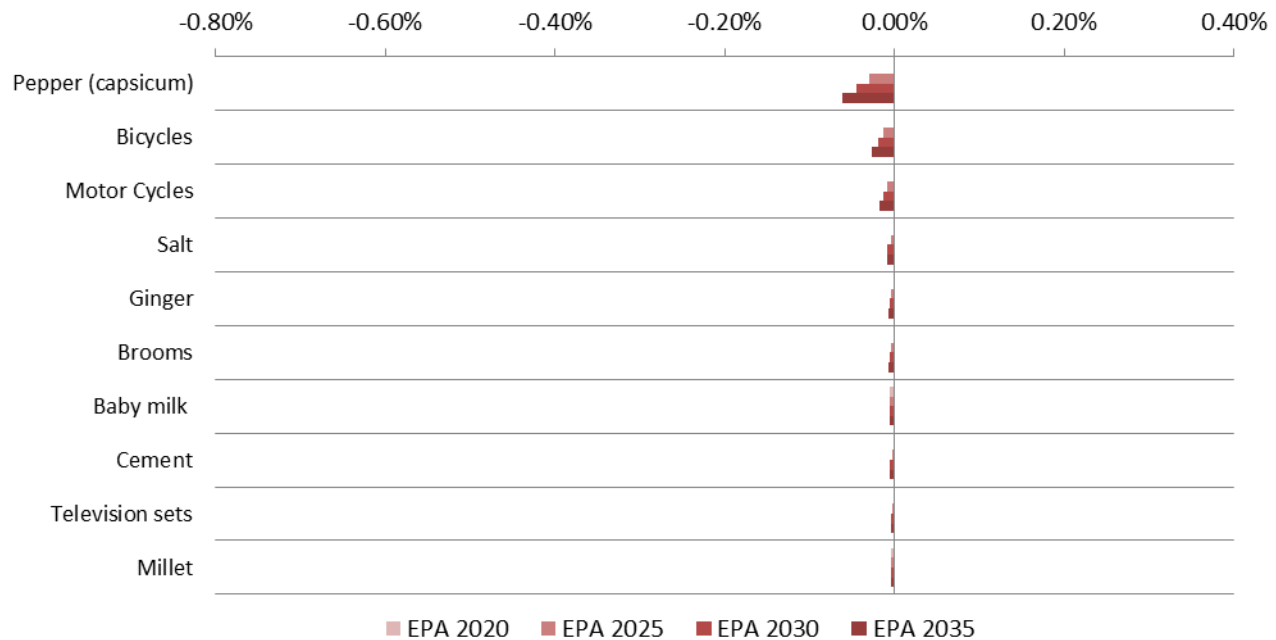


Figure 8. Net EPA Contribution to the Change of the Price of the Average Consumption Bundle for Households in the Lowest Income Quintile, by Product



Source: Calculation based on TRIST results and 2013 Ghana Living Standards Survey.

Taking the CET as a baseline, figure 8 shows the net contribution of the EPA by product to the overall price of the consumption bundle for households in the lowest income quintile. The fall in protection for peppers, bicycles, and motorcycles contributes most to the reduction in price of the average consumption bundle for the lowest income quintile; however, the magnitude of effect is significantly smaller than that of the CET.

5. Effects on Firm Competitiveness and Jobs

- Short-term winners and losers from the CET are split roughly 50/50 for firms in the manufacturing sector. The CET benefits some producers with higher output prices, but others suffer from higher input and capital prices. Windfall profits through higher output prices are unlikely to spur competitiveness and growth in the future and come at the expense of consumers.
- The EPA will increase profitability for 77 percent of firms in the manufacturing sector, mainly through lower input prices. An estimated 84 percent of workers are employed by firms that benefit from EPA implementation. Gains through lower input and capital equipment costs are likely to have a positive effect on long-run growth and competitiveness.

- Cumulatively, the CET and EPA together increase profitability by 2.6 percent on average.
- The negative effects of the CET are likely to be concentrated in the food and beverage products, apparel, chemical products, and metal products sectors. The negative effects of the EPA are likely to be concentrated in the non-metallic mineral products and furniture sectors. There is very little evidence of CET and EPA implementation causing firms to be no longer profitable, and most workers are in firms whose profits will increase.
- The effects of the CET and EPA on exporters' output prices is ambiguous and not formally incorporated into the model. However, exporters to ECOWAS are likely to gain from a higher margin of preference on average. Exporters to the European Union that gain most from continued access to the EU market with the EPA include exporters of some priority nontraditional products.
- Improving the competitiveness of import markets and distribution networks and disseminating information about tariff changes can help ensure that tariff changes are passed on to firms.

This analysis concerns only the immediate short-run effects of tariff reform and cannot incorporate the dynamic long-term effects. However, analyzing the short-run effects of a tariff reform is important to understand the forces of structural change that it is likely to trigger, and to prepare adjustment assistance to firms or workers where it may be required.

As with the consumer effects, we have assumed that any changes in prices caused by tariff reform are fully passed through to firms. The magnitude of effect simulated should therefore be considered to represent an upper bound for the same reasons as discussed in section 4 on the effects on consumer prices. If import markets and distribution networks are not competitive, traders and distributors may absorb changes in tariffs, meaning that tariff changes are not fully felt by firms. As with consumer prices, disseminating information about changes in tariffs and instituting policies to improve the competitiveness of import markets and distribution networks can help to improve the extent to which tariff changes are passed on to firms.

In addition, the results only cover the manufacturing sector; extending this analysis to the agriculture sector would have been highly desirable, but was not possible with the available data and resources. It is important to note that the manufacturing sector accounts for less than 20 percent of gross domestic product and about 10 percent of employment in Ghana.

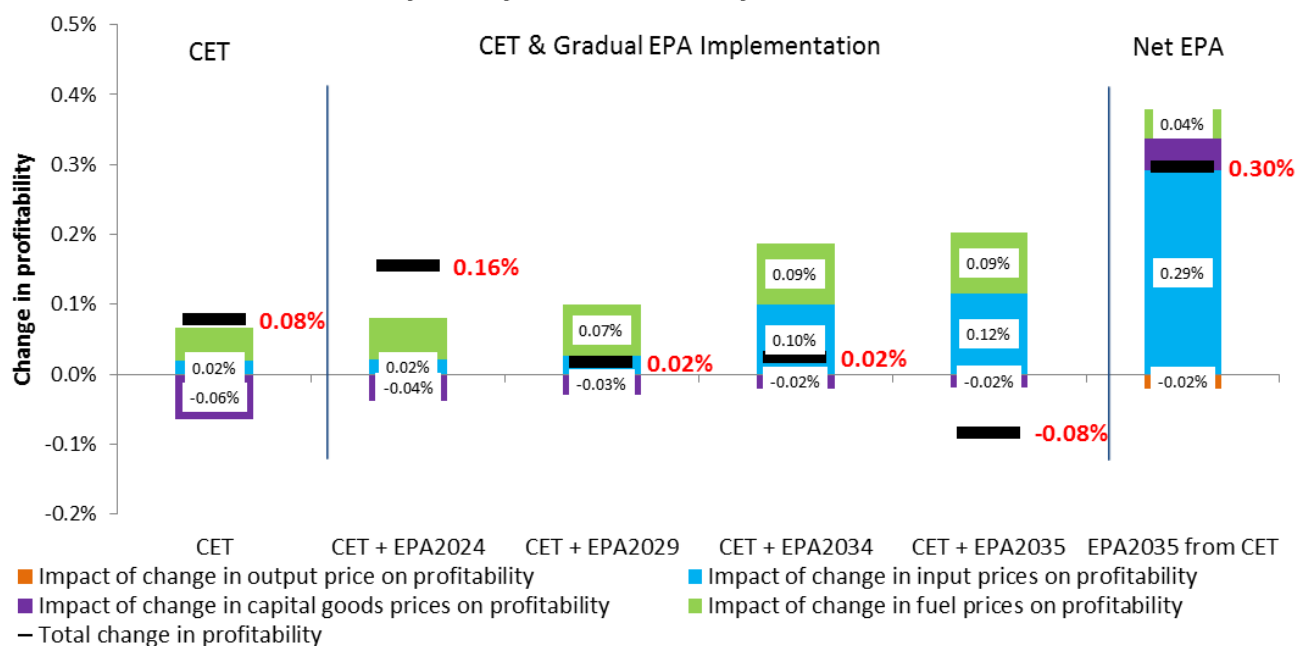
Tariff reform affects the productive side of an economy through several channels. In the long run, market opening encourages capital and jobs to be reallocated toward the sectors in which the economy has comparative advantage, and toward the firms within a given sector that are most productive (Melitz 2003; Melitz and Ottaviano 2008). Thus, in interpreting the following findings for the impact of the CET and EPA on short-term profitability, it is important to dissect the different channels of impact, as they may have very different implications for longer-term growth and competitiveness.

On the one hand, an increase in a firm's output price will, in the short term, increase the firm's income and thus generate a windfall profit. However, such profits come at the expense of higher consumer prices and less competitive price pressure in the domestic market, and thus may actually have a negative effect on growth and the competitiveness of domestic firms in the longer term.

On the other hand, firms' profitability in our short-term model may also increase because of reductions in the domestic price of inputs and capital equipment used by the firm. Unlike an increase in output prices, such a change is likely to have positive longer-term effects on growth and competitiveness. For instance, recent economic research has shown that tariff reductions on inputs raise productivity (Amiti and Konings 2007), expand firms' product scope (Goldberg et al. 2009), and ultimately lead to higher economic growth (Estevadeordal and Taylor 2008). Similarly, Eaton and Kortum (2001) find that 25 percent of cross-country differences in productivity can be attributed to price differences for capital goods, and that about half of these price differences are caused by trade barriers. Lower tariffs on capital equipment are therefore also associated with higher economic growth (Estevadeordal and Taylor 2008).

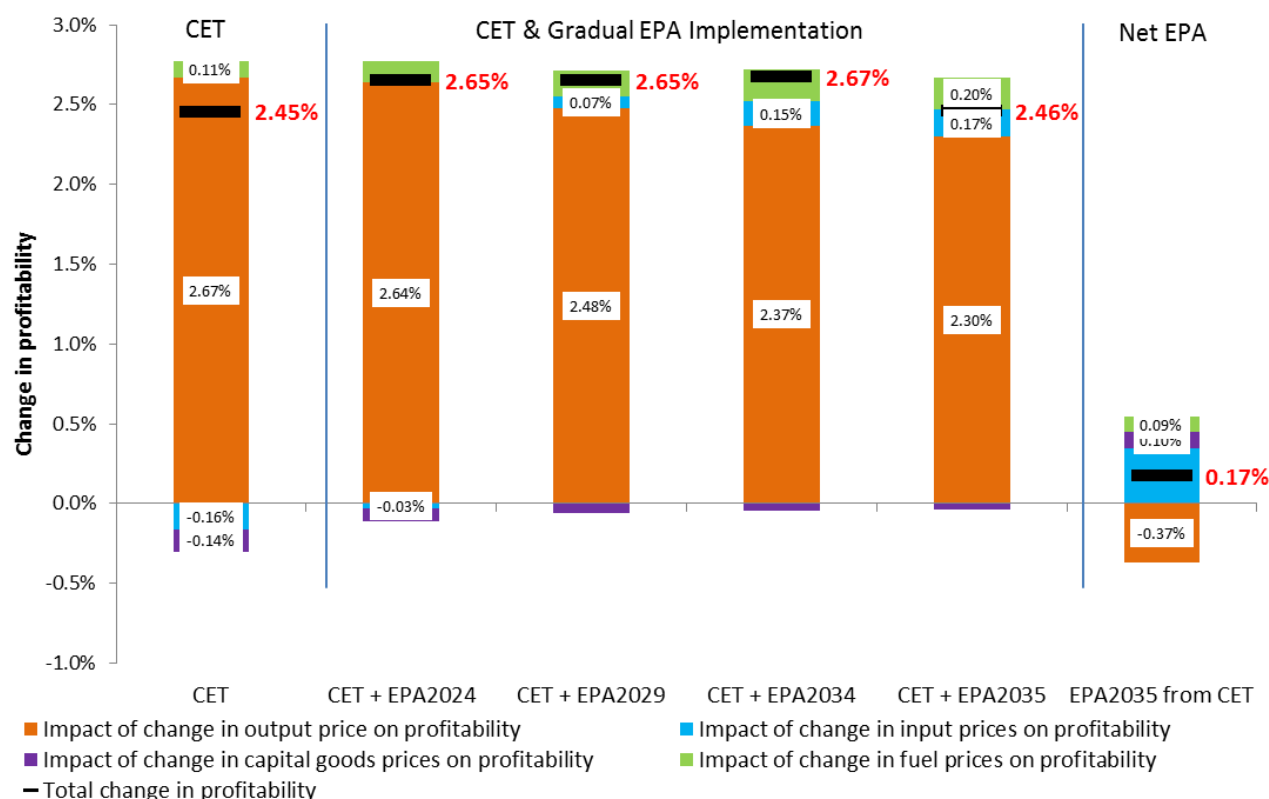
Figures 9 and 10 show the short-term modeling results by the impact of each price channel. Figure 9 shows the relative importance of each of the four channels (orange: output price change, blue: input price change, purple: capital goods price change, green: fuel price change) for the median firm in the sample. Black bars (and red numbers) represent the median of the total change in profitability. By the definition of the median, the total change in profitability is not equal to the sum of the four components. Figure 10 shows the same results as in figure 9, but instead of looking at the median firm we take means. For the mean, the four components add up to the total change (black bars).

Figure 9. Median Firm's Change in Profitability Due to Changes in Output, Input, Fuel and Capital Goods Prices



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

Figure 10. Mean Change in Profitability Due to Changes in Output, Input, Fuel and Capital Goods Prices



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

5.1 Effects of the CET and EPA on Changes in Firm Profitability

Overall, the CET has a small, positive impact on the profitability of the median firm, and a large, positive mean impact. The impact of output price changes at the median is zero, which is partially by construction: all exporting firms in the sample are assigned a zero output price change because their output prices do not depend on Ghana's tariff regime. The prevalence of exporting firms and potential effects of the EPA and CET on their output prices are discussed in the next section. However, the large positive mean effect of the CET is driven mainly by a strong increase in output prices. This is driven by a number of firms at the margin of the distribution that derive strong windfall profits from increases in tariff protection under the CET. Although other firms lose protection on their outputs, these gains dominate the sample mean. The EPA mitigates these windfall profits only slightly. These effects may contribute to higher profitability in the short run, but are likely to impose additional costs on consumers and have a negative impact on competitiveness and growth in the longer term. The distribution of gains and losses will subsequently be discussed more in detail.

The CET has a positive effect on firms' profitability through lower fuel prices, and a negative effect through higher prices on capital equipment, but both effects are relatively small. The effect on profitability of changes in input prices is ambiguous, slightly positive for the majority of firms, but with a slightly negative mean. The implementation of the EPA has a positive net effect on profitability through

input, fuel, and capital equipment costs, but for capital equipment the combined effect of the CET and EPA remains negative. Beyond their short-term impact on firm profitability, gains through these channels are likely to have positive long-run effects on growth and competitiveness.

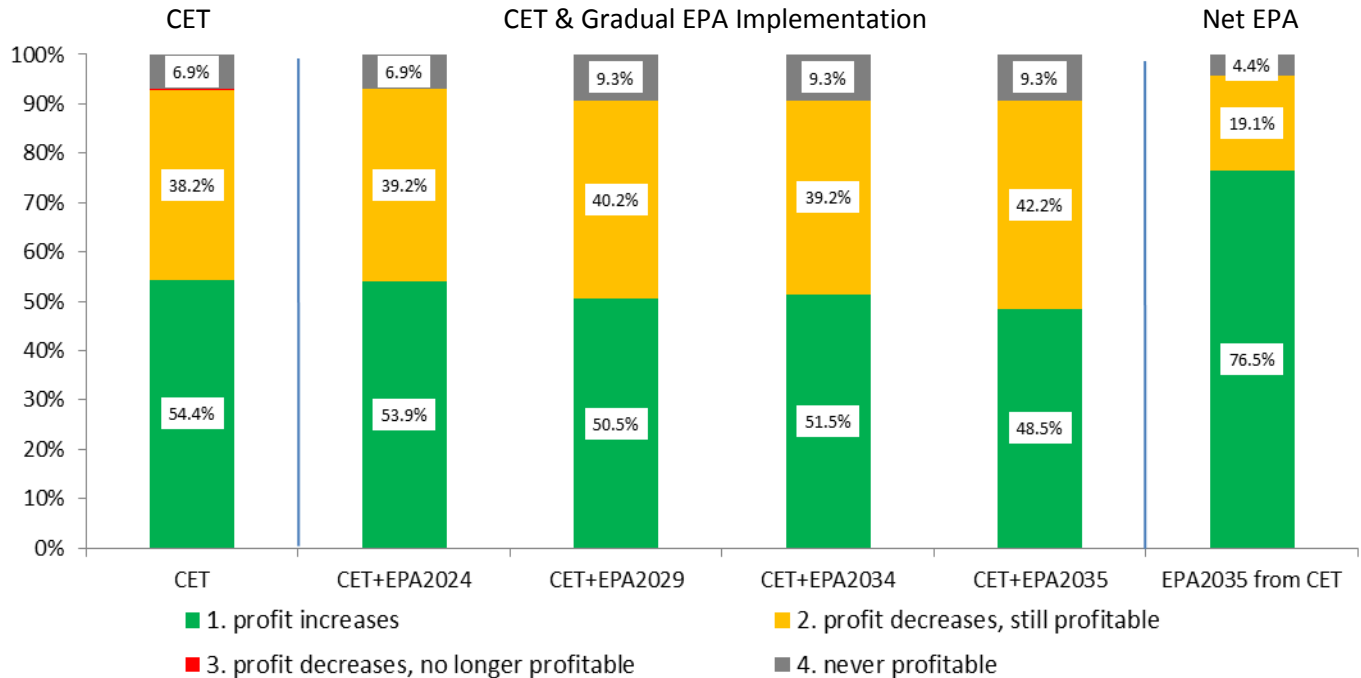
Much of Ghana's fuel imports are imported into the country under a special government regime and do not face duties. Fuel imported directly by firms via customs accounts for only a small proportion of domestic consumption. Thus, the positive effect from lower fuel prices is likely to be smaller than that indicated in the model.

5.2 Effects of Price Changes on Firms and Jobs

Figures 9 and 10 present aggregate figures over the entire universe of firms, but each trade reform generates winners and losers. Thus, it is important to understand the channels and likely direction of reallocation between firms and sectors, which can depend not just on the change in profit caused by the reform, but also on the pre-reform level of profit. In figure 11, all firms in the sample are categorized based on their current level of profit and the impact of the reform:

1. Green represents firms whose profit increases. The increase could be because of lower input, fuel, or capital prices, or higher output prices.
2. Yellow represents firms whose profit decreases, but that remain profitable nevertheless. This is the case if the impact of the trade shock is small or the level of profit was very high pre-reform.
3. Red represents firms whose profit decreases and falls below zero after the reform.
4. Grey represents firms that were not profitable in the first place and do not gain profitability with the reform.

Figure 11. Firm Level Changes in Profitability



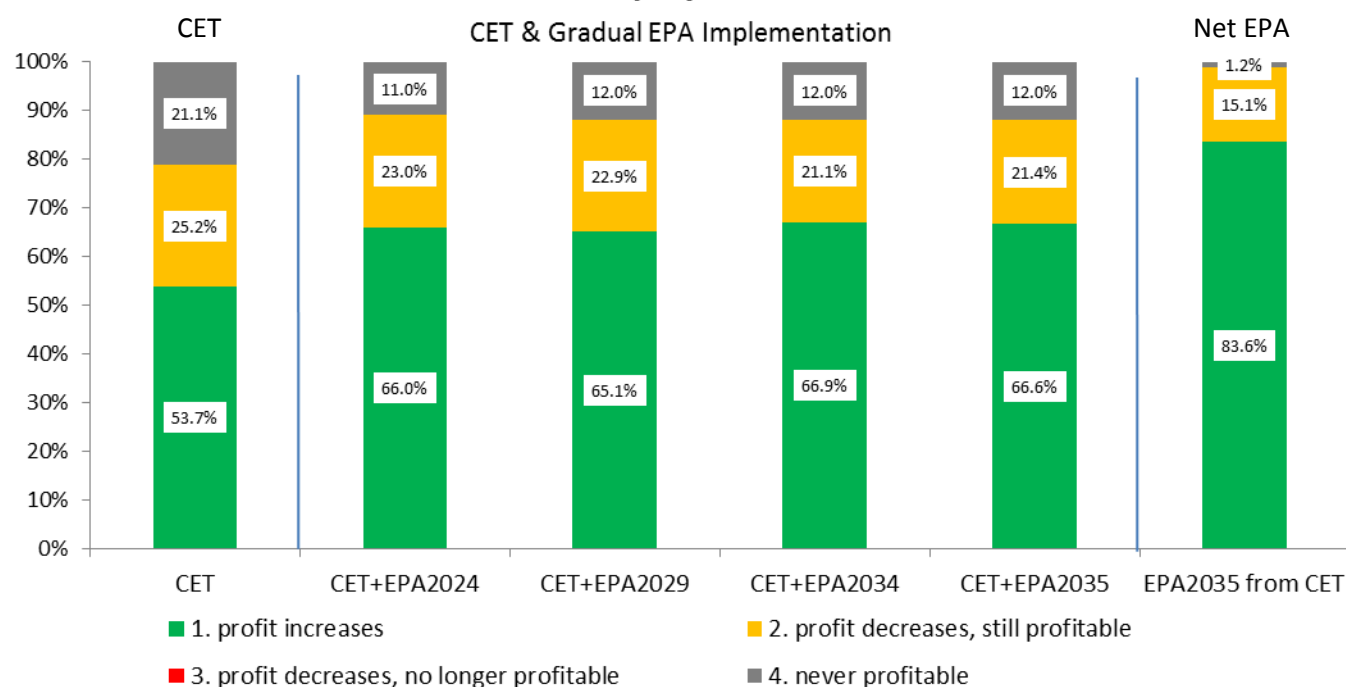
Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

Despite its positive mean effect, the CET splits the sample roughly evenly between firms gaining and firms losing out. However, only very few firms that lose out become unprofitable as a result.

The additional effect of the implementation of the EPA is not very strong. By 2035, the EPA shifts the balance by another 4 percent toward firms that lose out (while at the same time reducing to zero the number of firms whose profits drop below zero). However, the net effect of the EPA (using CET as a baseline) is strongly positive, with 77 percent of firms gaining profitability as a result. While seemingly contradictory, this result occurs because many of the firms that benefit from the EPA lose out more from the CET and vice-versa, so the effect of the combined CET and EPA appears more negative than the CET alone, although the effect of the EPA itself is positive. Many of the firms that lose from the CET are partially compensated by the EPA, but the CET effect still dominates.

The most important factor for the economic wellbeing of Ghanaians is not the fate of individual firms, but the fate of the jobs that these firms provide. It is often found that the best policy to facilitate adjustment to a trade shock is one that protects workers by helping them to transition into new jobs if necessary, rather than protecting individual firms. In this context, it is illustrative to weigh the firms in the sample by the number of jobs they offer (figure 12).

Figure 12. Firm Level Changes in Profitability, Weighted by Employment

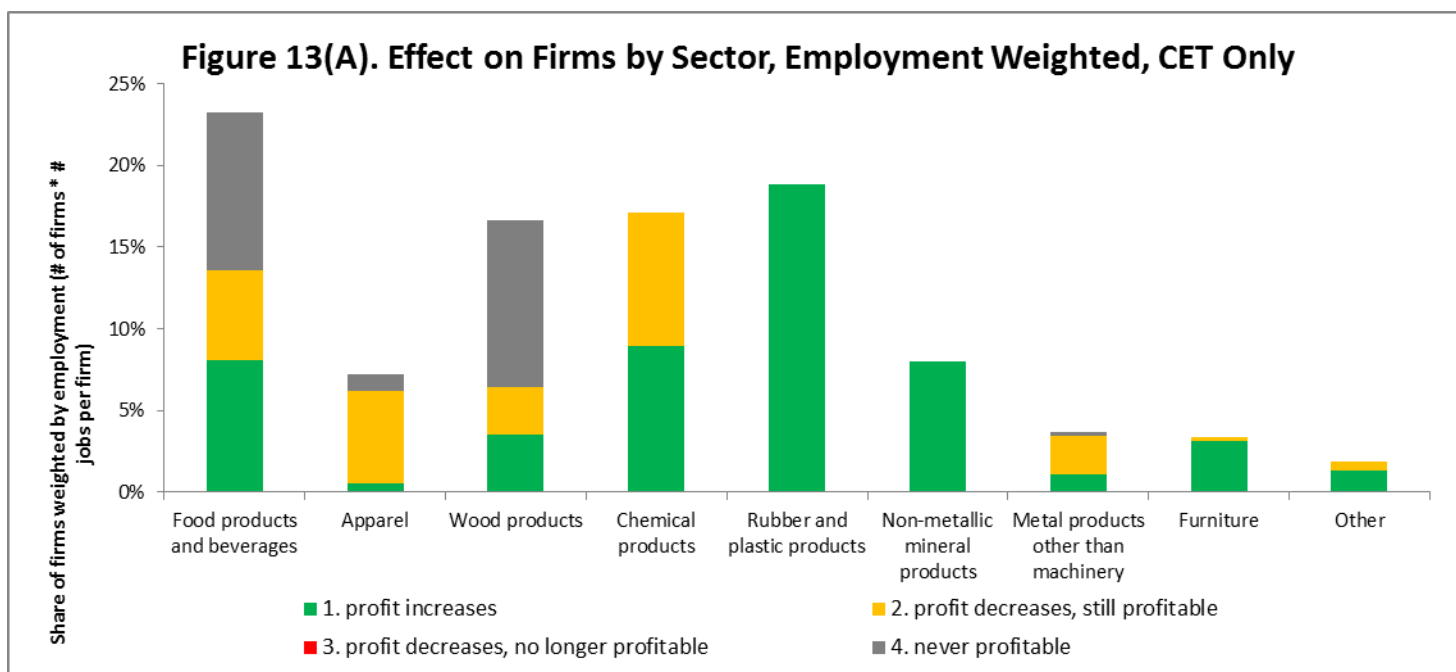


Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

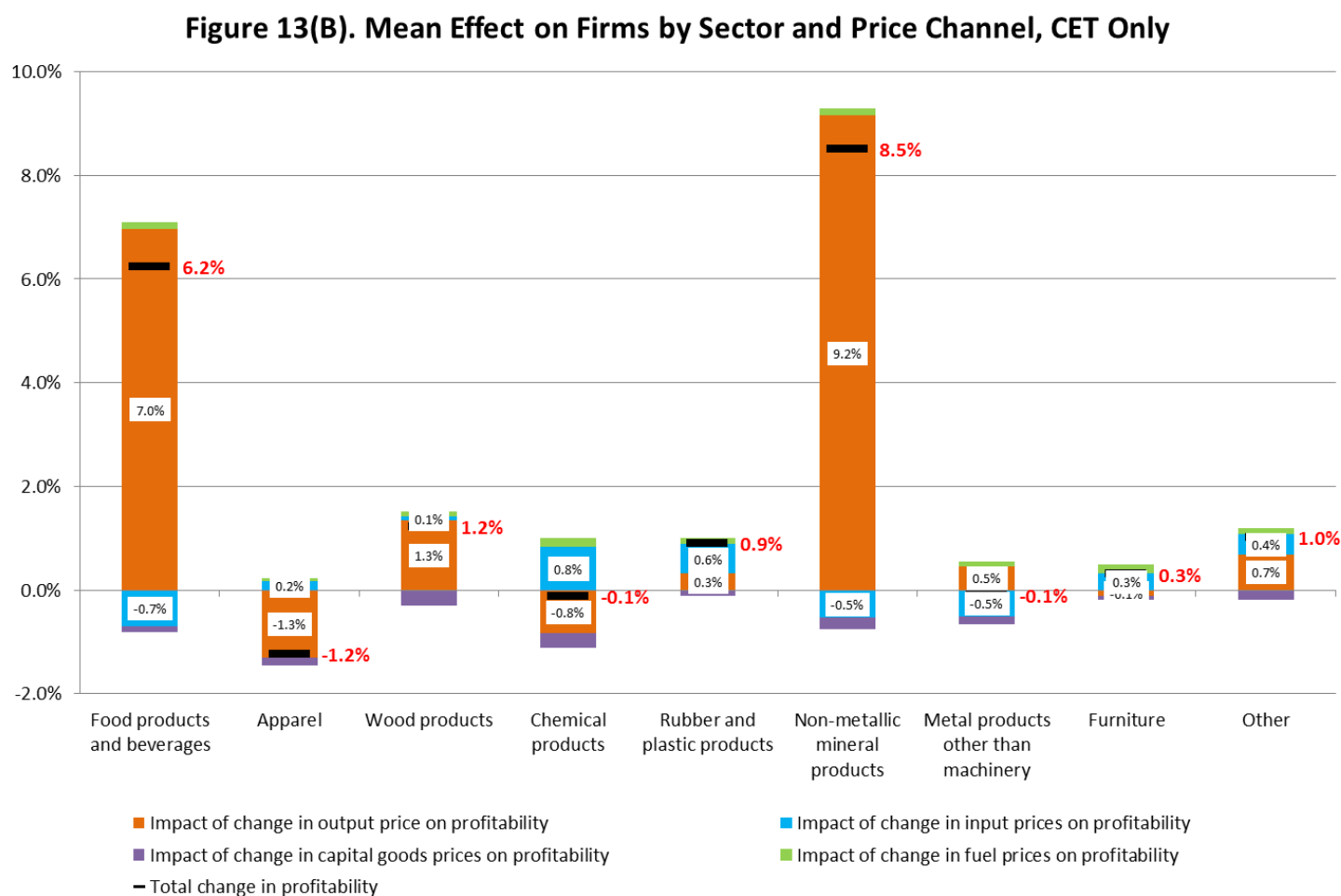
Figure 12 shows that firms that benefit from the EPA and CET account for more jobs than those that lose. Thus, the majority of workers are employed by firms that benefit in each scenario, and particularly from the EPA, where 84 percent of manufacturing workers are in firms that benefit from the EPA.

5.3 Winning and Losing Sectors

In figure 13(A), we show employment-weighted categories of impact for the CET, as in figure 12, but broken down by economic sectors. The distribution of employment across sectors needs to be seen with caution; it is derived from World Bank Enterprise Survey data, not a formal labor force survey. Sectors with five or fewer firms are aggregated into “other.” Figure 13(B) complements the picture with the mean change in profitability by price channels, equivalent to figure 10, but broken down by sectors.



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

In the food and beverage sector, there is a strong mean increase in profitability. However, this effect is concentrated in a minority of firms in the sector, which are smaller on average, while firms accounting for over two-thirds of the jobs in the sector actually lose out, often from an already negative level of profitability. In addition, there is an average increase in input prices for firms in the sector.

Firms in the apparel industry suffer a relatively small loss in protection under the CET. As a result, most firms are affected negatively, but they all remain profitable. A small compensatory effect is achieved through a decline in the price of inputs, mainly raw textiles imported from China.

Firms accounting for most jobs in the wood products sector are also affected negatively by the CET, often starting from a situation where firms' profitability is already negative. It should be noted that the sample is very small for this sector, with only six firms reporting complete data. The largest of these firms are exporters. Thus, they do not benefit from the slight average increase in output prices under the CET. However, they experience a very small negative effect from higher prices on capital equipment, resulting in an overall negative, although very small, effect.

For chemical products, roughly half the workers are employed in firms that benefit, while the other half lose out but remain profitable. Depending on the exact nature of their output, some firms in this sector gain and some lose from higher or lower output prices, while all of them benefit from lower input prices.

The effect on the rubber and plastics sector is positive for all firms and through all channels except for a very small increase in the price of capital equipment.

Firms producing non-metallic mineral products can expect a large windfall profit from a strong increase in protectionism.

For metal products other than machinery, the sample is again split, with a small increase in protectionism on outputs roughly offset by an increase in input prices.

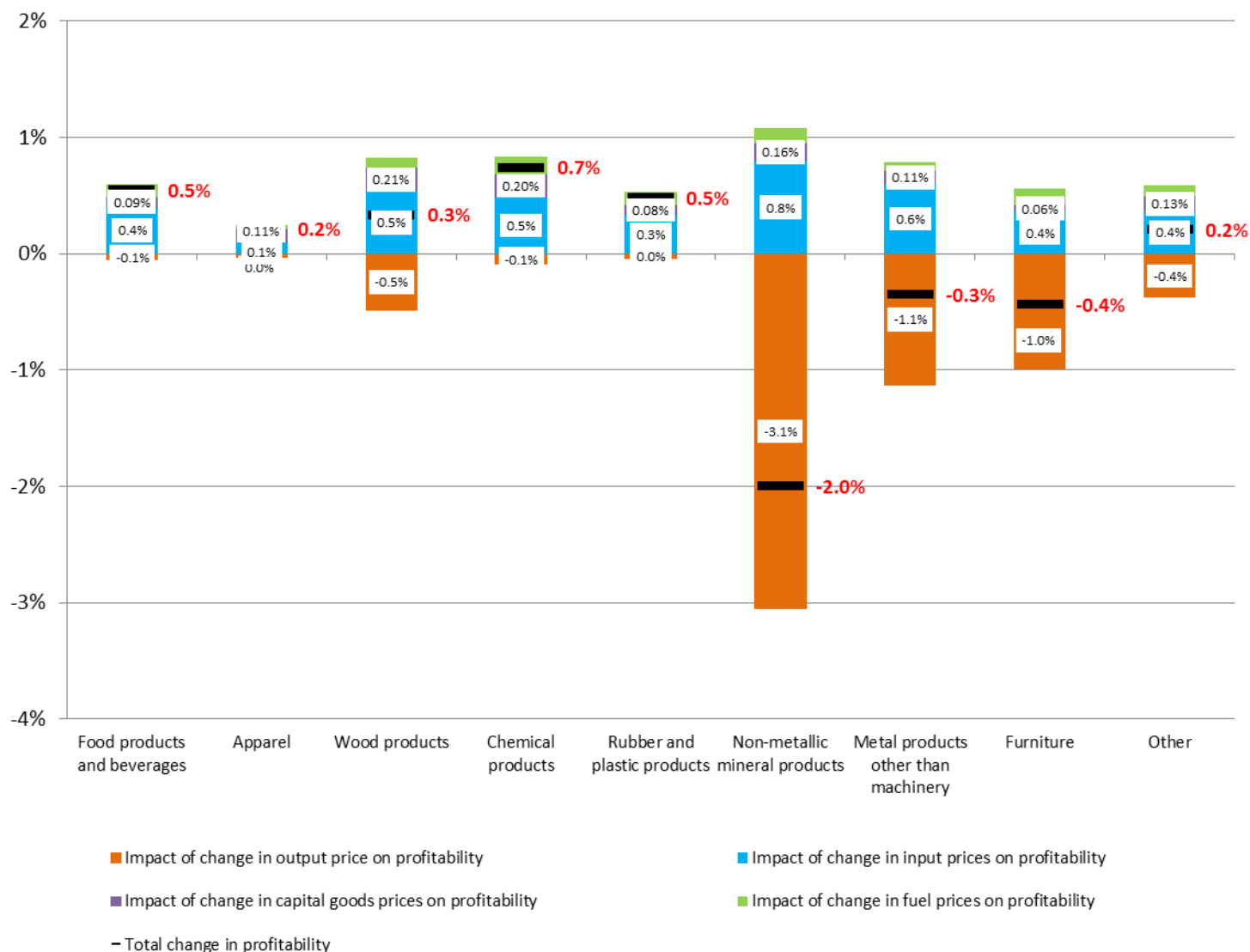
Finally, furniture producers experience a small decrease in protection that is more than offset by a decrease in the price of inputs. The net effect is positive, although very small.

Figure 14(A). Effect on Firms by Sector, Employment Weighted, Net EPA



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

Figure 14(B). Mean Effect on Firms by Sector and Price Channel, net EPA



Source: Calculation based on TRIST results and 2007 World Bank Ghana Enterprise Survey.

Figures 14(A) and 14(B) show the same information for the net effect of the EPA. The effects of the EPA are generally smaller than those of the CET (the difference in scale of the vertical axis between figures 13(B) and 14(B)).

For food products and beverages, apparel, wood products, chemical products, and rubber and plastic products, the negative effect of lower output prices is very small, and all firms gain unambiguously from lower input and capital equipment costs.

For non-metallic mineral products, the EPA causes a loss in protectionism, which is still much smaller than the windfall in additional protectionism that this sector gains through the CET, so the combined effect of the CET and EPA remains strongly positive. Metal products and furniture also lose some protection under the EPA, but gain through lower input and capital prices. The combined effect of the

CET and EPA is ambiguous, although the negative effects of the EPA on the furniture sector outweigh the small gains from the CET for most firms.

Our simulations find very little evidence of the CET and EPA causing firms to be no longer profitable, and the majority of workers are in firms whose profit will increase. However, it will be important to monitor the process of adjustment to the changes in trade environment, with a particular focus on the sectors identified here. If jobs appear to be threatened, temporary adjustment assistance could be provided to improve firm competitiveness as well as to assist retrenched workers in finding employment in other sectors.

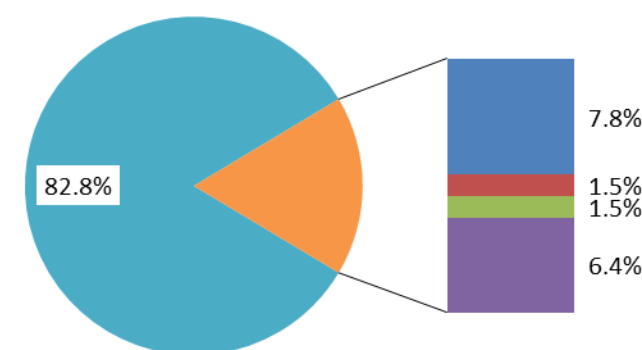
5.4 Effects on Exporter Markets

Although our firm-level model assumed an output price change of zero for exporting firms, the CET may in fact change export prices for firms that export into the ECOWAS subregion, which is an important export market for employment. Although this effect will likely be positive overall, as Ghanaian firms may benefit from a larger preferential margin over competitors from outside ECOWAS, it will vary across ECOWAS country markets and products.

The EPA will be particularly important for firms exporting to the European Union to secure continued preferential access to the EU market. But the effects of the EPA may be negative for the output prices of firms exporting to the ECOWAS market where they could lose a degree of preferential margin over EU competitors.

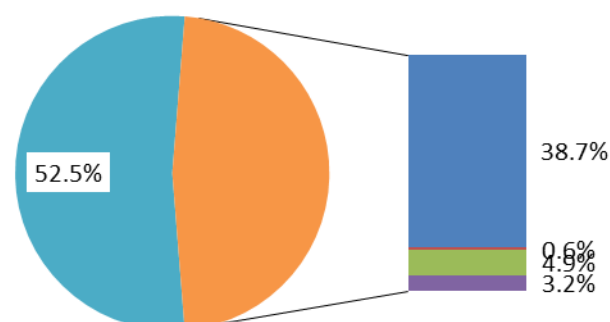
All exporting firms would benefit from lower prices on inputs and capital equipment.

Figure 15(A). Distribution of Firms by Exporting Status and Main Destination



■ Main export market ECOWAS
 ■ Main export market Rest of World
 ■ Main export market EU
 ■ Indirect exporters
 ■ Non-exporter

Figure 15(B). Distribution of Firms by Exporting Status and Main Destination, Employment Weighted



■ Main export market ECOWAS
 ■ Main export market Rest of World
 ■ Main export market EU
 ■ Indirect exporters
 ■ Non-exporter

Source: Calculation based on 2007 World Bank Ghana Enterprise Survey.

Figure 15(A) shows the distribution of manufacturing firms by exporting status. Figure 15(B) shows the same distribution but with employment-weighted firms. Of the manufacturing firms surveyed, those that export tend to employ more workers than nonexporters. The most important export market for employment is ECOWAS: exporters to ECOWAS employed 38.7 percent of the sample's workers. The second most important market was the European Union: exporters to the European Union employed 4.9 percent of the sample's workers.

In theory, Ghanaian firms already enjoy duty-free access to other ECOWAS markets via the ETLS. The CET and EPA will affect the margin of preference that the ETLS provides relative to firms in the rest of the world. Full implementation of the CET can cause the margin of preference to rise or fall, depending on the pre-reform tariff structure of the particular ECOWAS country exported to, and whether the CET results in an increase or decrease in tariffs from non-ECOWAS countries.

Nigeria's current tariff structure is characterized by pervasive import bans and levies (Uexkull and Shui 2014; Pitigala and Hoppe 2011). Full implementation of the CET could prompt the elimination of these for third countries, yet the effect on Ghanaian exporters is not clear, as many of these bans and levies are also currently applied to imports from Ghana (Hoppe and Aidoo 2012). Were the CET to galvanize the removal of such bans and levies, Ghanaian exporters to Nigeria could gain considerably.

Nontariff barriers, such as cumbersome ETLS registration and documentation requirements, border delays, and informal payments, were identified in a survey of manufacturing firms by Hoppe and Aidoo (2012) as being substantial challenges in exporting to Nigeria. If implementation of the CET is used to stimulate improvements in response to these challenges, the CET could have significant further benefits to Ghanaian exporters.

For all other ECOWAS countries, the CET will likely result in an overall increase in tariff protection and hence benefit Ghanaian exporters. However, changes in protection will vary by industry. Uexkull and Shui (2014) find considerable increases in the value of preferences expected for different types of machinery, motor vehicles, and transport equipment in other ECOWAS countries as a result of the CET. Small decreases in the value of preferences for the leather, basic metals, chemicals, paper, and medical instrument sectors were also expected.

The EPA will result in an unambiguous reduction in preference margins within the ECOWAS market. However, the effect of this on Ghanaian exporters will depend on the specific products excluded from liberalization, and the products in which the European Union competes with Ghanaian exporters.

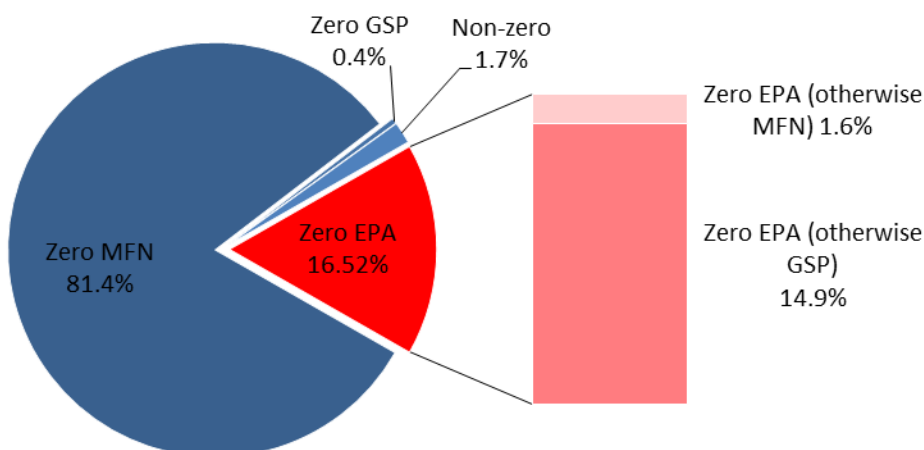
There are three tariff regimes through which Ghana's exports could reach the EU market: Most Favored Nation (MFN), Generalized System of Preferences (GSP), and EPA. As Ghana initialled the interim EPA in December 2007, the country's exports have been entering the European Union through the EPA regime since January 2008. The EPA grants Ghana duty-free access for all exports.³ If Ghana had rejected the EPA, it would have fallen back on the GSP, for applicable products, and MFN regimes. If Ghana rejects the regional West Africa EPA, it will likewise fall back on the GSP and MFN regime. The GSP would grant Ghana preferential access for a selection of products; however, many of these preferences do not

³ There was a transition period for access for rice (2010) and sugar (2015), although Ghana does not export these products to the European Union.

amount to zero tariffs and its coverage is not complete, meaning that Ghana would face MFN tariffs for many products. However, many MFN tariffs are also already zero.

Here we analyze what this situation would mean for the particular products that Ghana exports to the European Union. According to EuroStat trade data, Ghana's exports to the European Union in 2013 were worth €3.3 billion. In 2013, all but 1.7 percent of the exports entered the European Union duty free.⁴

Figure 16. Ghana's Access to the EU Market



Source: Calculation based EuroStat and ISBD GSP data.

In figure 16, the blue shaded areas show the proportion of exports that would be unaffected by whether Ghana had market access to the European Union through the EPA. This category includes exports on which the MFN and GSP rates are already zero, and exports on which preferences were not granted. The red shaded area shows the proportion of exports on which Ghana retains additional duty-free access as a result of the EPA that it would not enjoy otherwise. Of this, 14.9 percent is accounted for by exports on which the EPA represents an improvement in GSP rates and 1.6 percent is accounted for by exports on which the EPA represents an improvement over MFN rates because the GSP is not applicable for these products.

The exports on which MFN tariffs would be zero regardless of the EPA are mostly accounted for by petroleum oil (57 percent) and cocoa beans (19 percent). The EPA preferences are more important for many of Ghana's nontraditional exports. This is demonstrated in table 3, which shows Ghana's top 10 exports in value that gain from continued access to the European Union under the EPA. The implications of such reductions in preferences would also depend on the difference between the GSP and the zero tariff rate, and the degree of international competition in those markets. Processed cocoa products, tuna products, fruit, and vegetables are the most valuable exports that benefit from duty-free market access to the European Union from the EPA. These exports represent many of the processed, value-added exports that Ghana is trying to promote as part of its export diversification strategy.

⁴ Products within the 1.7 percent include those that did not satisfy the rules of origin required for preferential access, exports where the exporter did not apply for preferential access where it was available, or data for which the applied import regime was unknown.

Table 3. Ghana's Most Important Exports Affected by EPA Market Access, 2013

GSP rate (%)	Product description	Value of imports entering EU under EPA preferences (€, millions)
6.1	cocoa paste (excl. defatted)	112
20.5-21.5	Prepared or preserved tuna, skipjack, and Atlantic bonito, whole or in pieces (excl. minced)	107
4.2	Cocoa butter, fat and oil	105
2.8	Cocoa powder, not containing added sugar or other sweetening matter	42
12.5	Fresh or dried bananas (excl. plantains)	30
2.3	Fresh or dried pineapples	30
2.9-8.9	Fixed vegetable fats and oils and their fractions, whether or not refined, but not chemically modified (excl. soya-bean, groundnut, olive, palm, sunflower-seed, safflower, cotton-seed, coconut, palm kernel, babassu, rape, colza and mustard, linseed, maize, castor and sesame oil)	19
6.1	Cocoa paste, wholly or partly defatted	12
	Fresh tamarinds, cashew apples, jackfruit, lychees, sapodillo plums, passion fruit, carambola, pitahaya, and other edible fruit (excl. nuts, bananas, dates, figs, pineapples, avocados, guavas, mangoes, mangosteens, papaws "papayas", citrus fruit, grapes, melons, apples, pears, quinces, apricots, cherries, peaches, plums, sloes, strawberries, raspberries, mulberries, blackberries, loganberries, cranberries, fruits of the genus vaccinium, kiwifruit, durians, persimmons, black-, white- and redcurrants and gooseberries)	6
8.5-30.1	Orange juice, unfermented, whether or not containing added sugar or other sweetening matter (excl. containing spirit, frozen, and of a brix value ≤ 20 at 20°C)	5

Source: Calculation based EuroStat and ISBD GSP data.

6. Potential for Accompanying Policies

- Simplifying and reducing exemptions in Ghana's tariff structure could increase government revenue, as well as reducing administrative and compliance costs and the scope for rent-seeking and corruption. There are currently provisions with the CET to do exactly this.
- Improving the competitiveness of import markets and distribution networks and disseminating information about tariff changes can help ensure that tariff changes are passed on to consumers and firms and that the benefits of tariff reductions are fully realized by consumers and firms.
- The effects of the CET and EPA are small compared with even minor accelerations in firm productivity growth.
- Two examples—reducing power outages and reducing transport costs—for policies that could promote such productivity growth could have a much stronger (positive) impact on productivity than CET and EPA.

A particular feature of Ghana's tariff structure is the intensive use of exemptions. Tariff duties, VAT, excise duty, and other taxes are waived or reduced through various schemes based on the end-use or

status of the importer. These schemes, for instance, provide exemptions for churches and religious bodies, technical assistance schemes, the Volta Aluminum Company, the Volta River Authority, advertising material, mining equipment and inputs, manufacturers approved by the Commissioner, enterprises covered by the Investment Promotion Centre Act, and establishments under the Promotion of Tourism Instrument, as well as by importers under letters granting exemptions from the Ministry of Finance and other ministries.

In addition to increasing the complexity and the cost of compliance, exemptions create market distortions and encourage rent-seeking and corruption as users of imported goods brought in under exemptions have a market advantage and lobby for exemptions. Exemptions also reduce government revenue. According to the 2014 Budget Statement, the fiscal loss due to exemptions amounted to 5.6 percent (GHc 848 million) of Ghana's total tax revenue in 2013. Were Ghana to reduce exemptions by only one-third, this would more than compensate for losses caused by the EPA by the time of full implementation, assuming exemptions remain similarly proportional to total revenue.

The good news is that, as part of the CET, Ghana will indeed reduce many exemptions and concessions, in particular with the removal of those under Chapter 98 of Ghana's customs regime. This policy will simplify and streamline Ghana's tariff schedule, reducing the cost of administration and compliance as well as lessening market distortions and the scope for corruption.

The models used in this study to estimate the impact of the EPA and CET on consumers and manufacturing firms rely on the assumption that tariff changes are fully passed through to consumers and firms. In reality, the extent to which tariffs are passed on to consumers and firms is determined by traders and distributors. If markets are not competitive, traders and distributors may absorb the tariff changes, which can mean that consumers and firms do not benefit from reductions in certain tariffs. Policies that can improve the extent to which tariffs are passed on to consumers and firms include improving the competitiveness of import markets and distributive networks and disseminating information about tariff changes.

One argument for tariff protection is the desire to protect domestic industries until they reach international competitiveness. To illustrate the policy options, the remainder of this section explores the hypothetical impact of an accompanying competitiveness agenda relative to the EPA.

The EPA will be implemented over a 20-year period and will be supported with substantial adjustment assistance from the European Union under the EPA Development Programme (EPADP). Although the accompanying measures modeled in this section are exogenously assumed examples, that is, they are not the results of the EPA, the EPADP could contribute to funding them.

Figure 17. Summary of Impact across Distribution of Firms for All Scenarios

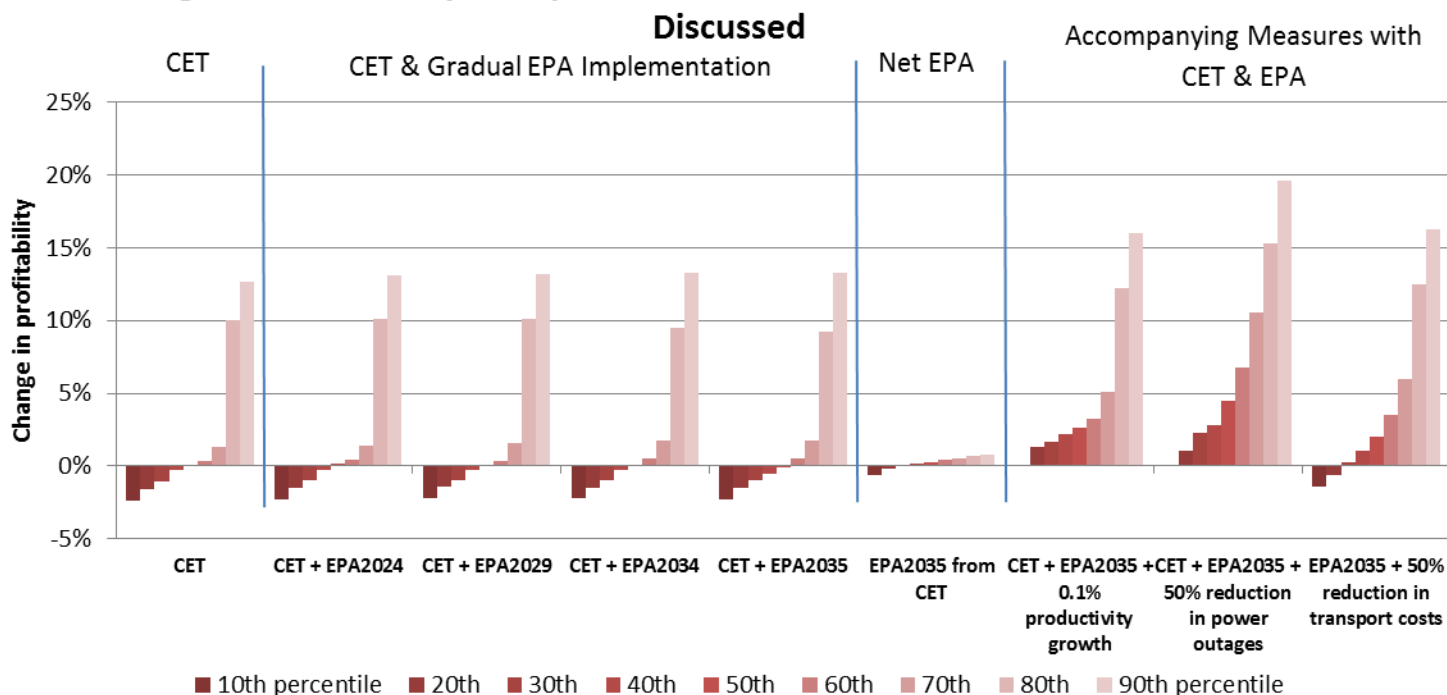


Figure 17 shows the distribution of the total impact on profitability across all firms for each of the scenarios discussed.

The effects of the CET, both positive and negative, is much larger than that of the EPA. Although this effect is close to zero for the median firm, gains tend to be larger than losses. The net effect of the EPA, although small, is positive for most of the firms affected.

All effects of the EPA, both positive and negative, and even those of the CET are small compared with even a minor acceleration in productivity growth over the implementation period. Two examples of policies that could promote such productivity growth are analyzed: reducing power outages and lowering transport costs, in each case by 50 percent. Adding such reform to the effect of the CET and EPA would significantly boost benefits at the top of the distribution and ensure a positive net effect for most firms. Where the net impact still remains negative, it would at least be mitigated. Unlike protection and higher output prices, such policies would boost competitiveness for all firms without harming consumers.

7. Conclusions

As with most policy decisions, there will be winners and losers from the CET and the EPA. Producers can gain or lose, depending on how such tariff reforms affect the prices of their input, capital, and output goods. Consumers can gain or lose, depending on how changes in tariffs affect the prices of their most important consumption items. Exporters are affected by access and competition in export markets.

Finally, the government fiscal balance is also affected by changes in import revenues. This study contributes to the analysis of tariff reform in Ghana by providing an intuitive and data-driven technical perspective on these effects. It quantifies and supplies context to the magnitude of tariff revenue losses, examines the impact on consumer prices, analyzes the effects on firm profitability and jobs, and investigates changes in export markets. The study also incorporates the CET and EPA tariff reforms within a single context to provide an appropriate perspective.

By increasing average tariffs on all non-ECOWAS importers, the CET leads to a significant increase in protection and tariff revenues, as well as lower imports. Although manufacturing firms are split roughly 50/50 in terms of winners and losers, winners gain more than losers lose in magnitude of effect. Very few firms become unprofitable as a result and exporters to ECOWAS could gain, particularly if the CET encourages improvements in nontariff barriers to regional trade. However, wins from the CET mainly result from higher protection on outputs. This can produce windfall gains in the short run for the firms that benefit, but imposes a burden on consumers and may have a detrimental effect on competitiveness and growth in the future. At the same time, the CET may slightly raise the cost of imported capital equipment, while its effect on inputs used by firms in the Ghanaian manufacturing sector is ambiguous. In the short term, losses from the CET are likely to occur mainly in the food and beverage, apparel, chemical products, and metal products sectors.

The effect of the EPA is much smaller than that of the CET: it only applies to imports originating within the European Union, and around 35 percent of the value of EU imports is excluded. The EPA causes a moderate decline in protection and tariff revenue, and an increase in imports and trade diversion toward the European Union. Over three-quarters of manufacturing firms, and an even higher share of manufacturing workers, can be expected to experience a small net benefit from the EPA in the short run. Benefits occur mainly through lower prices and easier access to imported inputs and capital equipment, and thus there is no harm for consumers and potential for continued productivity growth. For instance, food processors are predicted to gain from cheaper imports of some food products and sowing seeds, and wood processors gain from cheaper wood inputs. These benefits are supported by recent developments in the trade literature, which stress the importance of accessibility to intermediate goods in long-term productivity growth. Estimated losses from the EPA are concentrated in the mineral products and furniture sectors.

The export sectors likely to gain the most from the continued EU market access provided by the EPA include many of the sectors identified as being a priority in Ghana's export diversification strategy, including processed cocoa, fruit and vegetable products, and fish.

The impact of the CET and EPA is relatively small compared with even a minor acceleration in productivity growth. Examples of potential productivity-enhancing policy reforms, which could form possible targets for EPADP support, and that could offset negative effects and boost overall competitiveness include reducing electricity outages and lowering transport costs. To reduce the revenue impact of the EPA, a policy of simplifying and reducing tariff exemptions can be considered.

Although the average effects of the CET and EPA are not very large, trade reforms and especially the CET may lead to substantial adjustment dynamics with workers and capital likely to move across sectors as well as across firms within given sectors. This creates a policy challenge to ensure that such adjustment, on the one hand, can take place freely so that the Ghanaian economy can take full advantage of new

market opportunities. On the other hand, it will be equally important to ensure that adequate policy measures are in place to accompany the transition, ensure a socially equitable adjustment process, and prevent those who are affected negatively from dropping out of the labor market.

Appendix A: Sensitivity of Results to Elasticity Assumptions

TRIST Projected Import and Revenue Changes, Using Low and High Elasticity (ε) as Respective Base

Baseline (in million GHc)	Reforms	CET		CET+EPA2 020		CET+EPA2 025		CET+EPA2 030		CET+EPA2 035		EPA2035 from CET	
		Lo w ε	Hig h ε	Lo w ε	Hig h ε	Lo w ε	Hig h ε	Lo w ε	Hig h ε	Lo w ε	Hig h ε	Low ε	Hig h ε
Total imports	22,7	-	-	-	-	-	-	-	-	-	-	-	-
European Union	75	1.0	1.9	-0.8	-1.5	-0.7	-1.2	0.5	-0.9	0.5	-0.9	0.5	1.0
European Union	6,54	-	-	-	-	-	-	-	-	-	-	-	11.
European Union	7	1.4	3.3	-0.1	0.5	1.0	5.7	1.8	8.0	2.0	8.0	3.3	3
ECOWAS	1,16	-	36.	-	36.	-	25.	-	-	-	-	-	12.
ECOWAS	5	5.0	5	4.9	0	4.7	1	4.6	24.2	4.6	24.2	-0.4	3
China	4,27	-	-	-	-	-	-	-	-	-	-	-	-
China	0	1.9	7.5	-2.2	-8.7	-2.4	-9.6	2.5	10.0	2.6	10.0	-0.7	-2.5
United States	2,21	-	-	-	-	-	-	-	-	-	-	-	-
United States	2	2.4	5.3	-2.7	-6.4	-2.8	-7.0	2.9	-7.4	2.9	-7.4	-0.5	-2.1
Rest of world	8,58	-	-	-	-	-	-	-	-	-	-	-	-
Rest of world	0	0.8	2.3	-1.0	-3.2	-1.2	-4.3	1.4	-4.9	1.4	-4.9	-0.7	-2.6
Tariff revenue	1,79	23.	16.	18.	11.	14.	-	10.	-	-	-	-	-
Tariff revenue	3	4	7	4	5	3	7.9	8	3.6	9.8	3.6	13.5	1
Import revenue	4,38	10.	-	-	-	-	-	-	-	-	-	-	-
Import revenue	8	0	6.5	7.9	4.4	6.1	2.9	4.6	1.2	4.2	0.5	-5.2	-5.6
Old collected tariff rate (%)		7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
New collected tariff rate (%)		9.8	9.4	9.4	8.9	9.1	8.6	8.8	8.2	8.7	8.2	8.7	8.2

Source: Calculation using TRIST tool and Ghana CEPS data.

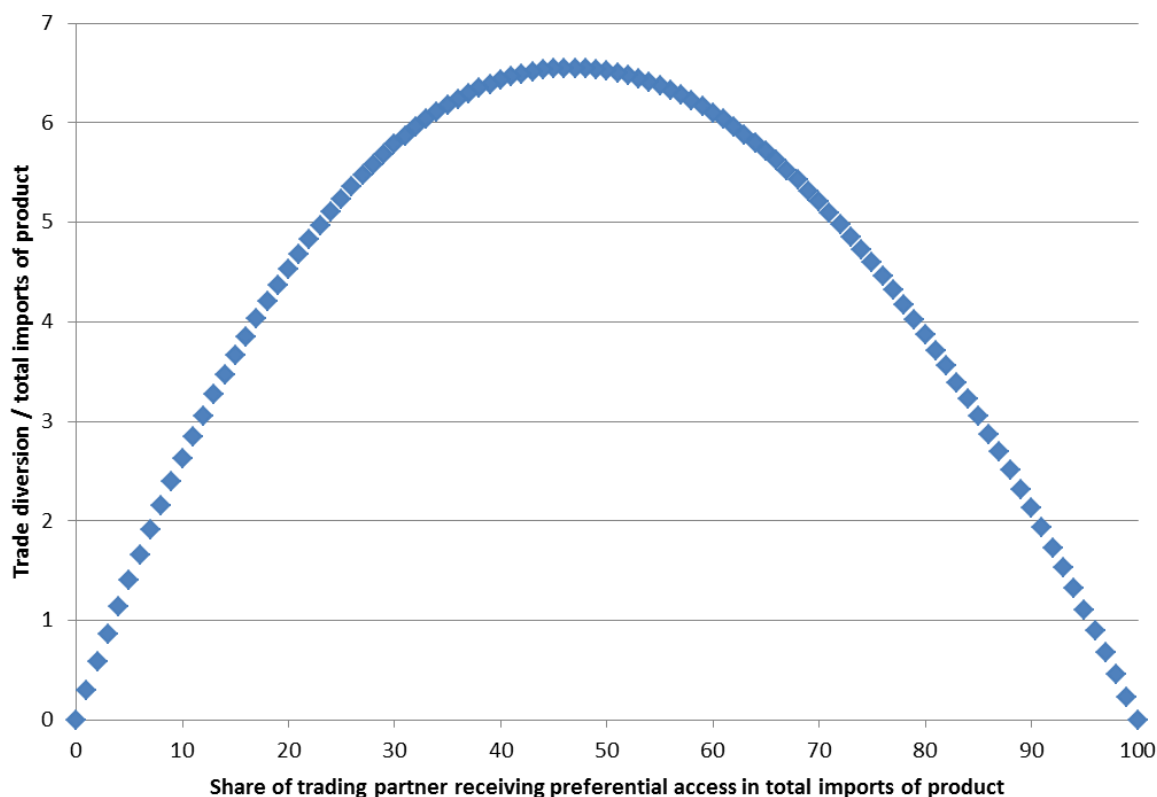
Note: CET = Common External Tariff; ECOWAS = Economic Community of West African States; EPA = Economic Partnership Agreement.

Appendix B: Trade Diversion Effects in TRIST

All trade effects in the Trade Reform Impact Simulation Tool (TRIST) are calculated at the detailed product level and then aggregated to assess total or sector-specific effects. There is no substitution across products. In this case, the most detailed available customs data at the HS10 digit level were used, leading to a breakdown of imports into 5,667 individual products.

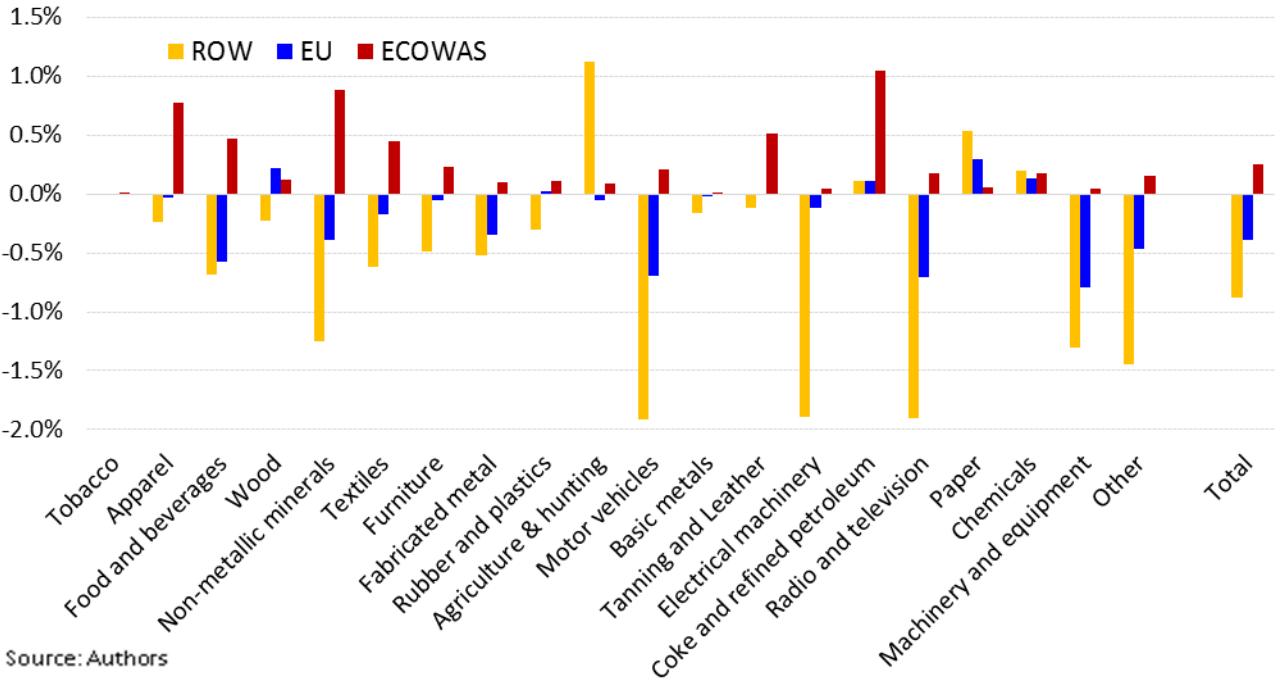
Trade diversion will only take place if a trade reform is asymmetric in the sense that it favors one trading partner over another. The exact calculation is explained in Brenton et al. (2009). For any product, trade diversion is a function of the relative magnitude of the tariff change for the trading partners receiving preferential treatment, the exporter substitution elasticity specified by the user, and the pre-reform trade structure. To illustrate the importance of the latter, figure B.1 shows the hypothetical example of a 10 percent reduction in the tariff rate for one trade partner with an export substitution elasticity of 3. If imports of the product in question from this trading partner are zero before the reform, they will by definition remain zero, resulting in no trade diversion. The same applies if the product in question is imported only from the preferential trading partner pre-reform. Figure B.1 illustrates the spectrum between these two extremes, showing that the strongest trade diversion effects for a given tariff change and substitution elasticity can be expected for products in which the trade partner receiving preferential treatment has a considerable but not dominant market share.

Figure B.1: Hypothetical Scenario of Trade Diversion for a 10 Percent Preferential Tariff Reduction and Exporter Substitution Elasticity of 3 Depending on Pre-Reform Import Structure



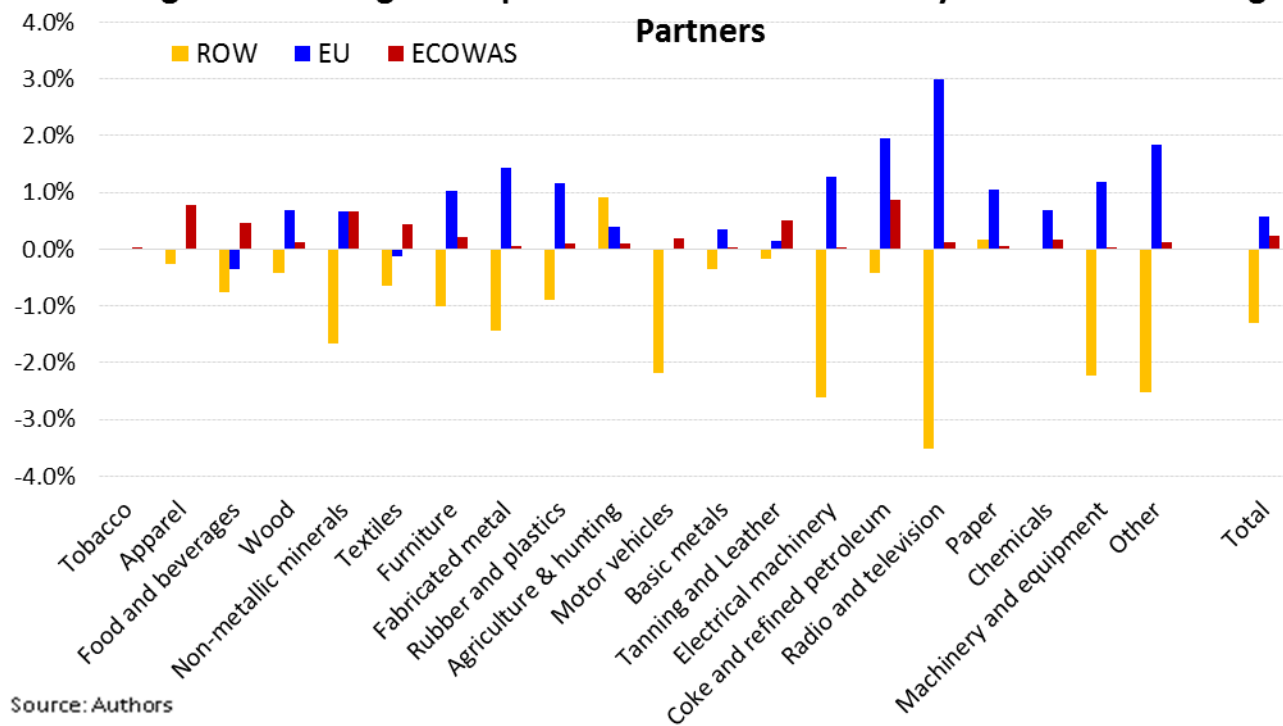
Figures B.2 and B.3 show the composition of trade diversion by sector and trading partner. Under the Common External Tariff (CET), trade diversion is smaller than half a percent of current imports for most sectors. By full implementation of the Economic Partnership Agreement (EPA) in 2035, the combined effect of the CET and EPA causes trade diversion to increase, especially for those sectors that enjoy more significant tariff reductions, such as radio and television and machinery and equipment. However, the size of the diversion is still fairly small relative to total imports, ranging from zero to 2.79 percent of total imports in each sector.

Figure B2. Change in Imports Under CET by Sectors and Trading Partners



Source: Authors

Figure B3. Change in Imports Under CET+EPA2035 by Sectors and Trading



Appendix C: Methodology for Firm-Level Results⁵

In the short run, firms are affected by a trade policy reform primarily through three price channels: changes in the domestic price on the output they produce, the inputs they use, and the capital goods they purchase. Typically, a lower tariff on a given good would reduce its domestic price, and thus diminish the profitability of firms producing this product. However, lower tariffs on their intermediate inputs and capital goods would increase the profitability of firms.

Ultimately, a firm's response to these changes will also depend on its pre-reform level of profitability. Firms operating in highly protected sectors often have considerable profit margins, and may well continue or even grow their operations even if their profit margin is slightly reduced because of a tariff reform. Recent trade literature has emphasized that adjustment to trade reforms often has more noticeable effects at the firm level, with capital and labor moving from less productive firms to more productive firms within a sector, than it does in movement across sectors (Melitz 2003).

To account for all these factors, the results from TRIST on changes in prices are matched with World Bank Enterprise data on Ghanaian firms. The sample comprises 204 manufacturing firms from different regions and sectors across Ghana.

The expected change in profitability for each firm i in the sample is calculated as follows:

Equation 1

$$\Delta\pi_i = \pi_i^{EPA} - \pi_i^0$$

with

$$\pi_i^0 = \frac{Y_i * p(Y)^0 - (I_i * p(I)^0 + L_i * \bar{p}(L) + C_i * p(C)^0 + T_i * \bar{p}(T) + O_i * \bar{p}(0))}{(I_i * p(I)^0 + L_i * \bar{p}(L) + C_i * p(C)^0 + T_i * \bar{p}(T) + O_i * \bar{p}(0))}$$

and

$$\pi_i^{EPA} = \frac{Y_i * p(Y)^{EPA} - (I_i * p(I)^{EPA} + L_i * \bar{p}(L) + C_i * p(C)^{EPA} + T_i * \bar{p}(T) + O_i * \bar{p}(0))}{(I_i * p(I)^{EPA} + L_i * \bar{p}(L) + C_i * p(C)^{EPA} + T_i * \bar{p}(T) + O_i * \bar{p}(0))}$$

where:

Y is the firm's output

I are the inputs used by the firm

L is labor used by the firm

C is the depreciation of capital used by the firm

T are transport services used by the firm

O are all other cost items (rent, water, electricity, and telecommunications)

$p(X)$ is the price of item X

⁵ This section is an adapted excerpt from Ukekull and Shui (2014).

Subscript i refers to firm-specific variables

Superscripts 0 and EPA refer to the baseline and post-EPA scenario, respectively; however, this also applies to the CET

\bar{p} refers to prices that do not change as a result of the trade shock.

For the employment-weighted graphs, each firm is weighed by its survey weight, which corrects for regional, size, and industry sampling bias in the Enterprise Survey, as well as its number of full-time employees before the results are aggregated.

For the policy scenario with 0.1 percent exogenous productivity growth, Y_i is multiplied under the reform scenario with $1.03^{(t-2014)}$ where t is the end year of the respective EPA scenario (2024, 2029, 2034, 2035).

For the policy scenario with a 50 percent reduction in losses due to electricity outages, Y_i is divided in the reform scenario by $(1-EL*0.5)$, where EL refers to a variable in the Enterprise Survey that asks firms to report the loss in total output due to electricity outages.

For the policy scenario with a 50 percent reduction in transport cost, $p(T)$ is divided by 2 in the reform scenario.

As with the consumer effects, we have assumed that any changes in prices due to tariff reform are fully passed through to firms. The magnitude of effect simulated should therefore be considered to represent an upper bound.

Appendix D: Data Matching Methodology

Converting the price changes produced by the TRIST model into results at the household and firm level requires the matching of trade data with household expenditure and firm sales and cost data.

The 369 Ghana Living Standards Survey (GLSS) categories of household expenditure are not organized into a standardized categorization system for which concordance tables are available. To match price changes at the trade data level with GLSS expenditure categories, a concordance between tariff line data and household expenditure data was therefore manually created.

Where expenditure categories were more detailed than the Ghana trade data, these expenditure categories were amalgamated. For instance, GLSS data distinguishes between jeans for men and jeans for women, while Ghana trade data do not. Jeans for men and women were therefore combined into a single category, “jeans.” More commonly, trade data are more detailed than expenditure data. To account for this, price changes at the trade data level were combined into weighted averages for broader GLSS expenditure categories. For instance, the price change for the GLSS category “fruit juices” is an aggregate of the price changes of tomato juice, mango juice, guava juice, and all other juices, weighted by the import value of each type of juice. The prices of non-traded expenditure categories, such as “baby sitters,” “cultural festivals,” and “x-rays,” are assumed to remain unchanged.

The World Bank Enterprise Survey data include detailed output and cost structure data for Ghanaian manufacturing firms. For outputs, price changes were aggregated to 4-digit ISIC industry level (146 sectors) and merged with the firm-level data based on what each firm reported as its main output. For inputs, the firm-level data detail only the cost of inputs, not what they are. A social accounting matrix (SAM) produced by International Food Policy Research Institute in cooperation with Ghana Statistical Service was therefore used to extract the composition of inputs typically used by a firm based on its output. For this, price changes were aggregated to the 33 sectors of the SAM. For capital goods, the firm-level data detail only the total cost of capital depreciation, not what type of capital is used. To measure price changes for capital, a generic average price change for all capital equipment was created based on the Broad Economic Categories classification system. This price change is identical for all firms in the sample, although the impact on profitability will vary based on the weight of capital equipment in total cost. Fuel costs are reported separately in the Enterprise Survey and were matched with price changes for fuel from the TRIST results.

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