

The Role of Trade Policy and Energy Efficiency Policy to Promote Highly Efficient Air Conditioner Markets

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CLASP



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01 Executive Summary

The world is poised to install 700 million new room air conditioners (AC) by 2030 and 1.6 billion by 2050.¹ In 2016 alone, the global market for room ACs amounted to approximately 130 million units sold.² The market is highly concentrated in a handful of countries, with the top ten markets accounting for 81.5% of global sales. China and Thailand dominate global AC production, accounting for nearly 80% of the total units produced in the world. Thus, the vast majority of economies around the world import their room ACs.

The growing use of home and office ACs worldwide will be a top driver of future electricity consumption and could double annual greenhouse gas emissions in coming decades, from 1.25 billion tons/year in 2016 to 2.28 billion tons/year in 2050.³ In India, improving average room AC energy efficiency by 30% by 2030 (relative to 2015 levels) would reduce carbon dioxide emissions by about 180 million metric tons/year.⁴ Transitioning to low global warming potential (low-GWP) refrigerants and improving energy efficiency in split room ACs could avoid 61-142 new 500-megawatt peak-load power plants by 2030 in India and 680-1,587 such power plants worldwide⁵.

More than 60 countries have implemented energy efficiency policies,⁶ such as minimum energy performance standards (MEPS) and labeling, to regulate and improve the energy performance of the ACs sold on their markets. The two largest AC manufacturing countries, China and Thailand, have established and enforce MEPS for ACs sold in their respective countries. However, numerous countries in Africa, Asia, and Latin America and the Caribbean still have not implemented any form of energy performance standard and therefore enable import of inefficient products that would be prohibited in their countries of manufacture.

Trade policy and energy efficiency policy are closely linked. Energy efficiency policies such as minimum energy performance standards and energy labeling can affect which products can be sold on the market, and thus can restrict trade in inefficient products. Trade-minded energy efficiency policy can enhance energy efficient markets by determining the availability and relative prices of highly efficient imported products. This report discusses how trade and energy efficiency policy can work together to reduce the dumping of inefficient products in developing and emerging economies and promote the transformation to highly efficient AC markets. The report also presents several case studies assessing the impacts of trade measures that have enhanced or restricted the availability of energy efficient products in various countries.

Energy efficiency measures affecting trade, such as MEPS, can directly prevent inefficient products from entering the market. MEPS must, among other things, be applied equally to imported and domestically manufactured products to comply with World Trade Organization (WTO) principles. More than half of the world's countries have applied some form of MEPS and approximately three-quarters of Chinese exports of ACs go to countries with MEPS in place.

Other measures preventing inefficient products from entering markets include bans on used appliances. This is particularly important in countries without MEPS in place. For example, Ghana's prohibition on the import of used refrigerators and freezers accelerated Ghana's shift to more efficient appliances. Before the 2008 MEPS on all (new and used) refrigerators and freezers and the 2013 import ban on used products, the refrigerator market was dominated by used products that were imported primarily from Europe. Only 6% of refrigerators imported into the country were new, and at least 35 per cent of all the imported

¹ Shah et al. 2015

² Euromonitor 2017

³ IEA 2018

⁴ TERI, NRDC and IGSD 2018

⁵ Zaelke et al. 2018; Shah et al., 2015.

⁶ CLASP 2018

appliances were used products that had to be repaired or rejected. After the used product import ban, the Ghanaian market is now dominated by new, more efficient products.

The processes for verifying that products comply with MEPS or labeling requirements can be efficient and cost effective, and are vital to effective policy implementation. Inadequate enforcement of standards on imported products can allow non-compliant products to continue to be sold on the market even though MEPS and labeling are in place. Pre-Verification of Conformity (PVoC) is one of the methods used by some countries to verify policy compliance of imported products. Under a PVoC scheme, the importer is responsible for paying the cost of PVoC thereby removing the financial burden from the regulatory authorities in the importing country. However, case studies in Kenya and Haiti suggest there is a perception of unfairness by importers, as they believe their products are subject to higher quality standards than competing domestically manufactured products that do not undergo PVoC. Another challenge is that, based on a review of the two processes in each country, it appears that most verification involves document inspections and that there is limited testing. Regional cooperation could increase testing at an affordable cost.

Preferential trade measures for energy efficient products can be acceptable under WTO rules. Indeed, there are several precedents for governments granting WTO-consistent tariff exemptions for more efficient products. Several countries have recognized the effect of tariff policy on market availability of high efficiency products and have implemented tariff exemptions for more efficient products in order to encourage their uptake. For example, tariff exemptions played a role in a shift to more efficient lighting in Caribbean Community (CARICOM)⁷ markets. Jamaica and Guyana exempted CFLs and LED lamps from tariffs and other taxes, and these more efficient lighting technologies now constitute more than 90% of the lamps offered by major retailers in the two countries and have virtually eliminated inefficient incandescent lamps from these two markets.

However, when other policy objectives are the primary focus of trade policy on energy consuming products and the energy efficiency impacts are not taken into account, trade policies can restrict the availability of energy efficient products. For example, Brazil's local content requirements⁸, designed to support local manufacturing, reduced the availability of more efficient components and ACs on the market. Similarly, Central American tariffs that were designed to protect local LED light manufacturers slowed the uptake of efficient lighting products in the region, as they increased the relative price of LEDs as compared with incandescent lights.

Trade policies can dramatically reshape national and regional markets for energy consuming products. In the Association of Southeast Asian Nations (ASEAN),⁹ tariff reductions on intra-regional trade along with regional standards harmonization has led to ASEAN markets for ACs being dominated by products manufactured and traded within ASEAN, as opposed to Chinese-made ACs. Similarly, tariffs and tax breaks in Brazil have led to a thriving domestic AC manufacturing industry.

Trade policy is rarely crafted with energy efficiency in mind; however, energy efficiency policies will have greater effect when the trade policies surrounding energy consuming products are adjusted to complement broader energy efficiency goals.

⁷ The Caribbean Community is a regional integration institution comprised of Antigua and Barbuda, the Bahamas, Barbados, Belize, Grenada, Guyana, Dominica, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

⁸ Brazil's local content requirement for ACs states that, in order to receive a set of tax breaks, a specific percentage of the manufacturing value added for each component in the AC unit must occur in Brazil.

⁹ The Association of Southeast Asian Nations is a regional integration institution comprised of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam

Trade policy can effectively complement national energy efficiency policies by increasing the availability of energy efficient products in the market and restricting the availability of inefficient products:

- Countries without MEPS can effectively remove inefficient, outdated, or environmentally harmful products from the market by implementing MEPS.
- Countries with MEPS can decrease the cost of energy efficient products and encourage consumers to purchase them through tariff exemptions or reductions for highly efficient products.
- Countries with significant markets for imported used ACs can prevent inefficient products from entering their markets by implementing bans to restrict the import of unwanted, used products.

Trade policy can also weaken national energy efficiency policies by restricting the availability of energy efficient products:

- By reviewing tariffs under current and future trade agreements, countries can ensure there are no tariffs impeding the sale of more efficient products.
- By reviewing and removing tariffs intended to protect local manufacturing from foreign competition, countries can encourage investment and access to highly efficient technologies.

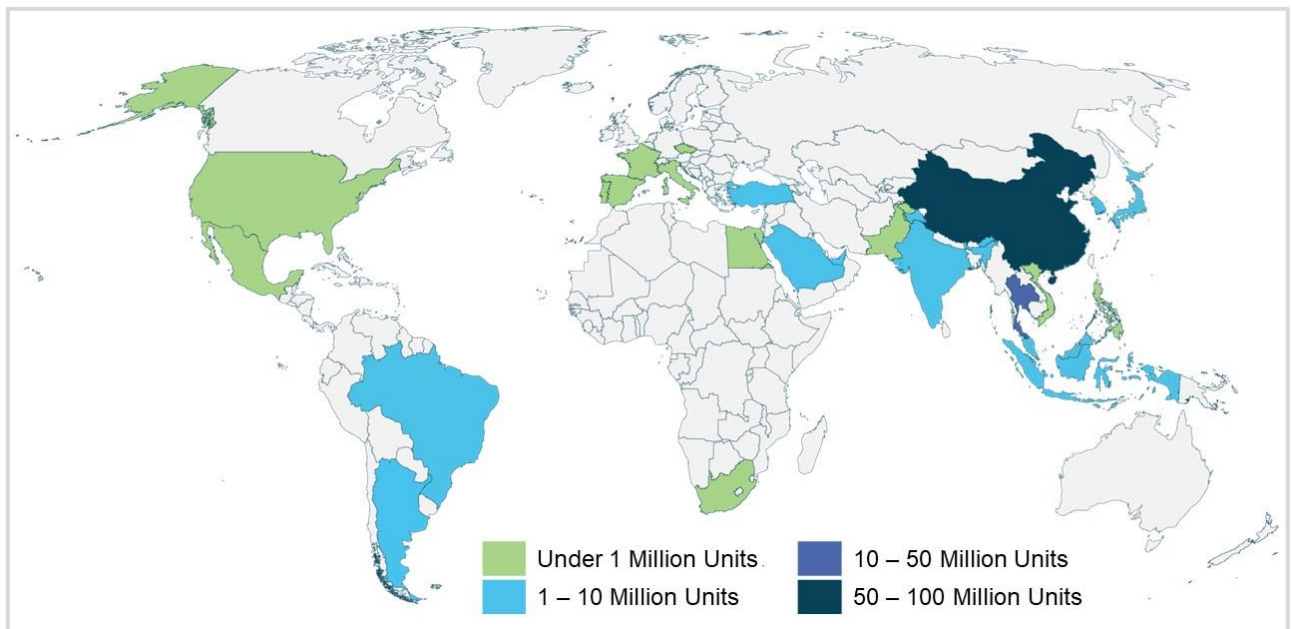
02 Background

The global market for room air conditioners (AC) amounted to approximately 130 million units sold in 2016.¹⁰ The market is highly concentrated in a handful of countries, with the top ten markets accounting for 81.5% of global sales, and China alone accounting for 52.6% of sales in 2016.¹¹

Room AC production by country is also highly concentrated, with China accounting for 68% of global production and Thailand accounting for 9%. No other producers account for more than 4% of global production.¹²

More than 80 countries around the world have implemented energy efficiency policies,¹³ such as standards and labeling, to improve the energy performance of the ACs sold on their markets. The two largest AC manufacturing countries, China and Thailand, enforce minimum energy performance standards (MEPS) for ACs sold in their respective countries. However, numerous countries still have not implemented any form of energy performance standard and therefore enable import of inefficient products that would be prohibited in their countries of manufacture.

Figure 1: Major Global AC Producers¹⁴



This concentration of production in just two countries also means that China and Thailand are the dominant global exporters of room ACs, as they account for 54% and 22% of global exports respectively.¹⁵ Notably, 23% of all Chinese AC exports go to countries with no MEPS whatsoever.¹⁶

¹⁰ Euromonitor 2017

¹¹ Ibid.

¹² Ibid.

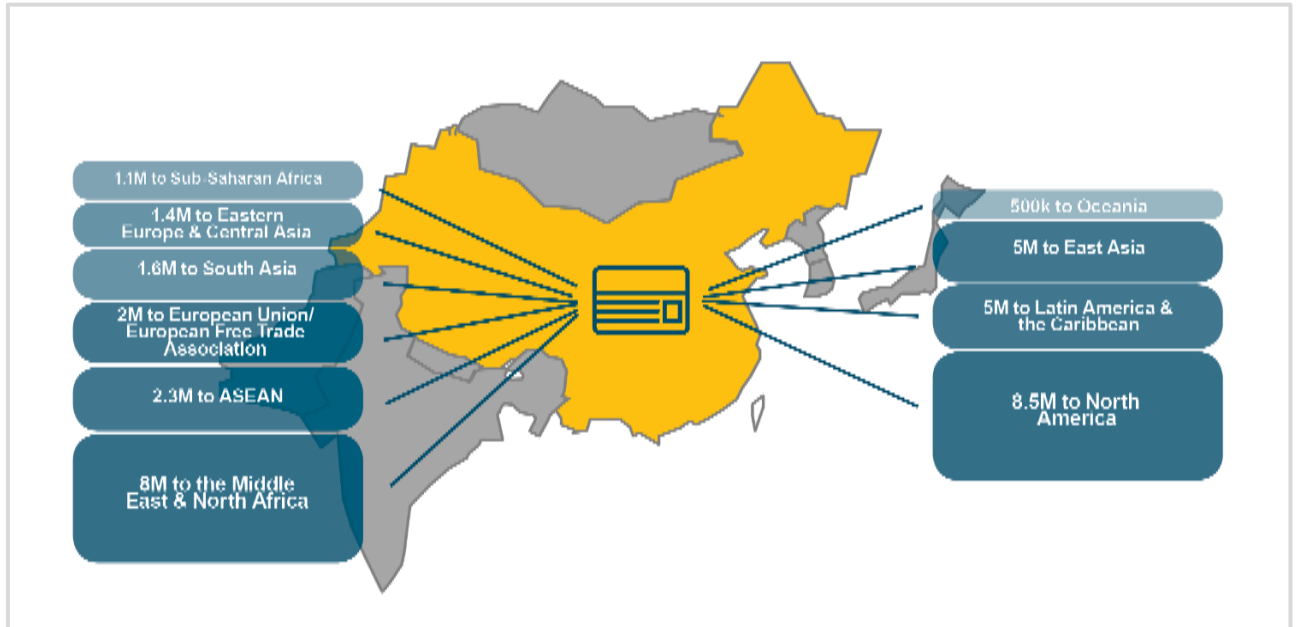
¹³ CLASP 2019

¹⁴ Euromonitor 2017

¹⁵ COMTRADE 2015

¹⁶ COMTRADE 2015 and CLASP 2018

Figure 2: Major Export Regions for Chinese AC Units¹⁷



This report discusses how trade and energy efficiency policy can work together to reduce the dumping of inefficient products and promote the transformation to highly efficient air conditioner markets.

The report provides a short introduction to energy efficiency policy and trade policy, and the links between the two. It discusses the World Trade Organization's (WTO) rules governing international trade and how those rules allow the use of MEPS to restrict the manufacture/import of low efficiency products, and the refrigerants trade restrictions under the Montreal Protocol.

The report also presents several cases studies of trade policies that have enhanced or restricted the availability of energy efficient products in various countries. These are grouped under two different trade mechanisms: i) case studies on non-tariff measures affecting energy efficiency, and ii) case studies of tax and tariff policies affecting energy efficiency.

¹⁷ COMTRADE 2015

03 Introduction to Energy Efficiency and Trade Policy

Trade policy and energy efficiency policy are closely linked. Energy efficiency policies such as standards and labeling requirements potentially constitute technical barriers to trade (TBTs), as they can affect which products can be imported. In addition, the processes for verifying that products comply with requirements can add costs to trade but are vital to effective policy implementation. Trade policy can also play an important role in enhancing energy efficient markets. In countries that import many of their energy consuming appliances, trade policy can determine the availability of various products on the market and their relative prices. This means that trade policy can act as an incentive or disincentive to the uptake of energy efficient products depending on policy design.

Trade policy can effectively complement national energy efficiency policies in several ways. Import restrictions, including those in the form of national standards, can help remove inefficient, outdated, or environmentally harmful products from the market.¹⁸ Tariff exemptions or reductions for energy efficient products can decrease the cost of those products and encourage consumers to purchase them. Conversely, higher tariffs on efficient products can increase their prices and serve as a disincentive to consumer purchase. Finally, trade policies regarding the enforcement of MEPS and labeling requirements can affect the process for importing products subject to such standards as well as the effectiveness of those standards. This can involve trade-offs: for instance, requiring that products be tested prior to importation can improve compliance, while not requiring testing can decrease costs.

Trade policy can also undermine national energy efficiency policies and act as an impediment to the proliferation of energy efficient products. Tariffs intended to protect local manufacturing from foreign competition may drive up the prices of energy efficient products relative to inefficient products. In addition, non-tariff trade measures such as quotas or safety standards may impede highly efficient products from entering the market.¹⁹

Trade policy is rarely crafted with energy efficiency in mind; however, energy efficiency policies will have greater effect when the trade policies surrounding energy consuming products are adjusted to complement broader energy efficiency goals.

3.1 The Role of WTO Rules

The WTO's rules limit the range of feasible trade policies that countries may implement to support energy efficiency. While the WTO lacks the ability to order a country to suspend a policy that violates its rules, the WTO can allow countries adversely affected by a prohibited policy to implement countervailing sanctions. This means that any country that implements a policy that violates WTO rules may face economic harm if, and only if, another country is willing and able to demonstrate that the policy affects their trade.

Most notably, import bans that are tighter than national standards violate Article III, paragraph I of the General Agreement on Tariffs and Trade (GATT), which requires that imported and domestically produced products be treated equally by all regulations. This paragraph states "internal...regulations and requirements affecting the internal sale, offering for sale, purchase, transportation, distribution or use of products...should not be applied to imported or domestic products so as to afford protection to domestic production."²⁰ The notes to this section indicate that this provision applies to regulations and requirements enforced at the point of importation. Based on these rules, it is clear that countries may not ban the importation of goods that would meet national standards if produced by a domestic manufacturer. However, it is unclear if trade bans in countries that do not produce a type of product could be litigated under this provision, as they would only afford protection to hypothetical domestic production. As with many issues regarding international trade law, there can be some variation

¹⁸ For a comprehensive review of the law and policy framework to stop the dumping of environmentally harmful products, including a trade policy "toolkit" for policymakers and their advisors, see [Anderson et. al. 2018].

¹⁹ Domestic trade policy may also play a more limited role in influencing the export of efficient products

²⁰ General Agreement on Tariffs and Trade 1994

between the strict letter of the treaty and the actual enforcement of WTO rules, as policies that violate WTO rules may not always be challenged by other WTO members due to their lack of interest in litigating the issue.

MEPS are allowed under the WTO; they are considered a technical barrier to trade (TBT) and fall under the WTO rules governing TBTs. This means that the MEPS must be applied equally to imported and domestically manufactured products. In addition, countries must notify the WTO before the standards go into effect, and there is typically a period of time for comments between notifying the WTO and the standards going into effect.²¹

Trade preferences for energy efficient products are also clearly acceptable under WTO rules. Generally, countries may set different tariffs for different products or components as they see fit, subject to some restrictions on the maximum tariff levels. There is no provision preventing countries from setting different tariff rates on different imported products according to their energy usage, and indeed, there are several precedents for granting tariff exemptions for more efficient products. In addition, broad exemptions from WTO rules are allowed for promoting environmental objectives under Article XX, if these policies to promote environmental objectives do not violate Article I (the Most Favored Nation principle, which mandates all WTO members receive equal treatment, with an exception for preferential trade agreements) or Article III.²²

3.2 The Montreal Protocol Trade Restrictions

The Montreal Protocol²³ also plays an important role in regulating international trade in cooling products. The protocol includes provisions restricting trade in ozone depleting substances as well as restrictions on trade in refrigerants with countries that are not party to the protocol. The trade restrictions of the Montreal Protocol might have violated the Most Favored Nation Principle in Article I of the GATT by discriminating between Montreal Protocol participants and non-participants; however, this issue was avoided because all WTO members joined the Montreal Protocol, in part due to the complications of challenging a trade restriction imposed to achieve global fairness in protecting the ozone layer, which is in the interest of all nations.²⁴ In this way, no WTO members were adversely affected by the implementation of trade bans, and therefore there were no affected countries who might seek to implement sanctions under the WTO. In addition, there have been proposals to allow trade restrictions to be imposed within the WTO framework if the trade restrictions are part of a multilateral environmental agreement, which would make tariffs an allowed mechanism for enforcing such an agreement.²⁵

²¹ Sugathan 2018

²² Ibid.

²³ The Montreal Protocol on Substances that Deplete the Ozone Layer was designed to reduce the abundance ozone depleting substances in the atmosphere by reducing the production and consumption of such substances. The original Montreal Protocol was agreed in 1987 and entered into force in 1989. It was amended in 2016 to include refrigerants with high global warming potentials. For more information, see: <http://ozone.unep.org/en/treaties-and-decisions/montreal-protocol-substances-deplete-ozone-layer>

²⁴ Kraus 2000

²⁵ Ibid.

04 Non-Tariff Trade Measures Affecting Energy Efficiency

Non-tariff trade measures, such as standards, are typically the most important energy efficiency policies affecting trade. Energy efficiency policies such as MEPS can directly prevent inefficient products from entering the market. In addition, the harmonization of MEPS, or at least test methods to measure and rate energy performance, can promote trade in higher-efficiency energy consuming products across a trade block. The method of enforcing these standards also plays an important role in ensuring that all products entering the market conform to the standards; verification methods should not be overly burdensome, to avoid becoming a barrier to trade. Finally, standards regarding other product qualities, such as safety, may have a significant impact on the availability of higher efficiency products as they may preclude the sale of certain technologies.

The case studies below provide examples of how each of these types of policies can be implemented, what effects they have had, and how they have been received. Ghana implemented MEPS as well as a ban on used appliances in order to directly prevent inefficient products from being imported. The Association of Southeast Asian Nations (ASEAN)²⁶ bloc implemented a free trade area and have launched a standards harmonization program to increase regional trade in appliances. Kenya and Haiti have both implemented pre-verification of conformity procedures to ensure that their standards are enforced without being overly costly and burdensome. Finally, US safety standards have prevented the importation of some more efficient ACs.

4.1 Ghanaian Standards and Ban on Incandescent Lights and Used Appliances

Ghana first launched its energy standards and labeling policy in 2005, with MEPS for ACs and fluorescent lamps. Ghana complemented this policy with an import ban aimed at removing common inefficient energy consuming products from their national market. The ban, implemented in 2013, prohibits the manufacture or import of incandescent lamps as well as the import of used ACs and refrigerators.²⁷ The ban on imported products was necessary because of the large number of used, inefficient products being imported into the country. Before the ban, the refrigerator market was dominated by used products, primarily from Europe. Between 2006 and 2009, only 6% of refrigerators imported into the country were new.²⁸ In addition, a study in Ghana found that from all the imported appliances entering the market, at least 35% were second-hand products that had to be repaired or rejected. Figures for ACs have not been reported separately from other appliances.²⁹

Because Ghana does not manufacture ACs, and manufactures relatively few refrigerators, nearly all of these products are imported into the country. Port inspectors, therefore, have an important role in enforcing MEPS on these imported products. In order to import any of the products covered by Ghana's MEPS, an importer must present the Energy Commission with a technical specification or a performance test report from a third-party laboratory that tests performance according to Ghanaian test standards. If these documents are in order, the Energy Commission issues a letter of approval and the products are entered into a database. When the products enter the country, customs officials then check them against approved products in the database and allow them to enter if they match the database.³⁰

This policy has generally been effective and well received. Although some importers of used appliances did complain about the regulation destroying their businesses, the general reaction amongst appliance importers has been positive. In addition, the policy has transformed the Ghanaian appliance market from importing old, inefficient products, to being dominated by new, more efficient products. Some used products are still smuggled into the country, but these now represent a small fraction of the market.³¹ According to the Energy Commission

²⁶ ASEAN Member States: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.

²⁷ CMA CGM 2016

²⁸ Amoyaw-Esei et al. 2011

²⁹ United4Efficiency 2017

³⁰ Zan 2017

³¹ Ibid.

of Ghana, 23,000 used refrigerators and freezers have been seized and destroyed since this policy was implemented, saving the country approximately 400 GWH of electricity.³²

4.2 ASEAN Standards Harmonization and Free Trade Area

ASEAN is a regional trading bloc that has been active in seeking to promote trade in all products, including energy efficient products, across the region. ASEAN member states have implemented a “Common Effective Preferential Tariff” among ASEAN members, creating a free trade area within ASEAN, with no tariffs on most products traded within, though there are still some products that attract a small (~5%) tariff. However, ASEAN does not have a common external tariff and each country is free to set its own tariffs for countries outside ASEAN, aside from those with whom ASEAN has collectively negotiated a preferential trade agreement. In addition, ASEAN has launched the ASEAN SHINE initiative to harmonize standards and remove non-tariff trade barriers for a variety of energy consuming products, including ACs. Though this initiative has yet to reach a harmonized MEPS across the region,³³ it has been successful in promoting a common test standard across the major AC markets in the region, allowing verified product efficiencies from tests in one market to be used in other regional markets.

The overall effect of these tariff reductions and the removal of non-tariff barriers to trade has been a vibrant regional trade in energy consuming products. The intra-ASEAN tariff on ACs is 5%, while the tariff on ACs from China is 15% and the tariffs from all countries without a preferential trade agreement with ASEAN is 30%.³⁴ As a result, 68% of all ACs imported by ASEAN countries are imported from other ASEAN countries, while only 28% of imported ACs come from China. Given that Chinese imports dominate most AC markets around the world, this shift to intra-regional trade is noteworthy and provides an opportunity for energy efficiency improvements since it represents a large regional AC market that can push local producers to move to more efficient products. This trend of intra-regional trade may shift in the future as Thailand has recently announced that they will reduce their tariffs on Chinese-made ACs to 0% in 2018.³⁵

This vibrant regional trade in ACs has also stimulated investment in local manufacturing. Thailand has already become the world’s second largest AC manufacturer and exporter, and several of its largest export markets are within ASEAN (Figure 3). In addition, several Japanese AC manufacturers have been increasing their investment in manufacturing in the region in the past year, with large investments in several ASEAN countries, including Thailand and Singapore.^{36, 37}

³² Peace FM online 2017

³³ ASEAN member states agreed to a defined MEPS target by 2020; some member states are still developing local regulations to implement the standard, while others have set MEPS well beyond the 2020 target.

³⁴ Vietnam Tariff Database 2017

³⁵ JARN 2018

³⁶ Cooling Post 7 April 2017

³⁷ Kawakami 2018

Figure 3: Major Export Markets for Thai AC Units³⁸

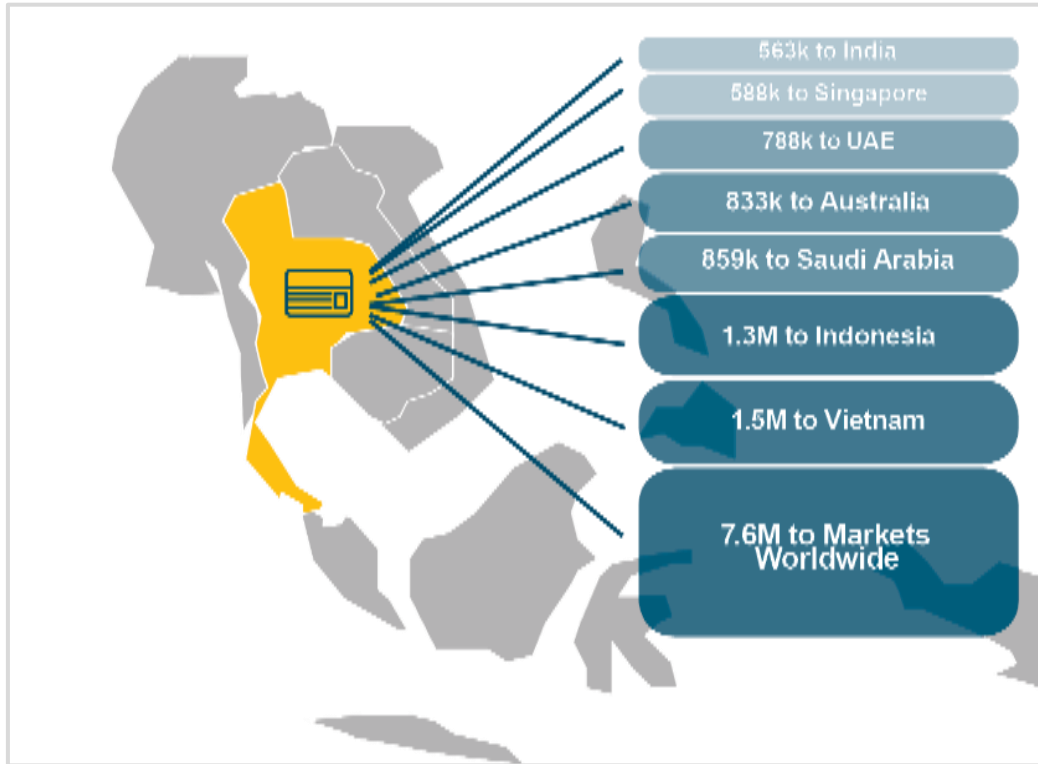
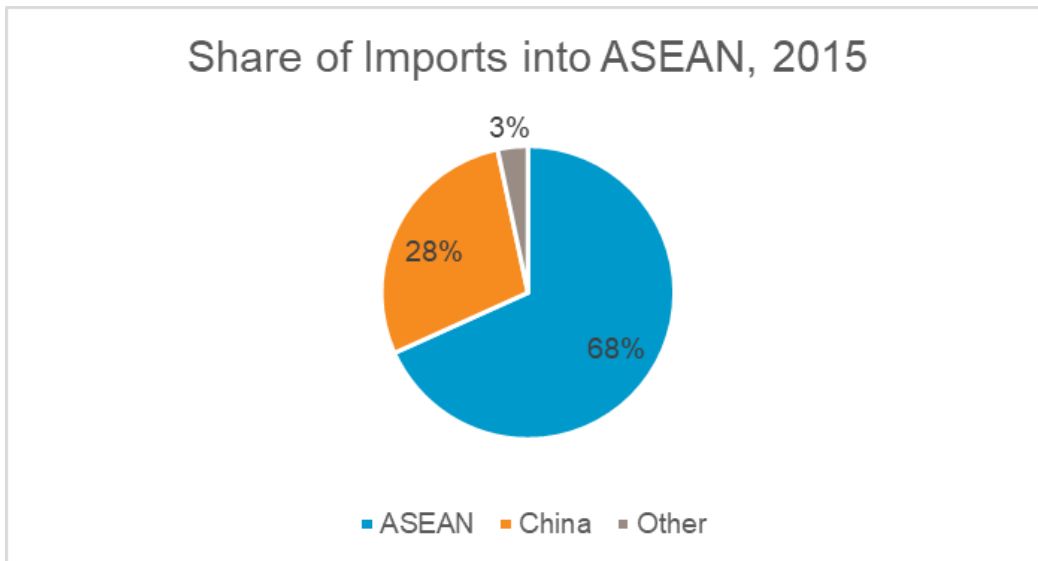


Figure 4: Sources of ASEAN AC Imports³⁹



³⁸ COMTRADE 2015

³⁹ COMTRADE 2015

4.3 Pre-Verification of Conformity

Ensuring that energy-consuming products conform to relevant standards can be challenging, particularly in countries with limited resources to enforce such regulations or countries with uneven enforcement of regulations by customs officials. One method of addressing these issues is Pre-Verification of Conformity (PVoC), wherein a third party verifies that products comply with relevant standards before they are shipped to the importing country. Typically, the importer is responsible for paying the cost of PVoC, thereby removing the financial burden from the importing country.

Kenya

Kenya has implemented a PVoC program for imported energy-consuming products. For this program, the Kenya Bureau of Standards (KEBS) has contracted four companies to provide inspection services throughout the world on products imported into Kenya. The four companies are Bureau Veritas, China Certification and Inspection Group, Intertek International, and SGS. There are then three routes to receiving a Certificate of Conformity (CoC) for importers:

- Route A: having each shipment tested and inspected.
- Route B: having the products registered as compliant and then only physically inspected, but with random testing carried out during the certificate validity period.
- Route C: having the producer licensed and then shipments randomly inspected with limited testing during the certificate validity period.⁴⁰

The choice of which method to use depends on the frequency and type of shipments, as the registration and licensing requirements are relatively burdensome for a smaller importer. Unknown traders/manufacturers, products procured for a project not for re-sale and small traders without access to manufacturer test results – whose freight on board (FOB) value of goods is below USD 20,000, not larger than a 20' container and who have no more than 4 shipments in a year - are subjected to Route A, while known traders/suppliers can opt for either Route B or C.^{41, 42} Additionally, used or second-hand goods must use Route A.

In lieu of testing by the PVoC agent, the exporter can supply the PVoC agent with manufacturer's test results from an accredited laboratory, product safety or conformity marks (e.g. CE mark) or request witnessing of testing by a PVoC staff member on the manufacturer's premises. The physical inspection reconciles the submitted test reports with the goods to be shipped. Where the PVoC agent determines random testing is required, the exporter should wait for the test results before shipping the goods. The cost of having a shipment inspected is typically 0.5% of FOB, subject to a minimum of US\$ 250 and a maximum of US\$ 2,675. Inspection of the goods should be carried out within 4 days after the PVoC agent receives the complete set of the required product documentation, and the response on the application will be issued within at most 2 days of receipt of the commercial invoice.

In addition to PVoC, the Import Standardization Mark (ISM) is required of all goods imported into Kenya. This mark is to allow easy identification of imported goods that have met the Kenyan standards. Importers are required to apply for ISM stickers before arrival of the goods at the Port of Entry. KEBS then issues the stickers within 2 working days of receiving the completed application forms and documents. A sticker should be affixed to all imported retail units. Each sticker costs KShs. 0.49 (~ US¢ 0.5).⁴¹

⁴⁰ Kenya Bureau of Standards 2016

⁴¹ Intertek 2016

⁴² KEBS Import Standardization Mark Guidelines

Haiti

Haiti has also chosen to implement a PVoC program, wherein SGS has signed a contract with the Ministry of Finance on behalf of the Government of Haiti to provide PVoC services on all products imported to Haiti. The primary responsibility of SGS is to work with the customs authority to ensure that products meet standards and taxes and tariffs are appropriately calculated. SGS works with the government to decide what standards should apply to various products.

The PVoC process in Haiti typically involves a two-step process where SGS first conducts a physical inspection followed by a documentation review. During the physical inspection, an SGS inspector will verify the quantity, packaging, and information labeling (e.g. expiration date) of the products. In the documentation review process, the importer or exporter must send required documentation such as a quality management system certificate (e.g. ISO 9001), marks of conformity (e.g. CE marking), technical data sheets, lab reports, and so forth. The importer then submits the documents to SGS, who reviews them against the regulatory requirements in force. Upon the successful review, SGS will issue the shipment a CoC. It is noteworthy that the CoC is more related to document review than performance testing or certification.⁴³

In principle, all products entering Haiti must be verified by SGS. For example, SGS provides PVoC services to one of the largest appliance distributors in Haiti. However, this appliance distributor has found unclear what standards SGS applies to some of their products for the Product Verification of Conformity process. Furthermore, they believe it unfair that they are required to pay the costs associated with the PVoC process when they believe that their products are higher quality than competing domestically manufactured products, which are not subject to this process.⁴⁴

4.4 Safety Standards as a Trade Measure Restricting the Availability of Efficient ACs

Safety concerns, as reflected in safety standards, have emerged as an important barrier to switching from the refrigerants currently used in ACs, hydrofluorocarbons (HFCs), which are scheduled to be phased down under the Kigali Amendment to the Montreal Protocol. This is because all known possible substitutes for the HFCs used in ACs are somewhat flammable, and flammable refrigerants have generally been restricted from use in ACs due to safety concerns.⁴⁵

There is global agreement of safety authorities that the refrigerant charge of a flammable refrigerant should be small enough to be safe if leaked into the air-conditioned space. However, authorities disagree on what is the safe charge and required engineered safety systems and on how to ensure that service of ACs with flammable refrigerants is also safe, particularly in situations where the informal AC service sector may not be trained, equipped and disciplined to assure safety. For example, at least one manufacturer in China considers propane (HC-290) room ACs safe when properly installed and operated in Germany, but unsafe in the circumstances of China.

One of the proposed substitute refrigerants is HFC-32, also known as R-32. HFC-32 is a component of R-410A, the most commonly used refrigerant in room ACs today. It has a global warming potential (GWP) of 675 and can produce efficiency improvements of up to 10%.⁴⁶ The reason HFC-32 has historically been mixed with other HFCs to produce R-410A, as opposed to being used by itself, is that HFC-32 is mildly flammable.⁴⁷ The safety regulations restricting the use of flammable refrigerants have been dealt with in several markets by

⁴³ SGS 2012

⁴⁴ Yu 2017

⁴⁵ McLinden et al 2017

⁴⁶ Daikin 2017

⁴⁷ Goetzler 2016

creating a new category of ‘mildly flammable’ refrigerants, A2L, and then creating workable safety standards for A2L refrigerants.⁴⁸ This has allowed Japanese AC manufacturer Daikin to develop HFC-32 ACs, and now major AC manufacturers including Gree, Daikin, Friedrich, and Mitsubishi have sold more than 10 million HFC-32 AC units across the world.^{49,50,51}

Another proposed substitute refrigerant is propane, also known as R-290. Safety restrictions in the US constitute a de-facto ban of R-290 ACs. ASHRAE Standard 34 classifies R-290 as A3, a non-toxic, highly flammable refrigerant.⁵² Underwriters Laboratory (UL)⁵³ then requires that A3 refrigerants have charge volumes of less than 3 times their lower flammability limit for domestic air conditioning. For R-290, this corresponds to a charge limit of 114g, which is large enough for ACs up to about 1.5 tons cooling capacity.⁵⁴ Given that room ACs with cooling capacity greater than about 1.5 tons typically require refrigerant charges of at least 200g, this amounts to a de facto ban on R-290 ACs. This ban of R-290 ACs in the US market limits the efficiency of ACs on the market, as R-290 is up to 10% more efficient in ACs than R-410A.⁵⁵

It is important to note that these safety restrictions may be modified in the future. For example, Germany in 2018 began allowing small room ACs to use R-290. The US EPA’s Significant New Alternatives Program (SNAP) recently proposed increasing the allowed charge size for R-290, R-600a, and R-441A in domestic refrigeration in order to match recent updates to UL’s standards for these refrigerants.⁵⁶ If UL finds that increasing the allowed R-290 charge in air conditioning does not constitute a significant safety threat, then it is likely that the charge limit will be increased.

⁴⁸ Richardson 2016

⁴⁹ Gree 2017

⁵⁰ Cooling Post May 19, 2017

⁵¹ Cooling Post April 28, 2017

⁵² ASHRAE Standard 34 classifies refrigerants according to their toxicity and flammability, with A meaning non-toxic, B meaning toxic, 1 meaning non-flammable, 2 meaning somewhat flammable, and 3 meaning highly flammable. These classifications are then referenced in safety standards around how each class of refrigerants may be used.

⁵³ Underwriters Laboratory (UL) creates safety standards for a variety of products. These standards are then used as the basis for legally-enforced safety standards in the US.

⁵⁴ UL 2017

⁵⁵ Domanski 2017

⁵⁶ EPA 2017

05 Tax and Tariff Policies Affecting Energy Efficiency

Although tariff policy is rarely made with energy efficiency in mind, it can have a major effect on the relative prices of goods and, therefore, on economic incentives for or against energy efficiency. Several countries have recognized this effect of tariff policy and have implemented tariff exemptions for more efficient products in order to decrease their relative price in the market and encourage their uptake.

The most thorough contemplation of how to use tariff policy to support energy efficiency has come in the negotiations around the proposed Environmental Goods Agreement (EGA). Discussions between potential EGA participants began in 2014. The agreement would reduce tariffs on goods that promote a healthy environment, particularly clean energy goods such as efficient appliances and renewable energy equipment. These tariff reductions would be applied by the participating countries to trade with all WTO members under the Most Favored Nation principle. A key aspect of the negotiations to date has been specifying the list of items that would see a tariff reduction. Progress toward reaching an agreement has been limited, as talks on the agreement have been stalled since December 2016.

One of the key challenges to incorporating energy efficiency into the EGA, and into tariff policy more broadly, has been the difficulty of identifying energy efficient products. In some cases, this is fairly simple, as the more efficient products are visibly different from the less efficient products, use different technologies, or may even have a different harmonized system (HS)⁵⁷ code to identify them. This is the case for LED lamps, which has made it relatively easy for many countries to exempt LEDs from tariffs.

In other cases, such as for refrigerators and ACs, energy efficient and inefficient products fall under the same HS code and are visually indistinguishable. For these products, two basic options exist for using tariff policy to encourage their sale. The first option is to create a separate “ex-out” category for products that fall into the highest efficiency category according to the energy efficiency standard for that product type, and then to exempt these products from import tariffs. The second option is to simply exempt all products that meet the importing country’s MEPS, though this would do little to differentiate higher efficiency products and would be unlikely to move the market to more efficient products than those already sold.⁵⁸ Neither of these options have been put into place by any country as of 2018.⁵⁹

5.1 CARICOM Tariff and Tax Exemptions for Energy Efficient Products

In the Caribbean, the Caribbean Single Market and Economy (CSME), an initiative of the Caribbean Community (CARICOM), includes a provision for all CSME member countries to have a common external tariff (CET) applied to all products imported from outside the region. The agreement on the CET allows for individual countries to publish lists of products to be exempted from the CET, so long as the exempted products are not also produced within CARICOM in sufficient quality and quantity to satisfy regional demand.⁶⁰ Given that appliance manufacturing in CARICOM is quite limited, this has allowed several CARICOM members to introduce tariff exemptions for highly efficient products and clean energy equipment. The rationale for such exemptions is to allow member states to incentivize the importation of higher efficiency products and renewable energy equipment to complement their national energy policies. This focus on energy efficiency and renewable energy in CARICOM is particularly important given that the vast majority of CARICOM members are small island developing states with very high electricity prices.

Several CARICOM member states have published lists of exempted products since the CSME went into effect. For instance, Jamaica has published a list of exempted products, including CFL and LED lamps, solar water heaters, photovoltaic panels, ice thermal storage air conditioning systems, and occupancy sensors, among

⁵⁷ HS codes 6-digit codes used by nearly every country in the world to classify all traded products. These codes identify the products to simplify the application of tariffs and other customs policies.

⁵⁸ Sugathan 2015

⁵⁹ Sugathan 2018

⁶⁰ CARICOM 2001

other items.⁶¹ Similarly, Guyana has tariff exemptions for “machinery and equipment for obtaining, generating, and utilizing energy from renewable energy sources; and energy efficient lighting, including compact fluorescent lamps and light emitting diode (LED) lamps.”⁶² In both of these cases, the products exempted from tariffs are also exempted from other taxes, such as the VAT. These exemptions significantly reduce the relative cost of energy efficient products, as other lamps attract a 30% tariff and a 16.5% general consumption tax in Jamaica and a 45% tariff and 14% VAT in Guyana.⁶³

These tariff exemptions have played a role in a shift to more efficient lighting in CARICOM markets. Inefficient incandescent lights have nearly disappeared from the Guyanese and Jamaican markets, with LEDs and CFLs constituting more than 90% of the lamps offered by major retailers in the two countries, a larger share than in most other CARICOM markets.⁶⁴ While the high electricity prices in these countries would have also contributed to the move to more efficient products, the tariff and tax exemptions certainly helped to make LEDs and CFLs more cost-competitive with less efficient products.

5.2 Tariff Exemptions for Energy Star Products in Turks and Caicos Islands and the Marshall Islands

Another example of trade preferences for energy efficient products is the tariff exemption for Energy Star products in the Turks and Caicos Islands and the Marshall Islands. Energy Star is a US voluntary labeling program, where the appliances that place in the top 25% in terms of energy performance can use an Energy Star label to note their high energy performance. Both of these small island countries, neither of which is a member of the WTO, have introduced tariff exemptions for Energy Star appliances, including ACs. In the case of the Turks and Caicos Islands, the government reduced the tariff for all Energy Star rated appliances from 15% to 0% in 2010.⁶⁵ In the case of the Marshall Islands, the government exempted ACs, refrigerators and freezers, and fluorescent and LED lights from tariffs if they have an Energy Star label or an equivalent energy efficiency endorsement label.⁶⁶

5.3 Tariffs Impeding Sale of Energy Efficient Products – Central America

The Central American Integration System (SICA) tariffs on LEDs represented an example of tariffs impeding the sale of higher efficiency products, though these tariffs have since been eliminated, ending the tariff preference for less efficient lamps. The customs union of the SICA is the Central American Tariff System (Sistema Arancelario Centroamericano), where participating countries⁶⁷ have agreed on harmonized import duties (Derechos Arancelarios de Importacion – DAI) for all types of products.

The tariff system is simple and consists of 4 categories as follows:

- 0% for capital goods and raw materials not produced in the region
- 5% for raw materials produced in Central America
- 10% for intermediate goods produced in Central America
- 15% for consumer goods

⁶¹ Petroleum Corporation of Jamaica 2007

⁶² Guyana Revenue Authority 2013

⁶³ Saint Lucia Customs 2007

⁶⁴ CLASP Data

⁶⁵ Bird 2010

⁶⁶ Nitijela of the Republic of the Marshall Islands 2011

⁶⁷ Guatemala, El Salvador, Honduras and Nicaragua. Costa Rica is under approval.

There is no differentiation between products or their parts, or between new and used products or equipment.

From this, the most relevant appliances and equipment for energy efficiency policy would fall under the last category, in most cases, or the first category, if the goods were not produced in the region. However, a detailed review of DAI rates for various products showed that there were differences in the 2015 classification.

Table 1: DAI 2015 rates for selected product types

Product class	DAI	More efficient	Less efficient
Refrigerators-freezers (residential)	15%		
Commercial refrigerators (display cabinets)	15%		
Air conditioners	15%		
Incandescent lamps	0%		x
Halogen lamps	5%		x
Linear fluorescent lamps	0%		
Metal halide and high-pressure sodium lamps	5%		
LED luminaries	0%	x	
LED lamps	15%	x	
Motors	0%		

The differences in DAI rates showed some disincentive to efficient lighting products: LED lamps (considered the most efficient technology as their efficacy – lumens/watt – can be up to six times better than incandescent lamps and twice that of compact fluorescent lamps)⁶⁸ had a rate of 15%, while the rate for incandescent lamps (the least efficient product) was 0%. On the other hand, the DAI rates for street lighting luminaries encouraged the use of the more efficient technologies by using a 0% rate for LED luminaries vs. a 5% rate for metal halide and high-pressure sodium lamps.

5.4 Brazil's Manaus Free Zone

Brazil has long used its trade policy to promote domestic manufacturing by protecting manufacturers from foreign competition through high tariffs on imported goods, which is allowed under the WTO rules. The imported products that face such high tariffs include ACs. Given the long distance between Brazil and China, the high tariff costs, and the time-consuming process of achieving customs clearance, Brazil has been a challenging market for Chinese AC exporters. In order to cope with these challenges, many Chinese manufacturers have set up factories in Brazil to assemble ACs made with Chinese parts.

In addition, Brazil has many local content requirements for various products, including ACs, and products meeting local content requirements receive more favorable tax treatment. These local content requirements have, however, been subject to several trade disputes, with a WTO panel ruling in August 2017 that the local content requirements for several industries in Brazil violate WTO rules.⁶⁹ It is unclear whether this ruling will lead to changes in the local content requirements for ACs, as the parties that brought the case against Brazil

⁶⁸ Luminous efficacy ranges taken from: http://www.fcgov.com/utilities/img/site_specific/uploads/led-efficiency.pdf

⁶⁹ WTO 2017

to the WTO were more focused on the local content requirements in the automobile and electronics industries.⁷⁰ As of February 2019, there had been no change to the policies affecting ACs.⁷¹

The most important set of tax and tariff policies for ACs relates to the Manaus Free Zone (Zona Franca de Manaus), where the vast majority of the country's AC manufacturing takes place. Companies manufacturing ACs in the Manaus Free Zone receive an exemption from several taxes, including import taxes and the manufactured products tax, so long as they meet certain local content requirements. These requirements include provisions regarding the share of Brazilian content in the compressors, motors, condensers, and other components of ACs. For instance, 30% of the process to manufacture compressors must be completed in Brazil.⁷²

One noteworthy case of a Chinese AC manufacturer setting up an assembly facility in Brazil is Gree, the largest AC manufacturer in the world.⁷³ Gree entered the Brazilian market in 1998 and managed to sell 100,000 units imported from China by 1999 but faced challenges in competing in the Brazilian market due to the high tariffs and shipping costs. This informed their decision to set up the first Gree plant outside of China in Manaus, Brazil in 2000 to produce 200,000 units a year. Manaus was an attractive location due to the Manaus Free Zone, which allowed Gree to import parts duty-free and receive the other relevant tax exemptions.⁷⁴

The decision to set up a factory in Brazil then influenced Gree's efforts to improve the energy performance of their products. At the time, in the early 2000's, Brazil was facing electricity shortages and had implemented MEPS that were significantly more stringent than those in China. Gree recognized that to remain competitive in the Brazilian market and earn a return on its investment in the Brazilian plant, they needed to improve the efficiency of their products. This led Gree to increase investment in research and development (R&D) and design more efficient products to be assembled at the Brazilian facility, which ultimately allowed Gree Brazil's AC units to lead the Brazilian market in efficiency for five consecutive years.⁷⁵

The policies surrounding the Manaus Free Zone have become more of a barrier to energy efficiency improvements in recent years. Various companies in the Brazilian AC industry have identified the local content requirement as a particular barrier to energy efficiency, as locally-manufactured compressors are not as efficient as those manufactured in other countries.⁷⁶ In addition, there is currently no local production of inverter compressors for ACs, and so manufacturers of inverter ACs are required to dedicate 3% of total revenues from the sale of inverter ACs to R&D, as directed by the government, in order to receive the preferential tax treatment from manufacturing in the Manaus Free Zone.⁷⁷ This effectively acts as a tax on inverter ACs and it is unknown how the R&D funds may or may not support energy efficiency. Such a policy that discourages inverter ACs is at odds with energy efficiency goals, as inverter ACs are typically more efficient than fixed speed ACs.

⁷⁰ Ibid.

⁷¹ Borges 2018

⁷² Diário Oficial da União 2014

⁷³ EUROMONITOR 2017

⁷⁴ De Toni 2016

⁷⁵ Ibid.

⁷⁶ Shores 2017

⁷⁷ Diário Oficial da União 2014

06 Conclusions

Trade policy and energy efficiency policy are closely linked. Energy efficiency policies such as MEPS and energy labeling can affect which products can be sold on the market, and thus can restrict trade in inefficient products. Trade-minded energy efficiency policy can enhance energy efficient markets by determining the availability and relative prices of highly efficient imported products.

Trade policy and energy efficiency policy are typically made separately, by different government agencies. Countries such as Ghana, Jamaica, and Guyana have seized the opportunity to use the connections between trade policy and energy efficiency policy to further energy efficiency objectives. In the Ghanaian case, standards and bans kept inefficient products from entering the market at all.

However, other countries discussed in this report have not managed to ensure that the two policy areas complement each other. In both Brazil and Central America, trade policy was crafted with a focus on supporting domestic industrialization, without regard for energy efficiency, leading these policies to become barriers to improving product efficiency in those markets.

The range of feasible trade policies is governed by WTO rules, if the country is a WTO member. Trade bans that do not apply to domestic production and local content requirements are both generally considered violations of WTO rules, specifically the principle of national treatment. However, preferential trade measures for energy efficient products are also generally acceptable under WTO rules. There are several precedents for granting tariff exemptions for more efficient products. For example, the Turks and Caicos Islands and the Marshall Islands both have exemptions for highly efficient appliances and Jamaica and Guyana's tariff exemptions for efficient lighting complemented other energy policies to move their markets towards CFLs and LEDs.

Non-tariff measures, such as standards, are typically the most important energy efficiency policy affecting trade. Energy efficiency policies such as MEPS can directly prevent inefficient products from entering the market. MEPS must be applied equally to imported and domestically manufactured products to comply with WTO rules. More than half of the world's countries have applied some form of MEPS and approximately three-quarters of Chinese AC exports go to countries with MEPS in place.

MEPS can be most effective when harmonized with major trading partners, as ASEAN is seeking to do, so as to continue to encourage trade in efficient products. In addition, the processes for verifying that products comply with the MEPS or labeling requirements can be efficient and cost effective and are vital to effective policy implementation. Inadequate enforcement of standards on imported products can allow non-compliant products to continue to be sold on the market even though MEPS and labeling are in place. Where countries face difficulty in enforcing such standards, PVoC can be a viable and cost-effective avenue to ensuring that imported products comply with the relevant standards, as has been the case in Kenya and Haiti. However, PVoC alone may not be enough to evaluate compliance with energy performance requirements as in general testing is limited.

Other non-tariff measures preventing inefficient products from entering markets include bans on second hand appliances. These are particularly important in countries without MEPS in place. For example, Ghana's prohibition on the import of used refrigerators and freezers accelerated Ghana's shift to more efficient appliances. Before the 2008 MEPS on all (new and used) refrigerators and freezers and the 2013 import ban on used products, the refrigerator market was dominated by used products that were imported primarily from Europe. Only 6% of refrigerators imported into the country were new, and at least 35% of all the imported appliances were second-hand products that had to be repaired or rejected. After the ban, the Ghanaian market is now dominated by new, more efficient products.

Tax and tariff policy can either boost or limit the effect of other energy efficiency policies. Relative tariff levels for energy efficient versus inefficient products can determine their relative prices and therefore the

competitiveness of high-efficiency products in the market. In Jamaica, Guyana, Turks and Caicos Islands, and the Marshall Islands, tariff and tax policies have been successfully leveraged to support energy efficiency. However, tax and tariff policies designed to promote local manufacturing can also limit the efficiency of products on the market if they restrict access to high-efficiency technologies from overseas, as in Brazil and Central America.

Trade policies can dramatically reshape national and regional markets for energy consuming products.

In ASEAN, tariff reductions on intra-regional trade along with regional standards harmonization has led to ASEAN markets for ACs being dominated by products manufactured and traded within ASEAN as opposed to Chinese-made ACs. Similarly, tariffs and tax breaks in Brazil have led to a thriving domestic AC manufacturing industry.

Trade policy is rarely crafted with energy efficiency in mind; however, energy efficiency policies will have greater effect when the trade policies surrounding energy consuming products are adjusted to complement broader energy efficiency goals.

Trade policy can effectively compliment national energy efficiency policies by enhancing the availability of energy efficient products in the market and restricting the availability of inefficient products:

- Countries without MEPS can effectively remove inefficient, outdated, or environmentally harmful products from the market by considering implementing MEPS.
- Countries with MEPS can decrease the cost of energy efficient products and encourage consumers to purchase them by considering tariff exemptions or reductions for highly efficient products.
- Countries with a significant market of second hand ACs can prevent inefficient products from entering their markets by considering implementing bans to restrict the import of used products.

Trade policy can also weaken national energy efficiency policies by restricting the availability of energy efficient products:

- By reviewing tariffs under current and future trade agreements, countries can ensure there are no tariffs impeding the sale of higher efficiency products.
- By reviewing and removing tariffs intended to protect local manufacturing from foreign competition, countries can encourage investment and access to high efficiency technologies.

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