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Cameroon regional report

Implementation of the International Standard on Phytosanitary Measures, ISPM 15 (Regulation of wood packaging material in international trade): An empirical analysis of how the regulation affects the economy of a group of countries in Africa

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Index

Table of Figures

Tables

1. Introduction to the Cameroon report

The Cameroon Ministry of Agriculture and Rural Development in 2006 signed the order number *003/06/A/MINADER/SG/DRCQ/SDRSQV/SQV*[3] laying down the procedures for processing and stamping WPM used for international trade in compliance with the ISPM 15.

The Minister of Agriculture and Rural Development is the organization responsible for issuing the license for the WPM treatment facilities. This license has a duration of five years, with a possibility of renewal. The license, as well as its renewal, is issued after the facility passes an inspection done by the NPPO. The inspection, as stated in the "Inspection protocol for phytosanitary treatment facilities", aims at assessing the ability of the structure to safely and efficiently conduct phytosanitary treatments.[4] It consists of checking the premises, the correct installation of the equipment used for treating WPMs, and the safety of the equipment. All those controls are done at the applicant's expense. Furthermore, the NPPO makes sure that personnel safety is guaranteed, and that the workers are knowledgeable about fumigants and how to handle them. The license may be withdrawn in the event of non-compliance. The protocol does not mention that facilities' records should be checked to understand whether treatments have been applied in accordance with ISPM 15.

The NPPO should carry out yearly audits, but this is rarely enforced and WPM treatment facilities are therefore not regularly inspected. In addition, the phasing out of MB was to take effect in 2015, even for quarantine purposes. Even though the last batch of MB was imported in 2014, some WPM treatment facilities are still using this chemical. The text N°A218/d/SG/PM of 18 May 2017, emanated by the Prime Minister's Office, has stressed the fact that the use of MB is now prohibited in the country.

For what concerns the manuals for import and export inspections, a phytosanitary inspection guideline has just been finalized by the NPPO and to be released soon. The guideline document is meant to cover the inspection procedures for both imported, transit and exported consignments.

The Cameroon report looks specifically at the implementation of the ISPM 15, its effect at the trade level and the costs and the benefits of the standard implementation at the WPM treating facilities point of view. The report is organized in the following way; next section sets out the context of the analysis by describing the effects –both at the economic and non-economic level- of standards for trade. Section 3 deals with the description of the qualitative component of the research. It reports the content of a number of qualitative interviews with private and public stakeholders and it highlights the main implementation challenges the country faced. Section 4 describe the macroeconomic analysis to see whether the standard implementation has had any effects at the trade level. The analysis points out which economic sectors have gained and which have lost in the international markets in the aftermath of the standard implementation. Section 5 looks at the viability –i.e. it compares the costs and the benefits- of the standard implementation from the point of view of the WPM treating facilities. The section looks at the costs and at the revenues the treating facilities face when treating WPMs.

[3] A copy of the document is available upon request.
[4] A copy of the "Inspection protocol for phytosanitary treatment facilities" is available upon request.

2. Context and Framework of the Analysis

There are many environmental measures nowadays that help us regulate the impact of a diverse range of human activities on the environment. In many domains of environmental protection (such as air and water quality, provision of ecosystem services, climate stability), markets are not sufficient alone to regulate the extent of environmental degradation that affects welfare in a non-excludable and non-rival manner. In other words, market mechanisms cannot reduce the extent of "public bads", since it is often prohibitively expensive to exclude certain individuals alone from the welfare costs of environmental damage, while the disutility and displeasure experienced by any individual is independent of the one experienced by others. These are typically referred to as the case of "missing markets", where those contributing to environmental damage and those demanding a reduction of it do not physically meet to negotiate solutions to the problem, in the form of appropriate compensation mechanisms or other implicit pricing. In such cases, negative environmental externalities often affect other individuals than the ones generating them and policymakers need to intervene in order to limit environmental degradation.

On many occasions, policymakers resort to market-based instruments to control for the levels of environmental pollution and degradation (Pirard, 2012). This rather heterogeneous group of policy instruments incorporate a price component that aims at incentivizing (or disincentivizing) certain behaviors through the provision of financial rewards and penalties. Charges and taxes on pollution or environmentally-destructive activities increase the price of goods and services that result in pollution or excessive resource use. These can be applied per item (e.g. plastic bag levies) or based on measurable environmental parameters (e.g. a tax linked to the carbon intensity of fuels). Using financial penalties is a similar mechanism that goes a step further by implicitly "criminalizing" certain unsustainable behaviors and imposing monetary penalties to those deviating from the pre-defined "status quo". Instead of imposing charges that limit but nevertheless legitimize a certain activity, financial penalties treat non-compliant behavior as an environmental offence (e.g. a fine imposed on those discharging waste in a water source or engaging in hunting during certain periods of the year). Tradable permits is a form of policy mechanism that allows one to sell some entitled environmental rights that are not exercised, such as carbon permits in the EU emission trading scheme where environmentally-conscious companies may sell unused carbon allowances to firms that exceed their own quota (at a price determined by the overall supply and demand of total carbon allowances).

Naturally, market-based instruments can also reward certain types of behavior, as in the case of subsidies and fiscal incentives. For instance, several energy-saving technologies are subsidized at their initial stages of development and adoption (e.g. solar panel technologies). Fiscal incentives can render certain types of behavior more attractive to tax payers, for instance by exempting from income tax accrued revenues from "green" investments. Policymakers, and increasingly so also private companies and large investment funds, may also use positive discrimination in favor of public investment projects and contracts that have a positive environmental impact.

On many occasions, governments resort to policy measures that restrict pollution more directly, rather than through market price signals. These types of instruments are often referred to as command and control regulatory measures (Engel *et al*., 2008) or, alternatively, as non-tariff or non-market barriers to

trade when the measures apply specifically to imports and exports of goods and services. Again, there is a wide range of policy instruments that aim to directly influence the level of unsustainable activities (rather than indirectly via distorting relative prices). Licenses and quotas regulate the level of trade transactions (and hence amount of imports of certain commodities) through the issuance of permits and quantitative restrictions. In extreme cases, embargoes can be imposed on the entire amount of a particular commodity before reaching a destination market. Standards fall in this latter category of command and control instruments that restrict the production or trade of certain commodities as they often prescribe certain conditions that products need to meet in order to minimize health risks and enhance consumer protection. Environmental standards specifically aim at products complying with predefined processes that minimize or eliminate certain types of environmental damage. ISPM 15 addresses the need to treat wood packaging material thicker than 6 mm (to prevent the spread of pests and resulting damage to the ecosystems of importing countries) and falls into this category of standards.

There are some important issues that need to be recalled when discussing the distinction between the market-based and the command and control type of instruments (as in the case of phytosanitary environmental standards; see Harrington and Morgenstern, 2007). First, command-and-control measures directly regulate the extent of environmentally damage, rather than attempting to achieve this indirectly by influencing relative prices across traded commodities. Taxes and charges, instead, try to limit environmental damage by making environmentally-polluting products more expensive. While, in practice, taxes and charges may achieve similar results as command and control measures, their success depends on the underlying price elasticity. In other words, the decline in demand for an environmentally-damaging commodity will depend on how consumers and firms respond to price changes with respect to the initial level of prices. First, setting a tax at a very low level may result in a minimal adjustment of behavior; similarly, setting a tax at a very high level may achieve the exact same result that a more modest tax could have achieved. Second, charges and taxes do not only discourage behavior that damages the environment (when fulfilling their role as a price signal) but also generate public revenues. These additional public revenues can have multiple purposes. Governments, for example, can decide to make use of them to finance green public investment that further improves environmental quality. Thus, they can dedicate financial resources for the same purpose that the original environmental tax was adopted in the first place. Alternatively, governments can view these additional public revenues as a substitute for existing unpopular taxes. For example, environmental taxes could allow governments to reduce income taxes, particularly for those economies suffering from high unemployment rates. Environmental standards (and command and control measures more broadly) have, in general, a neutral fiscal effect, although governments can still collect some fees through issuing permits to those firms that are allowed to implement the standards. Historically, market-based instruments (such as tariffs) played a much more important role in generating public revenues, but the increasing prominence of other sources of taxable income (e.g. through sales or income taxes), accompanied by the development of a sophisticated system to collect these, supported a gradual transition towards non-trade barriers (and a gradual elimination of tariffs).

2.1 Implementation of Environmental or Trade Standards – Key Issues

There is a wide range of criteria policymakers need to have in mind when designing appropriate instruments, including environmental or trade standards. Effectiveness is naturally a key criterion to consider when selecting and designing policy instruments, which should grasp the extent to which the desired outcome has been achieved (e.g. preventing the spread of plant pests and diseases in the context of ISPM 15). In practice, policymakers and governments face multiple constraints when deciding the appropriate policy (or policy-mix) response to an environmental problem and as a result of this, multiple criteria are normally applied simultaneously. Efficiency is another critical factor that influences decisions behind the optimal response and policy instrument to tackle some environmental concerns this and primarily focuses on how well resources (public funds, human resources, etc.) have been utilized to achieve a specific (environmental) objective. This is also where cost-benefit analyses (similar to the one presented in Chapter 6) become handy, as they provide estimates on the country-specific net benefits (associated with a specific instrument) translated in monetary terms.

Policy instruments can rank differently when assessed in effectiveness and efficiency terms (Oosterhuis et al., 2014). While an instrument can be very effective in environmental protection, it may at the same time be very costly (and inefficient), leaving few other resources available for other uses. Efficiency becomes a more meaningful concept when trying to take into account any indirect (positive or negative and often unintentional) effect that the policy instrument is likely to induce. Environmental standards, for example, increase the cost of exports and may, hence, result in a considerable loss of competitiveness. This effect is likely to be sector-specific (and is the focus of Chapter 5), depending on the final change in consumer prices and producer profits, as well as the intensity of competition in international markets. Some sectors, such an environmental improvement can, for this reason, come at the expense of output loss and increased unemployment for the local population. For other sectors, there can be an increase in employment and demand by allowing local firms to export to new markets with more stringent environmental regulations. Furthermore, the increase in demand for environmentally compliant materials could, for instance, also create additional employment for treatment facilities, inspection agencies, and so forth.

Implementation costs of standards or other policy instruments are naturally an integral part of efficiency. Some obvious direct costs of implementation (e.g. related to acquiring specialised equipment to manage the standard, or training personnel) are straightforward to calculate in monetary terms. Trade and environmental standards often involve multiple other, less direct, transaction costs that would also need to be taken into consideration. These include:

i. Information costs. These relate to the information that is required to implement effectively the standard. For example, awareness raising campaigns to sensitize the public or firms to the necessity of the standard and its environmental benefits, or surveys to capture the expected responsiveness of target groups to a change in price as a result of the implementation.

ii. Administrative costs. These can be substantial costs (both for the government and target groups) when the standard entails detailed bureaucratic procedures with large numbers of individual firms or households involved (e.g. processing and evaluation of forms, or sampling costs). For the government,

the costs also often involve planning and decision-making costs; for instance staff costs in policy-making departments, as well as the cost of stakeholder consultations.

iii. Monitoring and enforcement costs. These depend on the complexity of the requirements and the efforts involved in verifying compliance with the standard. These costs can be borne either by the government or by the target groups. Corruption is often one of the key constraining factors (particularly in developing countries) behind enforcement of standards and it is often perceived as a separate cost itself.

iv. Judicial procedures. A standard will be less costly in this respect if its provisions and conditions are clearly specified and unambiguous. Nevertheless, legislative amendments, required to support implementation, can involve substantial costs and may delay implementation.

In addition to these costs, a number of other situation-specific considerations play a role in terms of identifying how successfully a trade or environmental standard is implemented:

i. The scale and nature of associated environmental benefits. It is likely that the legitimacy and social acceptance of a standard will be higher (as a means to ensure some environmental benefits, such as pest control in the case of ISPM 15) when the public sees a close link between the standard's implementation and its intended environmental services.

ii. The number of actors involved. The larger the number of government departments and companies involved, the higher the associated transaction costs described above are likely to be. The spatial distribution of actors can also be relevant; costs are for instance likely to be higher when the monitoring and enforcement process of a standard takes place in multiple locations.

iii. Financial constraints of the local government or institutions. This is particularly relevant in the case of developing countries where the successful implementation of the standard might be hindered by the availability of resources. Even when these resources become available, they might come at the expense of the provision of another public good.

iv. Social and cultural conditions. Customs, habits and traditions can affect the acceptance of a specific standard. Misconceptions and the spread of inaccurate information can hinder the acceptance and enforceability of a standard. This is also likely to happen when the standard is at odds with established social norms and common practices. In such cases, there is often much resistance to change, when a new (potentially beneficial) instrument is introduced. Consequently, low social acceptance will typically lead to infringements and this, in turn, to reduced effectiveness and high enforcement costs.

2.2 Economic and Non-Economic Impacts of Standards

Any thoroughly conducted cost-benefit analysis needs to take into consideration all these additional socio-economic side effects (positive or negative) that are associated with the implementation of a standard. Many of these, often indirect, side effects might not be evident at first sight. The implementation of a standard, for example, can create employment gains or losses in associated economic sectors and changes in competitiveness as a result of price distortions.

In the case of trade standards with an environmental objective (as ISPM 15), the expected environmental benefits associated with the standard's implementation also need to be monetized and contrasted against costs. There is a wide array of benefits that need to be incorporated into such an analysis (Born *et al*., 2005), specifically:

i. Direct use values, which can for instance be (a) consumptive use values when the standard aims to preserve an environmental asset that will be consumed in the future (timber, food, etc.); (b) recreational use values, which indicate the environmental asset preserved (e.g. forest) that is valuable to individuals for recreational purposes (for walks, camping, etc.); (c) aesthetic use values, as evident from the price premium associated property in the vicinity of the environmental assets. In addition, for specific (often indigenous) communities, environmental assets can also provide significant spiritual values and fulfillment.

ii. Indirect use values, which include preserving an environmental asset (e.g. forest) through which also additional environmental services are safeguarded. For example, forests provide ancillary ecosystem services to local communities in the form of flood protection, improved erosion control, protection of water resources and biodiversity, and more, as well as benefits in the form of carbon sequestration for the global community.

iii. Option values, which relate to the value of potential (i.e. as of yet an undiscovered potential for use in the future). For example, the preservation of a particular species may allow the development of some future medical breakthroughs.

iv. Non-use existence values, which concern the satisfaction of continued existence of an environmental asset, even when there are no immediate tangible benefits associated. People might value the continued existence of a particular tropical forest or natural habitat, even if they never visited or intend to visit it in the future.

v. Non-use bequest values, which relate to the satisfaction one receives by ensuring that the environmental assets remain available to future generations. This is an issue of intergenerational equity and fairness where current individuals wish to safeguard the possible (yet unknown) satisfaction of future generations.

vi. Non-use altruistic values, which are those attached to a resource being available to others in the current generation. This captures the issues associated with intragenerational equity and fairness; although we might not be directly affected by a certain loss of an environmental asset, we value that this environmental asset is available for other communities and individuals (many of whom might have limited opportunities to substitute such an environmental asset with another one).

Any comprehensive cost-benefit analysis associated with a trade standard with an environmental objective should attempt to incorporate as many of these values as possible. Naturally, attaching monetary values to all the benefits discussed above is a formidable task that, in most cases, allows us only to approximate the real value of a particular environmental asset. Furthermore, this largely remains an anthropocentric approach to the benefits of environmental assets, given that the latter are directly or indirectly measured through human preferences.

2.3 Standards and Issues of Fairness

Fairness is another important dimension that policymakers should consider when designing a new standard (Gross, 2007). Environmental standards, for instance, are often designed with an emphasis on the attainment of certain environmental targets, with little consideration given to how certain groups (e.g. low income groups, women, indigenous people, small-scale firms) may be disadvantaged or proportionately less favoured in the process. Small firms may be unintentionally excluded from the implementation of a new standard because of budget constraints due to initial transaction costs, or simply through informational barriers. Much literature points to multiple barriers (financial, informational, discriminatory) that particularly women often disproportionately face when they attempt to engage in new business practices (Brindley, 2005; Pehrsson, 2009). There is also evidence pointing to a lower participation of small firms in many new environmental initiatives, often as a result of limited access to capital and skills or due to higher transaction costs compared to their income. Small firms may also be less willing to align their production methods to a new standard, when this adjustment entails uncertain financial returns given their high discount rates and relatively high risk aversion. This also concerns perceptions of typically disadvantaged groups regarding whether they feel that their voice is heard in the design and implementation of a standard. This type of fairness is often referred to as "procedural justice".

Another important aspect of fairness relates to the so-called "distributive justice"; the distribution of benefits (and costs) when the standard is implemented. Distributional justice can be examined at multiple levels. It might be that the costs of implementation of a particular standard affect small-scale firms disproportionately negatively (that subsequently struggle to maintain a positive profit margin and hence remain in production), or that firms that comply with the standard experience little improvement in the demand they face (and, hence, lose competitiveness with non-compliant producers). Fairness also relates to the distributional aspects of any anticipated benefits. It may be, for example, that any additional employment opportunities stemming from the implementation of the standard, only benefit specific groups of employees. In the case of trade standards with an environmental objective, the associated environmental benefits might largely accrue to others than those paying for the costs of implementation, and in many cases the beneficiaries might be located in other areas or even countries compared to those who bear the costs of implementation.

There are multiple ways to address issues of distributive injustice. In some cases, it might be possible that the additional cost initially borne by the implementing actor of the standard can be passed on to the ones ultimately enjoying the benefits accruing from the standard. This is not always easy, given that even in the case of agreed higher prices (e.g. passed to the final consumer), depending on the price elasticity of demand, those implementing the standard can face a substantially lower demand for their product and consequently a drastic reduction in profits. In other instances, the government or an international agency can compensate those who lose out from the implementation of the standard.

Perceptions of fairness, as to participation and distribution of benefits and costs, are often instrumental in the success of the implementation of and compliance with a standard. The legitimacy of new standards can, for this reason, depend on the following factors: (a) how involved actors are approached and how actively they become engaged in the process; and (b) the distribution of involved costs and

benefits, and compensatory schemes. In this sense, fairness perceptions are likely to relate to how involved actors reflect on the entire implementation process, from the beginning when the standard is designed extending to the stage when it is advertised, administered and monitored.

3. ISPM 15: findings based on qualitative interviews

This chapter will describe and critically analyse all the procedures put in place by the Cameroon NPPO to implement and comply with ISPM 15. The material used in this section derives from qualitative interviews with a number of stakeholders involved in the ISPM 15 implementation and compliance, such as exporters and importers, inspectors, and WPM treatment facility personnel. Through our descriptions of the field research in Cameroon, we will highlight the malpractices adopted by the ISPM 15 implementing agencies. Malpractices put in place by other agencies or organizations, either public or private, and that affect the correct implementation of ISPM 15, will be discussed too. Some of the malpractices are country-specific –i.e. are peculiar to the Cameroon case- but in most cases the same challenge and mal-practises highlighted in Cameroon can be detected in other countries too.

The rest of the chapter is organized in the following way. The next section will describe the field research undertaken in Cameroon; first we introduce the missions followed by a brief description of the interviews carried out with the stakeholders and an elaboration of the main findings. The policy implications of our findings and the main recommendations are summarized and discussed in the last section, whereas the appendix shows photos taken during the missions to help illustrate the issues discussed in this chapter.

3.1 Field research

The mission to Cameroon took place in Yaoundé and Douala from 4 to 11 July 2015. A complete list of the interviewed stakeholders can be consulted in Table 1.

Cameroon's key exports (excluding crude petroleum) consist of cocoa products (USD 676 million in 2014) and wood articles (USD 525 million in 2014), while machinery (USD 683 million USD in 2014) and cereals (USD 488 million in 2014) constitute its two major import sectors. The top export destinations of Cameroon are China, India, the Netherlands, France and Spain. The top import origins are China, France, India, Nigeria and the US. Over the last five years, the value of exports has remained quite stable (close to USD 5 billion, while the value of imports rose from about USD 5 billion to approximately USD 6 billion, resulting in a large trade deficit.

Cameroon is a larger country in terms of size, population, number of industries and agricultural production value, and the export sector is relatively well developed too. There are around 20 WPM treatment facilities operating in the country, and due to this Cameroon faces a higher degree of complexity when it comes to the implementation and compliance with ISPM 15. Cameroon initiated the implementation of ISPM 15 in 2005. However, 12 years after the NPPO is still struggling with a number of challenges.

Interviews with the stakeholders

The research team first met with the Director of the NPPO, Mr Leku-Azenaku, who provided a general overview of the ISPM 15 implementation in Cameroon. Cameroon began implementing the standard in 2005 and soon after 26 facilities applied to become authorized WPM treatment facilities. Nowadays, a

facility may both produce and treat WPM, but the NPPO wishes to separate those two functions to avoid confusion, overlapping roles, and problems with two licenses.

While it is quite straightforward applying to become a WPM treatment facility, the licence may be withdrawn if a failure in applying ISPM 15 is detected. To obtain a license the facility needs to be a legal entity, have a warehouse to store the WPM, comply with health and safety requirements, and be insured. The license is valid for five years and, in order to get the license renewed, the facility needs to provide the NPPO with all the records of past treatments, although there is no indication that the local NPPO will actually scrutinize these records to check the *modus operandi* of the facility.

WPM treatment facilities operating in Cameroon use MB and HT and the NPPO Director indicated that the use of MB for treatment purposes would be phased out by the end of 2015.[5] The NPPO had not received any guidelines in terms of how to correctly implement the standard by neither the FAO-IPPC nor IAPSC.

Similarly to the other case-study countries, the local NPPO does not collect any data related to the entry of pests. The lack of a proper data collection system influences Cameroon's ability to properly understand whether the implementation of ISPM 15 has been beneficial. As to the WPM leaving Cameroon over the past few years, only a handful of pest interceptions have been detected in foreign countries.

The interview with Mr Ekata, Director of the Phytosanitary Police Post, mainly focused on how Cameroon implements ISPM 15 at the import level. Most imports arrive in Cameroon via the port located in Douala. The inspections of fruits and vegetables (approximately worth USD 11.5 million in 2014) arriving in the country are done randomly by the Phytosanitary Police Post, and there are no specific protocol regarding which commodities should be inspected more closely. At the same time, and differently from what happens in countries outside Africa (see section 7), consignments from any country may be inspected, and Cameroon does therefore not focus its inspection on imports from any particular country.

For what concerns the inspections of imported goods, which are not fruits and vegetables, the Phytosanitary Police Post did not know whether they arrive on WPM or material that cannot harbour pests. This means that the Phytosanitary Police Post does not inspect any potential WPM. Normally, customs working in the port of Douala does not inform the Phytosanitary Police Post of the presence of WPM and this lack of coordination between the two entities may lead to the entry of pests.

The situation is different when it comes to imports via air, arriving at the airport in Yaoundé. Phytosanitary inspections are not carried out, despite the presence of a Phytosanitary Police Post at the airport. The challenge here too is to ensure that the customs operating at the airport, in charge of inspecting the imported goods for tax reasons, and the Phytosanitary Police Post collaborate on issues related to the import inspections.

[5] As stated in Chapter 3, the text N°A218/d/SG/PM of 18 May 2017, emanated by the Prime Minister's Office, stressed the fact that the use of MB is now prohibited in the country.

The research team visited several WPM treatment facilities. The first one, SIM, treated WPM using heat but is currently not treating WPM. Nevertheless, the NPPO has not withdrawn the stamp, despite the fact that the authorization has expired. This may constitute a problem if the facility decide to use the stamp again (as there is no oversight and the stamp could, in theory be applied to also non-treated WPM), or to pass the stamp to another facility.

Interviews with the other three facilities visited – Camerounaise d'Hygiene et de Services (CHS), Free of Pest and Services (FOPS) and Societé Camerounaise d'Hygiene et d'Assainissement (SCHA) – provided a number of interesting considerations, summarized in what follows. Similarly with the other countries part of this project, the NPPO does not subsidize facilities or provide any capacity building to help ensure the correct implementation of the standard. The WPM treatment facilities that operate using HT, treat the WPM directly and apply their ISPM 15 stamp. However, those facilities using MB, on the other side, do the treatment in the premises of the company that wishes to export.

In this case, the WPM treating facilities do not have their own ISPM 15 mark but a representative of the NPPO comes to stamp the WPM. All the MB facilities pointed out that the quantity of chemicals used varies depending on the final destination of the WPM, and that the length of the treatment amounts to 48 hours. There is a common misunderstanding about the efficacy of both the MB and heat treatments, as the treatment facility representatives claimed that the risk reinfestation is very high if the sea container transporting the WPM has not been treated.

Table 1: List of activities arranged for the mission to Cameroon

Name of the Company / Organization / Institution	Contact person	Main activity
NPPO	Bigueme Edmond Desire	Mission logistic
NPPO	Leku Francis Azenaku	Director of the NPPO
IAPSC	Bahama Jean Baptiste, Flaubert Nana and Zafack Joseph	IAPSC representatives
SIM – Heat treatment wood facility	n/a	Former wood pallet producer
NPPO	Enumerators	Training with the enumerators
Ministry of Agriculture and Rural Development ("Minader")	Bell Nyemb	Ministry of Agriculture and Rural Development
Phytosanitary Police Post at the Douala port	Ekata Mvondo	Port inspections
Camerounaise d'Hygiène et de Services (CHS) ; Free of Pest and Services (FOPS); Société Camerounaise d'Hygiène et d'Assainissement (SCHA)	Various people	WPM MB treatment facilities
SEEF	n/a	WPM HT treating facility

Customs		
Ministry of Forest and Fauna	Isaac Noe' Mandong	Interceptions division of Douala port customs
CNCC	Agbor Araw	
	Nteppe	

Note: The transcripts of the interviews are available upon request.

Main findings

Through the interviews with the stakeholders involved in the implementation of ISPM 15 at both the import and export levels, a number of interesting key points have emerged. These are summarized in the text that follows. One of the most important issues identified is that Minader, with law 3/2006, allows for the phosphine PH3 treatment to be used to treat WPM, which is not in compliance with ISPM 15.

However, national regulation also contradicts ISPM 15 on other accounts. The NPPO does not provide WPM treatment facilities using the treatment MB with a unique stamp code. This renders trace back in the event of pest interceptions impossible, as all the WPM have the same mark.

ISPM 15 is also not systematically applied at import, with the problem being more accentuated when the imported commodities are not in the fruits and vegetables category. The lack of coordination between customs, in charge of understanding the value of the imported goods for tax purposes, and the NPPO, which aims at verifying that the imported goods meet the phytosanitary import requirements, effectively prevents inspections of WPM.

Similarly to the other target countries, in Cameroon there are also several facilities repairing broken WPM. The repaired WPM, whose parts may or may not be treated, looks like a treated WPM but might not be compliant with ISPM 15.

Another important qualitative result, which will have a bearing on the local policy implications, is represented by the fact that not all the WPM treatment facilities agreed to release information and data related to several aspects of the implementation process for the purposes of this project. It is peculiar that the NPPO representatives were not allowed to collect data, similar to that they are supposed to gather during their yearly audit.

Figure 1**Error! Reference source not found.** shows how the country as a whole and the NPPO in particular have organized the implementation process.

i) PH3 is not an approved treatment

Ministry of Agriculture and Rural Development ("Minader"), through the emanation of law number 3/2008, indicates the treatments allowed to be used for treating WPM. One of the three treatments Minader authorizes is PH3 (phosphine) – with the other two being HT and MB (

Figure 2). PH3 is not an ISPM 15 approved treatment. It is not clear whether the WPM treatment facilities based in Cameroon use the PH3 treatment or not, but the country regulation clearly allows it. A

manager of a treatment facility indicated that it takes around three days to apply a PH3 treatment and he therefore opted to use MB.

ii) The producer/treatment provider code is not unique

The facilities treating WPM using MB do not have their own ISPM 15 stamps, instead the NPPO provides the mark directly. This fact per se does not contradict the requirements set out in ISPM 15; the NPPO is entitled to keep all the stamps and apply them upon completed treatment. However, it is a major issue that the NPPO stamps all WPM, treated by different facilities, with the very same mark without distinguishing the producer or treatment provider. This poses a problem in case of pest interception, as trace back will be impossible. In addition, this contradicts not only ISPM 15 but also the Minader law number 3/2008, which states that the producer/treatment provider code should be unique for each of the authorized WPM treatment facility.

iii) The ISPM 15 stamp is not always readable

The stamps applied by the NPPO to the treated WPM are, in some cases, partly or fully illegible (Figure 3).

iv) Essential and inessential components of the stamp

ISPM 15 clearly describes the essential requisites of the stamp ("A mark indicating that wood packaging material has been subjected to approved phytosanitary treatment in accordance with this standard comprises the following required components: the symbol, a country code, a producer/treatment provider code, a treatment code using the appropriate abbreviation according to Annex 1"). As Figure 4 shows, it is very frequent in Cameroon to see additional components in the mark, for instance "DB", which stands for debarked wood. This additional component is not a requisite of ISPM 15 and is unnecessary as, by default, only debarked wood should be used to produce WPM.

v) Minader law does not reflect ISPM 15

The misunderstanding regarding the information needed on the stamp may derive from Minader's misinterpretation of the international regulation. The Minader law states that the stamp should have, among others, the date of the treatment, the code of the institution in charge of stamping and the number of the batch (see

Figure 2). All these features are not required by ISPM 15.

vi) Customs inspections

Several representatives of the customs phytosanitary service, the group carrying out phytosanitary inspections, have pointed out that inspections of WPM are not carried out with a systematic frequency. The lack of inspections of the WPM entering Cameroon is due to the fact that the import permits accompanying consignments do not report the type of packaging material they are transported on. The Phytosanitary service representatives stressed that it is extremely difficult for customs to guess what type of packaging material is used for all consignments, and therefore only inspects those carrying fruits

and vegetables[6] because the inspectors expect the presence of WPM. A possible solution to this issue could be improved communication between the inspectors working at customs and those performing phytosanitary inspections, because although this communication is actually foreseen, in reality there is no functioning mechanism to ensure it.

vii) Quantity of chemical used and length of the treatment

Several WPM treatment facilities using MB have stated that the amount of MB used for the treatment varies depending on the country the treated WPM is moved to. According to ISPM 15, any approved treatment may be applied with equal effect, and irrespective of the importing country. For what concerns the length of the MB treatment, ISPM 15 only sets minimum exposure time ("not less than 24 hours"). Some facilities treat the WPM with MB for about 48 hours. However, it is not possible to know whether such exposure time ensures the required level of efficacy, as no records related to the concentration of the gas used are kept. In this regard, the NPPO should examine the treatment records and advice on the procedures adopted.

viii) Not all the WPM treatment facilities have accepted to be interviewed

The research team had planned to interview the 26 WPM treatment facilities present in Cameroon, but only 14 of them accepted to be interviewed. Nine of them refused to allow the local NPPO enumerators to enter their premises and three of them had closed down at the time of the data collection. The problems related to the lack of data from 12 WPM treating facilities will be discussed more thoroughly in Chapter 6. Nevertheless, we note that the NPPO was unaware that three WPM treating facilities had closed down, although it is responsible for authorizing the treatment facilities. Apparently, the NPPO does not keep a list of which facilities are operating, which is also severe because the closed facilities continue having the ISPM 15 stamp, and could, potentially, use it to mark untreated WPM. It is also acknowledged that the facilities are not willing to share any type of information about their business cycle with the local NPPO, although the NPPO should have a supervisory function. This poses problems in terms of transparency and accuracy of the treatments carried out.

Conclusions

One of the most important issues identified is that Minader, with law 3/2006, allows for the phosphine PH3 treatment to be used to treat WPM, which is not in compliance with ISPM 15. However, national regulation also contradicts ISPM 15 on other accounts. The NPPO does not provide WPM treatment facilities using the treatment MB with a unique stamp code. This renders trace back in the event of pest interceptions impossible, as all the WPM have the same mark.

ISPM 15 is also not systematically applied at import, with the problem being more accentuated when the imported commodities are not in the fruits and vegetables category. The lack of coordination between customs, in charge of understanding the value of the imported goods for tax purposes, and the

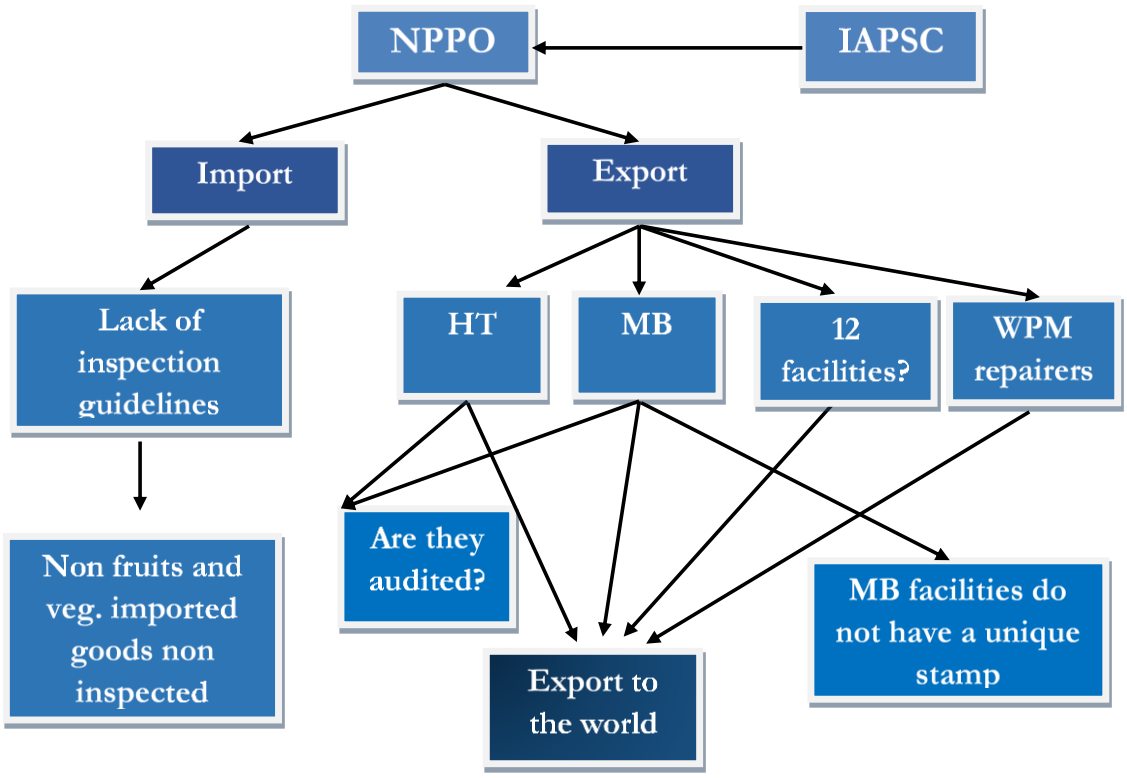
[6] This communication challenge exists in many other countries too, some of which overcome it by establishing a database of commodities most likely to be associated with WPM. Customs then targets these commodities and the NPPO inspects the WPM.

NPPO, which aims at verifying that the imported goods meet the phytosanitary import requirements, effectively prevents inspections of WPM.

Similarly to the other target countries, in Cameroon there are also several facilities repairing broken WPM. The repaired WPM, whose parts may or may not be treated, looks like a treated WPM but might not be compliant with ISPM 15.

Another important qualitative result, which will have a bearing on the local policy implications, is represented by the fact that not all the WPM treatment facilities agreed to release information and data related to several aspects of the implementation process for the purposes of this project. It is peculiar that the NPPO representatives were not allowed to collect data, similar to that they are supposed to gather during their yearly audit.

Figure 1: Flow chart of the ISPM 15 implementation process in Cameroon



Note: Authors' elaboration.

3.2 Policy implications and policy advice

Through the country missions and the stakeholder interviews, a number of malpractices were highlighted in relation to the working procedures of NPPOs and other organizations when implementing ISPM 15 (see Table 2). In some cases, these malpractices were generated from a misunderstanding of the standard. In other cases, the NPPOs are aware of the malpractice but they do not have the

necessary resources or an adequate level of know-how to address it. It may also be that the NPPO is not aware of the specific issue.

Improvements in how ISPM 15 should be implemented should come from several directions. In the text that follows we propose possible solutions to the identified malpractices out. These proposals all stem from ISPM 15 or from procedures adopted by other NPPOs in other areas of the world. Some of these proposals will be discussed in more details in Chapter 6, where qualitative results will be merged with the macroeconomic evidence and with the results stemming from the microeconomic analysis.

Table 2: Overview of the malpractices observed when implementing the ISPM 15 in the four case-study countries

Malpractice	Cameroon
Auditing the WPM treatment facility	V
Lack of inspections for imported goods	V
Readability of the stamp	V
Not all the facilities have an unique ISPM 15 stamp	V
Non-authorized treatment	V
Lack of information on some WPM treatment facility	V
Awareness of ISPM 15	V

Source: Authors' elaboration.

Note: "V" indicates that the malpractice is present in the country; whereas "X" indicates that it is not present

Regulation

An NPPO that needs to implement a standard should first develop a legislative and regulatory framework that will help explain it, to support delegation of functions as needed, and support auditing activities and inspections. In other words, Cameroon should develop a law to ensure that the standard is well described in its entireness and all the stakeholders are well aware of its existence. Efforts should be made to inform all stakeholders whose activities may be affected by the standard of its existence.

Currently, in Cameroon the legislative support is present but it portrays the wrong information (the use of PH3 as an authorized treatment and the information the mark should contain). The legislative support should explain all the steps needed to implement and to comply with the standard, and should therefore, among others, explain the approved treatments adopted and how to certify their uses, how WPM treatment facilities obtain license to operate, how to carry out audits, how to inspect imported consignments and how to disincentive fraud.

In what follows we try to enumerate all the information the legislative tool should have and we propose interactions and exchange of information between the public and the private sector.

Coordination

Awareness campaigns should be organized and informative brochures be prepared to promote the existence of the standard. As it stands several important stakeholders are still not aware of ISPM 15,

including ministries regulating trade, agricultural activities, or in charge of safeguarding the environment.

It should be clear that the correct implementation of and compliance with the standard is not the responsibility of the NPPOs alone, but a joint effort of all the stakeholders, both public and private.

Import control

Since WPM is associated with almost all shipments, including those that are not the target of phytosanitary inspections, cooperation with custom agencies is a *sine-qua-non* requirement for a correct implementation of the standard. The way inspections for imported goods are organized are similar in the four countries; the NPPO inspect plant-related imports, while customs inspect all imports for tax purposes. As there is no exchange of information between these organizations as to the arrival of consignments, which are not plant related, the WPM associated with these consignments are rarely inspected. Cooperation between customs and NPPOs should be reviewed to ensure effectiveness in detecting potential non-compliance of WPM.

We already mentioned the fact that other countries overcome this challenge by establishing a database of commodities that are most likely to be associated with WPM. Customs then targets these commodities and the NPPO inspects the WPM. Overall, an inspection manual should be prepared to inform inspectors on the share of imports to be inspected and based on what principle, and which actions should be taken when cases of non-compliance occur. It should for instance be decided whether to inspect randomly or according to assessment of risks based on the exporting country or type of consignment.

Continuous training of all staff (customs and NPPO inspectors, port employees) should be organized. A number of countries rely on paper documentations to track consignments. This challenges sharing of knowledge and the identification of pest risks, as the data is not easily analysed. All steps of the implement process should be computerized (lessons should be drawn from the ePhyto system).[7]

Definition of all those measures related to the non-compliance at the point of entry

Where WPM does not carry the required mark, action should be taken unless other bilateral arrangements between countries have been put in place. This action may take the form of treatment, disposal or refused entry, and the NPPO of the exporting country should be notified (ISPM 13 *Guidelines on notification of non-compliance and emergency action*). However, the authors did not find evidence of NPPOs having set up guidelines for non-compliance situations.

Treatments used

The treatments should be monitored extremely well by the NPPOs. Treatments different from those approved in ISPM 15 should not be used for treating WPM. One of the main objectives of the audits should be whether the amount of MB and the length of the HT are appropriate (see also *Contents of the audits*).

There are cases in Cameroon where the WPM treatment facilities may be using treatments that are not contemplated in ISPM 15. In other cases, the facility treating WPM does not have a unique ISPM 15

[7] For more information on the ePhyto project see http://www.standardsfacility.org/PG-504 (last accessed: 28/06/2017).

stamp, but where the NPPO lends the stamp to various facilities when required. This prevents trace back in cases of non-compliance.

Content of the audits

Does the chamber used for the HT meet the prescribed operating conditions? And do the treatment facilities use the prescribed amount of MB? Is the HT chamber properly loaded to allow the heated air to move through the entire load? Is the chamber equipment properly calibrated? Will the starting temperature of the wood – e.g. frozen wood – affect the treatment duration? Is the chamber appropriately sealed? Such questions highlight the fact that appropriate auditing would help improve implementation of the standard. Many interviewees stressed that audits need to be more accurate more frequent and unexpected, and records of the treatment operations need to be seen and studied. The auditor needs to be able to answer questions related to the mark application, and if the mark is in line with the ISPM.

All this information is necessary to gather a complete view on different phases of the implementation process. As we have seen, malpractices can occur for a number of reasons; it is possible that WPM treatment facilities attempt to treat WPM according to ISPM 15 but that the treatment is not applied properly. This may be because the minimum required dose of fumigant or heat, or the time of the treatment are not adequate. The malpractices that may lead to non-compliance can be unintentional. As an example, a WPM treatment facility may follow the treatment schedules correctly based on sensors within the chamber, but because of cold pockets or uneven distribution of the fumigant not all wood is treated equally.

For heat treatments, ISPM 15 specifies that temperature probes need to be carefully inserted to the core of the largest wood pieces present in the chamber during each treatment cycle. If the probes do not reach the centre of the wood or if a probe is not well sealed from the ambient air then the target temperature of 56 °C will be indicated sooner than it should. To obtain accurate readings all equipment must be calibrated and working properly. In addition, fans are often needed in chambers to help circulate the fumigant or heated air, and the individual pieces of WPM should be properly stacked to ensure good airflow. Each of these factors, as many others (e.g. presence of bark, cross-sectional size of wood pieces), could result in reduced mortality of the pests during treatment and in the subsequent non-compliance.

Understanding how the WPM treatment facilities apply MB or HT is as important as defining what happens if inspections of those facilities find non-compliance. Is the facility interdict from operating for a limited period of time? Is it inspected more frequently? What happens to its stamp if the facility is suspended for some months? The NPPOs should take punitive action against the non-compliant companies and this information should be made public. NPPOs in other countries often take such action to incentivize other facilities to comply. As an example, Canada publishes the information of non-compliant facilities, thereby creating a deterrent for other producers. In our understanding, such actions are not being taken in the four case-study countries.

WPM treatment facilities

In Cameroon, the NPPO was not aware that some of the authorized facilities had closed down, and the ISPM 15 stamp had not been returned. In another case, one exporter was purchasing treated WPM by a company whose license had not been renewed. Such issues could be solved by listing the authorized facilities on the NPPO's website, indicating also the expiration of the license and other details needed by the exporters to make a decision on which facility to use.

Another important issue related to the WPM treatment facilities is that most of them are still using MB, which is being phased out in most countries. The NPPO should encourage those facilities to change the treatment to HT or DH and possibly recommend using solar panels, as the temperature in several months of the year in the African target countries may reach 40 C^{o}.

Fraud

Episodes of intentional ISPM 15 non-compliance or fraud can occur. This happens when the ISPM 15 stamp is knowingly applied to WPM that has not been treated, or not properly treated. Widespread usage of WPM with fraudulent marks, especially if infested, would reduce the apparent impact that the ISPM 15 has on reducing WPM infestation rates.
While we were not made aware of any intentional case of non-compliance, the issue of WPM repair facilities remain serious. These facilities repair broken WPM with an end result that appears to be treated WPM, as it has the ISPM 15 stamp. However, the repaired WPM may not necessarily comply with the ISPM 15; this is only the case when the repaired part is maximum a third of the total wood.

Database on pest interceptions

Several countries maintain databases of pests that are intercepted at their points of entry. Long-term pest interception databases have been developed by governments and NPPOs in Australia, Canada, Chile, Europe and North Africa (developed by the EPPO), Mexico, New Zealand, and the US. Typically, inspectors target high-risk products, countries of import or pathways, rather than conducting completely random inspections. In addition, interception records are usually included in a country's database only when pests are found although there are exceptions.

This type of database is not present in ether of the four countries. A centralised database including all the 55 countries under the umbrella of IAPSC would be advisable, as it would offer a comprehensive picture of the impact of the standard.

3.3 Appendix

Figure 2: Extract of the Minader law 3/2008

ANNEXE 1

Modèle d'estampillage des matériaux d'emballage et des emballages à base de bois destinés au commerce international

(a)

CM [b] **– 000-AA-SQV**[c]

YY [d]

(e) _____

(f) _____

(g) _____

a. Le symbole comportant l'abréviation en anglais **IPPC** est mis pour désigner « La Convention Internationale pour la Protection des Végétaux » en français CIPV.

b. **CM** désigne le Code ISO du Cameroun suivi d'OOO-AA-SQV

c. le numéro d'identification unique assigné par la Direction de la Réglementation et du Contrôle de Qualité des Intrants et Produits Agricoles à l'entreprise de fabrication ou de production des matériaux à base de bois.

d. **YY** désignant le code ISO du traitement effectué.

- **HT** pour traitement thermique,
- **MB** pour le traitement au Bromure de Méthyle,
- **PH3** pour la fumigation à la phosphine.

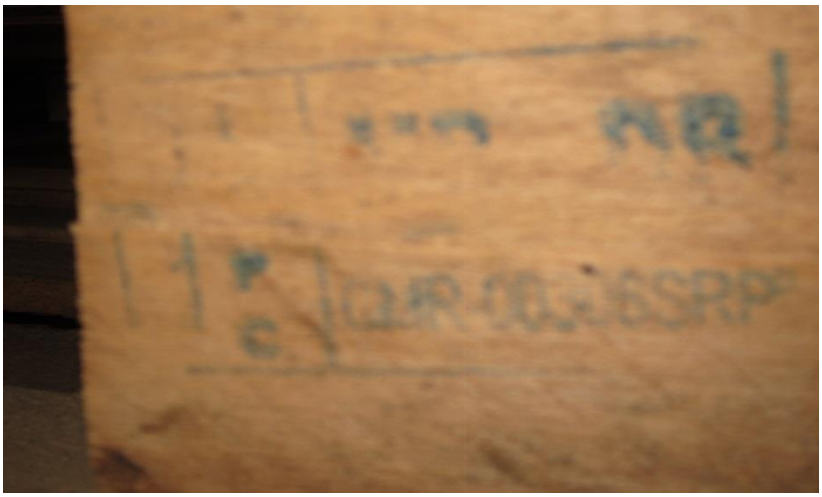
e. La date de traitement

f. Le code de l'institution chargée du marquage

g. N° du lot traité

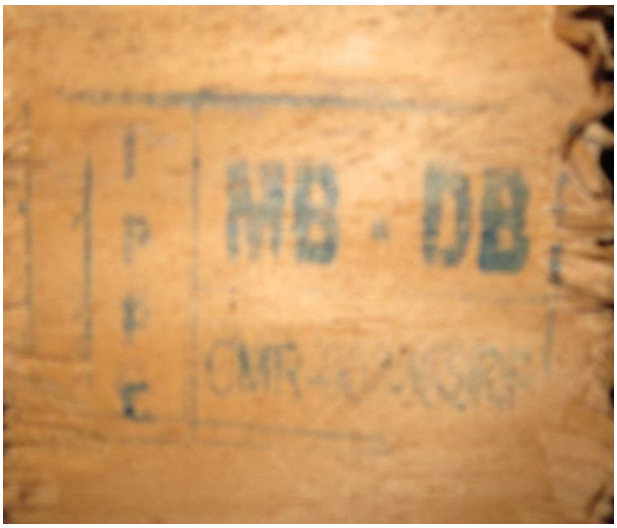
Note: A copy of the Minader law is available upon request.

Figure 3: ISPM 15 stamp applied to treated WPM



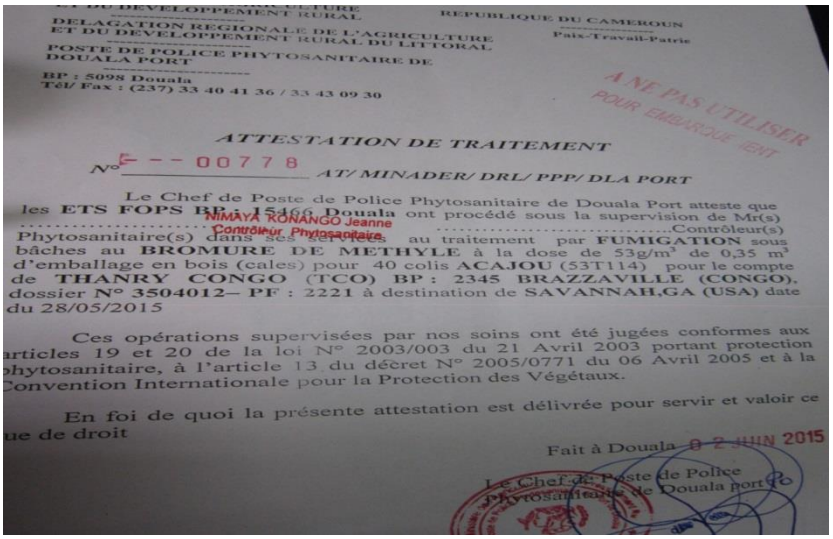
Note: The stamp is not legible in all its parts.

Figure 4: MB stamps applied to WPM treated by SIC-COCOA



Note: The ISPM 15 stamp has the characters "DB" as part of the stamp (left). The MD characters are added outside the official ISPM 15 stamp (right).

Figure 5: Treatment certificate for untreated imported WPM, Cameroon



DELEGATION REGIONALE DE L'AGRICULTURE ET DU DEVELOPPEMENT RURAL DU LITTORAL

POSTE DE POLICE PHYTOSANITAIRE DE DOUALA PORT

BP : 5098 Douala
Tél/ Fax : (237) 33 40 41 36 / 33 43 09 30

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

A NE PAS UTILISER POUR EMBARQUEMENT

ATTESTATION DE TRAITEMENT

N° E - - 00778 AT/ MINADER/ DRL/ PPP/ DLA PORT

Le Chef de Poste de Police Phytosanitaire de Douala Port atteste que les ETS FOPS BP : 15466 Douala ont procédé sous la supervision de Mr(s) NIMAYA KONANGO Jeanne Contrôleur Phytosanitaire Contrôleur(s) Phytosanitaire(s) dans ses SETTRES au traitement par FUMIGATION sous bâches au BROMURE DE METHYLE à la dose de 53g/m³ de 0,35 m³ d'emballage en bois (cales) pour 40 colis ACAJOU (53T114) pour le compte de THANRY CONGO (TCO) BP : 2345 BRAZZAVILLE (CONGO), dossier N° 3504012– PF : 2221 à destination de SAVANNAH,GA (USA) date du 28/05/2015

Ces opérations supervisées par nos soins ont été jugées conformes aux articles 19 et 20 de la loi N° 2003/003 du 21 Avril 2003 portant protection phytosanitaire, à l'article 13 du décret N° 2005/0771 du 06 Avril 2005 et à la Convention Internationale pour la Protection des Végétaux.

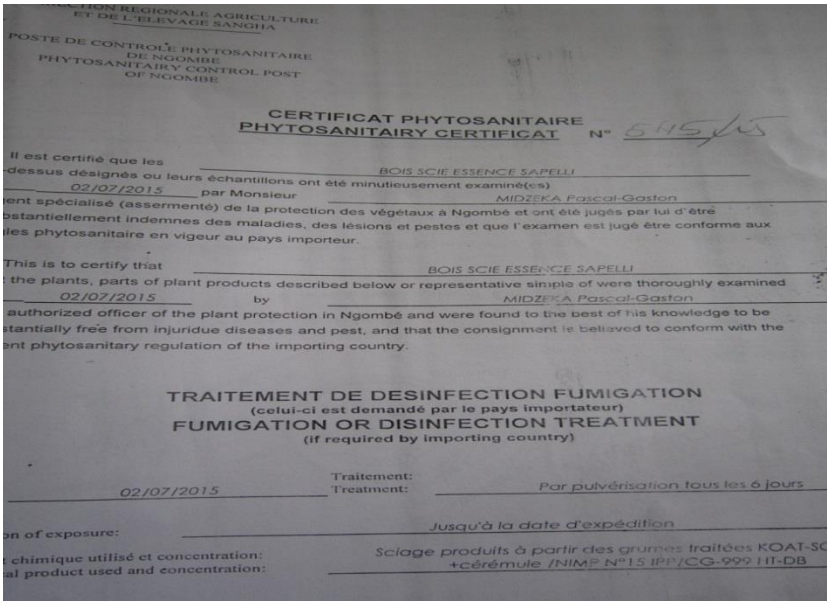
En foi de quoi la présente attestation est délivrée pour servir et valoir ce que de droit

Fait à Douala 02 JUIN 2015

Le Chef de Poste de Police Phytosanitaire de Douala port

Note: The document does not say how long the untreated WPM entering Cameroon should wait before getting treated.

Figure 6: Phytosanitary certificate for untreated imported wood material



DIRECTION REGIONALE AGRICULTURE ET DE L'ELEVAGE SANGHA

POSTE DE CONTROLE PHYTOSANITAIRE DE NGOMBE
PHYTOSANITAIRY CONTROL POST OF NGOMBE

CERTIFICAT PHYTOSANITAIRE
PHYTOSANITAIRY CERTIFICAT N° 515/15

Il est certifié que les BOIS SCIE ESSENCE SAPELLI
-dessus désignés ou leurs échantillons ont été minutieusement examiné(es)
02/07/2015 par Monsieur MIDZEKA Pascal-Gaston
ient spécialisé (assermenté) de la protection des végétaux à Ngombé et ont été jugés par lui d'être
bstantiellement indemnes des maladies, des lésions et pestes et que l'examen est jugé être conforme aux
iles phytosanitaire en vigeur au pays importeur.

This is to certify that BOIS SCIE ESSENCE SAPELLI
the plants, parts of plant products described below or representative simple of were thoroughly examined
02/07/2015 by MIDZEKA Pascal-Gaston
authorized officer of the plant protection in Ngombé and were found to the best of his knowledge to be
tantially free from injuridue diseases and pest, and that the consignment is believed to conform with the
ent phytosanitary regulation of the importing country.

TRAITEMENT DE DESINFECTION FUMIGATION
(celui-ci est demandé par le pays importateur)
FUMIGATION OR DISINFECTION TREATMENT
(if required by importing country)

02/07/2015 Traitement: Treatment: Par pulvérisation tous les 6 jours

on of exposure: Jusqu'à la date d'expédition

chimique utilisé et concentration: Sciage produits à partir des grumes traitées KOAT-SC
al product used and concentration: +cérémule /NIMP N°15 IPPC/CG-999 IIT-DB

4 Description of Macroeconomic Analysis

The macroeconomic analysis employs econometric methods to assess changes in trade volumes (for a wide range of sectors) after the implementation of ISPM 15. We follow the conventional methodological approach used for such purposes in the empirical trade literature, which is the estimation of trade gravity models (see Clougherty and Grajek, 2014; De Santis, 2012). These allow estimating simultaneously the statistical correlation (association) of these bilateral trade flows with several socio-economic and geographical factors. Three gravity models were estimated for 86 different types of commodities:

1. A parsimonious (simple) "fixed effects" model, which can be summarized by the following specification:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + \varepsilon_{ijt}\ , \qquad \textbf{(1)}$$

where V_{ijkt} refers to the value of trade (imports/exports) in product type *k* from/to our case study country (Cameroon) *i* to/from any trade partner country *j* at time *t*, $Income_{ijt}$ captures the real GDP size of both trading partners *i* and *j* (which, hence, controls for the fact that trade tends to expand in accordance with the increasing size of both exporting and importing economies), and $ISPM\ 15_{it}$ is a time dummy taking the value of 1 for the years corresponding to the year Cameroon implemented the standard. ε_{ijt} captures the unexplained component of the estimated statistical relationship (i.e. the part of the variation in the dependent variable, the sector-specific trade volume, that cannot be explained by either). All the *b*'s correspond to the estimated coefficients that capture the size of the correlation between trade flows and other explanatory variables. Fixed effect estimators control for the effects of time invariant variables (in other words, fixed effects models impose time independent effects for each entity, i.e. country combination, that are possibly correlated with the explanatory variables) and are typically the preferred analytical tool in econometric analysis, since they are able to control for often important (but often unobservable and hence omitted) time invariant factors (e.g. cultural characteristics).

Particular attention will be given to the coefficient *b2*, which measures changes in trade volumes during the periods before and after implementation of ISPM 15. We hypothesize that the sign of this coefficient can be either positive or negative, dependent on a number of factors. Implementation of ISPM 15 can harm some exporting sectors, assuming that compliance increases the costs of pallets and, hence, of exported products, rendering them less competitive in international markets. It can also be the case that the implementation has the opposite effect, for instance by creating opportunities for an increase in export volumes by allowing access to markets with stringent plant protection regulations. It can also reduce the volume of imports for specific commodities by permitting imports only from a reduced number of ISPM 15-compliant trading partners. Such a reduction in imports can be the combined result of reduced competition and higher import prices, of fewer trading partners to meet demands, of the higher WPM costs passed on to the price of the final product, or due to higher administrative (e.g. inspection) costs of the importing country. All trade volumes will be measured in a natural logarithmic

scale, and, therefore, the *b2* coefficient will capture the percentage change between the periods before and after ISPM 15 implementation.

2. A richer "fixed effects" model, which includes a more sophisticated specification with additional explanatory factors:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + b3\ X_{jt} + \varepsilon_{ijt}\ , \qquad \textbf{(2)}$$

where again, the volume of bilateral trade will depend on (a) the size of economic activity (*Income*); (b) ISPM 15 implementation of Cameroon and a vector *X* of additional control variables. These additional explanatory factors include: (c) an interaction variable that examines how non-implementation of ISPM 15 in Cameroon can interact with ISPM 15 implementation in the export country to potentially reduce export volumes (variable: *ISPM 15 partner*). For the case of exports, this variable takes a value of 1 for the years when the trading partner implemented ISPM 15 but Cameroon had not done so. For the case of imports, the corresponding variable takes a value of 1 when Cameroon implemented ISPM 15 but the trading partner had not done so. Last, this richer model includes an institutional variable that relates to the extent of corruption in the export country (*Transparency*). The institutional variable aims to capture whether Cameroon prefers to trade with countries characterized by higher levels of transparency in transactions (see Anderson and Marcouiller, 2002). Again, the fixed effect estimators control for the effects of time invariant variables (in other words, fixed effects models impose time independent effects for each entity (country combination) that are possibly correlated with the explanatory variables).

3. A random effects model, that includes, in addition to the variables of Model 2, an additional set of time-invariant factors:

$$V_{ijkt} = b0 + b1\ Income_{ijt} + b2\ ISPM\ 15_{it} + b3\ X_{jt} + b4\ Z_{ijt} + \varepsilon_{ijt}\ , \qquad \textbf{(3)}$$

where the vector *Z* captures the additional time-invariant variables, namely: (a) *Distance* which is a variable capturing distance between countries (distance between capital cities in km) – we expect distance to correlate negatively with trade flows, as a result of larger transportation costs; (b) a dummy variable taking a value of 1 when Cameroon and each trade partner share borders (variable *Borders*) (we expect countries with common borders to trade more with one another, other things equal); (c) a dummy variable taking a value of 1 when trade partners share a common language as this may facilitate trade (variable *Language*); and (d) a dummy variable taking a value of 1 in cases of historical links between colonies and colonial powers, which may increase trade for involved parties (variable *Colony*). For gravity models using similar geographical variables see the papers by Gómez-Herrera (2013) and Lohmann (2013). All the other explanatory variables appearing in Model 2 (fixed effects richer model) are also included in the random effects model. Contrary to fixed effects estimators, random effects models do not impose time-independent effects for each entity (country combination) that are possibly correlated with the explanatory variables. In other words, we assume that variation in the explanatory

variables arises from random causes and is not systematically related to the country-combinations over time.

The second model (fixed effects richer specification) provides the most reliable estimators (although results are shown also for the more parsimonious fixed effects and random effects specifications for key export and import commodities). Random effects estimations are based on the assumption that individual-specific effects are uncorrelated with independent variables, an assumption that is often violated in panel data settings (in other words, the corresponding Hausman tests conducted are in favour of the fixed effects estimators). The first model is likely to provide biased estimators as a result of an omitted variable bias (i.e. a restricted model with few variables is likely to omit key explanatory factors and, hence, bias either downwards or upwards of the estimated coefficients of the included variables). All models make use of robust standard errors that correct for any heteroscedasticity effects on statistical significance.

4.1 Description of Macroeconomic Data

The research team has compiled data from multiple sources such as UN Comtrade dataset, World Development Indicators, and World Governance Indicators. Below is a detailed description of all variables used in the macroeconomic analysis.

Trade flows: These have been captured by the value of imports and exports across 86 commodity categories from/to Cameroon and to/from any trade partner country. These bilateral annual trade flows are expressed in a natural logarithmic scale and are available for the years 1995–2013. All data are available from the UN International Trade Statistics Database, commonly known as the Comtrade website (https://comtrade.un.org).

ISPM 15: Data on ISPM 15 implementation for all countries. The *ISPM 15* variable is a time dummy taking the value of 1 for the years corresponding to the implementation year of the standard by Cameroon. The variable *ISPM 15(partner)* is an interaction variable that examines how non-implementation of ISPM 15 in Cameroon can interact with ISPM 15 implementation in the export country to potentially reduce export volumes. For the case of exports, this variable takes a value of 1 for the years when the trading partner implemented ISPM 15 but Cameroon had not done so. For the case of imports, the corresponding variable takes a value of 1 when Cameroon adopted ISPM 15 standard but the trading partner had not done so.

Income: Data on real GDP in 2010 constant prices. In all regressions, the natural logarithm of the product of the GDP size (of pairs of trading partners) has been used. Data are available from the World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators).

Transparency: An institutional variable that relates to the extent of corrupt practices in the export partner economy. This is a control of corruption index that captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" (appropriation) of the state by elites and private interests. It is measured in a −2.5 to 2.5 scale

where 2.5 corresponds to the lowest level of corruption and −2.5 corresponds to the highest level of corruption. Data are available from the Worldwide Governance Indicators (www.govindicators.org).

Borders: A dummy variable taking a value of 1 when Cameroon and each trading partner share borders.

Language: A dummy variable taking a value of 1 when the trading partners share a common language.

Distance: A variable capturing distance between the capital cities of partner countries (expressed in km and logarithmic scale).

Colony: A dummy variable taking a value of 1 in cases of historical links between colonies and colonial powers.

The descriptive statistics for all variables are available in Table 3.

Table 3: Descriptive statistics - Cameroon

Variable	Mean	Standard Deviation	Minimum	Maximum
Trade flows (exports)	10.32	3.43	0	20.54
Trade flows (imports)	9.83	3.17	0	21.01
ISPM 15	0.52	0.50	0	1
ISPM 15 (export partner)	0.03	0.18	0	1
ISPM 15 (import partner)	0.03	0.16	0	1
Income	49.36	2.23	40.57	54.05
Transparency	0.39	1.16	−2.06	2.50
Borders	0.11	0.31	0	1
Language	0.51	0.50	0	1
Distance	8.39	0.79	6.13	9.85
Colony	0.04	0.20	0	1

4.2 Empirical Analysis

A total of 516 models were estimated (i.e. 86 sectors × 2 trade categories (imports/exports) × 3 model specifications). Results are presented below.

Exports

Tables 28 and 29 present detailed results for the two most important export sectors of Cameroon (in terms of export value); cocoa products (

Table 4) and wood articles (Table 5). We present estimates for all three empirical models (column 1 for the parsimonious fixed effects specification, column 2 for our preferred richer fixed effects specification and column 3 for the random effects specification).

According to

Table 4 (Model 2), there was a non-statistically significant increase by 56% in the exports of cocoa products during the period after the implementation of ISPM 15 (60% and 92% according to Models 1 and 3). For the case of wood articles (Table 5, Model 2), there was a non-statistically significant increase by 8% during the same period (9% and 4% according to Models 1 and 3).

Table 4: Cameroon exports of cocoa products

Dependent variable:	FE	FE	RE
	(1)	(2)	(3)
Constant	−45.29	−39.29	−13.74
Income	1.19***	1.07***	0.53***
	(0.25)	(0.37)	(0.16)
ISPM 15	0.60	0.56	0.92**
	(0.46)	(0.50)	(0.41)
ISPM 15 (partner)		−0.11	0.14
		(1.10)	(0.11)
Transparency		−0.83	0.25
		(0.84)	(0.42)
Borders			2.69***
			(1.00)
Language			−1.21*
			(0.73)
Distance			−0.01
			(0.62)
Colony			3.88***
			(0.80)
R^2 overall	0.26	0.16	0.34
(within; between)	(0.21; 0.34)	(0.16; 0.26)	(0.14; 0.46)
Countries	52	52	51
N	330	282	273

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Table 5: Cameroon exports of wood articles

Dependent variable:	FE	FE	RE
	(1)	(2)	(3)
Constant	−16.85	−22.33	−16.07
Income	0.61***	0.72***	0.53***
	(0.20)	(0.23)	(0.16)
ISPM 15	0.09	0.08	0.04
	(0.14)	(0.15)	(0.13)
ISPM 15 (partner)		0.10	0.08
		(0.16)	(0.16)
Transparency		0.54**	0.24
		(0.26)	(0.19)
Borders			0.04
			(1.08)
Language			0.35
			(0.45)
Distance			−0.66*
			(0.37)
Colony			2.34***
			(0.57)
R^2 overall	0.23	0.20	0.25
(within; between)	(0.05; 0.28)	(0.05; 0.26)	(0.31; 0.25)
Countries	120	115	108
N	1042	867	842

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Figure 7 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2) across all export sectors (based on the estimates of our preferred Model 2). Effects are presented in descending order, with the sectors experiencing the largest increases in export volumes during the post-ISPM 15 period appearing at the top. The majority of the sectors experienced an increase in export volumes. The largest increases were in man-made filaments (+356%) and basketware and wickerwork (+347%), while the largest decreases were in vegetable textiles and fibres (−439%) and lace and embroidery (−333%).

Figure 7: Distribution of ISPM 15 effects across all exporting sectors

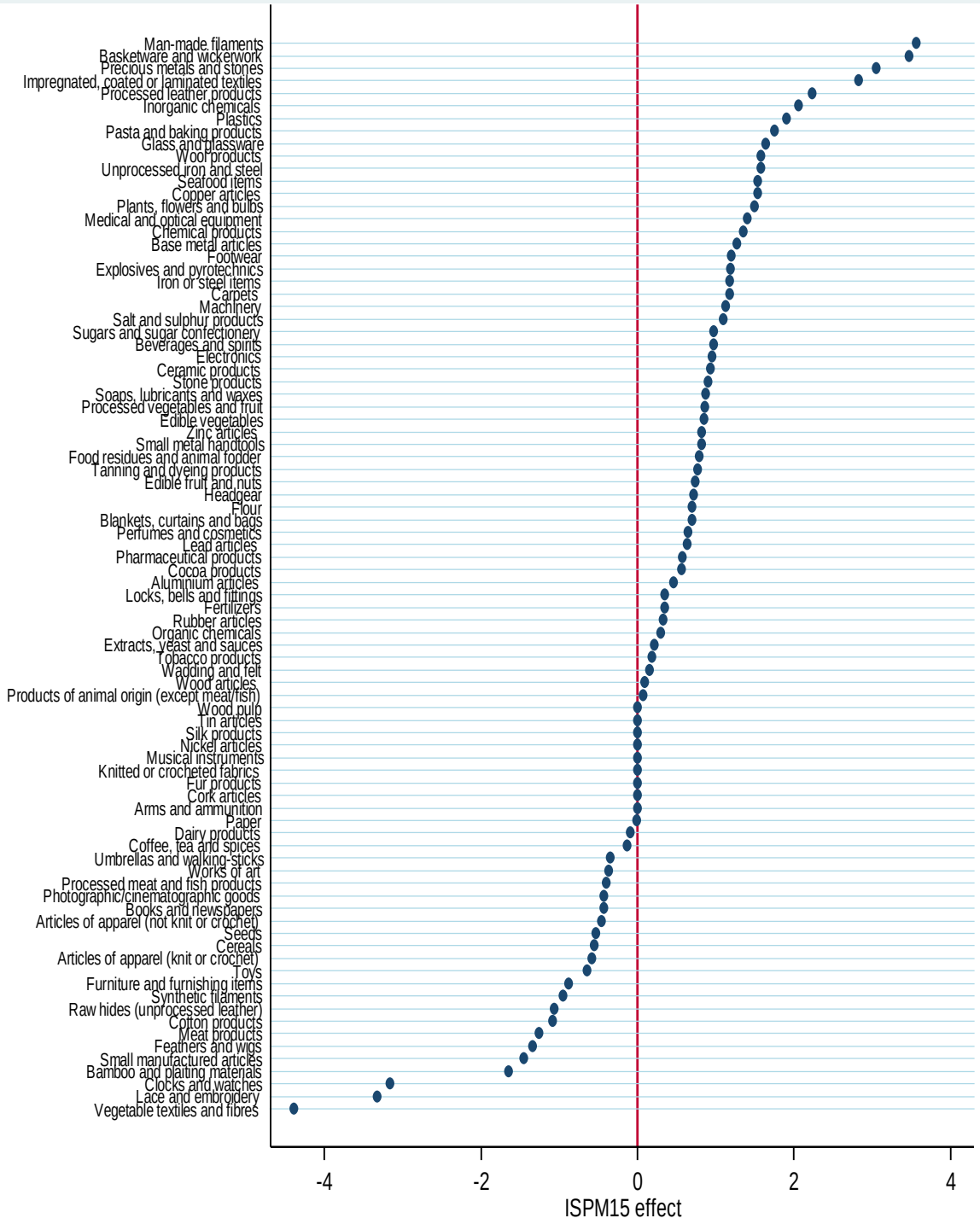
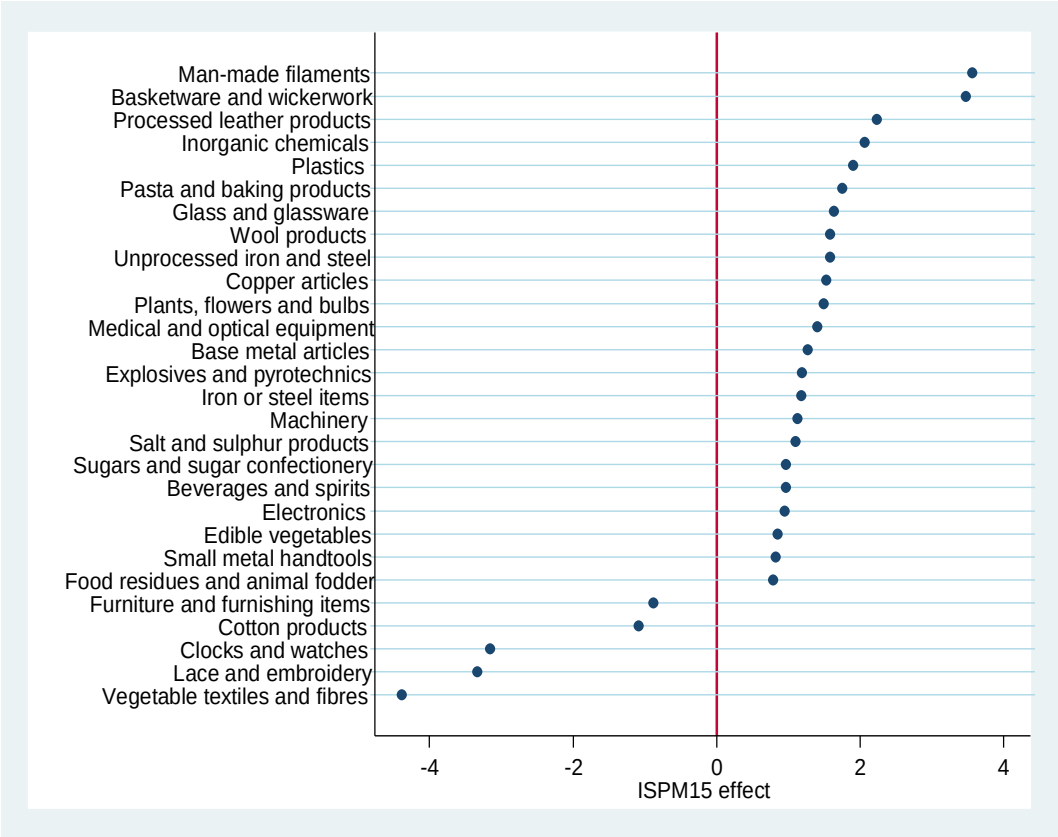

Man-made filaments
Basketware and wickerwork
Precious metals and stones
Impregnated, coated or laminated textiles
Processed leather products
Inorganic chemicals
Plastics
Pasta and baking products
Glass and glassware
Wool products
Unprocessed iron and steel
Seafood items
Copper articles
Plants, flowers and bulbs
Medical and optical equipment
Chemical products
Base metal articles
Footwear
Explosives and pyrotechnics
Iron or steel items
Carpets
Machinery
Salt and sulphur products
Sugars and sugar confectionery
Beverages and spirits
Electronics
Ceramic products
Stone products
Soaps, lubricants and waxes
Processed vegetables and fruit
Edible vegetables
Zinc articles
Small metal handtools
Food residues and animal fodder
Tanning and dyeing products
Edible fruit and nuts
Headgear
Flour
Blankets, curtains and bags
Perfumes and cosmetics
Lead articles
Pharmaceutical products
Cocoa products
Aluminium articles
Locks, bells and fittings
Fertilizers
Rubber articles
Organic chemicals
Extracts, yeast and sauces
Tobacco products
Wadding and felt
Wood articles
Products of animal origin (except meat/fish)
Wood pulp
Tin articles
Silk products
Nickel articles
Musical instruments
Knitted or crocheted fabrics
Fur products
Cork articles
Arms and ammunition
Paper
Dairy products
Coffee, tea and spices
Umbrellas and walking-sticks
Works of art
Processed meat and fish products
Photographic/cinematographic goods
Books and newspapers
Articles of apparel (not knit or crochet)
Seeds
Cereals
Articles of apparel (knit or crochet)
Toys
Furniture and furnishing items
Synthetic filaments
Raw hides (unprocessed leather)
Cotton products
Meat products
Feathers and wigs
Small manufactured articles
Bamboo and plaiting materials
Clocks and watches
Lace and embroidery
Vegetable textiles and fibres
-4
-2
0
2
4
ISPM15 effect

Figure 8 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2; Model 2) only for those export sectors where the effect was found to be statistically significant (at least at the 10% level of significance). The majority of sectors experienced an increase in export volumes. The largest increases in the period after ISPM 15 implementation were in man-made filaments (+356%) and basketware and wickerwork (+347%), while the largest decreases were in vegetable textiles and fibres (−439%) and lace and embroidery (−333%).

Figure 8: Distribution of only statistically significant ISPM 15 effects (exports)



Imports

Tables 30 and 31 present detailed results for the two most important import sectors in Cameroon (in terms of import value); machinery (

Table 6) and cereals (Table 7). We present estimates for all three empirical models (column 1 for the parsimonious fixed effects specification, column 2 for our preferred richer fixed effects specification and column 3 for the random effects specification).

According to

Table 6 (Model 2), there was a statistically significant increase by 76% in the imports of machinery during the period after ISPM 15 implementation (73% and 55% according to Models 1 and 3). For the case of cereals (Table 7, Model 2), there was a non-statistically significant increase in export value by 78% during the same period (78% and 54% according to Models 1 and 3).

Table 6 : Imports of Machinery - Cameroon

Dependent variable:	FE (1)	FE (2)	RE (3)
Constant	−37.32	−33.63	−44.42
Income	0.99***	0.92***	1.17***
	(0.28)	(0.35)	(0.10)
ISPM 15	0.73***	0.76***	0.55***
	(0.16)	(0.19)	(0.12)
ISPM 15 (partner)		−0.31	−0.33
		(0.24)	(0.28)
Transparency		−0.32	0.25
		(0.37)	(0.18)
Borders			0.34
			(0.98)
Language			0.57
			(0.42)
Distance			−0.28
			(0.40)
Colony			2.72***
			(0.50)
R^2 overall	0.57	0.51	0.63
(within; between)	(0.19; 0.52)	(0.17; 0.49)	(0.16; 0.63)
Countries	151	150	138
N	1437	1182	1121

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Table 7: Imports of Cereals - Cameroon

Dependent variable:	FE	FE	RE
	(1)	(2)	(3)
Constant	10.49	9.17	−29.65
Income	0.02	0.05	0.23
	(0.82)	(0.91)	(0.28)
ISPM 15	0.78	0.78	0.54
	(0.56)	(0.57)	(0.39)
ISPM 15 (partner)		−0.19	−0.26
		(0.87)	(1.01)
Transparency		−0.77	−0.95**
		(0.81)	(0.41)
Borders			3.69*
			(2.11)
Language			0.76
			(0.99)
Distance			3.21***
			(0.99)
Colony			8.42***
			(1.09)
R^2 overall	0.01	0.01	0.31
(within; between)	(0.03; 0.08)	(0.04; 0.01)	(0.04; 0.21)
Countries	68	67	65
N	409	339	336

*Note: Robust standard errors of coefficients in parentheses. Superscripts *, **, *** correspond to a 10, 5 and 1% level of significance.*

Figure 9 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2) across all import sectors (based on the estimates of our preferred Model 2). Effects are presented in descending order, with the sectors experiencing the largest increases in import volumes during the period after ISPM 15 implementation appearing at the top. The majority of the sectors experienced an increase in import volumes. The largest increases in the aftermath of ISPM 15 implementation were in seafood items (+186%) and tin articles (+183%), while the largest decreases were in meat products (−249%) and base metal articles (−191%).

Figure 9: Distribution of ISPM 15 effects across all importing sectors

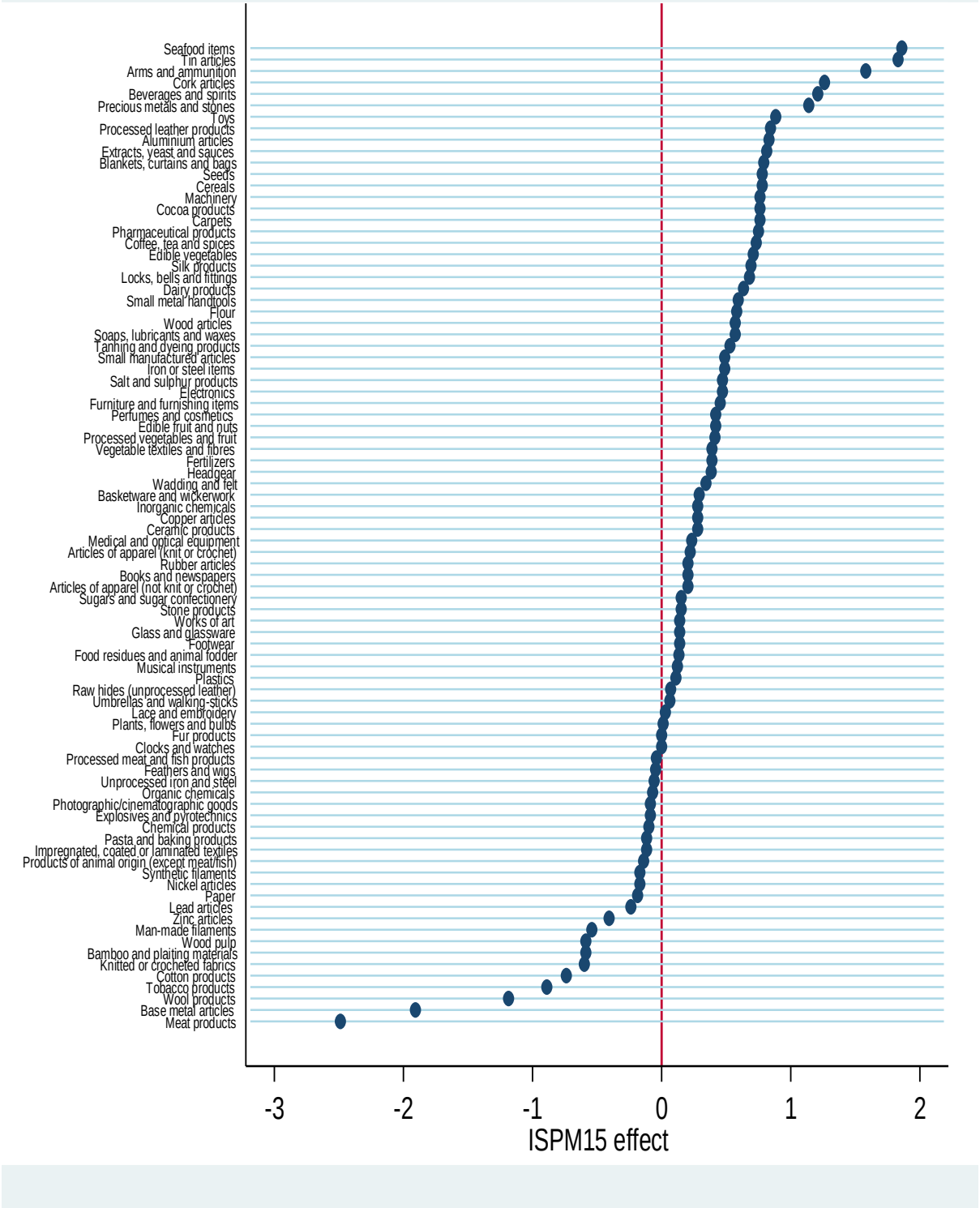
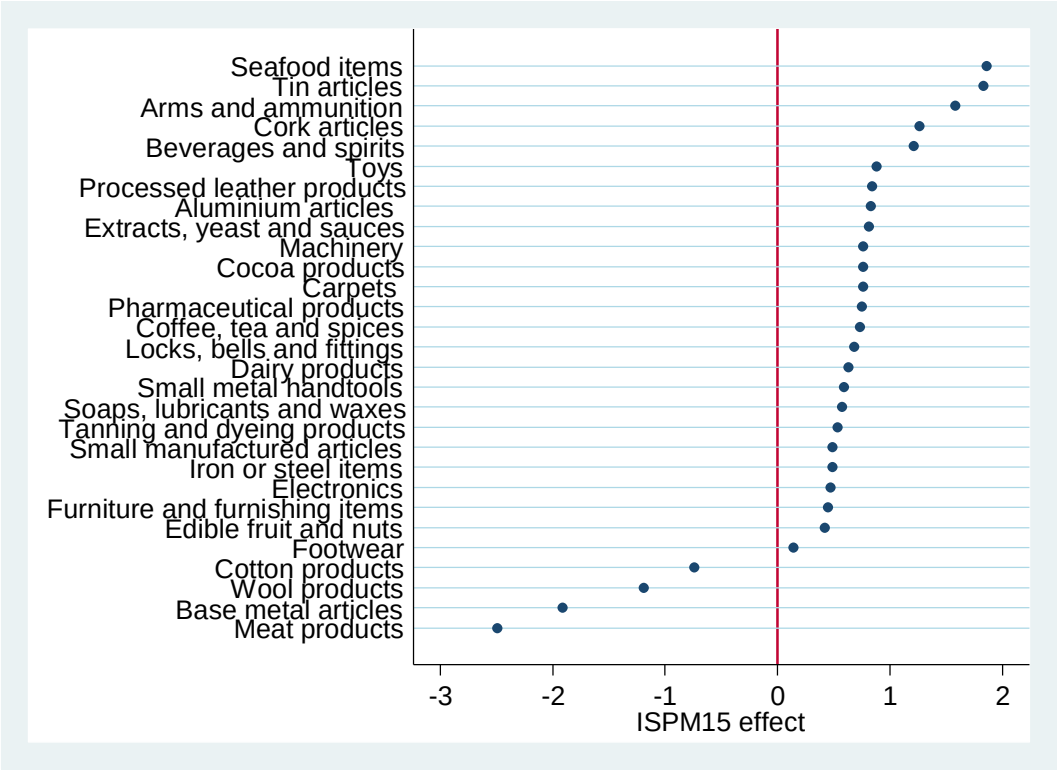


Figure 10 provides in graphical form the distribution of the size of effect of ISPM 15 implementation (b2; Model 2) only for those import sectors where the effect was found to be statistically significant (at least at the 10% level of significance). The vast majority of the sectors experienced an increase in import volumes. The largest increases in the aftermath of ISPM 15 implementation were in seafood items (+186%) and tin articles (+183%), while the largest decreases were in meat products (−249%) and base metal articles (−191%).

Figure 10: Distribution of only statistically significant ISPM 15 effects (imports)



Change in Trade Balance

Multiplying the sector-specific coefficient of the ISPM 15 with the value of the corresponding sector (2013 values) provides an estimate of the change in value for the particular exporting/importing sector between the periods before and after ISPM 15 implementation (after controlling for other determining factors, such as the size of economic activity, transparency levels, etc.). We do this for all sectors where the ISPM 15 effect is statistically significant (i.e. those listed in Figure 8 for exports and Figure 10 for imports). Tables Table 8 and Table 9 display the change in export and import value (in million USD) per sector. The largest drop in export values were in cotton products (USD −163.5 million) and furniture and furnishing items (USD −0.81 million). The largest drop in import values were in meat products (USD −21.66 million) and cotton products (USD −6.59 million).

Aggregating these values across all these exporting and importing sectors provides the overall change in value for all exports and imports. Overall, exports increased by USD 149,612,000, while imports

increased by USD 1,478,612,000. As a result of this, the trade balance deteriorated by USD 1,329,000,000 (Figure 11).

Table 8: Change in export values per sector (in million USD)

Cotton products	−163.50
Furniture and furnishing items	−0.81
Lace and embroidery	−0.03
Clocks and watches	−0.02
Paper	0.00
Man-made filaments	0.01
Processed leather products	0.04
Food residues and animal fodder	0.04
Copper articles	0.05
Basketware and wickerwork	0.14
Base metal articles	0.46
Plants, flowers and bulbs	1.19
Edible vegetables	1.28
Explosives and pyrotechnics	2.62
Small metal handtools	2.71
Electronics	5.04
Pasta and baking products	6.83
Salt and sulphur products	13.20
Medical and optical equipment	13.30
Sugars and sugar confectionery	13.58
Beverages and spirits	13.58
Iron or steel items	18.88
Plastics	19.00
Glass and glassware	24.60

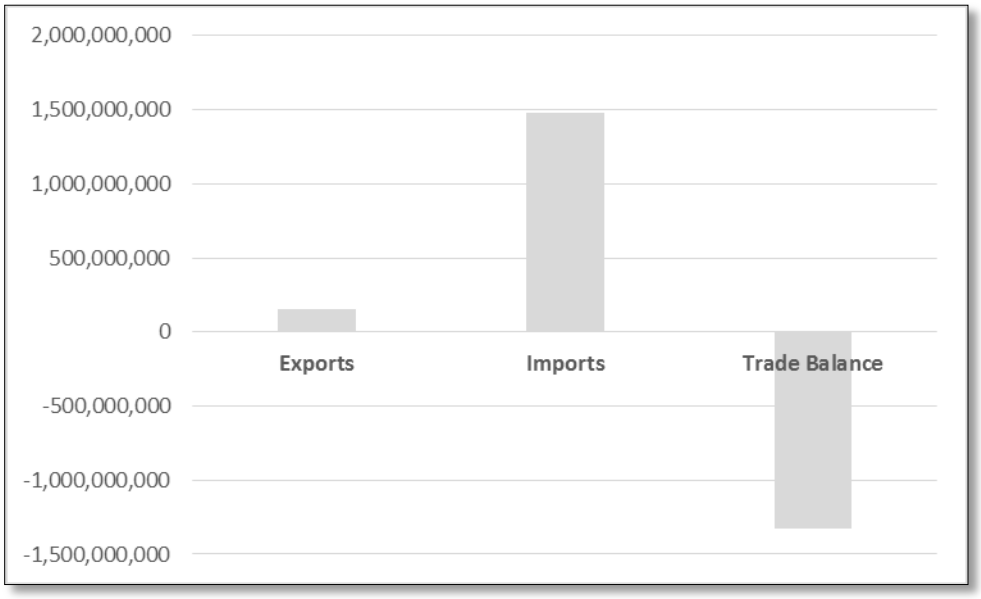
Unprocessed iron and steel	56.88
Machinery	58.76
Inorganic chemicals	61.80

Table 9: Change in import values per sector (in million USD)

Meat products	−21.66
Cotton products	−6.59
Base metal articles	−1.38
Wool products	−0.03
Cork articles	0.05
Tin articles	0.05
Coffee, tea and spices	1.61
Edible fruit and nuts	1.97
Cocoa products	2.28
Carpets	2.43
Small manufactured articles	4.31
Footwear	4.76
Toys	5.28
Processed leather products	7.56
Tanning and dyeing products	10.07
Arms and ammunition	10.27
Soaps, lubricants and waxes	13.11
Small metal handtools	13.57
Furniture and furnishing items	18.00
Aluminium articles	18.26
Locks, bells and fittings	20.40
Extracts, yeast and sauces	30.78
Dairy products	36.54

Iron or steel items	78.40
Beverages and spirits	79.86
Pharmaceutical products	135.00
Electronics	164.50
Machinery	402.80
Seafood items	446.40

Figure 11: Changes in values of exports/ imports/ trade balance in Cameroon (USD)



Summary of Findings

The purpose of this macroeconomic analysis is to estimate changes in trade volumes (exports/imports) during the periods before and after ISPM 15 implementation across multiple commodity sectors. We followed the conventional methodological approach used for such purposes in the empirical trade literature, which is the estimation of trade gravity models. These allow estimating simultaneously the statistical correlation (association) of these bilateral trade flows with several socio-economic and geographical factors. Overall, we found that:

- The majority of sectors experienced an increase in export volumes. The largest increases in the aftermath of ISPM 15 implementation were in man-made filaments (+356%) and basketware and wickerwork (+347%), while the largest decreases were in vegetable textiles and fibres (−439%) and lace and embroidery (−333%).

- The vast majority of the sectors experienced an increase in import volumes. The largest increases in the aftermath of ISPM 15 implementation were in seafood items (+186%) and tin articles (+183%), while the largest decreases were in meat products (−249%) and base metal articles (−191%).
- Overall, exports increased by USD 149,612,000, while imports increased by USD 1,478,612,000. As a result of this, the trade balance deteriorated by USD 1,329,000,000.

Policy Recommendations

Given the unequal distribution of effects across sectors, the authorities in Cameroon need to pay attention to those sectors that experienced an economic contraction in the aftermath of the ISPM 15 implementation. The export sectors with the largest percentage decreases were: vegetable textiles and fibres (−439%) and lace and embroidery (−333%). In total, five export sectors experienced a statistically significant drop in export revenues (Figure 8). A more qualitative-based analysis per sector needs to identify the extent to which the drop in export revenues for each sector has been associated with the administrative burden and costs associated with the implementation of ISPM 15 in combination with other underlying internal and external factors (e.g. changes in prices locally and globally, emergence of new competitors, constraints in domestic productive capacity, or exchange rate volatility). The same should also apply in the context of import sectors.

In Cameroon, the ISPM 15 implementation appears to be associated with an overall increase in both exports and imports. Overall, exports increased by USD 149,612,000, while imports increased by much more (USD 1,478,612,000). As a result of this, the trade balance deteriorated by USD 1,329,000,000. This is an issue of concern, given that Cameroon has been running an overall trade deficit since 2008. Supporting those exporting industries that experienced a contraction in the aftermath of ISPM 15 implementation could at least partly offset these persistent trade deficits. Alternatively the government could support those sectors that grew substantially after the implementation of ISPM 15, as long as these industries can expand further and compensate for the value and employment loss that other contracting sectors experienced.

5. ISPM 15: findings based on microdata

The precise assessment of the costs and the benefits related to implementation of ISPM 15 does not constitute an easy task. Available studies on the subject have not been able to go beyond rough estimates, as a number of hypothetical and sometimes unquantifiable factors are often involved. There are no studies, to our understanding, trying to quantify the costs and the benefits related to the implementation of ISPM 15 in developing countries, which makes the present research of particular importance for its contribution to the subject matter.

The available evidence – mostly based on country case studies and regional assessments conducted in developed areas of the world – suggests that:

- **i.** The burden of the compliance cost is imposed on exporting countries.
- **ii.** WPM treatment facilities (i.e. private businesses) have to bear the implementation costs. Those costs are later transferred to the exporters and to the final consumers via the importers.
- **iii.** The cost of compliance is relatively high if put in relation to the income level of the low income and least developed countries.
- **iv.** While the cost of compliance is high, the short- and long-term costs related to the lack of compliance is enormous, in terms of potential foregone export, income and employment.
- **v.** The cost and efficiency of the compliance depend, *inter alia*, on the organization of the supply chain.

Although the implementation and compliance costs relate to both imports and exports, the majority of the costs burden the exporter. For this reason, this chapter will assess the costs and the burden of compliance from the perspective of the WPM treatment facilities, which were very likely to experience a number of new fixed and variable costs and benefits since implementation of ISPM 15 became compulsory in the country.

Implementation of and compliance with ISPM 15 may, however, also generate costs on stakeholders other than the WPM treatment facilities. For instance, the NPPO may incur additional costs related to the organization of training courses, or there may be the need for additional phytosanitary inspectors (Table 10).

Table 10: Costs and benefits related to the ISPM 15 implementation

Implementation at the export level		**Implementation at the import level**
Costs	*Benefits*	*Costs*
Fixed costs for the WPM treatment facilities Inspections/audits costs for the WPM treatment facilities Variable costs for the WPM treatment facilities Validation checks	Revenues from the sale of treated WPM	Legislative changes Hiring of inspectors and inspections Training inspectors Adminstrative costs Purchase of the necessary equipment
Overall benefits for the country	Being able to export Reduction in the introduction and spread of economically devastating pests Agricultural yields not affected by economically devastating pests	

Source: Authors' elaboration.

Those costs are not taken into account here when computing the overall costs that compliance with the standard may have generated. In this chapter we limit our analysis to estimating the costs the WPM treatment facilities are facing and comparing them to the revenues. For the time being we will disregard all the costs related to organizing the import inspections.

From the perspective of the WPM treatment facilities, the compliance costs can be high in absolute and relative terms, especially for those developing countries lacking the know-how, resources and specific competencies related to ISPM 15. According to the available literature on this issue, the cost of compliance is the sum of all expenses that are directly and indirectly related to the standard's implementation. Those costs include the funds disbursed for purchasing components of the supply chain (fixed costs) for instance to purchase a heat chamber or the necessary equipment to apply MB. In addition, the cost analysis should take into account a number of variable costs too; costs related to hiring workers with the necessary technical expertise of the treatment, to carrying out inspections, to obtaining the license to operate, and so forth.

The revenue benefits for the WPM treatment facilities relate to the mark-up price WPM treatment facilities can charge for their treated WPMs. If there is a positive difference between the benefits and the costs it would indicate that the WPM treatment facilities are economically viable entities. In addition, it would indicate that the whole system created ad-hoc for implementing and complying with the standard is generating revenues and that there is enough demand for treated WPM. However, if the costs are higher than the financial benefits this may indicate that the overall chain is not profitable enough. In this case, it would be important to understand which are the system bottlenecks, why a loss exists and which potential remedies could be put in place.

The cost-benefit analysis of ISPM 15 cannot be limited to the assessment of the economic profitability of the WPM treatment facilities. There are a number of other direct and indirect economic consequences the implementation of the standard may generate. For the sake of completeness, we have supported the results of the cost-benefit analysis with the analysis of the procedures put in place by the NPPOs (i.e. the agencies responsible for implementing ISPM 15), and with a macroeconomic analysis of the trade position of the country. The first type of analysis, referred to as the qualitative analysis (Section 3), will

assist the NPPOs to implement ISPM 15 better. The second type of analysis, the macroeconomic analysis (Section 4), looks at how the trade position of each of the four case-study countries has evolved after the implementation of ISPM 15, and which sectors have benefited the most. The third, the microeconomic analysis, will be discussed in this section.

The stakeholders of ISPM 15 implementation, and especially the NPPOs, should take the results of the three types of analysis into consideration to increase their understanding of the effects the standard has generated. Therefore, the three analyses may be read as stand-alone or as three different components of the same phenomena.

The rest of this section is organized in the following way. The next section introduces and describes the survey tool used for the data collection process. The questionnaire was given to all the WPM treatment facilities operating in the country, and the rate of responsiveness, any missing data problems as well as data quality will be discussed too. The presentation of the descriptive statistics and the costs and benefits analysis is presented in Section 5.3, followed by the conclusions.

5.1 Description of the survey tool

There are many ways to conduct a cost-benefit analysis related to the implementation of ISPM 15. One way could be to examine all the expenditures the central government faced to guarantee the correct implementation of the standard. Those costs may relate to the research needed to understand and correctly apply the treatments, to the change in the regulation adopted by the country in matters related to trade and in the management of the "new" supply chain, or to the hiring of phytosanitary inspectors. Another strategy could be to assess the aforementioned costs and compare them with the number of pests that have been introduced in the country before and after the standard was implemented; this comparison would help quantifying the funds saved as a consequence of the reduction of such pests. This analysis would also help understanding the impact the standard has had at the phytosanitary level and, possibly, on the agricultural yield and productivity. Data for assessing these costs and impacts are scarce, if not completely lacking.[8] As previously discussed, the activity of keeping up-to-date records of pests in the country is not conducted in any of the four case-study countries.

In what follows, we will assess the costs WPM treatment facilities have faced, and if the costs will outcast the benefits coming from the sale of the treated WPM. For this purpose, we prepared a survey tool consisting of a detailed questionnaire directed at the WPM treatment facilities operating in each of the four case-study countries. The questionnaire comprises several different sections, each of which relates to different aspects of the WPM treatment facilities' business cycle.[9] The seven sections the questionnaire are composed as following:

[8] The lack of data is related to the fact that it is extremely difficult to know, with a high degree of certainty, that a particular species was introduced by a particular commodity. Usually, such information is largely based on assumptions. Furthermore, it is computationally complicated to assess the economic and environmental impact of the pest in a particular region.

[9] The questionnaires used in the four countries differ slightly to reflect country-specific situations. However, the content of the four questionnaires, as well as the data collected, are in any case comparable. A copy of the master questionnaire, which was developed before the country missions, is attached to this study. Copies of the four country-specific questionnaires are available upon request.

i. Section 1: Questions regarding the wood treatment facility

ii. Section 2: Wood treatment facility: general information

iii. Section 3: Wood treatment information

iv. Section 4: Wood treatment training

v. Section 5: Costs related to the wood treatment

vi. Section 6: Benefits related to the wood treatment

vii. Section 7: General comments.

Section 1 includes general questions about the respondent and its role within the facility, the year the facility started to operate as a treatment facility, and all the requirements needed to obtain the license to operate. The section also queries the number of employees and whether there was an increase in the number of employees following the implementation of the standard.

The second section, investigates the main activities performed by the facility. For instance, whether the facility also manufactures the WPM it will later treat, or if it repairs broken WPM. Given some types of packaging material is made of different materials, the section also queries if the facility only produces WPM or also other packaging material. Also the capacity of the facility in terms of number of treated WPM per year is queried, as are details as to potential repetition of treatments, and which companies buy the final product and for what purpose. In other words, the section aims at understanding the core businesses of the facilities and their capacity.

The third section poses questions regarding the wood treatments used. We query which treatment the facility uses and the main reasons for choosing that instead of another treatment. We also query whether the facility is planning to invest in another treatment and the reasons behind that choice. Lastly, we inquire about any cases where their ISPM 15 mark has been used by other facilities without them knowing.

Section 4 outlines questions regarding the training received by the WPM treatment facility. In this section, we gather information about the type of training received and the organization offering the training, to understand if guidelines have been given to the treatment facility. Furthermore, we ask whether the treatment facilities receive updates on how to comply with ISPM 15 considering its various revisions. The section also seeks information on the time the facility spent purchasing new equipment or adapting old equipment for implementing the international standard. This part tries to assess whether the implementation process is time consuming, for instance in terms of permits required. The section then moves on to gather information on the audits the NPPO does of the facility; the frequency and the type of audit, whether they are done unexpected, and the result of the audits.

Section 5 gathers a series of financial data related to the costs the facility has to cover every year in order to run the treatment business. These are the fixed costs (e.g. investment costs, costs for equipment, license cost) and the variable costs (costs of labour, energy, maintenance, timber, and administration). We also query if the company received any Government subsidy.

Section 6 examines the sources of revenues of the facilities. In this section we gather data on the pieces of treated WPM sold, the unit price and the amount of the unit price for each WPM before ISPM 15 was implemented. The respondent is also asked to indicate the overall economic benefits and costs of ISPM 15 at the facility level.

Section 7 deals with perceptions and gathers data on the knowledge the interviewee has on the possible costs and benefits of the ISPM 15. Here, we try to differentiate between socio-economic impacts (both positive and negative), the main implementation challenges, and the main environmental consequences of the implementation.

5.2 Description of the respondents

Table 11 lists all the WPM treatment facilities currently operating in Cameroon and that have answered the questionnaire. The collection of the data was delegated to a team of enumerators working for the NPPO of the given country. The connection between the enumerators and the NPPO served to make sure that the enumerators were knowledgeable about ISPM 15 and to help ensure that the respondents (the WPM treatment facility employees) would trust the enumerators when providing any type of data, especially those pertaining to financial aspects. This strategy was successful in many cases, but failed in a few.

Table 11: List of WPM treatment facilities for which microdata have been collected, divided by country

Progressive number	Name of the WPM treatment facility	District	City
	Cameroon		
1	Fipcam	Centre	Mfou
2	SCIFO	Centre	Nsimalen
3	SN COCAM	Centre	Mbalmayo
4	CDC	South WEST	Tiko
5	ETMS SARL	Littoral	Wouri
6	SEEF	Littoral	Wouri
7	Ets FOPS	Littoral	Wouri
8	PREMIUM	Littoral	Wouri
9	CHS SA	Littoral	Wouri
10	PHP	Littoral	Moungo
11	ECAM PLACAGE	Centre	Mbalmayo
12	GIR	Littoral	Bonaberi-Douala
13	SCHA	Littoral	Douala

Note: Some of the above-mentioned WPM treatment facilities are also WPM manufacturers.

For what concerns the data collection process, the following should be noted.
It took the research team about three months to receive the lists of the WPM treatment facilities from the Cameroon NPPO. For some European countries, such as Italy and the Netherlands, this list is published online, and only the WPM treatment facilities that have a valid license to operate are included (the list is updated regularly). Having an online list available to anyone is beneficial for several reasons, for instance exporters can check that the WPM treatment facility they buy treated WPM from has been authorized by the NPPO.

When designing the data collection process, we aimed at interviewing all the WPM treatment facilities operating in the four countries (and not a sample of them) to get a complete and exhaustive picture of that specific business. This approach has not worked well in Cameroon, where out of the 26 facilities contacted, only 14 facilities provided responses. For various reasons, ten of the facilities refused to receive the NPPO enumerators, despite the fact that they had been previously alerted about the survey and a copy of the questionnaire had been sent to them before the visit. They did not motivate their refusal but it is assumed that the facilities feared disclosing any financial data, thinking perhaps that this information could be used for tax purposes. It seems contradictory, and highly peculiar, that the NPPO, which authorizes the WPM treatment facilities and is in charge of auditing them at least once a year, is denied access to those facilities. In addition, there were two cases in Cameroon where the facilities were no longer active. This poses questions as to the authorization process, since the NPPO was not aware of the closure. It also provides for possible fraud, as the ISPM 15 stamp might still be with the closed facility (in the case of HT, as for MB treatments the NPPO keeps the stamp).

It is also crucial to highlight a few things about the quality of the data collected by the enumerators. The overall rate of responsiveness was relatively good. The questionnaires were well compiled by the enumerators and well answered by the respondents. However, the section, aimed at gathering data on the financial disbursements of the facilities, presented some issues, as in some cases respondents were not willing to disclose their costs and their revenues. This in spite of making it very clear to all the interviewed facilities that data would have been used in an anonymous way. This is particularly true for the facilities located in Cameroon and for the facility located in Botswana. On the contrary, those in Mozambique and in Kenya showed greater interest in participating at the survey.

Some of the questions in the survey presented missing values where the respondents did not give an answer. In those situations we have not imputed the missing value but continued the analysis without that particular data point. In several cases the information gathered via the survey tool has been triangulated with the qualitative information collected during the country missions or with other information or data coming from third sources. This check has been necessary to verify the correctness of some of the microdata, and in some cases, the data collected tell a different story than that told in the qualitative interviews. As an example, the manager of the WPM treatment facility located in Botswana, mentioned that he had never been audited by the NPPO whereas the data collected using the questionnaire reports that he is audited once a year. We cannot always determine which version reflects the reality, and can therefore only make the reader aware of such inconsistency. However, most of the data collected is in line with data collected by third parties and published in academic publications, which underpins the quality of the data and of the analysis presented here.

5.3 Descriptive statistics

Each NPPO, at its own discretion, sets a number of requirements each of the applicant facilities should present to obtain authorization as a legitimate WPM treatment facility. These requirements are not well communicated to the facilities. The respondents' answers within each country highlight that there is no consistency in the type of requirements requested from the facilities, even within the same country (Table 12).

In Cameroon, the 14 facilities, which disclosed information on the requirements can be divided in three groups, each of which mentions different documents to be presented to obtain the treatment license. In some cases, the difference in the requirements that companies need to meet to be considered for authorization might simply be due to different wording, as "comply with legislation" may be the same requirement as "having a formal license to operate". In other cases, the requirements listed by the respondents are completely different from facility to facility, and go from showing proof of having paid income taxes, being insured, providing copies of the diplomas of the employed technicians, to having a legal plan.

Generally speaking, the NPPOs should have clear requirements that apply to all applicants for WPM treatment authorization, and they should communicate these publicly. The NPPO could achieve this by preparing a document to be published in the country's official gazette or on its official website. This issue will be discussed more in details in the next concluding chapter.

Table 12: Requirements for becoming a legit WPM treating facility

# of facilities	Requirement	Req.	Req.	Req.
6	Comply with legislation	Employees' contract	Diploma for technicians	Inspection
4	Authorization from the Min. of agriculture	Insurance	List of personnel	A legal plan
3	Tax receipts	Formal license	Report of activities	

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

On average, the facilities in Cameroon are relatively small with the number of paid and permanent employees equal t0 7 (Table 13). The implementation of ISPM 15 has influenced the number of employees hired; 20 percent of the Cameroonian facilities observed an increase with an average increase in the number of employees of 2.

Most of the interviewed WPM treatment facilities were already in the WPM business before ISPM 15 was implemented and, as there was no requirements for treatments, they were manufacturing WPM and selling it to export companies. With the implementation of the standard, some of them became, in addition to being WPM manufacturers, treatment facilities too. Those facilities that were not in business before the implementation of ISPM 15, opened their facilities because they believed it would be a profitable business. In Cameroon, 23 percent of the facilities still manufacture WPM, and about 29 (33) percent repair non-treated (treated) WPM.

Table 13: Size and employees number of the WPM treating facilities and type of business

Average number of employees working in the WPM treating facility	Share of WPM treating facility which had an increase in the number of employees after ISPM 15 implementation (in %)	Average increase in the number of employees	Share of WPM treating facilities manufacturing WPM (in %)	Share of WPM treating facilities repairing WPM (in %)	Share of WPM treating facilities repairing treated WPM (in %)	Share of the WPM produced/ treated in the facility made of wood (in %)
7	20	2	23	29	33	100

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

Table 14 presents the amount of WPM treated monthly by the treatment facilities, and at the use and destination of the treated WPM. In Cameroon, an average of 700 WPMs are treated each month by each facility. However, it should be noted that these numbers may be inflated; some of the facilities in Cameroon repeat the treatment after two weeks, if the treated pallets have not been used. This contradicts ISPM 15 that instead provides that "[…] a unit of wood packaging material that has been

treated and marked in accordance with this standard and that has not been repaired, remanufactured or otherwise altered does not require re-treatment or reapplication of the mark throughout the service life of the unit".

When it comes to the treatment used, the facilities located in Cameroon use either HT or MB treatments (Table 14). In addition, a few facilities in Cameroon use the "vaporization" treatment, which is not an ISPM 15 recognized treatment. However, this matches the qualitative evidence described in Chapter 3 where we observed that the NPPO of Cameroon, incorrectly, informed facilities that PH3 was one of the possible ISPM 15 treatments. All facilities have chosen the treatment method based on the same reasons (whether HT or MR); lower costs, easier implementation, and effectiveness of treatment the WPM.

The share of facilities considering using other treatments is very low, and the majority there are considering this are those currently using MB, wishing to apply instead HT. The treatment facilities are allowed to use the MB treatment for the time being but they will need to switch to HT soon because MB will be phased out for quarantine purposes too.

Table 14: Number of WPM treated, their use and type of treatment

Average number of WPM being treated per month	Internal or international customers	Use of the treated WPM	Treatment used	Reason for choosing that treatment	Share of facilities thinking of adopting a new treatment (in %)
709	n/a	Agricultural Manufactured Wood	HT (54%) MB (54%) Vaporization (9%)	1. Less expensive 2. Easier to implement 3. More effective	15

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

One of the main activities the NPPOs have had to organize when the country decided to implement ISPM 15 was training of stakeholders (Table 15). For all four case-study countries, an initial training was offered to the vast majority of the WPM treatment facilities. In Cameroon the Ministry of Agriculture carried out the majority of the training; the data on the training clashes with the information gathered via non-structured interviews (see Chapter 3), where some of the interviewed stakeholders stated that no training had been received.

It is also crucial that the NPPOs notify all stakeholders, and particularly the WPM treatment facilities, on matters related to compliance with the standard; more than three quarters of the interviewed facilities are aware of changes adopted to ISPM 15.

ISPM 15 clearly prescribes that the NPPO should audit all the facilities present in the country. The data indicate that the NPPOs inspect the facilities randomly, and that the inspections are carried out either by the NPPO or by the Ministry of Agriculture (Table 15). The frequency of the inspections is yearly or biannual. Two main observations arise from this. First, ISPM 15 does not clearly specify the frequency of inspections, leaving it up to the NPPO to decide. The NPPOs of the four case-study countries have decided for one or maximum two inspections per year, and this is in line with ISPM 15.
Second, the content of the inspections is unclear and varies between the inspections. The NPPOs do not have guidelines or standard operating procedures for the inspections to guide the inspectors. This presumably leads to the result that different inspectors carry out the inspections different ways; some

of them may assist at the WPM treatment, others may look at the records of MB used, yet others may simply have an informal chat with the facility managers. ISPM 15 also prescribes that "[…] for the purpose of auditing, the treatment provider keeps records of heat treatments and calibrations for a period of time specified by the NPPO", but the interviewed NPPOs did not show any indication that they comply with this.

Table 15: Types of training received and inspections being made

Share of WPM treating facilities which have received training	Agency which organized the training	Share of WPM treating facilities which are receiving updates about the standard	Share of WPM treating facilities having random inspection (in %)	Organization in charge of organizing the random inspection	Number of random inspection per year
92	Ministry of Agr. (82%) Other (36%) NPPO (10%)	77	100	Ministry of Agr. (100%)	2 (67%) 1 (33%)

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

The last section of the questionnaire refers to the consequences, at many different levels, the implementation of ISPM 15 may have had in the country. This section has the objective to understand the knowledge of the interviewees have of the standard and its spillover effects. The first question sought details on the effects on the small wood processing facilities (Table 16). All respondents agreed that the implementation of ISPM 15 has had and will have positive consequences for wood processing facilities, mainly in terms of job creation. This matches the findings presented earlier one, namely that the implementation of standard has increased the employment rate.

The second part of the table presents the positive and negative environmental effects caused by the implementation of the standard. The answers given by the respondents are all correctly related to ISPM 15. Few respondents focus on the negative aspects, and stress that the persistent use of MB will likely deplete the ozone layer, which is indeed the reason why the use of MB has been banned in several other countries. The positive environmental impacts the implementation of standard may generate are related to the improvement of the overall phytosanitary situation of the country, which is incidentally the reason why the standard was developed in the first case, and in an improved pest management, which has not actually been dealt with in any of the countries under analysis.

We finally focus on the general impacts of the implementation of the standard in the short and in the long run. Positive aspects range from increased employment to an increase in the foreign market access along with the country credibility. Some of the positive outcomes of ISPM 15 are interlinked with negative impacts. The respondents mention the high initial investments, which may constitute a barrier for entering into the WPM treatment business, and the use of toxic gas.

Table 16: Main social, environmental and overall impacts of the ISPM 15

Main social impacts
Job creation
Environmental impacts
Increase in pollution
Ozone depletion for MB use
Better pest managment
Positive (p) and negative (n) impacts of the ISPM 15
Increase in employment (p)
Increase access to foreign markets (p)
Protection of the environment (p)
Good international image of the country (p)
Use of toxic gas (n)
Initial high investments (n)

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

Table 17 lists the types of costs borne by WPM treatment facilities. The costs, which were originally measured in the local currency of the country, are expressed in USD in the table.[10] First, we query the amount spent for all the equipment and the number of years that equipment should be used for. The costs here are higher if the facility uses HT, just as the number of years the equipment will last for is higher than for MB treatments. The life expectancy of the equipment will serve to discount the amount spent for the equipment and allocate a share of those expenses to the next years. Equipment and license costs constitute the fixed costs each facility has every year.

Table 17: Average annual cost –in USD- for the WPM treating facilities, disaggregated by the source

Cost	Cameroon
Equipment cost	2,747
(Life expectancy of the equipment)	(8)
License	230
Costs for repairing equipment	620
Administrative cost	922
Timber costs	0
Salaries	850
External costs	2,622
Energy related costs	2,893
Other material cost	579
Other cost	0
Total	**11,471**

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

The process of estimating the costs related to the implementation of and compliance with ISPM 15 should consider the time needed to set up a WPM treatment facility This period relates to the time needed for the facility to purchase or update equipment, present all the necessary documentation, be

[10] The costs, as well as the revenues, refer to the year before the year when the interview has taken place. The interviews took place in 2016, hence the financial data refer to 2015.

inspected by the NPPO, and obtain authorization to operate. In the questionnaire, this was tackled through two questions; the first pertained to the time needed to purchase any equipment needed for treating the WPM, and whether the facility needed to update existing machines; the second related to the number of months needed to become fully operational.

There is substantial variation in terms of months needed among countries and among facilities located in the same country (Table 18); the overall number of months needed for a facility to become operational ranges between seven to about 18 months.

The questionnaire also queried the revenues the WPM treatment facilities have realized in the current year. In order to compute this figure, we first queried the maximum capacity of the facility, (i.e. the maximum number of WPM the facility is able to treat per year). Here again, the answers may vary among facilities; on average the maximum capacity amounts to about 70,000 WPM per year. The actual number of WPM the facilities treat every year is lower than the maximum number; in Cameroon, the facilities' capacity are underused, as only 12 percent is used. The demand for treated WPM has slightly increased compared to the previous year, as the comparison between the number of WPM treated this year and last year shows.

The last part of Table 18 shows all the different data previously analysed to assess whether the WPM treatment business is a profitable one.

The first column of the table presents the estimated annual cost each WPM treatment facility will bear to be operational. These costs are average, meaning that some of the facilities may face higher costs than those expressed. The second column indicates the number of WPM the facility treats every year. Based on the price each treated WPM is sold for –approximately 1,2 USD- we can infer what would be the ideal amount of WPM to be treated and sold every year for the revenues to cover the total costs. This information is in the third column.

Results indicate that costs are higher than the revenues for the facilities located in Mozambique, and that to reach the breakeven point these facilities should treat an additional 700 pieces of WPM each year. The facilities operating in Cameroon and Kenya are doing so in surplus, as they treat approximately 1,000 and 3,000 WPM more than what they need to operate without incurring in any loss.

Table 18: Time needed for updating/purchasing equipment, total WPM capacity and total costs

Average number of months needed to update/buy machineries	Average number of months needed to become operational	Share of WPM treating facilities undergoing a verification process (in %)	Maximum number of WPM the facility can treat, per year	Number of WPM being treated in the current year	Number of WPM being treated in the previous year
12.4	5.4	100	83,547	10,147	9,025
Total cost	# of WPM treated	# of WPM treated for to break even			
11,471	10,147	6,858			

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.

After having investigated whether the facilities operate in a loss or in a surplus, we will now examine whether it would be more profitable to close the facility and instead invest the money. To answer this, we need to know the current interest rates on savings in the four countries. Table 19 shows two different interest rates, one that is more conservative with lesser return, and the other less conservative with higher potential return on the investment. The interest rates relate to a deposit investment for a

period of 24 months. The last two rows of the table show that in either case, whether a more conservative interest rate or a more speculative one is chosen, the revenues coming from the investments would be lower than the surplus coming from the facility.

Table 19: Cost-benefit analysis for the WPM treatment facilities

	Cameroon
Costs	11,471
Revenues	9,639
Surplus/deficit	+ 3,124
Interest rate (lower band)	3.04
Interest rate (higher band)	4.77
Revenues with no investments in WPM (lower band)	166
Revenues with no investments in WPM (higher band)	260

Source: Microeconomic data gathered from WPM treatment facilities. Authors' elaboration.
Data on Cameroon come from https://tradingeconomics.com/cameroon/deposit-interest-rate .

5.4 Conclusions

Is implementing ISPM 15 sustainable for the WPM treatment facilities? Does it offer a good return on the investments disbursed by the facility? Is it necessary for the central government to subsidize the facilities? Would it be better to disinvest from the WPM treatment business and invest in a 24-months bank deposit?
This chapter has tried to answer these questions by using the microeconomic data gathered from the WPM treatment facilities located in the four case-study countries.

The objective of this chapter goes beyond the mere measurement of the costs and the revenues of the facilities. Instead it examines the implementation of the standard by looking at it from the perspective of the facilities. To do this, the facilities were studied with a magnifying glass to understand how they are organized, which have been their choices of treatments and why, and what is the demand of treated WPM. Furthermore, we wished to understand whether the information the facility gets from the NPPO is clear, if any training is provided and what the overall level of knowledge the facilities have of ISPM 15 is.

With this in mind, we designed a facility-level questionnaire with questions ranging from the documentation needed to be presented when requesting authorization from the NPPO to operate in the WPM business, the employment rate of those facilities, the treatments the facilities use, to the training organized to instruct the facility appropriate in how to comply with ISPM 15. In addition, we asked the respondents to elaborate on possible effects – environmental, social and economic – they feel ISPM 15 may have caused. Lastly, an entire section of the survey tool looked at the financial costs the facilities bear when operating, and at their annual revenues. We looked at all the costs related to the treatment process, both fixed and variable costs, and after assessing the costs related to the equipment, to

obtaining authorization, and to salaries and energy, we compared them with the revenues from the sale of the treated WPM.

The analysis highlighted a number of interesting key points. First, there is no homogenous approach to what is requested from applicants wishing to obtain authorization as a WPM treatment facility. While ISPM 15 does not set requirements around this, there should be clarity within the country on the documentation requested from the applicant facilities to provide for transparency, equality and efficiency, and help ensure that the facilities meet all the requirements for operating the treatments set out in ISPM 15.

The authorization process is rather fast; overall the process from purchasing all the necessary equipment to receiving the license may take up to two months. The NPPOs should improve the process by providing clearer indications and ad-hoc training.

On the financial side, the content of this chapter, discussed in combination with the qualitative evidence and the macroeconomic analysis, will help understand the overall costs and benefits of implementing the standard. There has recently been controversy over whether it is economically viable to implement and comply with the standard. Those in disagreement with the standard presents the argument that most introduced pests are innocuous whereas ISPM 15 implementation is costly and usually only delays pest introductions, rather than eliminating them.

This chapter demonstrates that the WPM treatment facilities operating on Cameroon are self-sustainable and that the costs are off-set by the revenues from the sale of treated WPM.

We also presented the hypothetical scenario in which the average investment spent on a facility would be put in the bank for two years. This hypothesis demonstrated that investing in the facilities is more profitable than investing in a bank. The exercise shows the viability of the WPM treatment business in the four countries, and that the costs related to implementing the standard at the export level are off-set by the revenues. In the next and concluding chapter, we will incorporate the results from all the different analyses to offer a more complete view on the sustainability of the international standard, considering here also other benefits, such as the possibility to export to countries implementing the standard, which have not been considered in this chapter.